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Report for the Presidential Climate Commission

Social Ownership Models in the Energy Transition

About this report

This Presidential Climate Commission (PCC) report on social ownership models in the energy transition presents preliminary research and stakeholder consultation findings as a basis for a work programme to blueprint viable models for diverse ownership of new electricity generation assets.

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About the Presidential Climate Commission

The PCC is a multi-stakeholder body established by the President of the Republic of South Africa. The PCC advises on the country's climate change response and supports a just transition to a low-carbon climate-resilient economy and society.

The PCC produces recommendations to government based on research and evidence and facilitates dialogue between social partners—ultimately aiming to define the type of economy and society we want to achieve and detailed pathways for how to get there.

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Abbreviations

ABM	Abahlali Base Mjondolo
ACSA	Airports Company of South Africa
AITF	Automotive Industry Transformation Fund
AMCU	Association of Mineworkers and Construction Union
AoU	Assembly of the Unemployed
ASDU	Alternative Service Delivery Unit
ATTP	Assistance to the Poor
BESS	Battery Energy Storage System
BMZ	Germany's Federal Ministry for Economic Cooperation and Development
CAPEX	Capital expenditure
CBAM	Carbon Border Adjustment Mechanism
CJC	Climate Justice Coalition
CJCM	Climate Justice Charter Movement
CoCT	City of Cape Town
COSATU	Congress of South African Trade Unions
CORE	Community-Owned Renewable Energy
CPA	Communal Property Associations
CPI	Consumer Price Index
CSIR	Council for Scientific and Industrial Research
DFI	Development Finance Institutions
DHET	Department of Higher Education and Training
DMRE	Department of Mineral Resources and Energy
DPWI	The Department of Public Works and Infrastructure
DSI	Department of Science and Innovation
DTI	Department of Trade and Industry
DTIC	Department of Science and Innovation
ED	Enterprise Development
EDF-SA	Energié de France South Africa
ERA	Electricity Regulation Act
ESMAP	Energy Sector Management Assistance Program
EV	Electric Vehicles
FBE	Free Basic Electricity
FiT	Feed-in Tariff
FTE	Full-time Equivalent
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit

IDC	Industrial Development Corporation
IDP	Integrated Development Plan
IDZ	Industrial Development Zones
IMF	International Monetary Fund
INEP	Integrated National Electrification Programme
IPCC	Intergovernmental Panel on Climate Change
IPILRA	Interim Protection of Informal Land Rights Act
IPP	Independent Power Producer
JET	Just Energy Transition
JET-IP	Just Energy Transition Investment Plan
JT	Just Transition
kV	Kilovolt
kW	Kilowatt
kWh	Kilowatt-hours
LED	Local Economic Development
MFMA	Municipal Finance Management Act
MIPPP	Municipal Independent Power Producers Procurement
MPPP	Municipal Public-Private Partnership
MW	Megawatt
MWh	Megawatt-hour
NAACAM	National Association of Automotive Component and Allied Manufacturers
NAAMSA	National Association of Automobile Manufacturers of South Africa
NACTU	National Council of Trade Unions
NDP	National Development Plan
NEDLAC	National Economic Development and Labour Council
NERSA	National Energy Regulator of South Africa
NGO	Non-governmental Organisations
NPO	Non-Profit Organisation
NPV	Net Present Value
NUM	National Union of Mineworkers
NUMSA	National Union of Metalworkers of South Africa
OPEX	Operational Expenditure
PARI	Public Affairs Research Institute
PCC	Presidential Climate Commission
PPA	Power Purchase Agreement

RDP	Reconstruction and Development Programme
RE	Renewable Energy
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
SAFTU	South African Federation of Trade Unions
SALGA	South African Local Government Association
SAMWU	South African Municipal Workers Union
SATAWU	South African Transport and Allied Workers Union
SDCEA	South Durban Community Environmental Alliance
SEA	Sustainable Energy Africa
SETA	Sector Education and Training Authority
SEZ	Special Economic Zone
Solar PV	Solar Photovoltaic
SORE	Social Ownership for Renewable Energy
SSEG	Small-Scale Embedded Generation
TA	Traditional Authorities
ToU	Time of Use
TSO	Independent Transmission and System Operator
VEM	Vukani Environmental Movement

The Wesley-Ciskei wind farm, situated on communal land near Hamburg in the Eastern Cape, became operational in 2021. Source: https://www.goodthingsguy.com/environment/eastern-cape-wind-energy-farm-officially-connected-to-the-grid/

EXECUTIVE SUMMARY

The objective of this significant study was to undertake an extensive literature review and stakeholder consultations on social ownership models for the energy transition, leading to the development of a work programme to blueprint viable models for diverse ownership of new electricity generation assets.

The methodological approach used in the **literature review** involved searching university databases and grey literature using specific terms related to renewable energy and social ownership. Case studies were chosen based on diversity of approaches, economic viability, and additional contributions to wider social benefits, community empowerment, and energy democracy. The selection of case studies was not based on the organisational form of social ownership but rather on the diversity of models and approaches by a range of constituent parties.

For conducting **consultation**, the identification of relevant stakeholders involved a systematic process to include diverse perspectives and expertise on social ownership for renewable energy in South Africa. The objectives of the consultations were to outline key sectors, gather and consolidate views, understand the principal elements of social ownership models, and establish a consensus on recommendations for incorporating social ownership into energy investment and generation. The findings include perspectives from specific stakeholders such as the civil society, private sector, and government officials. Methods of data collection included written comments, semi-structured interviews, and dialogues which allowed sector actors to become familiar with the content and context of socially owned renewables. These consultations provided a platform for deeper and more meaningful feedback on the proposed models.

Developing the **work programme** entailed expanding on the four models based on the literature review and stakeholder consultations in South Africa using a specified criteria. The literature review surveyed case studies of social ownership in developed and developing countries, while the stakeholder consultation engaged key stakeholders in the energy transition. The research team integrated findings from the review and consultation, identified specific stakeholders for in-depth consultation, and completed basic financial modelling for each model.

The key findings and recommendations of the study are summarised below.

Literature review

This literature review summarises and analyses the experience of social ownership of renewable energy (SORE) globally and in South Africa. It sets out the constraints and opportunities of SORE in the context of the national and local regulatory frameworks in South Africa.

The study defined social ownership as 'pro-poor and pro-people' programmes based on human needs. It included a wide diversity of ownership models, such as state ownership at different levels, employee ownership, co-operative ownership, citizen ownership of equity in private companies, and collective ownership. The study challenged the binary of 'state' versus 'private' and defined 'community' as geographical and organised groups amongst socially and economically disadvantaged people.

The review of SORE in the Global South indicates that some form of feed-in tariff and/or subsidy has proved to be viable as a way of incentivising photovoltaic (PV) solar participation by residents, so that they become 'prosumers', both consumers and producers of energy to contribute to the grid. Incentives and subsidies to households and businesses to install PV solar have worked in many countries.

Concerns, risks, and barriers to the implementation of socially owned renewable energy in South Africa were identified, including regulatory barriers, loss of revenue to municipalities, community buy-in, and concerns from various stakeholders. Furthermore, opportunities and benefits, such as feed-in tariffs and subsidies were also identified, including the potential for township households to contribute as producers to solving the energy crisis.

The study concluded by noting that adequate support for socially owned renewable energy models could shift them from being peripheral to constituting a substantial element of the energy system in South Africa, playing a transformative role in making the just energy transition empowering in both senses of the word.

Stakeholder consultation

The outcomes of consultation on the four proposed models are highlighted below.

The Mini-grid model was recognised for the potential to benefit underserved communities, relieving energy poverty, and providing ownership and benefits to community members. However, concerns were raised about high costs, inadequate energy for household needs, and regulatory challenges.

The Township/Tenant Co-op model was recognised for its potential to provide energy security, cost savings, and stability, as well as address load-shedding issues. However, concerns were raised about the impact of subsidised feed-in tariffs on electricity prices and the loss of municipal revenue.

The Community Renewable Energy Independent Power Producer Procurement (REIPPP) Programme model was seen to mitigate climate change and provide a stable energy supply, but concerns were raised about community control and the complexity of assessing a model without the details provided in the work programme.

The Worker-Owned Renewable Energy model received positive feedback for its potential to empower workers, reduce the risk of unemployment because of the Carbon Border Adjustment Mechanism (CBAM), and generate income. Concerns were raised around possibilities for deepening shopfloor conflict between labour and management, as well as about the capacity of workers and trade unions to manage renewable energy (RE) projects.

The recommendations for all models included seeking financial support from National Treasury and municipalities, increasing corporate social investment in the energy transition, and leveraging trade union investment arms and pension funds. The need for regulations that cater to co-operatives' needs, proactive industrial policy to support a just transition, and adjustments to national legislation to accommodate decentralised energy systems were highlighted. Land access issues and regulatory limitations on loans for social ownership of renewable energy were also discussed. The discussions emphasised the need for tailored and progressive regulations to ensure equitable and sustainable outcomes.

Overall, the discussions highlighted the need for holistic, community-centred approaches, emphasising education, collaboration, and flexibility to ensure the success of socially owned renewable energy projects and to foster a just and sustainable transition to cleaner energy sources.

Work programme

The four proposed models based on the criteria developed in the literature review and informed by stakeholder inputs, were further assessed, and developed as part of the work programme to meet the following criteria set out in the research brief:

- Enable social ownership as defined in the literature review.
- Provide a social and/or economic benefit.
- Have relevant stakeholder support.
- Be technically feasible, replicable and/or scalable.
- Be economically/financially viable and/or fundable.
- Fall in line with government and Intergovernmental Panel on Climate Change (IPCC) policies/ guidelines.

Mini-grids

Mini-grids are regarded as key to achieving 2030 universal access to electricity as set out in the Sustainable Development Goals by the United Nations and ensuring that 45% of energy generation capacity comes from renewable energy sources. With approximately 10% of households in South Africa not connected to the grid, mini-grids are poised to address the lack of access to clean, safe, affordable energy. The two mini-grid sub-models assessed were for rural villages and urban informal settlements where the majority experience energy poverty challenges such as reliance on unsafe fuels for their basic energy needs leading to risks of injury, loss of life, and property damage. The lack of formal land tenure, insufficient public space and facilities, and poor access to municipal services further exacerbate the challenges faced by these communities.

In rural villages, mini-grids should be installed where it is too costly or difficult for Eskom or the local municipality to connect households and small businesses to the main grid. The technology could be PV solar, small-scale wind, or micro-hydro, and a hybrid grid would be optimal to provide sustained energy. The energy provided should cover basic needs, including cooking, heating, lighting, and appliances and additional capacity. Ownership can be organised through co-operatives, community trusts, or social enterprises.

For informal settlements the system is intended to provide a permanent alternative to grid-connected electricity provision, with a focus on providing access to electricity for household use, street lighting, and other basic services. The technology and infrastructure for the mini-grid would be similar to those used in other contexts, but the layout and placement of the PV solar panels would be adapted to suit the informal settlement environment.

The economic viability of the project should be carefully considered, including funding requirements such as capital costs, training, and running costs. Funding for a micro grid should be through non-conditional grants, and stakeholders should include the Department of Energy, provincial structures, Eskom, municipalities, and funding partners. The Industrial Development Corporation (IDC) Township Energy Fund provides grant funding for small and micro businesses within townships, small towns, and rural areas.

The mini-grid model offers various benefits, including the opportunity for residents to produce their own energy, mitigate against load-shedding, create work opportunities, and have a positive impact on health and the environment. It also costs less than traditional grid expansion and supports the national power system.

Ownership and organisation of the mini-grid system would involve a combination of community members, state and/or NGOs, and private entities, with a focus on community ownership and management. A community organisational structure, for example, a co-operative, would be facilitated to ensure the community's sense of ownership and the incorporation of the energy provided according to their needs.

The economic viability of mini-grid models depends on the context and on available energy infrastructure. Funding for the development of micro grids should be through non-conditional grants, such as the Independent Development Corporation's Township Energy Fund, for example, and provisioned not only for capital costs but also for training and initial operational costs. The system is designed to be replicable and scalable for communities of between 50 and 1000 households.

Various stakeholders, including relevant departments from all levels of government, development practitioners, and funding partners, should be involved in the implementation of the mini-grid model. The work programme makes recommendations for government funding, the revision of existing policy and regulatory frameworks, and the reconceptualisation of existing grant programmes to address energy poverty in rural areas and informal settlements.

Grid-tied co-operatives

The purpose of the grid-tied system is to benefit socially marginalised communities organised into co-operatives comprising 35 households. The technology involves the installation of solar panels on household rooftops and public open spaces. The potential scenarios for remuneration include selling electricity to an energy trader, selling to the municipality, or using the electricity for the community's use. The benefits of the project include decarbonisation, local energy provision, and economic and social benefits for the community. The model is considered replicable and scalable across urban township communities, and ownership is intended to be collective through household membership in a small area in a co-operative.

The economic viability of the project depends on factors such as remuneration through feed-in tariffs, funding, and the potential for income for community members. Funding for the project is recommended to come from non-conditional grants to avoid undermining the social benefit of the project. Legal and regulatory aspects of the project, including the need for clear ownership and mechanisms for receiving remuneration, need to be clarified to manage expectations. Stakeholders in the project include the community, the municipality, utility companies, solar installers, and government entities. Recommendations for the project include defining the legal entity of the organisation, ensuring clear legal rights to use public land for renewable energy production, and accommodating the model in municipal infrastructure plans.

Overall, the grid-tied system emphasises the importance of community ownership, democratic practice, and the potential for economic and social benefits from the renewable energy project. It also highlights the need for clear legal and regulatory frameworks, funding mechanisms, and stakeholder involvement to ensure the success and sustainability of the project.

Community REIPPP programme

It is proposed that this model is mainly applicable to rural land held by the state under communal land ownership and administered through traditional authorities (TA), or communal property associations (CPAs). Leasing the communal land to renewable energy projects enables rural communities to earn additional income through a partnership agreement with an independent power producer (IPP). The purpose of this model is to contribute to the national energy supply and benefit society through energy provision to the national grid or reduced demand on the grid.

Ownership of the land administered traditionally could rest with the CPA through a trust, co-operative, or company. Although communal land is technically state land, the consent of the families and individuals who are the communal land rights holders is required when there is a danger of their existing land use rights being alienated. A CPA is recommended. Grant funding is needed for capacity-building programmes for community and private sector partners.

Key stakeholders include the RE developers, government entities, and community representatives. Recommendations include awareness raising and education for private sector partners and communal landowners, an incentivised procurement environment, support programmes for effective partnership creation, financial innovation with financing institutions, and tailored private sector partnering support programmes. Furthermore, the REIPPP programme in its current format should be revised to incentivise a higher percentage of local ownership and make special provision for communal land partners. There is also a need for a more ambitious land redistribution program in South Africa, incorporating social ownership of renewables, and support for agrivoltaics to contribute to electricity production and sustainable farming methods. Further research and consultation are needed to identify an appropriate site for a pilot of this model.

Worker-owned co-operative

The proposed project is modelled for renewable energy installation on a factory site, designed for small or medium-sized factories in urban or rural areas with an existing grid connection. It is intended to work in collaboration with local government and address the impact of the CBAM. The model aims to support the energy transition in the manufacturing industry, with a focus on securing a stable electricity supply and protecting jobs and workers' income.

The technology proposed is a PV solar array on a factory rooftop or car park, with the potential for a hybrid grid combining solar, wind, and green hydrogen. The model is not automatically scalable due to the variability in industrial processes and energy needs. The benefits of the model include supporting decarbonisation, reducing demand on the national grid, and providing a secure energy supply at a lower cost than traditional energy sources. In rural areas worker ownership of the renewable energy project could also increase energy access and protect jobs in the long term.

Risks include potential negative impacts on municipal income, job losses due to automation, and conflicts between factory owners and trade unions. The proposed ownership model is through a worker-owned co-operative, with variations including majority shareholding by workers or a trade union investment company. Economic viability is supported by state incentives, low-interest loans, and grant funding for a just energy transition.

Stakeholders involved in the project include workers, trade unions, industry associations, development finance bodies, municipalities, and various levels of government. General recommendations include reviewing grant funding conditions for renewable energy transition, establishing conditions for grant funding that enables worker ownership, and supporting trade unions in developing education programmes around a just energy transition. Possible pilot sites for the project include medium-sized manufacturing companies.

Key recommendations

The recommendations for socially owned renewable energy initiatives are categorised into funding, regulations, skills development, and capacity building.

Funding for viability

The terms of loan agreements and the lack of transparency from international finance institutions are factors impacting the Just Energy Transition Investment Plan JET-IP framework and the viability of socially owned renewable energy. Securing funding for socially owned renewable energy initiatives requires careful consideration of funding sources, mechanisms, and transparency. The diagram below summarises key recommendations regarding funding.

Summary of recommendations on funding

- Unlock **funding sources** through financial support from National Treasury and municipalities.
- Establish clear accountability mechanisms in relation to **loan agreements.**
- **Corporate social investment** agreements in socially owned renewable energy projects should include specific requirements and responsibilities towards the communities they aim to benefit.
- **Model 4:** The potential for trade union and pension fund investment in SORE should be investigated. **Model 3:** The potential for leveraging land assets require further investigation and consultation.
- Improve oversight in agreements on loans from international finance institutions to avoid the possibility of terms that increase the likelihood of 'green' structural adjustment.
- Remove limitations on the funding allocation for social ownership within the framework of the JET-IP.

National and municipal regulations

Discussions regarding regulations included the need for regulations that cater to co-operatives' needs, a proactive industrial policy from the government, and various issues and potential reforms in the national and municipal regulatory landscape. A consensus emerged that tailored and progressive regulations are essential to ensure equitable and sustainable outcomes. The discussions also highlighted the need for holistic, community-centred approaches, emphasising education, collaboration, and flexibility to ensure the success of socially owned renewable energy projects.

Summary of recommendations on national and municipal regulations

Image source: https://medafricatimes.com/15534-south-africa-inks-hotly-contested-4-7-billion-renewable-energy-deal.html

Skills development and capacity building

Capacity building is recommended for municipalities and other stakeholders to partner in the implementation of socially owned renewable energy projects. A generic modelling tool is recommended to be developed and made available for stakeholders to design the projects to be implemented.

Summary of recommendations on skills development and capacity building

	Adjust national legislation to enable viable socially owned renewable energy projects.
	Incorporate mini-grids within the Integrated National Electrification Programme with its own dedicated fund for monthly service charges allocated to participating households.
	Introduce dedicated conditional funds granted to municipalities specifically for SORE.
	Revise the Municipal Systems Act to remove challenges in the distribution of licenses to implement in rural villages and other rural areas.
	Facilitate capacity building in consultation and project implementation to ensure inclusivity and knowledge parity among all stakeholders.
	Facilitate treasury and municipalities collaboration to develop standardised agreements for public procurement to enable co-operatives selling electricity back to municipalities.

Skills development and capacity building

Capacity building is recommended for municipalities and other stakeholders to partner in the implementation of socially owned renewable energy projects. A generic modelling tool is recommended to be developed and made available for stakeholders to design the projects to be implemented.

Summary of recommendations on skills development and capacity building

Model 1
• Capacity building is required where appropriate, with rural municipalities/district municipalities and traditional authorities.
Models 1 and 2
• Imperative that municipalities are capacitated to partner in the implementation of SORE for residents of rural villages, townships, and informal settlements.
Model 2 (grid-tied)
• Facilitate the municipal electricity department being a key partner.
• Establish dedicated training programmes for municipal electricity departments and officials in departments such as IDP, economic developmen and accounts.
Recommendation for all models
• Develop an accessible generic modelling tool. Avail the tool for all stakeholders to both understand and design the projects to be implemented.
• Build capacity especially among all social owners, to understand exactly what benefits will accrue to them and to manage expectations.

The concluding recommendation is for the state and relevant national and international development finance institutions to fund and support the implementation of the proposed models through pilot projects to test the financial and technical feasibility towards formulating viable business cases.

The transformative potential of renewable energy in South Africa has not been realised, and it is concluded that policy makers, municipalities, and civil society stakeholders need to be more ambitious in realising this potential. The transition from fossil fuels should become a transition to a transformed, inclusive, and more equal economy.

An employee at the Matsila farm checks on one of the solar stations that powers a borehole supplying water to animals on the property. (Photo: Lucas Ledwaba/ Mukurukuru Media)
Source: https://www.dailymaverick.co.za/article/2022-04-20-solar-energy-is-the-way-and-the-light-for-this-limpopo-village/

Introduction

The Presidential Climate Commission (PCC) is a multi-stakeholder body established in 2020 by the President of South Africa to advise on the country's climate change response and support a just transition to a low-carbon, climate-resilient economy and society. The Commission comprises government ministers and 22 commissioners that represent the diversity of perspectives of its social partners which including academia, business, civil society, labour, and youth. The Commission emanates from the Presidential Jobs Summit held in October 2018, when social partners agreed that a statutory entity should be formed to coordinate and oversee a just transition towards a low-carbon, inclusive, climate-resilient economy and society.

One of the first tasks of the PCC has been to develop a Just Transition Framework (JTF), setting out a shared vision for a just transition in South Africa, the principles to guide the transition, and the policies and governance arrangements to give effect to the transition. The JTF proposes inter alia that major industrial development takes place around a new green economy. It also advocates for a transition away from a carbon-based economy and argues for a diversity of ownership models to facilitate a just energy transition.

Nelson Mandela University (NMU) was commissioned by the PCC to undertake an initial scoping and consultation on Social Ownership Models in the Energy Transition across different regions in South Africa. The study was conducted during April–October 2023. The purpose of the project was to undertake a literature review to identify possible models for socially owned renewable energy, followed by consultation on these models, and finally leading to the development of a work programme to develop viable models for diverse ownership of new renewable electricity generation assets, and increased community ownership of these assets.

This report is divided into three sections, reflecting the three components of the project: Section 1 is the literature review; Section 2 is the report on stakeholder perspectives; and Section 3 is the work programme with recommendations on how the models of social ownership of renewable energy may be implemented in South Africa.

SECTION ONE: LITERATURE REVIEW

About this section

This literature review summarises and analyses the experience of social ownership of renewable energy (SORE) globally and in South Africa. It sets out the constraints and opportunities of SORE in the context of the national and local regulatory frameworks in South Africa. The review then examines the experience of local community and worker ownership models in South Africa, including community shareholding in REIPPP projects, and the extent to which these have constituted viable projects for further roll-out. It identifies four models of SORE which have the potential to offer low-income households both access to energy and revenue generating opportunities, if financial and other barriers are addressed.

Saltuba Co-operative, KwaZakhele, Nelson Mandela Bay launches new smart building.
(https://www.heraldlive.co.za/news/2022-12-12-saltuba-forges-ahead-with-new-smart-building/)

RevoluSolar and members of the Babylonia community in Rio de Janeiro install solar for a co-operative that will benefit 35 households.
(https://www.portalsolar.com.br/noticias/mercado/consumidor/ong-revolusolar-instala-primeira-cooperativa-de-geracao-distribuida-no-rio-de-janeiro)

1. Scope and conceptual framework

1.1 The Just Energy Transition (JET) in the South African context

The global imperative of a rapid transition from fossil fuels to renewable energy has led to an increase in research and published literature on the topic. Countries where the transition is at an advanced stage have much to tell us. In the South African context, where there is an additional imperative for the transition to be a 'just' one, we can learn from existing cases of socially owned renewable energy in both the Global North and the Global South.

The specific context of South African society requires a selective and critical evaluation of models of social ownership. The South African economy is characterised by the concentration of wealth and high levels of poverty and unemployment. An energy crisis is exacerbating these problems and resulting in a desperate search for solutions which will alleviate the immediate problem.

A critical aspect of a just transition in the post-apartheid context is to address this concentration of wealth and ensure restorative and distributive justice. As one way of progressing this ambition, the national Just Transition Framework (JTF) thus calls for "affordable, decentralised, diversely owned renewable energy systems" (Presidential Climate Commission, 2022, p.7) and for a broadening of ownership of productive assets (ibid., p.18) in support of a just transition. This follows calls over the past decade from social partners, including the major industrial unions and their research partners, for including forms of social ownership in the conceptualisation of the just energy transition (Ashley et al., 2020; Satgar, 2015) and learning from international labour movements.

1.2 Social ownership

How is social ownership defined in relation to the JET in the South African context?

As a starting point, this review confines itself to those cases analysed which conform to a definition of social ownership, as per the scope of the study outlined in the introduction. The term 'social ownership' can be interpreted broadly, to include "a wide diversity of ownership models, including state ownership at different levels (for example, municipalities), employee ownership, co-operative ownership, citizen ownership of equity in private companies or vehicles, individual ownership, and collective ownership (and management)." (National Economic Development and Labour Council, 2022, p.21)

In this study, the term is limited and defined for relevance to the South African context and the objective of exploring models of SORE that will conform to the 'just transition' imperative. Social ownership will refer in this report to 'pro-poor and pro-people' programmes which are based on human need (Clarke, 1991). Therefore, social ownership of renewable energy is a response to the question about the appropriate organisation of society in a Just Transition, and the relations between classes in South Africa. This definition of social ownership includes but is not limited to co-operative ownership; and there is some blurring of lines for example with worker share ownership of a company, community shareholding in a facility, or municipal agreements regarding purchase or distribution of electricity. Municipal partnerships with household and neighbourhood co-operatives in production and/or distribution of energy are included. Some public-private partnerships may be characterised as 'social', depending on the ownership model. Share ownership can be defined as social ownership when a substantial or majority share is owned by a collective or co-operative, for example, a trade union, or the residents of a village or neighbourhood. Certain utility-scale energy production facilities are included if they involve substantial social ownership as per this definition; however individual ownership of shares is not defined as social ownership.

The cases that are explored here thus challenge the binary of 'state' versus 'private' that is the dominant narrative in South Africa: either there is a single, centralised state-owned enterprise (like Eskom) or electricity is privatised and corporatised (see Ashley et al., 2020). As will be demonstrated, there are many models in between the two. While the models presented are not confined to community-based projects, it is important to further define the term 'community' in the South African context. 'Community' is a subset of 'social' and can refer to any group of people with a common interest or living in a common locality or neighbourhood. In South Africa, it is often used as a euphemism for 'poor' or 'black' and refers to residents of townships or informal settlements. In terms of the broad definition, residents of an elite golf estate may also be considered a community; however, in this study, community is defined both geographically and socio-economically to refer to residents of a particular village, neighbourhood or township; in other words, 'community is defined as geographical and organised groups amongst socially and economically disadvantaged people' as stipulated in the inception report, (Cherry & Mokwatlo, 2023). It should be noted that sharing a common location does not mean that there is a common interest, and there may be conflicts of interest within a locality (a village or a township) and even within a neighbourhood. 'Social' thus presupposes some level of social relationship and organisation.

Walker & Devine-Wright (2008) argue that community energy projects ideally should involve both community participation in the process and community benefit in the outcome of the project. Their case study is of projects in the United Kingdom (UK), but their warning that 'labelling a project as a community and then local people feeling they are getting nothing out of it will itself simply increase the scope for resentment and objection' (ibid., p.499).

This is related to two additional concepts that are central to this discussion: decentralisation and localisation. Chmutina et al. (2014, p.123), note that 'whilst energy problems are large-scale, small-scale solutions do exist' and that in the Global North, in the UK in particular, '[a]n emphasis on the potential benefits of a more localised and distributed pattern of energy generation and on the involvement of the community emerged… in the late 1990s' (Walker et al., 2007). As the technology of PV solar allows for decentralisation of electricity production, it simultaneously allows for municipal and community energy projects to become viable as part of a larger national strategy for transition (Sustainable Energy Africa & South African Local Government Association, 2021).

Community energy projects form a significant aspect of the transition through decentralised energy. This has been studied extensively in the UK, Germany and elsewhere in the Global North (see McGovern, 2021; McGovern & Klenke, 2018; Chmutina et al., 2014) with the focus being on the 'drivers' of urban decentralised energy projects.

Social ownership may or may not be organised to begin with: in the case of workers who are members of a trade union, the union has the organisational experience to facilitate and manage the renewable energy enterprise (see for example, the VW Workers case study below). In the case of residents of a village, the households collectively constitute the 'social' and an appropriate form of organisation and participation must be explored. (See for example, Mieterstrom case study and in Annexure 2).

Questions of mobilisation and organisation, and then of participation, ownership, and management – in other words, issues of process as well as of outcome or intention – are explored in the cases below. This should also inform the choice of model of social ownership to be supported; in other words, the models to be explored for viability should also be those that conform to the expressed community's "identified problems and associated needs, be it local investment and jobs, income-generation, poverty alleviation, energy security, and participation in and management of assets" (Cherry & Mokwatlo, 2023). As the study is explicitly concerned with models of social ownership, renewable energy projects owned by private companies that have some downstream community benefits are not considered as meeting the criterion of social ownership, unless social ownership as per the definition in this report is a characteristic of a specific project.

2. Methodology

Researchers searched university databases and grey literature using the terms 'socially owned', 'community owned' and 'renewable energy'. Using the definition of social ownership (see previous section 1.2), researchers chose case studies to achieve the best diversity of approaches in terms of who the key participants were and chose models currently operating (both recent and for some time). Additionally, case studies were selected if they were economically viable examples of using renewable energy to produce electricity, i.e. the project covered its installation and running costs (at least in the medium to longer term). We further explored (where information was available) what additional contributions the project made in terms of wider social benefits, community empowerment, and energy democracy. Researchers also selected case studies to demonstrate both urban and rural cases and considered who were the main social groupings that benefitted.

The approach to the selection of case studies was therefore not primarily based on the organisational form of social ownership, be it ownership through a co-operative, trust or other form of enterprise, but on the diversity of models and approaches to such ownership by a range of constituent parties, be these organised workers, residents of geographical area, tenants of social housing, or citizens across a geographical region sharing a common approach to the struggle against the ecological crisis and concomitant social crises.

A common set of criteria derived from the brief were used to describe the value of each case study. These included contextual issues such as the energy regime in which the initiative operated, its relationship with the state, its purpose, the organisational form which enabled members' participation and ownership, technological issues driving the model's viability, and how it was financed.

Case studies were therefore not chosen to exemplify 'success' but rather what lessons and challenges they posed for the consideration of viability in the South African context.

3. Exploration and evaluation of global SORE projects

3.1 Which models of SORE have been implemented in other countries?

In the Global North, forms of socially owned renewable energy are primarily through equally shared common ownership in co-operatives which are organised by:

i. Members in a common locality, in either an urban or a rural context (see for example, Cooperativa Elèctrica d'Alginet).

ii. Citizen members dispersed nationally but with a common interest to push back against ecological crises (see case study Som Energia).

iii. Members in a common locality with a common organisational affiliation such as tenants or workers (see Mieterström and VW Plant case studies).

In the European Union (EU), earlier forms of social ownership were self-organised and emerged from concerns about nuclear power and the ecological crisis amongst their members (Sladek, 2015). More recent SORE initiatives were also informed by the ecological crisis and emerged as well out of cost-of-living crises (Ahlemeyer et al., 2022; Cuesta-Fernandez et al., 2020; Sokolowski, 2020).

New community renewable energy co-operatives have been supported through the EU network, REScoop, which brings together 1 900 co-operatives representing 1 250 000 members (REScoop, 2023). What distinguishes members of REScoop is their adherence to internationally recognised co-operative principles and their advocacy of the social economy[1] (Guell, 2023).

SORE initiatives are both urban and rurally based in the Global North, whilst in the Global South, drivers of the development of socially owned renewable energy are issues of access and affordability. This means SORE projects are mainly rurally based where grid access is unavailable because it is considered too costly to develop (Lee, Miguel & Wolfram, 2016).

Whereas ownership of some SORE initiatives in the Global South are organised through co-operatives, ownership can also be vested in associations, NPOs or rural governance structures, such as a village council. (See examples of Puerto Rico and Odanthurai in India and in more detail in Annexure 3).

1 The term social economy (and more strongly, social and solidarity economy) refers to a global range of practices that challenges the mainstream market economy directed at maximising profits and extracting resources from nature. Instead, these economic practices focus on community ownership, democratic decision-making, and mutuality and are rooted in the recognition of social integrity and ecological limits. (Johanisova & Vinkelhoferova, 2019)

3.2 Models that have worked in the Global North

Table 1: Summary of socially owned renewable energy models in the Global North

Participants	Members nationally	Urban area – interest group (workers/tenants)	Rural area-based (co-operative/business)
Name of example	• EWS Schönau (Germany). • Som Energia Co-operative (SEC) (Spain).	• Tenant electricity (Mieterstrom) at Bürgerenergiegenossenschaft BENG (Germany). • Solar Co-op VW Plant Emden (Germany).	• Villanovaforru and Ussaramanna municipalities (Italy). • Valencia, Cooperativa Elèctrica d'Alginet (CEA).
Energy regime	• Liberalised electricity market with an electricity stock exchange (European Energy Exchange (eex)) and a strict oversight body (Federal Network Agency – Bundesnetzagentur). • Liberalised energy market with five large private energy providers operating regional monopolies.	• Liberalised electricity market with an electricity stock exchange (European Energy Exchange (eex)) and a strict oversight body (Federal Network Agency – Bundesnetzagentu. • As above.	• Liberalised national electricity market. • Liberalised energy market with large regional private energy monopoly.

Participants	Members nationally	Urban area – interest group (workers/tenants)	Rural area-based (co-operative/business)
Purpose	• Ecologically oriented, decentralised, non-nuclear and citizen-owned energy production from renewable sources that is operated by a co-operative run by citizens of the community. • SEC is an ecologically oriented, decentralised networked co-operative of local energy producer/consumers.	• Tenants invited to participate in the 'civic energy' co-operative (Bürgerenergie), owned by citizens, that operate PV installations and own them; tenants could also acquire shares and thereby own parts of the PV installations on their rooftops; the co-operative owns and operates several PV installations also on schools, etc. with the goal to create renewables-based decentral energy markets close to where electricity is being used in mostly urban areas. • Establishment of a workers' co-operative owning and managing a PV installation on the rooftop of a car manufacturing plant; initiated by the workers' council, the goal was to provide additional and long-term earning from renewable energy.	• Municipality (mayors) led formation of local energy communities as co-operatives to provide renewably produced electricity to its members directly (Currently PV installations are connected to the grid and provide energy to local buildings). • Developed out of community-based rural electrification programme of the 1920s. • High energy prices and unstable supply. • Since 2015, green certified energy to members. • Ecological crisis new and part of education campaign amongst members.

Participants	Members nationally	Urban area – interest group (workers/tenants)	Rural area-based (co-operative/business)
Participation	• EWS co-operative has more than 650 members, mostly from the region. • SEC has 55 000 members and 90 000 consumer contracts. Members can support up to five households to connect to energy network without having to pay a membership fee. • Enables access by low-income groups; also, members who become financially precarious get free electricity for one year. Members include individuals, small businesses, and small rural villages. • Run by members (70 employees); campaign against fracking, nuclear and fossil fuels; membership education and debate at local level.	• Co-operative with more than 400 members. • The co-operative has 357 members (as of 2017), all workers in the plant.	• Villanovaforru energy community: 45 households and a hotel; Ussaramanna energy community: 56 households and four small businesses. • CEA distributes and retails electricity to approximately 6 000 local customers as well as to a limited number of regional public bodies. • Discount for pensioners. • Food subsidy for members facing economic insecurity. • Initiatives to support schools (textbooks and sport).

Participants	Members nationally	Urban area – interest group (workers/tenants)	Rural area-based (co-operative/business)
Technological drivers	• PV, hydro, retail of green electricity sourced nationally. • Primarily solar powered (also biogas and hydro; building wind-powered plant) and enabled by smart-metering. Purchases green certified energy in market and provides 3% from own generation.	• 40 "citizen solar installations" (Bürgersolaranalagen) with more than 1.25 MW. • PV (1100 kWp).	• Villanovaforru: 44 kW PV installation; Ussaramanna: two PV installations, in total 71 kW. • Connection to semi-public national grid bypassing privately owned grid. • Connection to smart metering lowered costs and removed error based on human readings and estimated consumption.
Finance	• Membership fees, bank loans. • Membership fees and membership investment; commitment to be independent from bank loans.	• Membership fees, bank loans.	• Initial funding for feasibility study by the municipalities; funding from EU Projects LifeLoop financing smart meters and initial investments. • Funding primarily from membership fees and members raising capital. • Membership derived from both local citizens and farmers' co-operatives.

Participants	Members nationally	Urban area – interest group (workers/tenants)	Rural area-based (co-operative/business)
Policy framework	• German Renewable Energy Act (EEG): Feed-in tariffs with 20 years' runtime, priority access for renewable electricity. • A government supervised system certifies the renewable origin of the energy. Initially a feed-in tariff, but now withdrawn by state.	• German Renewable Energy Act (EEG): Feed-in tariffs with 20 years' runtime, priority access for renewable electricity, special federal law regulating tenant-owned electricity solutions (Mieterstromgesetz, 2017). • German Renewable Energy Act (EEG): Feed-in tariffs with 20 years' runtime, priority access for renewable electricity.	• EU support for citizen's energy co-operatives (European Commission's Intelligent Energy Europe Program), Italian national regulation allowing feed-in of locally produced electricity. • A government supervised system certifies the renewable origin of the energy. Initially a feed-in tariff, but now withdrawn by state.

Participants	Members nationally	Urban area – interest group (workers/tenants)	Rural area-based (co-operative/business)
Contributing factors to viability/ barriers	• Indirect subsidies via feed-in tariffs, local as well as country-wide support, also financially, media coverage. • Active membership participation and volunteer work building. organisation based on affinity; ability of some members to provide development finance and keep co-operative free from bank loans; shared code of ethics and decentralised autonomous local participation with own rules and regulations. Technological development and productive capacity in Spain for solar and wind.	• Indirect subsidies via feed-in tariffs, close collaboration with municipal housing organisation. • Barrier: not all tenants wanting to participate, land-lords often hesitant to provide rooftop-space. • Indirect subsidies via feed-in tariffs, initiative by the trade union run workers' council.	• Support through European federation of citizen energy co-operatives with a network of 1 900 energy co-operatives involving 1,250,000 citizens (REScoop.eu), organisationally facilitated by the Italy-wide co-operative "énostra". • Barrier: current Italian law requiring members of an energy community to be connected to the same low-voltage station of the PV plant for sharing electricity; not all community members connected to the same station. • Spanish regulations request the same financial requisites and volumes of information from the small electricity distribution co-operatives as from the big five distribution utilities; part of a national network of small RE producers and consumers to pressurise state. • Energy poverty in economically depressed communities drive membership.

See sources in the tables for each case study in Annexure 2.

3.3 Models that have worked in the Global South

Table 2 Summary of socially owned renewable energy models in the Global South

Participants	• Urban area-based (citizens/business)	• Rural area-based (citizens/business/NGO)
Name of example	• RevoluSolar in favelas of Babilônia and Chapéu Mangueira, Rio de Janeiro, Brazil.	• Casa Pueblo/Community Solar Energy Association (ACESA) (Puerto Rico). • People Centred Business and Economic Institute (Yayasan Ibeka)/Mekar Sari Co-operative (Indonesia). • Odanthurai Panchayat (India).
Energy regime	• Liberalised market. Government body, Brazilian Electricity Regulatory Agency regulates and controls the production and transmission of energy according to national laws. The National Electricity System (ONS) is a non-profit private entity that is responsible for the coordination and control of the generation and transmission. Large state-owned companies control sector with about 27% of sector privately owned. • Main energy sources in Brazil are generated by hydropower, fossil- and biofuels.	• Net-metering/mini-grid (localised wheeling tariff). • Feed-in tariff. • Municipal owned/feed-in tariff.
Purpose	• RevoluSolar wants to address longer term structural solutions to problems in low-income communities through solar energy installations and on-the-job training and to create eco-consciousness through children's workshops.	• Breaking Puerto Rico's dependency on fossil fuels and providing electricity to the town of Adjuntas following the collapse of Puerto Rico's electricity grid. • Many rural Indonesians are without electricity. The initiative to supply electricity through micro2 hydro power plants began with the intention for the community to own the installation and to improve their livelihoods through the revenue it generates. • The initiative began as an effort to improve the overall welfare of the village.

2 Microgrids and mini-grids: Microgrids and mini-grids share the same definition. The US Department of Energy's Microgrid Exchange Group defines microgrids as "a group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity to the grid. A microgrid can connect and disconnect from the grid, enabling it to operate in grid-connected or island mode." In some contexts, a mini-grid can be applied as a microgrid with a larger configuration and higher load capacity. (Ton & Smith, 2012)

Participants	• Urban area-based (citizens/business)	• Rural area-based (citizens/business/NGO)
Participation	• RevoluSol was started by workers who were unionised and volunteer solar energy technicians and engineers. They support area-based community associations to introduce participation by self-employed workers and other members of favela who wanted to move away from clandestine energy connections or who experienced high costs, frequent outages, and slow repairs. • Volunteer residents installed the first solar plant and educated members of the 34 households who formed the co-operative. Support to co-operative to transition to self-management: model the solar cycle: installation, energy efficiency, professional training, and cultural and educational activities. • Volunteers in community conscientised.	• The initiative is led by a local non-profit community organisation, Casa Pueblo. There is an association of 18 local businesses, Community Solar Energy Association of Adjuntas (ACESA), that participates in using the solar electricity transmitted through the mini-grid infrastructure by paying a rent, which subsidises the free installation of solar on people's houses. Those most in need, elderly and disabled, are prioritised. A neighbourhood mini-grid is now operational for approximately 45 households. • The Mekar Sari Co-operative consists of 450 members. Maintenance of the facility is conducted by the co-operative. Conflicts are resolved through a meeting called Rapat Anggota. A supervisory body of community representatives audits the co-operative's management on a regular basis. • The Panchayat Council undertook the initiative and is responsible for paying back the loan taken out for the windmill. Eight thousand residents in the panchayat receive electricity for free.
Technological drivers	• Rooftop solar generate power for around 34 households organised as a co-operative; grid-tie model with discount on electricity bills.	• Puerto Rico's electricity grid failed in 2017 and precipitated Casa Pueblo's disaster response which led to its construction of solar installations and its accompanying grid infrastructure. • The Mekar Sari's micro hydro power plant is the first community-owned renewable energy installation of its kind. • The Panchayat Council had conducted research on renewable energy before purchasing a windmill from a wind farm located 140 km away. The panchayat also took advantage of government programmes subsidising solar-powered streetlights and houses.

Participants	• Urban area-based (citizens/business)	• Rural area-based (citizens/business/NGO)
Finance	• 100% grant financing via RevoluSolar who in turn receives funding via the philanthropic organisation, Institute for Climate and Society.	• Initial resources were provided by the University of Puerto Rico Mayagüez. Participating local businesses subsidised further solar household installations. • UNESCAP elected this project to be part of its 5P programme (Pro-Poor Public-Private Partnership). • UNESCAP provided a \$75,000 grant, the private company HIBS provided \$75,000, and the NGO IBEKA provided \$75,000. In Cinta Mekar, the power plant is 50% owned by the local co-operative and 50% owned by a private company. • The Panchayat Council pooled its own money and took out a loan from a nationalised bank. The Panchayat Council pays a monthly premium for the loan while receiving a monthly payment for the surplus electricity produced.

Participants	• Urban area-based (citizens/business)	• Rural area-based (citizens/business/NGO)
Policy framework	• PV systems below 5 MW in size are eligible for net metering tariffs until 2045 which are compensated at the retail rate for electricity.	• Co-operative legislation in Puerto Rico imposes a tax on revenues from these enterprises, which led Casa Pueblo to form a non-profit organisation composed of local businesses, Community Solar Energy Association of Adjuntas, rather than a co-operative. • Ten years after the Puerto Rican government's promise to approve net metering, its implementation was finally granted in 2018. This allowed the solar panels atop Casa Pueblo's headquarters to sell 25% of its electricity back to the national grid. • Following the construction of the neighbourhood mini-grid, Casa Pueblo is aiming to connect with the national grid infrastructure and establish a net metering scheme. • Mekar Sari Co-operative, the first co-operative set up by IBEKA, was also the first initiative in Indonesia to implement a feed-in tariff after much pressure imposed on local officials by co-operative members. • Odanthurai Panchayat's initiative was the first of its kind. The project was not initially sanctioned, but following a court ruling, the development was allowed to continue.

Participants	• Urban area-based (citizens/business)	• Rural area-based (citizens/business/NGO)
Contributing factors to viability/ barriers	• Support/intermediary organisation. • Availability of grant funding. • Community technical training around installation and organisation development support for co-operative. • Net metering regulations. • The Brazilian authorities have introduced new rules to ensure that PV systems below 5 MW in size will still be eligible for net metering tariffs until 2045. A grid fee for prosumers will go into effect from 2023. The economic profitability of rooftop PV and small solar parks are expected to remain high.	• Casa Pueblo and ACESA have been instrumental in capacitating the community, financing installations, and implementing solar power in Adjuntas, Puerto Rico. • The regulatory environment in Puerto Rico was slow to implement the net metering policy it outlined in 2008. • Hurricane Maria caused the second largest blackout in the world. Adjuntas, being a rural area, left the community with no choice but to generate their own sovereign source of electricity through solar power. The Mekar Sari Co-operative's renewable energy installation: • Mekar Sari Co-operative is currently facing a threat from the local government. Local corruption, and demands for bribes, are imposing pressure on the co-operative for its control to be taken over by the local government. • Beyond a small number of community members trained to operate and maintain the power plant, there is little understanding of how the renewable energy installation functions. • Due to the lack of resources in Cinta Mekar, the Mekar Sari Co-operative required public funding from UNESCAP to enable equal ownership of the renewable energy installation with a private company. In this sense, the community does not fully own the community energy they produce. • Odanthurai's development needs coincided with deficient access to electricity. The nearby wind farm enabled the Panchayat Council to meet its needs. Government subsidised renewable energy programmes also oriented the community around renewable energy by addressing their needs.

See sources in the tables for each case study in Annexure 3.

3.4 What factors make SORE viable in the global context?

3.4.1 What factors make SORE viable in the Global North?

Over the last twenty years (and in some instances longer) localised initiatives in the EU developed into a network of community renewable energy co-operatives that collaborate to support the development of new community-owned renewable energy co-operatives and initiate energy efficiency projects. Collectively, these groups monitor the implementation of EU-wide policy initiatives that promote community renewable energy endeavours (REScoop, 2023), lobby to maintain or institute arrangements to protect community-owned renewable energy initiatives from the effects of liberalising energy markets and provide experienced support and seed funding (see for example, support to Villanovaforru and Ussaramanna).

However, some scholars such as Sweeney et al., (2020) argue that community energy initiatives remain on the margins and that "the unplanned, ad hoc, and ultimately irrational nature of this [feed-in tariff subsidies for all] 'policy' has wreaked havoc on the entire system" (2020, p.27). The implementation of feed-in tariffs (FiT), at a pre-agreed and above-market price, during the initial roll-out of community renewable energy projects in Europe during the early 2000s led to unforeseen consequences that undermined the original intention of the policy instrument, which was to incentivise distributed generation. Sweeney et al. (2020) point out "one of the most important lessons that can be drawn from this experience is that, within the current neoliberal policy framework, community energy is not a viable model without subsidies. Put differently, community energy that is expected to 'compete' as a 'market actor' has no future" (2020, p.12). The authors go on to note that the policy shift to competitive auctions resulted from the costs of FiT contracts showing up in higher electricity bills as utilities sought to recover system costs resulting from the integration of market-protected renewables by tacking them onto electricity rates. Therefore, the increasing costs imposed by subsidised FiTs were then reflected on consumer electricity bills, which "may have contributed to the loss of political support among the broader working class" (Sweeney, Treat & HongPing Shen, 2020, p.23).

On the other hand, in research modelling, the effect of FiTs in Germany, Bauer & Uriona (2018) found that FiTs were a significant driver of the growth of renewable energy in Germany, even beyond anticipated saturation levels. They conclude that careful planning and consideration of the wider ambit of government support, including issues such as grid reliability and demand predictability, and reduced interest rates on PV panel purchases over a longer period, are important additional factors to FiTs (ibid., p.296).

Volunteer work and active membership participation appear to play an important part in the establishment of community-owned renewable energy co-operatives in the EU member countries, such as Spain (Pellicer-Sifres, 2020) where Som Energia is able to spark membership participation and self-management. Pellicer-Sifres et al. (2018) make a case for the critical importance of building deep empowering processes that facilitate scaling up localised community ownership of renewable energy. A technocratic approach focusing only on the energy regime, production and distribution technologies and enabling policy, is inadequate for radical transformative and sustainable change, they argue. Echoing the need for empowerment, Moser et al. (2021) point to general apathy amongst renters as a key contributing factor for the slow uptake of tenant-based renewable energy co-operatives in Germany. Active participation in energy co-operatives is still heavily gendered. Lapniewska (2019) argues that this is in part because technical and managerial work and associated skill sets are still biased towards men and women's "heavy work burden and time poverty" (ibid., p.3) and hamper active participation.

The importance of access to national and regional distribution grids in enabling the scaling up of initiatives is self-evident. More recently, community-owned co-operatives starting up were able to buy green certified energy from private producers and distribute energy to their members at cost by piggybacking onto existing grids (Pellicer-Sifres, 2020). As their membership grew, they were able to generate surplus and raise funds to add productive capacity of their own (see for example, the case studies for Schönau and Alginet).

The drive for community energy self-sufficiency (energy autarchy) has been an important factor in community renewable initiatives in the Global North. For example, Som Energia (Morandeira-Arca, Etxezarreta-Etxarri, Azurza-Zubizarreta & Izagirre-Olaizola, 2021) leverage start-up funding through membership fees and the issuing of shares with a fixed return over a period of 20 years, rather than borrowing from banks. Tröndlea et al. (2019) found that the potential for renewable energy self-sufficiency exists in the EU and for its member states. However, this potential for self-sufficiency does not always exist to the same extent at municipal and regional levels, especially in built-up areas with a high population density, because of the demand it could outweigh available roof space and environmentally suitable land. An additional factor in some cases, is the high energy demand of some industries in urban areas. These realities require national and regional planning and provisioning, as opposed to local energy democracy, they argue (ibid.).

Specific regulatory provisions to support small-scale independent power producers such as co-operatives or rural energy initiatives, are needed. These might consist of simplified bureaucratic solutions for these small-scale initiatives to access renewable energy provision and to protect them from competition with large-scale corporate energy providers that might be cheaper but have limited social impact (Oregon Department of Energy, 2023).

3.4.2 What factors make SORE viable in the Global South?

Socially owned renewable energy is a largely Global North phenomenon. As a capital-intensive technology, historical inequities in global wealth distribution have resulted in most of the world's population exclusion from renewable energy. There are few examples in the Global South where small-scale renewable energy projects have been implemented, and even less that can claim social ownership in any substantive sense. Therefore, it is important to highlight where socially owned renewable energy has been viable to understand applicable attributes for future projects. Key factors for SORE in the Global South are intermediary organisations for facilitation and capacity building, unconditional grant funding to ensure direct community benefit, and appropriate technology that addresses local needs.

Intermediary organisations are indispensable in facilitating the financial, technical, and social capabilities that renewable energy installations demand (Guerreiro & Botetzagias, 2017). The variety of socio-economic contexts in the Global South, largely peripheral to the global economy, introduce new dimensions to consider when assessing the viability of socially owned renewable energy models. Many communities in the Global South face high rates of unemployment, poverty, and lack access to basic services. Therefore, unlike their counterparts in the Global North, there are fewer material resources, technical capacities, or professional skills to facilitate a substantive programme for self-reliance from within the community. An intermediary organisation plays the key role of capacitating the community to make the renewable energy installation their own.

The case of RevoluSolar in Brazil, a society which faces similar challenges of inequality to South Africa, demonstrates this potential for the mobilisation of 'citizen solar installations' through intermediary organisations. RevoluSolar, which operates in the favelas of Rio de Janeiro, provides technical and co-operative training to supplement the installation of renewable energy.

Communities in the Global South do not have disposable income to invest in renewable energy installations. Financing SORE in this socio-economic context takes on a developmental character, which means the focus is not only implementing renewable energy but also improving livelihoods. In a development context, renewable energy must also supplement basic services the community requires to meet its needs. Unconditional grants imply communities without sufficient capital can genuinely own the renewable energy installation without expectation of repaying debts they cannot afford (Sweeney, Treat & HongPing Shen, 2020). The type of finance implemented through SORE will determine the extent to which such projects genuinely build self-reliance, by enhancing livelihoods, or behave as a force for market liberalisation, and therefore subsume communities to powerful external economic forces.

Orienting renewable energy installations around communal needs is crucial for the viability of SORE. Understanding the community's context will determine the problems SORE might resolve, and they will remain viable in the long term if they establish relevance to the community from the outset of the intervention (Massol González, 2022). Rural and urban contexts present different issues that must be thoroughly understood before getting involved. Mini-grid or off-grid electrification in a rural context addresses a different set of problems than renewable energy in an urban context. One substantially improves social reproduction where basic services were previously non-existent, while the other provides relief from blackouts and introduces possibilities for communal activities, economic or otherwise.

Of additional importance to the viability of initiatives in the Global South (as in the Global North) are connection to the public grid through a feed-in or wheeling tariff; the technological advantage of smart metering, especially in big cities; the importance of community support for SORE; and acceptance of co-operatives as organisational forms, whether as farmers, shack dwellers, tenants of inner-city blocks, or rural villagers.

Socially owned renewable energy has the potential to harmonise society's relationship to its environment. In the Global South, this means building communities free from legacies of colonial domination and exploitation which shape the inequities South Africa currently faces. The factors outlined above are necessary to ensure SORE is a transformative, rather than debilitating force in the Global South. Ultimately, SORE must transform the community in which it emerges, toward a higher standard of living, rather than simply decentralising generation capacity that replaces basic services provided by the state.

On the African continent, there are very few SORE projects worthy of mention. Beyond a few cases, where there are small-scale renewable energy systems, there is no measurable social ownership by those using such installations. In countries like Uganda, Kenya, Malawi, and Tanzania there are programmes under way to install mini-grids which constitute efforts toward rural electrification, but there is little consultation beyond token involvement in many instances (Ambole, Koranteng, Njoroge & Logedi Luhangala, 2021). The Global Energy Transfer Feed-in Tariff (GET FiT) programme funded by several EU countries in Uganda since 2013, and replicated in Zambia and Mozambique, has had some success in creating business opportunities together with grid strengthening and energy access through a feed-in tariff (GET FiT Uganda, Annual Report 2020). However, in these programmes, as in Malawi's case, one review determined, "As a gauge of community ownership or buy-in at inception, almost no projects had any sort of community contribution (and no monetary contributions at all" (Dauenhauer & Frame, 2016, p.79). The few examples of top-down initiatives across African states should serve as a cautionary tale for future implementation of socially owned renewable energy. Ownership in any substantive sense must be materially determined by the people using such installations.

4. Policy and regulatory frameworks for SORE in South Africa

The previous section explored the global models for socially owned renewables in the Global North and South. The following section outlines an analysis of policy and regulatory frameworks for the implementation of SORE in South Africa, with specific focus on legislation concerning each tier of government, and further explores factors which enable or constrain implementation at a local level.

4.1 National policies and regulatory frameworks for SORE

The energy sector lies at the heart of South Africa's economy and society, with coal remaining the dominant energy carrier in South Africa's energy supply industry. The entrenchment of fossil fuels is a function of a regulatory system that legitimised and perpetuated this domination and current reforms aimed at encouraging renewable energy are not articulated within a nuanced regulatory foundation (Murombo, 2015). The lack of a coherent renewable energy regulatory framework, and in particular one which addresses social ownership models, has a disruptive effect on the just energy transition that meets social and economic goals.

The most pertinent national regulations and policies relevant to renewable energy generation, transmission and distribution are summarised in Annexure 1.

The Constitution mandates the national Department of Mineral Resources and Energy (DMRE) to administer energy matters generally, and renewable energy as per Part B of schedule 4 (Glazewski, 2006). As a key custodian of policies and regulatory frameworks governing the generation, transmission and distribution of electricity in South Africa, the DMRE as indicated in Table 19, is obligated through the National Energy Act No. 34 of 2008 to ensure that diverse energy resources are available in sustainable quantities and at affordable prices (GIZ and DMRE, 2015). It is argued that this centralised approach to policy development and sector planning has resulted in inadequate responses to local concerns, because it excludes key role players in the electricity system such as municipalities, the South African Local Government Association (SALGA) and the Association of Municipal Electric Utilities (AMEU). (Hermanus, Scholtz & Kritzinger, 2022). This regulatory oversight is further exacerbated by the horizontal fragmentation within the context of the regulation of renewable energy provision. This hinders the sustainable development of renewable energy resources in the country (Mauger & Barnard, 2018) and indicates a "lack of coordination and synchronisation of the legislation, institutions and sectors that ideally should be interlinked" (Murombo, 2015, p.321). The need for a more agile and inclusive vertical and horizontal integrated approach is evident, critically within the context of new amendments to the Electricity Regulation Act No. 4 of 2006 which will allow for socially owned renewable models.

Since 2011, the DMRE has amended the Electricity Regulation Act No. 4 of 2006 in response to various sector trends and policy drivers (ICLEI Africa, 2022; Beare, 2022; Richards & Stolp, 2023; The Presidency, 2022; Mining Review Africa, 2022). Amendments are set out below:

- The 2011 amendments made provision for the procurement and new generation capacity of electricity by organs of state, and the REIPPPP is a programme managed through such determination.
- The 2020 amendments allowed for municipalities to purchase new electricity generation on condition said procurement is in accordance with section 34 of the IRP 2019 and must obtain any approvals required in terms of the Public Finance Management Act (PFMA) and Municipal Finance Management Act (MFMA).
- The 2021 amendments increased generation license threshold from 1 MW to 100 MW, and this exemption was further amended in 2023

whereby any generation facility, irrespective of its size or capacity, was further exempted from applying for and holding a license, with or without energy storage. The generation facility must still enter into a connection agreement with an entity that holds a transmission or distribution license.

- The 2022 draft amendments were accompanied by the new ministerial determination for 18 000 MW of generation capacity from wind and solar including improved storage, and reductions in time frames of the regulatory processes, i.e. environmental authorisations for transmission infrastructure, National Energy Regulator of South Africa (NERSA) registration, grid connection and land use authorisation, etc. Further exemptions include both licensing and registration for prospective generators who do not intend to wheel electricity.

These amendments represent a significant move towards the liberalisation of the South African energy market and have opened an opportunity not only to diversify the energy mix but also implement social ownership models.

Measures which are pertinent to socially owned renewable sources were announced with the 2022 draft amendments to tackle load-shedding as set out in the National Energy Plan and its subsequent six-month report released in January 2023, and include:

- Removal of the licensing thresholds for new generation projects.
- The reviewing of the IRP 2019 to ensure its continued relevance in line with the country's energy needs.
- Reducing designated local content for solar panels from 100% to 30%.
- Broader reforms to establish a competitive electricity market enabling private investment, including removal of guarantees, thereby allowing generators to compete on equal footing.
- Eskom granting access to land adjacent to its existing power stations in Mpumalanga to enable private investment in renewable energy projects, which is expected to unlock around 1 800 MW of new generation capacity.
- Eskom mandated to develop a feed-in tariff for small-scale embedded generation (SSEG).
- National Treasury mandated to expand tax incentives to residential and commercial renewable energy installations, i.e. the R15 000 tax rebate introduced as incentive for solar PV panels.
- Releasing further bid windows for renewable energy, gas and battery storage, and increasing the amount of capacity to be procured.
- The procurement of battery storage through its Battery Energy Storage System (BESS) programme by 2023.
- Establishing an independent transmission and system operator (TSO) which is expected to provide an electricity trading platform on a multi-market basis and facilitate access to the transmission network on a non-discriminatory basis, though its mandate will be highly constrained by the current grid capacity which will take time and funding to resolve. (Richards & Stolp, 2023; The Presidency, 2023; The Presidency, 2022)

According to Van der Poel et al. (2022) the only drawback to the draft amendments is the removal of NERSA's obligation in Section 14(e) to include the methodology used to determine rates and tariffs in the license conditions for grid-connected renewables, which means IPPs will not be able to see how tariffs and rates are calculated. Their recommendation is to reinstate the obligation but maintain the procurement process based on price competition.

The NDP is the apex socioeconomic development policy guiding the implementation of the government's mandate which aims to eliminate poverty and reduce inequality by 2030 (Mkhize & Radmore, 2022; GIZ and DMRE, 2015). In a nutshell, the NDP is an overarching strategic document with chapter four informing the development of the National

Infrastructure Plan (NIP) 2050 (NPC, 2012, p.55). Renewable energy generation indicators contained in NDP can only be realised through the implementation of the NIP 2050.

The National Infrastructure Plan 2050 (NIP 2050) (2022) emphasises "reduced reliance on coal and growing reliance on renewable energy, especially solar and wind which are the least-cost technology, and where SA has significant comparative advantage" and that "the transition away from fossil fuels progresses in a convincing and just manner" (DPWI, 2022, p.5).

The strategy for this transition to be realised includes the 'stimulation of multi-markets' "with centrally procured IPPs selling to the grid and other IPPs selling to traders or qualifying customers". In addition, it stipulates that "there will be an introduction of electricity consumers acting as suppliers" (DPWI, 2022, p.17). In the process, "significant support must be made available to enable the energy transition for communities and companies" – in other words, although there is an emphasis on market competition, the NIP 2050 also emphasises that "the just elements of the Just Energy Transition will be prioritised" (DPWI, 2022, pp.16,18). There is also provision for "off grid innovations such as microgrid solutions" which "will increasingly contribute to electrification, while at the same time providing opportunities for industrialisation and empowerment" (DPWI, 2022, p.13). These aspects of the NIP 2050 can be interpreted to support certain forms of SORE, including the 'mini-grid' model outlined below, and the 'prosumer' and 'wheeling' co-operative models, as implemented successfully in Europe (see Section 2) as well as SSEG and IPP models.

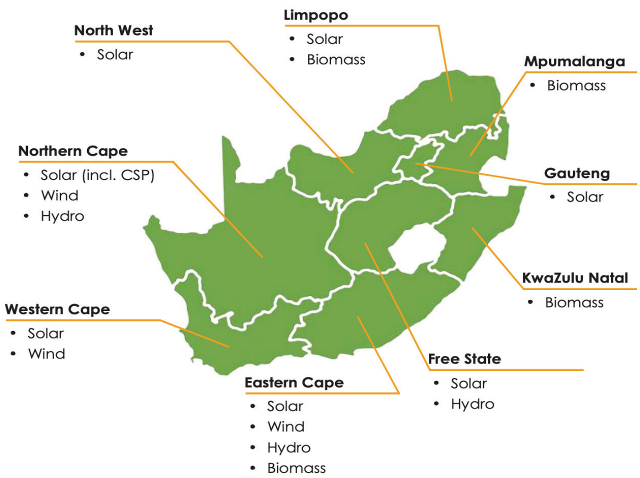
Wilhelmina Farm, solar micro-grid at Ficksburg, Free State Province

Source: https://www.esi-africa.com/wp-content/uploads/2018/11/Solar-microgrid.-Wilhelmina-Farm-600x450.jpg

4.2 Provincial policies and regulatory frameworks for SORE

Policies that promote and support sustainable economic development are structured differently in the respective provinces, though none explicitly addresses SORE models. (See Annexure 1). These provincial frameworks and structures are also informed by the availability of natural resources as depicted in Figure 1 below and have accordingly taken a unique approach to renewable energy developments (GIZ and DMRE, 2015).

Figure 1: Provincial distribution of renewable energy sources



Source: GIZ and DMRE (2015)

The availability of different natural resources provides a significant comparative advantage for South Africa to transition away from fossil fuels in a convincing and just manner, and importantly calls for a collaborative and integrated approach – both vertical and horizontal – which will ensure the country benefits from the economies of scale.

4.3 Municipal and district regulations relating to SORE

Historically, municipal roles have been largely limited to the distribution function (known as reticulation), upon which most municipalities' funding models are based (Zeller, Giljova, Ferry & Gross, 2017). Subsequently, there have been important changes in regulations affecting municipalities, including procurement, pricing, and licencing regulations. The overall context of the municipal regulations regarding electricity are outlined in Table 5, followed by a discussion of recent changes and the implications of these. (See Annexure 1 for an overview of legislative mandates for municipal provision of electricity).

The role of the municipality as a service authority is based on various pieces of legislation. The Constitution gives local government executive authority over electricity distribution and the right to administer it, including a mandate to deal with new energy generation in their areas of control (National Treasury, 2022).

Essentially, the intention of the various municipal acts is to provide core principles, mechanisms and processes that will enable municipalities to move progressively towards social and economic upliftment, and universal access to affordable energy. To this end, NERSA has issued 177 distribution licenses to municipalities, which includes 165 local municipalities, eight metropolitan municipalities, one district municipality, Eskom and 13 private distributors (SALGA, 2017), with some municipalities – Mangaung and City of Johannesburg having established licensed subsidiary entities as their electricity service providers, which are Centlec and City Power respectively.

The municipal procurement of electricity from an IPP is regulated through the New Generation Regulations of 2011 which outlines certain conditions a municipality should satisfy, such as (i) municipalities submitting an application to the Minister; (ii) conducting a feasibility study; (iii) submit proof that it has complied with the provisions of the MFMA and Municipal Public Private Partnership (MPPP); and (iv) submit proof that the application is aligned with its Integrated Development Plan (IDP) (SALGA, 2018).

The release of the MFMA Circular No.118 of 14 June 2022 has further clarified the legal framework for procurement of new generation energy capacity, particularly from RE sources, within the provisions of the Constitution, MFMA and other related legislation. Key in the circular is the criteria of scenarios stated for Municipal Independent Power Producers Procurement (MIPPP) road maps. (See Table 20 for a description of the different scenarios.) Regulatory and policy compliance requirements to the MFMA, Municipal Systems Act, Municipal Supply Chain regulations, Electricity Regulation Act (ERA) and New Generation Regulations (NGR) in relation to section 34 on ministerial determination make the implementation of RE complex and lengthy.

The environmental scan of municipalities conducted by (Ngcobo & Mudau, 2022) indicates that metros such as City of Joburg, City of Tshwane and City of Ekurhuleni are leading in accelerating the procurement from IPPs. The clear distinction between metros and other municipalities is brought by their organisational alignment to focus and deliver such mandates.

4.4 Regulatory enabling and constraining factors for SORE

SALGA (2018) has summarised the risks and opportunities for municipalities in implementing SORE. The main concern from municipalities is loss of revenue; as SALGA (2018, p.2) notes, "Without adequate preparation, municipalities may not be able to adapt quickly enough to the changing market. This could have a significant impact on income streams for municipalities, as well as result in a potential loss of opportunities in the new emerging sector."

In addition, IPPs wishing to sell electricity to municipalities will require a long-term power purchase agreement (PPA) with a municipality at a particular tariff. SALGA (2018, p.7) notes, "A key risk is that the tariff escalation may result in the municipality paying in the long term for renewable electricity at a higher rate than the bulk electricity price."

Municipal lack of capacity to manage both technical and financial complexities of SORE poses a major challenge; as noted by SALGA (2018, p.8) "the intermittent supply of renewable energy projects … requires high levels of electricity demand-and-supply planning and tariff modelling".

The two examples below are used to illustrate these risks and challenges.

City of Cape Town (CoCT)

According to Scholtz (2018) the CoCT initiated a process to purchase electricity from IPPs to meet its renewable energy and climate change commitments. From the outset the CoCT acknowledged that the IPP would need to obtain a generation licence from NERSA. However, NERSA indicated that there was a requirement for a ministerial determination for it to grant generation licences. Following two years of unsuccessful discussions between the CoCT, NERSA and the Department of Energy, the Minister of Energy refused to gazette the determination. In 2017, the CoCT initiated legal proceedings against NERSA and the Minister requesting the court to allow the municipality to buy electricity directly from the IPP. The basis of the court application is to test whether a ministerial determination is in fact needed (or is just a possibility) and, if the determination is needed, to test the constitutionality of section 34 of the Electricity Regulation Act and the ministerial determination process (SALGA, 2018). On August 11, 2020, the court postponed the application indefinitely.

Mafube Local Municipality

Rural Maintenance (Pty) Ltd is an electricity distributor for Mafube Local Municipality in the Free State which supplies solar generated power to Frankfort. Eskom had approved the application for Rural Maintenance (Pty) Ltd to implement self-load-shedding. Its subsidiary, Rural Free State (RFS) brought a court application against Eskom. According to Tshikalange (2023) the dispute between the two parties arose when Eskom expressed concerns about Rural Maintenance (Pty) Ltd implementing the solar energy project through a system of "voiding", which essentially allowed the company to manage the town's own load-shedding schedule, thus protecting critical infrastructure such as water pumps and sewerage systems from electricity interruptions. Eskom had repeatedly rejected this "voiding" as it was in violation of the load-shedding code of practice and threatened Rural Maintenance (Pty) Ltd with a court action if the violation persisted. The Johannesburg High Court dismissed the application on technicality, on the basis that Rural Maintenance Pty (Ltd) did not have a mandate from Mafube Local Municipality to institute legal proceedings on its behalf (Tshikalange, 2023).

4.5 Implications for municipal revenue

According to Van Schalkwyk, Borchers, Botha & Van Ravenswaay (2019), the rapid uptake of SSEG has the potential to significantly impact municipal revenue and their case study. This finding is based on case studies that were undertaken on four municipalities which covered different city characteristics (two metros and two intermediary cities) reflecting different approaches to SSEG tariff setting. The study found that solar PV can affect a municipality's revenue as follows:

- Municipal revenue is reduced through reduced sales volume to SSEG customers and when compensating SSEG customers for their excess electricity that is fed onto the grid.
- The municipality's costs can decrease due to

(i) a reduction in bulk power purchases from Eskom, (ii) a reduction in technical losses from these purchases, and (iii) cheaper electricity from SSEG customers which can be on-sold to other customers with a higher profit margin than from the bulk purchases.

The above findings indicate that the impact of RE on revenue can be neutralised by developing an appropriate electricity pricing model and policy (Sustainable Energy Africa, 2018).

5. Exploration and evaluation of local SORE

South Africa's energy landscape is relatively sparsely populated with existing examples of SORE in action. As discussed previously in this report, the regulatory environment, nationally and locally, is only recently opening up to the participation of more diverse actors in energy generation. Financial, political, social, and other reasons, which will be further elaborated on in this report, continue to hamper innovation on policy and project level. Yet, several niche developments can be showcased and discussed for learnings. The following short summaries provide evidence of the current state of analysis of relevant project examples, including utility-scale projects with community shareholding, solar projects for residential supply, mini-grid installations in rural areas and alternative forms of energy service delivery to individual households.

It is important to note that various new project ideas and concepts are currently at various stages of development and construction – driven largely by load-shedding and economic dynamics. It is assumed that there is a substantial project pipeline nationally, including for example renewable energy projects initiated by body corporates. These developments are yet to reach operational stage. The further research in this project will engage with relevant stakeholders to understand better the various ideas and concepts in development, and what can be learnt from those for SORE.

5.1 What models of SORE have been implemented in South Africa?

The **REIPPP programme** has brought about over 100 large-scale RE projects that incorporate community shareholding. The procurement requirements stipulate that local communities, located in a 50 km or district municipal radius around project sites need to be allocated a minimum of 2.5% of total project shareholding (Independent Power Producers, 2023). The most common legal entity chosen by companies to incorporate within the project structures is that of community trust (World Wide Fund for Nature South Africa, 2015). The socioeconomic benefit of these trusts has been limited (Dlamini, 2021) and they do not meet the criteria of social ownership outlined above. Only one project is reported to have chosen a different entity structure, that of a community company (Swartz, 2019). In all but one project these entities are practically newly founded organisations. Yet, one project, the **Tsitsikamma Community Wind Farm** partnered with the existing Tsitsikamma Development Trust. The Trust owns 16% of the project shareholding (Exxaro, 2020). This example is further outlined in section 6.2.3 of the literature review.

Another noteworthy REIPPP programme project, also located in the Eastern Cape, is the **Wesley-Ciskei Wind Farm,** which was established in collaboration with Energié de France South Africa (EDF-SA) and is the only project in the REIPPP programme located in a former homeland region (RenewSA, 2021). The project is founded on land owned by black farmers who received access to the land as part of the land reform process. The landowners receive lease income and hold shares in the project.

Sun Exchange supports renewable energy solutions for public and private buildings via crowdsourced investments into mid-sized (15–100 kWp) grid-tied or off-grid solar PV installations (Sun Exchange, 2023). The common target group is schools, businesses, and organisations. The approach of Sun Exchange is that of an intermediary linking private investors who contribute upwards of R100, with organisations that need fixed-price long-term electricity supply. Through the platform crowdsourced approach, investors effectively purchase shares in a specific Sun Exchange project, which translates into project implementation capital and a lease to the end-user over a 20-year period. The firm has been growing steadily and is today sourcing finance for projects across southern Africa (Sustainable Energy Africa, 2022; Sun Exchange, 2023).

Smaller RE technology is deployed in the Lyndoch Ecovillage mini-grid project, outside Stellenbosch in the Western Cape. The Ecovillage is hosting the Eskom test mini-grid installation consisting of a rooftop solar PV and storage system on 27 houses and required grid infrastructure. The system overall includes six 360W PV-T1 panels and a control system with a charge controller, batteries, inverter, and communications interface. A local community member is trained to handle basic operations and maintenance of the grid-tied mini-grid system, yet the project reports challenges including community dissatisfaction with the tariff (that is priced equal to Eskom grid electricity) and recommendations made include reviewing the overdesigned system and electricity pricing (Sustainable Energy Africa, 2022; Bloem, 2019).

Another village-size installation is in place in Orania in the Northern Cape Province. Orania's freestanding solar PV plant generates 841 kW, a supply that covers about 30% of the town's electricity needs during the daytime, while at night the town still relies on its Eskom supply. "The town council owns the solar plant, along with the Orania irrigation scheme and sells electricity to the internal network of the town at the same price as Eskom." (Nair, 2022; Njanji, 2022).

An older example of a rural mini-grid is the experience of the village of Lucingweni in the Eastern Cape. Following a mandate from the Energy and Minerals Minister to the National Energy Regulator to pilot off-grid electrification solutions, the Independent Development Trust facilitated the implementation of wind generators (six 6 kW), solar technology (50 kW array of S100 solar modules), batteries and control equipment to provide electricity to the 560 rural dwellings, with a longer-term plan to interconnect the several mini-grids into a macrogrid. The project was implemented around 2011 and was reported to have suffered from poor maintenance and vandalism. It eventually came to an abrupt stop due to insufficient community engagement (Sustainable Energy Africa, 2022; Mohlakoana, 2014). Nombakuse (2019) also recorded that lacking social cohesion in the area surrounding Lucingweni was observed to be a factor influencing the project negatively, as interpreted to be associated with the reoccurring theft of project infrastructure and that unwillingness to pay by the users further led the project to fail.

Similar also, is the second Eastern Cape case of the Hluleka mini-grid – another pilot site under the same government instruction and implemented around the same time as the Lucingweni project – which implemented two 2.5 kW Proven wind generators and a Shell Solar PV array of 56 100W PV modules with batteries and also failed due to lack of community buy-in and ownership (Bekker, 2010). In addition, Nombakuse (2019) also reported about inadequate energy supply to meet the demand, which consisted of a nature reserve as well as domestic needs.

The Transition Township Project, in Gqeberha in the Eastern Cape is an example of an urban solar installation aiming to benefit low-income households. The project is building on long-standing engagements between Nelson Mandela University and community members of KwaZakhele (Brennan & Cherry, 2021) and plans for neighbourhood co-operatives to sell electricity to the municipality by feeding into the grid (Cherry, 2021). As this example tests feed-in and wheeling of RE by a township co-operative, it is described in more detail in section 6.2.2.

Another mini-grid offering is promoted by the company Zonke Energy that targets unelectrified informal settlements with a modular PV system that services up to 16 households (Zonke Energy website, 2023). "These power lights, mobile phones, TVs, refrigerators and more from a central power hub. Their pre-paid metering platform enables payments to be made. Ownership of infrastructure involves investors, Zonke Energy, and communities. The capital cost entails R8 000 per household. Households rent a portion of the PV generator for a pre-paid monthly rental fee. Rental fee includes power and installation. Power is available day and night, summer and winter." (Sustainable Energy Africa, 2022, p.57). While awarded for its innovative technical and financial implementation design, the project is reported to have caused disappointment amongst participating households who find themselves stressed with additional costs when converting their appliances to solar compatible fridges for example (Damba-Hendrik, 2022).

The **Upper Blinkwater** smart renewable mini-grid project in rural Eastern Cape is providing electricity to non-electrified households (Ravanbach, Hanke & Kuhnel, 2020). This project is part of the GIZ partnership with South African municipalities to provide RE through PV solar to 67 households which are not on the municipal grid. While there is direct (although limited) benefit to the households, they are not the owners of the RE installation, nor are they organised; hence they do not meet the criteria for social ownership per se. The project brought electrification 10 years ahead of the government-envisaged electrification date for the area. Due to the collaboration of national, regional, and international actors, it is celebrated as a 'new institutional model for rural electrification' (Ravanbach, Hanke & Kuhnel, 2020). It is further described in Section 5 as an example of the mini-grid model.

The **iShack** project in **Enkanini**, outside Stellenbosch in the Western Cape, is approaching off-grid electrification through household-level installations of solar technology (iShack, n.d.). The project is installing off-grid 50–70 watt peak (Wp) solar systems to power lights, cell phones and a TV to urban and peri-urban households. The technical installation and maintenance are localised via iShack agents who have implemented over 1 600 systems to date. The project is well documented by students and staff of Stellenbosch University and other institutions, reflecting for example on the numerous enabling factors that allowed the project to succeed, including the instrumental role of intermediaries such as researchers and others in bringing the project and its stakeholders together, various government support and broad community participation, as well as challenges and concerns. The latter include the potentially divisive nature that delivering services (to some) can carry (Glasser, 2017; Visser, 2017; Wessels, 2015). iShack also inspired community members from **Siqalo, Freedom Farm and Malawi Camp** in Cape Town, who took to implement pilot installations in their communities. Siqalo, for example, is located on private farmland, where residents were left without municipal services including electricity. "One hundred households joined the pilot with each paying off the cost of a solar home system (and a television) over 24 months" (Sustainable Energy Africa, 2022).

GreenCape's Alternative Service Delivery Unit (ASDU) has been working with the Freedom Farm and Malawi Camp communities in Cape Town since 2019, the intention was from the outset to create a strong social foundation for community-led alternative service delivery. The communities are located on land belonging to the Airports Company of South Africa (ACSA) and the City of Cape Town Metropolitan Municipality. "This involved building an inclusive platform for local community members to express infrastructure preferences and understanding the communities' propensity to pay for infrastructure services while also mapping existing infrastructure assets." (Sustainable Energy Africa, 2022, p.62). GreenCape developed a three-fold approach to alternative service delivery, bringing together: 1) social inclusion and mobilisation of the affected community, 2) customised technical design, and 3) financial sustainability and affordability of the interventions. (Sustainable Energy Africa, 2022).

The **Urban Movement Incubator Energy Democracy Project** is another current effort to bring together three South African social movements from different urban locales, supported by two service NGOs to reconstruct and implement a campaign that realises widespread installation and operation of community-led socially owned renewable energy solutions. The project is a partnership of three community based organisations – **Vukani Environmental Movement (VEM), Abahlali Base Mjondolo (ABM)** and **South Durban Community Environmental Alliance (SDCEA)** – which in turn are supported by two service organisations, namely **GroundWork** and **Sustainable Energy Africa (SEA),** each with more than 20 years of experience in campaign and technical support to communities (Sustainable Energy Africa, 2021).

Table 3: Local examples of socially owned renewable energy

	Urban area-based (citizens/business)	Rural area-based (citizens/business/ NGO)
Name of example	a. SunExchange b. Lyndoch mini-grid c. Saltuba Co-operative, Transition Township Project d. Zonke Energy e. iShack f. Green Cape's Alternative Service Delivery Unit g. Urban Movement Incubator Energy Democracy Project	a. REIPPP programme projects b. Orania solar c. Lucingweni mini-grid d. Hluleka mini-grid e. Upper Blinkwater mini-grid
Purpose	a. Peer-to-peer solar leasing platform b. Test mini-grid installation for Eskom c. Sell electricity to municipality and derive electricity and financial benefits for community d. Deliver clean and affordable energy e. Household PC installation for urban shacks f. Platform for alternative service delivery solutions g. Dialogue initiative exploring role of social movements in energy service provision	a. Energy generation and economic development b. PV solar electricity supply c. Electricity supply for unelectrified village d. Electricity supply for unelectrified village e. Electricity supply for unelectrified households
Participation	a. SunExchange identifies schools, businesses, and organisations in southern Africa that want to go solar and conducts feasibility studies, investments can be made by qualifying individuals and organisations worldwide b. Residents and other buildings local to the Lyndoch eco-village c. Residents of KwaZakhele through neighbourhood co-operative d. Urban households e. Urban social movements/households	a. REIPPP programme host communities b. Households in Orania c. Households in Lucingweni d. Households in Hluleka and Nature Reserve e. Households in Upper Blinkwater

	Urban area-based (citizens/business)	Rural area-based (citizens/business/ NGO)
Finance	a. Initial grassroots crowdsourcing campaign, now financial independent b. Eskom funded (its own test installation) c. Research funding and donor funding d. Research funding e. Green Fund, Gates Foundation, Research Funding, Free Basic Electricity (FBE) subsidy, and group finance schemes (Flash Wallet) f. Donor and Government funding g. UMI Fund	a. Combination of finance, commonly development finance institutions (DFI) loans for community shareholding b. Community funded c. Shell Solar d. Donor funding e. German bilateral development funding (BMZ, GIZ)
Policy framework	a. No distinct policy b. No distinct policy c. SSEG wheeling or feed-in tariff d. No distinct policy e. Free Basic Electricity f. No distinct policy g. No distinct policy	a. Renewable Energy Independent Power Producer Procurement Programme (REIPPP programme) b. 100MW allowance (not correct term) c. Off-grid electrification d. Off-grid electrification e. Off-grid electrification
Contributing factors to viability/ barriers	a. Research engagements required to establish b. Technically sound, yet overdesigned and overpriced c. Municipal regulatory framework d. Importance of extensive community engagement to manage expectations e. Unique solution combining various forms of government support (FBE, local government etc.), importance of intermediaries to facilitate collaboration, critical role of community engagements and knowledge co-production with beneficiaries, risks for social cohesion associated with delivering services f. Importance of intermediaries to facilitate collaboration g. Research engagements required to establish	a. Policy requirement for community shareholding, lacking guidance for project developers and financiers on enabling structures and conditions for community impact b. Research engagements required to establish c. Importance of community engagement, relevance of localising technical installation/maintenance skills, importance of municipal partnership d. Importance of community engagement, relevance of localising technical installation/maintenance skills, importance of municipal partnership (same as c) e. Crucial importance of social facilitation, sound financial model, institutional and stakeholder model for maintenance, localisation of skills and contract opportunities

5.2 What has worked and what has not worked?

The humble list of examples presented is clearly not the evidence required to study or showcase the lessons learnt of actual community and socially owned renewable energy. The projects presented, historic (e.g. Lucingweni and Hluleka mini-grids) and current efforts (iShack; Alternative Service Delivery Unit [ASDU]; Urban Movement Incubator Energy Democracy Project) indicate though that there is policy and other space for niche developments to emerge.

Intermediary facilitation has shown results in project development and implementation, oftentimes it has been such facilitation that enabled collaboration within and between government(s) and third parties (including academia and implementation agencies) to gain traction. The private sector, in the instance of Zonke Energy and Sun Exchange and residential installations in more affluent contexts (e.g. Orania, body corporates, gated estates) is increasingly able to find commercial value in especially the deployment of solar energy (standalone and rooftop).

Most important for the research on socially owned renewables though is the evidence that shows just how irreplaceable are relationships with not only project stakeholders but, importantly, end-users, for a project's success. In the hypothetical context of a socially owned renewables project, these end-users and others might extend to be the owners and potentially, operators of projects. It is evident in the lessons learnt of most of the presented project examples that, crucially, projects across the board succeed or fail based on the quality of the relationships between the project stakeholders. Most importantly, the engagement with community and households relevant to the project is critical, yet ineffective engagement is frequently cited as the reason that projects experience vandalism, theft, non-payment, and other challenges that undermine project success. Such weaknesses are the very focus of attention in the ongoing Urban Movement Incubator Energy Democracy Project, which is working with established movements that enjoy an enabling degree of social capital, in organising for energy interventions. Another critical set of relationships is with government, which saw the Upper Blinkwater project succeed and the Transition Township Project struggle.

The advice of Nombakuse (2019, p.6) is that "socio-economic issues are critical to be addressed before the inception of renewable energy technologies, and the expectations of communities need to be guided." The scholar, Szewczuk (2015) in Nomabakuse (2019, p.10), recommends a "dynamic, systematic, subject to standards, responsive, and replicable to developing countries" sociological dimensions approach to ensure successful introduction of new technologies to areas and people who do not have prior experience with it. With this approach, acceptance of critical factors such as the linkage between energy technology implementation and economic development, and integration of the incoming technology services into local economic development planning can be expected. Stressed again though, in this cited research, is the importance of building upon the locally existing capacity to ensure effective utilisation and maximum benefits can be derived, built through deliberate integration of local stakeholders into decision making processes, awareness raising, training and practical support (Szewczuk, 2015 in Nombakuse, 2019).

5.3 Plans for renewable energy in identified provinces and municipalities

As Mpumalanga is the province most directly affected by the transition from fossil fuels, there is a strong case for ensuring that the repurposing of decommissioned coal-fired power stations not only contributes to renewable energy generation but also ensures social ownership of the repurposed facilities (Cloete, 2018; Satgar, 2015). In addition to reskilling and new job opportunities, there is potential for workers and/or local communities to benefit as shareholders in the new facilities (Winkler, 2020).

There are plans for the Komati power station, decommissioned in October 2022, to produce solar PV energy in combination with agriculture (agrivoltaic production), as well as to be used as a manufacturing hub for solar PV microgrids (Eskom, 2022). In addition, it is planned to serve as a training centre for reskilling the coal-fired power station workers. However, the extent and nature of worker or community ownership of this facility – if any – is not yet established. As with the REIPPP projects, the extent of social ownership is unclear at this stage; whether workers will be employees or have some form of ownership in the energy and agrivoltaic production. Workers and their organisational representatives are understandably concerned about the decommissioning (Nyathi et al., 2022). Other energy projects are planned in terms of the REIPPP Bid Window 4; however, none are socially owned.

6. Categorisation of models and identification of case studies

6.1 Main models of SORE

The review of literature (Sustainable Energy Africa, 2022; Davies et al., 2021) and the projects summarised above indicate the limited extent to which SORE has been adopted in South Africa. Between the large-scale REIPPP installations and the off-grid household solar PV installations, there is a gap that is waiting to be filled. As the Just Transition Framework (Presidential Climate Commission, 2022) document emphasises, "Supporting municipalities to develop a new revenue model for electricity sales in the transition to clean electricity system" (ibid., p.21) is required. If this new revenue model can encourage not only businesses and middle-class households but millions of township residents to contribute energy to the grid with the incentive of receiving economic benefit, one of the main barriers will be overcome.

Four broad categories of SORE appropriate to the South African context, and using the definitions of social ownership established in Section 1, emerged from the review:

1. Mini-grid owned/co-owned/managed by rural village or informal settlement. This model is appropriate for communities that are not currently connected to the grid; approximately 10% of households in South Africa (urban and rural).

2. Township or tenant co-operative-owned PV solar generation and feed-in to/wheeling through municipal grid.

3. REIPPP large-scale RE generation on community land and/or where there is substantial community or worker share ownership.

4. Share or direct ownership of SSEG on factory/mine/repurposed power station or institutional rooftops by workers or community members.

This literature review is confined to providing the broad parameters of the models of social ownership that may be appropriate and viable for the South African energy transition. Rigorous technical detailing of the proposed models is necessary. Moreover, the models presented need to be scalable, replicable, and financially feasible, and to be linked into mainstream mechanisms and policies such as Free Basic Electricity (FBE), social grants, and equitable share to municipalities for Assistance to the Poor (ATTP), land reform, land tenure and land restitution programmes, feed-in and wheeling tariffs; and JET-IP funding potentials. This will be done in the 'Work Programme' section of this report.

6.2 Identification and description of one South African case study project in each category

6.2.1 Rural village or informal settlement generation through mini-grids

This model is for a group of houses in a rural village where there is currently no grid access, or a peri-urban informal settlement where there is not yet grid infrastructure.

This model can use three modes of solar PV generation: SSEG on institutional/public infrastructure (schools, clinics); private household rooftop solar; 'mini-PP' freestanding array on public or communal land (traditional authorities/PTOs/restitution land/ municipal commonage).

This model can accommodate different combinations of energy including biogas, as well as small solar appliances and appropriate technology such as hotboxes and solar stoves for cooking. Informal settlements may involve 're-blocking' and access to communal infrastructure including energy.

Ownership model can be through household co-operative or community trust or NGO.

Benefit is through access to free electricity for members/users/linked households. This benefit will be limited by the capacity of the array/mini-grid. Depending on the ownership model and the capacity, owners could sell surplus to each other or to third parties (e.g. local businesses). If the village/ settlement is linked to the municipal/Eskom grid at a later stage, it can sell surplus electricity to the grid.

Upper Blinkwater mini-grid, Raymond Mhlaba Municipality, Eastern Cape

This is a pilot project of GIZ in partnership with Raymond Mhlaba Municipality and does not at this stage involve community ownership. The objective of the pilot was "to develop and test a decentralised, sustainable energy supply concept for the rural population in South Africa" (GIZ, 2020, p.9).

Free-standing solar PV array on municipal open space linked to 67 houses in the village in a hybrid mini-grid with diesel backup, providing electricity for lighting, and domestic appliances (GIZ, 2020).

Benefit is access to electricity to assist household members, and savings on fuel that would be purchased in the absence of electricity (e.g. paraffin for lighting).

6.2.2 Township grid-linked generation with co-operative ownership

This model can use three modes of generation: SSEG on institutional/public infrastructure (schools, clinics); private household rooftop solar; 'mini-IPP' freestanding array on municipal ground, feeding into municipal grid or a combination of the above.

SORE in townships is not restricted to PV solar generation, and various combinations of PV and battery storage; PV and wind; and PV and gas (biogas or hydrogen) can be considered.

The ownership model can be through household co-operative or community co-operative linked to an institution (e.g. a school). This model can incorporate rental housing, either social housing or inner-city tenants of blocks of flats or in co-operative ownership of rooftop solar as seen in Germany and elsewhere.

Benefit can be either through feed-in tariff (sell surplus to municipality as co-operative or group of households), wheeling through municipal grid to a third party, or use of solar PV array for co-operative businesses, selling surplus to the grid. In reference to the model of grid-tied township co-operative solar installations, Sustainable Energy Africa has explored private household rooftop solar and struggled to find a strong case for house-by-house SSEG in the low-income sector. SEA highlights the costly infrastructure, protection, maintenance, and technical management while there are also challenges for the utility developing from fixed costs associated with grid, metering, and other associated upgrades.

Source: Solar hybrid systems. https://sa-solar.blogspot.com/2012/01/small-freestate-town-goes-green-with.html

Saltuba Energy and All Purpose Co-operative, KwaZakhele, Nelson Mandela Bay, Eastern Cape.

This is the only pilot of this type to date and is a project of the Nelson Mandela University together with the Amandla Collective (NPO) and the KwaZakhele Development Agency (NPO) with residents of Sali and Tubali Streets in KwaZakhele township.

Free-standing PV solar array on municipal open space ('gap tap') in a formal township using existing infrastructure. A 5-kW system with potential to expand to 35 kW. Household co-operative of 25 adjacent households. Grid feed-in but no feed-in tariff yet; plan is to wheel to a third party. Co-operative has applied for lease of the land and has obtained a municipal account.

Current community benefit: use of electricity for lighting, charging of devices, internet access, waste recycling business; enables study during load-shedding.

Rooftop solar on households can be integrated into this model but was not selected for the pilot because of complexities of explaining Free Basic Electricity and feed-in tariff to household consumers and municipal officials.

Institutional rooftop solar was not selected for the pilot as benefit would in the first instance be to the institution (e.g. to the Department of Education or Department of Health) rather than primarily to the community.

6.2.3 REIPP land and share ownership by community

This model is for large-scale generation by wind or concentrated solar which is privately owned and managed through the REIPPP programme, in a situation where local community is a direct beneficiary through being landowners as well as shareholders. Significant community or worker share ownership (40%+) and/or community ownership of land (restitution/land redistribution/communal land/CPA/municipal commonage). Benefit is through revenue from rental of land and/or sale of electricity/dividends from share ownership.

There is an opportunity to leverage land reform as an asset into the REIPPP process. This will require land reform objectives to be aligned with the energy transition. The precise ownership/benefit model will depend on the nature of the land ownership.

Tsitsikamma Wind Farm, Mfengu Community Trust, Kouga Municipality, Eastern Cape Province.

The community in this case is defined as the amaMfengu land claimants from the Tsitsikamma area, who are defined in terms of the land claim. The benefit is managed through the Trust.

6.2.4 Worker share ownership of a repurposed power station

This model is based on the opportunity for repurposing the decommissioned coal-fired power stations and the need for benefit to communities where these power stations are located, as well as reskilling and reemployment of the workers in these communities. If there is potential for the power stations to be repurposed for biogas, agrivoltaics, or other forms of production of energy (possibly combined with waste recycling or food production), then there is potential for social ownership.

The model is not confined to decommissioned power stations and may be implemented on the roofs of functional factories or commercial buildings.

Ownership may be direct worker ownership and management of the facility, through a worker co-operative, or through share ownership in the facility by a trade union or other worker or community collective or trade union investment fund.

Komati Power Station, Mpumalanga Province

This project has not yet commenced. Extent of worker or community ownership has not yet been established.

The above examples of the four models of SORE are all tentative and limited in significant ways. The Rural Mini-grid (Model 1) is not owned by the residents and is a municipal project. The Township Co-operative (Model 2) is not yet able to sell electricity to the Municipality. The REIPPP Share Ownership/Land Ownership (Model 3) has limited share ownership and delayed benefit to the community. The Worker Ownership of Repurposed Power Station (Model 4) has not yet been implemented.

Figure 2: Proposed models of SORE based on the literature review

MODEL 1: MINI-GRID

- *Owned/co-owned/managed by residents*
- *Model used to improve energy access*
- *Rural areas or informal settlements with no grid*
- *Provides free basic electricity to households*

MODEL 2: GRID-TIED

- *Co-operatively owned generation system*
- *Rooftop (household SSEG)/array on public land/ community building*
- *Grid-tied urban infrastructure*
- *Feed-in/wheeling through municipal grid*
- *Smart metering integrates household/community building with array*
- *Can integrate households/be owned by households (massive roll-out of rooftop solar)*

MODEL 3: COMMUNITY REIPPP

- *Large-scale generation by private developer on community-owned land*
- *Selling to Eskom as part of REIPPP programme/private sector (industrial or mining)*
- *Community share ownership of more than a minimum 10%*
- *Additional rental income from land*

MODEL 4: WORKER SSEG

- *Shared/direct ownership of SSEG by workers*
- *Feed-in through municipal grid*
- *Factory/mine/repurposed power station/institutional rooftops*

Each of these models has potential. The detailed business case is set out for each model in the 'Work Programme' section of this report.

The review of projects above indicates the limited extent to which SORE has been adopted in South Africa. Between the large-scale REIPPP installations and the off-grid household solar PV installations, there is a gap that is waiting to be filled. Municipalities have a crucial role to play in this regard, but do not currently have the capacity to do so.

7. Conclusion

7.1 Concerns, risks, and barriers to implementation of SORE in South Africa

It should be noted that this literature review does not consider the status of SORE models in the national energy architecture, nor what proportion of the national energy supply they could potentially contribute. It is anticipated that if adequate support for such models is obtained, at both policy and financing levels, they could be shifted from being peripheral to constitute a substantial element of the energy system in South Africa; and in the process play a transformative role in making the just energy transition empowering in both senses of the word.

7.1.1 Regulatory barriers

In section 4 of the literature review, the barriers to small-scale or community participation in energy generation and sale are outlined. Licencing, public procurement processes and municipal regulations all create challenges for communities and households to engage in RE businesses. Partnerships with municipalities are essential in many of the models advanced.

7.1.2 Loss of revenue to municipalities

One of the main barriers to municipal adoption of SORE is the anticipated loss of revenue from electricity sales. Stats SA reported in 2017 that 42% of Eskom electricity generated in 2015/16 was rerouted through municipalities (Department of Statistics South Africa, 2017). In the first quarter of 2017, South Africa's 257 municipalities earned over 25% of their income from selling electricity (ibid.).

The metropolitan municipalities traded over two-thirds (about R15 billion) of all electricity sold by local government institutions in the first quarter of 2017 (ibid.).

While there may be gains from procurement of electricity from SSEGs/prosumers or IPPs, municipalities that are already struggling are afraid of loss of revenue, and require reassurance through pilot projects that prove the 'win-win' of decentralised RE procurement or feed-in.

7.1.3 Community buy-in

In the context of township or informal settlements, concerns are around access and affordability.

Township residents who receive Assistance to the Poor (ATTP) are threatened that their free basic services will be terminated if they are registered members of a co-operative or business owners, or if their household income increases substantially (see the Saltuba case study).

Informal settlement residents are worried that solar PV and other forms of alternative energy will not meet their needs and are 'inferior' and contributing to ongoing energy poverty and marginalisation of the poorest communities.

REIPPP beneficiaries are concerned that benefits from shareholding are delayed for many years, and there is little tangible developmental benefit to their communities.

Workers and households in communities dependent on power stations that are decommissioned are concerned primarily about loss of jobs and income to these communities.

Regarding REIPPP projects, (Dlamini, 2021) notes the importance for private RE companies of having a 'social licence to operate':

"Without a social licence to operate, there is a good chance that renewable energy financing may be rendered redundant, particularly in contexts where communities are not experiencing adequate participation in project planning and implementation. In the event that they are not effectively engaged, communities might object to, and even militantly reject, any renewable energy investment in the vicinity." (Dlamini, 2021, p.219)

7.2 Opportunities and benefits for SORE in South Africa

The models of social ownership of renewable energy identified above are all in the category of energy generation. There are opportunities for other kinds of social ownership of renewable energy, including manufacturing of components such as photovoltaic cells and lithium-ion batteries. There are also opportunities for co-operative ownership of businesses engaged in installation and servicing of solar PV, and distribution or wheeling of energy. The latter potentially involve partnerships with local government as have been implemented in Uganda, Zimbabwe and elsewhere.

The survey of SORE in the Global South indicates that some form of feed-in tariff and/or subsidy has proved to be viable as a way of incentivising solar PV participation by residents, so that they become 'prosumers', both consumers and producers of energy to contribute to the grid. Incentives and subsidies to households and businesses to install solar PV has worked in many countries. In July 2022, President Cyril Ramaphosa addressed the nation on the energy crisis, urging citizens to "join in a massive roll-out of rooftop solar and contribute to the solution"; in January 2023, he indicated that a new pricing structure would be introduced that would allow customers (of municipal electricity/Eskom) to sell surplus electricity from rooftop solar into the grid – municipal or national (BusinessTech, 2023).

The potential of township households to contribute as producers to solving the energy crisis is significant, as it could enable them to benefit financially while contributing to solving the energy crisis as well as the climate crisis – a truly 'win-win' solution as part of the just transition from fossil fuels. However, there are several challenges in the implementation of this model. To date, it has only been wealthy households who have been able to benefit from installing rooftop solar PV. A recent regulatory change has allowed for businesses to benefit from an SSEG model of feed-in to the grid, and for municipalities to buy electricity from small IPPs without a NERSA licence.

However, residents of working-class townships have been unable to participate in such programmes. Despite the President's Electricity Plan announced in July 2022, a feed-in tariff that allows residents (which would include township residents and co-operatives made up of such residents) to receive payment for electricity generated, has not been introduced. If the millions of residents of townships are viewed as potentially benefitting from SORE, not just as consumers but as producers, there needs to be a decisive intervention. Municipalities are key to this intervention, as the models proposed should neither undermine municipal revenue sources nor be privatised. The feed-in or wheeling models which benefit both municipalities and residents need to be tested and then upscaled.

Nelson Mandela Bay Municipality was innovative in pioneering a net-metering tariff (SALGA, 2018), but this has now changed. City Power in Johannesburg is offering – as of July 2023 – a feed-in tariff; however, this also functions on a 'net metering' basis, i.e. without direct financial benefit to prosumers; "customers with solar PV systems can feed back their excess power to the grid and reduce their monthly electricity bills" (BusinessTech, 2023). Despite claiming to offer 'Cash for Power', the City of Cape Town has yet to introduce a feed-in tariff for residential generation (rooftop solar on households), although it has introduced a policy for SSEGs on business premises to sell electricity to the grid. For this, an exemption from National Treasury was obtained (City Power, 2023).

Other constraints on SORE, including land use authorisations and grid strengthening to allow for multiple points of input, should be noted for the recommendations on pilot projects.

Land is a critical aspect of RE deployment and fossil fuel phase-out, and ownership of land requires careful consideration. While it may perpetuate existing inequalities, there are opportunities to bring about greater justice in access to land and wealth. Approaches should include creative and innovative solutions to land access including technological solutions among the enabling mechanisms.

SECTION TWO: STAKEHOLDER PERSPECTIVES ON SORE

About this section

The stakeholder perspectives section of the report combines the documented and public positions on SORE with inputs from three processes of stakeholder engagement: a public dialogue; a survey process; and key informant interviews. In these three processes, the models of SORE outlined in Section 1 of this report were presented. In addition to general questions about SORE, feedback on specific models was sought from relevant stakeholders. The key findings from all three data sources are presented in this report, reflecting the stakeholders' perspectives and the lessons learnt from the engagement with them.

Stakeholder consultation workshop, Pine Lodge Gqeberha, 12–14 July 2023.

1. Introduction

While the published views of major stakeholders on the JET was taken as a starting point, the focus of this report was to solicit input into the models of SORE that were developed through the literature review, as outlined in Section 1. Stakeholder mapping and an online survey offered opportunities for participation from a wide range of stakeholders. However, the essential feedback on the viability and acceptability of each model came through identifying specific stakeholders who are key to a particular model and soliciting their input. It should be noted that the objective of the process was neither to critique nor to negotiate consensus around an approach.

2. Methodology for stakeholder consultations

The identification of relevant stakeholders involved a systematic process to include diverse perspectives and expertise on SORE in South Africa. The objectives of the stakeholder consultation programme were to outline key sectors, gather and consolidate views, understand the principal elements of social ownership models, and receive feedback and recommendations for incorporating social ownership into energy investment and generation. The report includes perspectives from specific stakeholders such as civil society, trade unions, the private sector and government officials. Methods of data collection included an online survey, written comments, semi-structured interviews, and dialogues which allowed sector actors to become familiar with the content and context of socially owned renewables. Formal consultations provided a platform for deeper and meaningful feedback on the proposed models.

2.1 Stakeholder identification and analysis

The identification of relevant stakeholders to provide input on SORE involved a systematic process aimed at including diverse perspectives and expertise. It was determined that input on SORE with a specific focus on issues relating to the four proposed models were required.

Based on the models and the proposed content and key issues, a comprehensive list of potential stakeholders was created. The broad categories of stakeholders are depicted in Figure 3 below.

Figure 3: Stakeholder categories

NATIONAL GOVERNMENT
- *National departments*
- *Provincial government*
- *State-owned entities*
- *Government agencies*
- *Traditional leaders*

LOCAL GOVERNMENT
- *Local municipalities*
- *District municipalities*
- *District and local development units*

BUSINESS
- *Umbrella organisations and associations*
- *Individual companies*
- *Industries and sectors (mining, oil and gas, manufacturing)*

CIVIL SOCIETY
- *Community-based organisations*
- *Faith-based organisations*
- *Traditional healers*
- *Environmental organisations*
- *Climate justice organisations*

ORGANISED LABOUR
- *Federations*
- *Trade unions*

EDUCATION & RESEARCH
- *Universities*
- *Colleges*
- *Institutes*
- *Think tanks*

To protect privacy and uphold the consent agreement, individual details (unless they gave consent) are not included in this report. The list of stakeholders includes some 240 persons and organisations within the South African context.

2.2 Data collection

The formal consultation sessions were conducted using three approaches: an engagement session at the Climate Justice Coalition (CJC) dialogue held in July 2023; an online survey circulated to a broader stakeholder database between July and August 2023; and online and in-person interview sessions with available stakeholders during August to October 2023, and feedback received through participation and presentations in online meetings and conferences.

2.2.1 CJC Dialogue

The CJC dialogue information session gave many civil society and organised labour stakeholders the opportunity to gain early insights into the proposed models. Three main federations were represented in the CJC Dialogue: COSATU, SAFTU and NACTU. Trade union representatives also included members of key sectors involved in the transition: the South African Municipal Workers Union (SAMWU); the National Union of Mineworkers (NUM); and the South African Transport and Allied Workers Union (SATAWU).

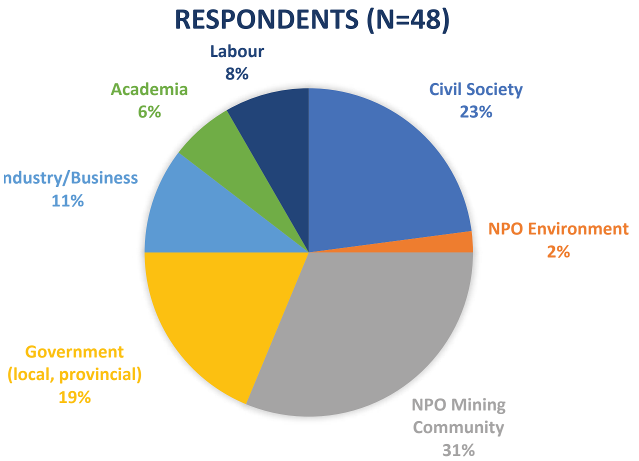
The information session started with a summary of the findings from the literature review and presented models for socially owned renewables from the Global North and South, followed by an overview of SORE models that have been implemented in South Africa. The presentation concluded by setting out four broad categories of SORE relevant to the South African context. The presentation was followed by a facilitated discussion with the CJC participants.

The information that was shared with all respondents is included in Annexure 4.

2.2.2 Online survey

The electronic survey was distributed via email to stakeholders. A total of 180 emails were delivered to respondents via email. Automated follow-up reminders were distributed to email recipients. Two recipients indicated that they wished to opt-out from the survey. A total of 48 responses were recorded. Figure 4 depicts the distribution of respondents across the different stakeholder categories.

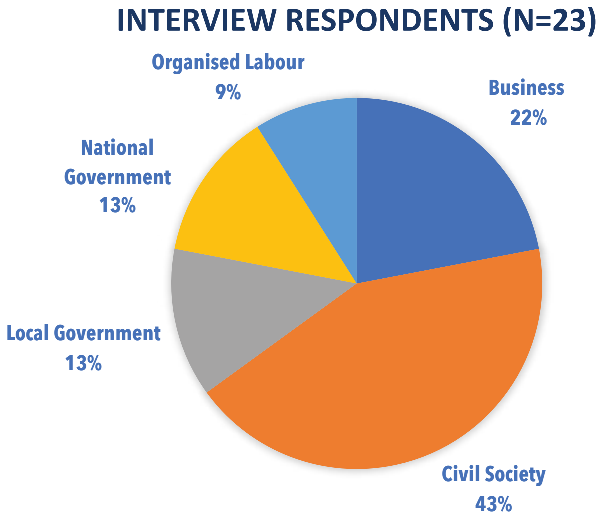
Figure 4: Respondents representing different stakeholder categories



2.2.3 In-depth interviews

In addition to the survey datasets collected, interviews of between one and two hours were conducted to follow up on stakeholders who were willing to give more input through consultations. Interviews were conducted with representatives of organised labour, RE consultancies, business, Eskom, national government, and local municipalities. The interviews were conducted with individuals and small groups, via email, online via Teams or Zoom, and in person. Figure 5 below depicts the distribution of respondents across the different stakeholder categories.

Figure 5:Interview respondents representing different stakeholder categories



Detailed notes were captured, video/audio recordings were made with all comments and questions raised in the discussions noted and captured. This included the names of individuals and/or organisations providing feedback, questions, and comments. The project team also transcribed and analysed the notes recorded during information sharing and consultation sessions, as well as written feedback submitted by stakeholders. Transcription software was used to produce the transcripts of the video and audio recordings.

2.3 Data analysis

Transcripts enabled systematic coding and categorisation. Using the software package, ATLAS.TI the team highlighted, marked, and annotate sections of the text to identify key themes, ideas, or noteworthy statements. This process of coding and categorisation formed the foundation for data analysis, facilitating the identification of commonalities and variations across different sources of data.

Stakeholder feedback and comments were classified and clustered by topic, theme, and sub-theme. This classification and clustering allowed the project team to identify frequently raised stakeholder perspectives and comments, in an unbiased manner. Clustering also allowed a preliminary view of emerging points of convergence and divergence amongst stakeholders. While the key themes were pre-identified, with stakeholder perspectives classified accordingly, a range of sub-themes to these emerged from the analysis of the dialogue discussions and these were integrated into Section 3 of this report.

3. Findings from stakeholder engagements

3.1 Key findings on contextual issues impacting SORE

Civil society stakeholders were categorised into community-based organisations, education and research, faith-based and traditional organisations, youth, and environment and climate organisations. Organised labour, while part of civil society, is dealt with as a separate stakeholder category given its centrality in the just transition and as one of the NEDLAC partners in the labour-government-business cooperation. Contextual issues raised by respondents and summarised here, are key to an understanding of the possibilities and risks for the implementation of socially owned renewable energy. This feedback from engagements is organised by stakeholder group and is applicable across models.

3.1.1 Civil society

Two major climate justice movements have emerged in South African civil society. One is the Climate Justice Coalition (CJC), facilitated by the global climate movement, 350.org. The CJC describes itself as a "coalition of South African civil society, grassroots, trade union, and community-based organisations". The other, the Climate Justice Charter Movement (CJCM), led by the South African Food Sovereignty Campaign, is based at the University of Witwatersrand. There is some overlap between the two coalitions/movements; they share many policy positions on climate justice, and some organisations are members of both.

The CJCM has a wide appeal, with the Climate Justice Charter being endorsed by over 280 organisations, including the Climate Justice Coalition itself. Some of the key environmental activism organisations have endorsed the Charter, including Extinction Rebellion, Greenpeace, Oceans not Oil, and Fossil Free South Africa. The CJCM also includes several locally based community organisations engaged in food sovereignty, housing, water, and other struggles, as well as networks of informal traders and small farmers. The key difference between the two is that the CJCM is explicitly socialist, while the CJC is constituted by environmental NGOs and trade unions and is coordinated by the local chapter of the global climate movement 350.org and its organising principles are based on environmental and social justice. However, both emphasise that only a fundamental transformation of the economy can bring about a just transition from fossil fuel in South Africa.

The Climate Justice Charter Movement

CJCM has developed a charter for a Just Transition in South Africa and is in the process of developing more detailed policy documents on specific aspects of the charter. It is committed to "***socialised"*** ownership of energy production and is opposed to a transition to RE which benefits corporations, in particular multinational corporations. It is also deeply distrustful of the transition being dependent on foreign direct investment and loans from the advanced industrial economies of the Global North, as well as from international financial institutions, including the JET-IP funding mechanism. Many of the partners in the CJCM are open to participating in the piloting of decentralised renewable energy projects which are worker or community owned, and a few of them are already involved in piloting such projects. Partnerships in these cases are with NGOs or small RE installers/service providers who are willing to partner with community organisations as social enterprises.

While the CJCM is in the process of developing more detailed policies, at its launch on 17 October 2023 at University of Witwatersrand, Matthew Wingfield from the Rapid Transition Alliance presented a draft outline of what SORE could entail. He referred to communities owning a stake in and/or running renewable energy generation facilities located close to the community and generating income through the sale of electricity. This indicates an openness to forms of social ownership operating within a market economy, at least as an interim measure, through forms such as worker co-operatives, communal land lease, or tenant and household co-operatives.

The Climate Justice Coalition

On SORE, the Climate Justice Coalition states clearly that trade unions, workers, and communities across South Africa constitute the main basis for social ownership of renewable energy. The Climate Justice Coalition understands socially owned renewable energy to be ownership "by workers, co-operatives, communities, citizens, municipalities, and the state through entities like Eskom. The aim of social ownership is for the benefits of energy to go to the people rather than to profit multinational companies" (350.org, 2021, p.28). As per this definition, the CJC does not distinguish between social and state ownership. The Green New Eskom campaign calls for "a rapid and just transition to a more socially owned renewable energy powered economy, providing clean, safe and affordable energy for all, with no worker or community left behind in the transition" (ibid., p.4).

The CJC also maintains that Eskom needs to play a central role in ensuring a transformative and just transition to renewable energy. That does not mean that Eskom is the only producer of energy, but it does mean it is regarded as a key player in the generation, distribution, and transmission of renewable energy (350.org, 2021, p.10).

While the focus of the CJC's ***Green New Eskom*** campaign is on the role and transformation of Eskom, there are general recommendations for SORE and SORE models (350.org, 2021, p.5):

- *Enabling policies and incentives for socially owned renewable energy so that workers, communities, small-to-medium businesses, and households can own and benefit from clean energy.*

- *Ending harmful and regressive subsidies for coal, oil, and fossil gas, and redirecting them to urgent needs like education, healthcare, energy access, and renewable energy.*

- *A mass roll-out of solar panels; electric vehicles and accompanying infrastructure; affordable, electrified mass transit; smart grids; battery and storage technologies; and building efficiency retrofits especially for low-income houses; all with policies to encourage local production.*

- *A massive skills, jobs, and training programme to create opportunities for the people of South Africa in the renewable energy economy and unlock One Million Climate Jobs. Women and youth empowerment must be a vital part of this programme.*

The CJC argues that rather than the widespread privatisation of the energy sector in the hands of multinational corporations, stronger forms of social ownership of renewable energy can better ensure a democratic process for the allocation of downstream benefits from social ownership, such as jobs, income, and energy access. CJC and other social movements, like Cry of the Xcluded, link this understanding of social ownership with the need for a radical 'Green New Deal', which puts South Africans to work building a more socially and ecologically just future that tackles the deep inequality, unemployment, and poverty in society.

3.1.2 Organised Labour

In addition to the federations and trade unions which were represented in the CJC Dialogue, interviews were conducted with leadership in a NUMSA region, SAMWU's head office, as well as in-person communication with three local and regional officials associated with other unions in SAFTU.

Overall, the responses reflect broad support for SORE and specifically for worker-owned IPP approaches, particularly in collaboration with local government and in contexts involving mining and industry, where social and economic benefits and environmental sustainability goals can be achieved. The inclusion of unions and workers in decision-making processes around energy needs was emphasised as an essential consideration across all models.

However, respondents from trade unions also pointed to the following issues in the interviews and emerging from policy documents which were shared with interviewers:

- The transition should be based on the unity of workers across federations.

- The pace of transformation should not only be based on environmental concerns but should also prioritise socio-economic concerns.

- Government should avoid loan agreements with organisations such as the IMF that entrench "green structural transformation", where the path and objectives of the transition are determined by capital.

- The unbundling of Eskom should end, and ways should be found to build low-carbon generation capacity consistent with upholding energy sovereignty and building local supply chains.

- The foundation of the transition should be based on the transformation of Eskom into a public utility producing energy from renewable resources for the public good.

- Workers at coal-fired power plants who may lose their jobs because of the transition from fossil fuels to renewable energy should be trained and absorbed into the renewable energy sector.

- Local government has a strong role to play in partnering decentralised approaches that incorporate models for worker models of SORE. However, as a SAMWU official explained:

"We are anti-privatisation that has been reaffirmed by national congresses from the first Congress in 1987 until the last Congress in 2020. Now, it's one thing to say that the way of solving this thing [transition to low carbon energy] is to involve the private sector, or maybe it's to co-opt workers to own something in relation to that thing. We want ... renewables to be publicly owned, to be owned by government, not to be outsourced. However, it's clear that we are interested to have an influence on how [renewable energy] is unfolding. How it is being implemented [affects us] as workers, as trade unions or as the working class. We want to have influence. However, we don't want to have the illusion that we must own something…". (Ntuli, 2023)

- A SORE sector where workers and the community will be direct owners and beneficiaries of RE projects is a possibility but will need popular education campaigns and specifically tailored education programmes to develop technical and managerial skills, and an understanding of the social and solidarity economy (NUMSA, 2023).
- Some worker leaders also pointed out that debates around a just transition and specifically an energy transition have not involved discussions with workers on the shopfloor in an organised manner. This they felt was an important issue that needed to be put right and were in support of popular education campaigns involving the labour movement (NUMSA, 2023).

3.1.3 Business

Several private companies were consulted to solicit their views on the proposed models. Most were involved in provision of solar PV. A respondent in the auto industry was engaged around the worker SORE model. This respondent noted that the transition to electric vehicles (EVs) and the implementation of the CBAM will have important implications for the development and viability of the industry in South Africa. The localisation of value chains and support for manufacturing of RE components were highlighted (Madwara, 2023). This points to the potential for integrating industrial policy with the just transition and with Model 4, the worker-owned renewable energy model.

Business and industry respondents acknowledged that engaging with renewable energy sources would result in gaining knowledge and skills about these technologies. This is viewed to have broader educational and economic benefits for individuals and communities. Furthermore, the private sector, in particular renewable energy installers and energy traders, expressed enthusiasm for SORE and are willing to collaborate with social and community partners if it enables expansion of their market and to decentralise and scale up RE provision.

3.1.4 Government

Some respondents (predominantly government and business) acknowledged that solar energy is vital due to the ongoing issue of load-shedding in the regions of Limpopo, the Eastern Cape and Mpumalanga. This highlights the role of renewable energy in mitigating power shortages and improving energy availability.

Municipal officials consulted have noted the importance of RE projects being included in Ward Development Plans and IDPs, having 'buy-in' of councillors for planning purposes, land zoning and infrastructure maintenance.

Respondents from academia and government recognised that shifting to renewable energy could lower energy production costs, in contrast to traditional energy sources which are subject to escalating fees.

This could be achieved by substituting NERSA rate increases with more stable, CPI-based fees, potentially leading to up to 30% cost savings.

3.2 Key findings on SORE Models

Findings from the data analysis indicated a popular reception towards Models 1 and 2, whilst Model 3 raised doubts with participants especially with regards to communal land ownership issues. Models 2 and 4 elicited concerns around regulatory environments, especially for grid-tied models.

3.2.1 Model 1: Mini-grid

The importance of community involvement in socially owned renewable energy projects was recognised by all stakeholders. NGOs and university research projects have tested solar PV in informal settlements and rural villages, but to date, such projects have not provided households with sufficient energy for their needs. The advantages of community-owned renewable energy projects include ownership and benefits for the community, relieving energy poverty, addressing energy needs in underserved communities, reaching underserved communities, benefiting women, children, and youth, meeting workers' needs, and providing local economic benefits.

Concerns about community-owned renewable energy projects include the high costs associated with sustainable energy inputs, technical concerns about the suitability of solar PVs, batteries, wiring, and connections, appropriate forms of social ownership and management, and the need for expanded access to reliable, affordable energy, in a context of limited provision through renewable energy.

Overall, the potential social, economic, and environmental advantages associated with community involvement in, and ownership of renewable energy initiatives were recognised, highlighting the broader positive impacts on local communities and individuals. The complex interplay of social, economic, regulatory, and technical factors in the discourse surrounding renewable energy and social ownership was also acknowledged.

3.2.2 Model 2: Township and tenant co-operative

The respondents expressed various viewpoints regarding the potential outcomes of grid-tied initiatives.

The notion that households could pay for energy reflects an understanding that investing in renewable energy sources offers benefits like energy security. Government respondents recommend the integration of backup solutions, so that communities can ensure a reliable power supply even during times of grid instability.

While acknowledging the potential benefits of renewable energy, some civil society and NPO mining community respondents suggested that a portion of the generated power should be sold to cover costs. This reflects a practical consideration of balancing the financial aspects of renewable energy projects.

The CJC supports an ambitious roll-out of rooftop solar projects:

> *A transformed Eskom can be at the heart of a renewable energy revolution, where households, companies, communities, municipalities, and Eskom all work together to produce reliable, affordable, clean, and renewable energy.*
>
> *Across South Africa, households, communities, and businesses can benefit from more socially owned renewable energy and energy efficiency projects, creating jobs, and making and saving them money. (350.org, 2021)*

However, this would be dependent on a fair feed-in tariff and a partnership between municipalities and communities (Lenferna, 2023).

In relation to the Township Co-operative model, a COSATU representative at the CJC dialogue noted that they envisaged municipal utilities for RE generation and distribution working in partnership with communities, with subsidies (possibly some form of a subsidised feed-in tariff, although this was not specified). An additional SORE model proposed at the CJC dialogue was 'state-owned and community controlled'. This, for example, could take the form of municipal-owned RE generation together with community co-operative distribution or a subsidised household feed-in tariff.

Another concern expressed was that community ownership at municipal level – especially if Eskom were to be 'cut out' of the energy provision model – would facilitate the liberalisation and privatisation of the energy space. For Eskom, the concern was the potential loss of revenue from municipalities. There is a tension between public ownership and community ownership. For some respondents, the concern is the loss of revenue from the sale of electricity at municipal level.

> *Our interest is to represent workers, not to own something for the sake of profit, to generate profit. That is not our position. Our position is to have influence on how renewable energy ownership is unfolding, how this thing is being implemented. But up to now, we haven't taken a position on maybe being the owners of that thing.*
>
> *The municipality, the municipalities, … must own some of those renewables because municipalities depend heavily on electricity. Like most of the municipalities, the revenue that comes from electricity is close to 30%. And now if municipalities are not owning that [renewable energy and they're owned by the private sector, [then] they are in the hands of the private sector. The municipalities will lose revenue. As a result, the collective bargaining in the sector will be affected. (Ntuli 2023)*

However, this is not necessarily a shared view. Grid-tied models, that feed renewable energy into the grid, counter the argument of imminent revenue losses to municipalities. How the role of the state is understood needs to be redefined with new forms of public ownership which are not only state-centric.

Municipalities dependent on revenue from the sale of electricity will need convincing that this model can be beneficial to them. This would require that: i) the municipality buys the electricity from the community-owned renewable energy (CORE) project at a lower cost than Eskom; and ii) that the municipality continues to sell electricity to its customers as before, i.e. the township and tenant models do not replace the municipal grid; and iii) that municipal workers continue to service the municipal grid, i.e. the municipality is the key partner with the community in this model. These views were reiterated by the national research officer of the South African Municipal Workers Union (SAMWU) who argued that SAMWU is not in principle opposed to an energy transition, but it cannot be done at the expense of municipal workers jobs in electricity departments and it should not lead to a decrease in the income of municipalities who are already struggling to meet service delivery demands in the context of declining funding (Ntuli, 2023).

Based on insight gained from the German electricity market, concerns were expressed around subsidised feed-in tariffs and their impact on electricity markets, leading to tensions as commercial prices increased for consumers and utilities faced pressure to recover costs. There is an intricate relationship between subsidies and market dynamics.

On the regulatory front, attention was drawn to the European Commission's State-Based Guidelines on Environmental Protection and Energy policy, which prompted a shift away from feed-in tariffs towards more competitive options in 2014. Concerns emerged regarding how this policy change influenced electricity prices for ordinary individuals, emphasising the broader implications of regulatory decisions on affordability and accessibility. This could impact the viability of a township or tenant grid-tied co-operative.

Regulatory challenges were highlighted in relation to the ability of 40 municipalities to credit small-scale embedded generation to export into the grid, indicating obstacles encountered by township co-operatives in utilising this approach. Technically, some concerns were expressed on whether municipal grids have the capacity to handle multiple CORE projects feeding into local grids.

A recommendation made by CJC was to expand the insufficient basic free electricity access grant for low-income households. CJC's 'Green New Eskom' recommendation is that "***(Eskom) must … make the investments needed to extend and upgrade the grid – allowing socially owned renewable energy to feed into the grid.*** (350.org, 2021, p.4).

The capacity of municipalities to partner in implementing such a model, including a fair feed-in tariff, is limited at present and would need to be augmented. The Climate Justice Charter notes that local government must be strengthened 'to have enhanced powers and democratic planning competencies to deal with the climate crisis'.

3.2.3 Model 3: Community REIPPP

The responses to the proposed community IPP model reflected a mix of viewpoints especially on land tenure and ownership where concerns were expressed around commun8ity control and benefits. Another concern around land issues, included delays in land reform processes.

A government respondent recognised the potential benefits of the model, particularly for industrial tenants seeking stable energy prices and reliable supply. The concept of power purchase agreements (PPAs) between community generators and corporate entities was presented where such agreements could facilitate community benefit through return on investment from asset holding and subsidised or free power provisions.

The REIPPP programme is recognised for its advantages in terms of stable energy supply, financial returns, and environmental benefits. There is potential for REIPPP projects to be implemented on land owned by communities, providing added benefit for land reform or restitution beneficiaries, or as communal property associations. The varying perspectives highlight the need for clear communication, transparency, and community involvement in the planning and implementation of renewable energy projects.

Alex Lenferna (2023) noted that there are cases such as the Ingonyama Trust and the Royal Bafokeng Trust where communal land has been used to establish income-generating relationships with mining companies and other private enterprises. Case studies around communal land should be analysed to understand which models of governance have led to wide community benefit, and what the potential is for social ownership.

3.2.4 Model 4: Worker SORE

The responses from the CJC workshop and follow-up surveys showed general agreement and a positive sentiment towards the worker SORE approach. Both labour and business leaders interviewed expressed broad support for worker ownership and held a favourable view of involving workers in the ownership and management of renewable energy projects.

Some CJC participants from mining communities saw the potential for synergies between mining activities and renewable energy generation, that would protect the viability of operations at mines and other high energy users such as smelters and manufacturing plants concentrated in industrial zones.

Respondents emphasised the importance of community engagement, participation, and empowerment in renewable energy initiatives. Implementing renewable energy projects was seen as a potential means to reduce unemployment, particularly in areas where the current energy arrangements and the energy transition away from fossil fuels could negatively impact workers. A well-planned transition to renewable energy that involves trade unions could see new job opportunities created in RE.

There is also an opportunity for financial benefit from the transition to renewable energy for trade unions. Trade union investment companies and trade union pension funds could invest in new and/or existing IPPs some respondents felt at the CJC dialogue. To foster socially led and majority-owned IPPs, labour investment vehicles could buy local renewable energy company(ies), to acquire technical competencies in 'social hands' and enter a competitive market.

Trade union representatives emphasised the importance of localising value chains for renewable energy components.

Company owners agreed that worker ownership of RE was a possibility. A strong concern around possibilities for deepening shopfloor conflict between labour and management, as well as about the capacity of workers and trade unions to manage RE projects, was also expressed.

4. Conclusion

Collectively, these discussions underscored the intricate web of regulations, policies, and challenges that must be navigated to enable effective social ownership of renewable energy projects. A broad consensus emerged that tailored and progressive regulations are essential to ensuring equitable and sustainable outcomes. The discussions surrounding social ownership of renewable energy projects were rich and multifaceted, addressing various aspects related to community participation and benefits. Projects should address community problems, involve the youth, and prioritise technical training. Overall, the discussions highlighted the need for holistic, community-centred approaches, emphasising education, collaboration, and flexibility to ensure the success of socially owned renewable energy projects and to foster a just and sustainable transition to cleaner energy sources.

SECTION THREE: WORK PROGRAMME

About this section

This section of the report builds on the four models of social ownership of renewable energy outlined in the first two sections. Drawing on the review of literature on models of social ownership of renewable energy in the Global North and Global South in Section One and on consultations with diverse stakeholder groupings in Section Two, the four models were then applied to specific settings using the original definition and criteria of social ownership. The economic viability of each of the models was tested through a spreadsheet modelling process. The summary is presented in the form of a dashboard for each model. Recommendations are made regarding partnerships, capacity building and regulatory requirements for each model to be implemented. Where appropriate, potential pilot projects are suggested.

GreenPeace helps to bring renewable energy to a community crèche in Diepsloot, Gauteng, through Project Sunshine. Source: https://thegreentimes.co.za/help-project-sunshine-bring-light-to-the-children-of-diepsloot/

1. Methodology underpinning the work programme

The work programme is intended as a dynamic tool for use in identifying projects and institutions which require support to implement models of social ownership for the just energy transition. This tool is the cumulative result of two different but interrelated processes, which formed the first and second deliverables for this project. The literature review (Section 1) surveyed case studies of social ownership in both developed and developing countries and drew lessons for which models are appropriate for the South African context. Four possible models emerged from this review. The stakeholder consultation (Section 2) engaged with key stakeholders involved in the energy transition, to obtain their input on which models of social ownership would be appropriate, viable and beneficial to their constituencies.

Following the stakeholder consultation, four teams were established, to integrate the findings from the literature review and the stakeholder consultation, and to solicit additional feedback and information where required. For each of the four models, specific stakeholders were identified for in-depth consultation and information. Additional case studies and examples of existing social ownership of RE in South Africa were drawn on, including the August 2023 report of the Centre for Sustainability Transitions (CST) of Stellenbosch University, ***Bottom-Up Responses to the Energy Crisis: Case Studies*** (Jacob, Foster, Tshabalala & Swilling, 2023).

The next step was to develop a 'high level' outline of each model, meeting the criteria as defined. Once the four models were defined, a further categorisation of the four models was done. One or two models in each category was selected, and a basic financial modelling was completed to test the economic viability and possible economic benefit of each model. This was done through a spreadsheet with the relevant criteria adapted for each model.

It was hoped that at least one potential pilot for each model would be identified and more detailed modelling provided. However, detailed technical modelling is not possible in this report, as the specific sites and partners in each project would need to be finalised before this could be done. Site-specific particularities could alter the inputs for the model. Where there are existing pilot projects, a higher level of detail is presented.

1.1 Criteria for models

The models developed as part of the work programme had to meet the following criteria to be considered for piloting:

- Enable social ownership as defined in the literature review.
- Provide a social and/or economic benefit.
- Have relevant stakeholder support.
- Be technically feasible.
- Be replicable and/or scalable.
- Be economically/financially viable and/or fundable.
- Fall in line with government and Intergovernmental Panel on Climate Change (IPCC) policies/guidelines.

It was acknowledged by the PCC that the assessment of some models against these criteria may require additional research in the form of specialised studies and analysis to ascertain if a specific model and especially project idea and location would meet them.

In addition to the above criteria, the following additional issues considered important to the success of SORE were drawn from the literature review, stakeholder consultations and PCC feedback:

- Benefits of the model to a specific stakeholder constituency.
- The form of ownership that would best support each model (e.g. co-operative, non-profit trust).

- What issues should be considered to facilitate members' active participation.
- The contribution of each model to a just transition.
- Interest from stakeholders in implementing a pilot model.

1.2 Models of social ownership: Framework

Four broad models of SORE appropriate to the South African context were identified using the definition of social ownership established in the literature review, the identification of potential models through the literature review and stakeholder consultation process. For the purpose of the work programme, the four main models were further divided according to context (urban or rural; formal or informal); technology (grid-tied or off-grid); ownership (co-operative, trust, land or share ownership); and partnership model; (social-private partnership or social-public partnership). These variants of the main models are summarised in Figure 6 below.

Figure 6: Models of SORE for a South African context

MODEL 1: MINI-GRID CO-OPERATIVE OR TRUST	MODEL 2: GRID-TIED CO-OPERATIVE
• *1a) Rural village* • *1b) Urban informal settlement*	• *2a) Rural village with electrical infrastructure* • *2b) Urban township with electrical infrastructure* • *2c) Inner-city tenant housing or social housing*
MODEL 3: COMMUNITY REIPPP	**MODEL 4: WORKER SSEG**
• *3a) Land restitution* • *3b) Land redistribution* • *3c) Communal land or community property association*	• *CO-OPERATIVE* • *4a) Decommissioned power station* • *4b) Workers of factory or commercial building*

For the purpose of developing a feasible work programme, only one category in each of the four broad models is modelled in detail, with the exception of the mini-grid (Model 1) where two models are presented.

Model 1: Mini-grid co-operative or trust is demonstrated for a rural village(1a), and an urban informal settlement (1b). A key learning from the existing pilots is that the limited solar PV energy provided does not meet all the needs of residents. One example of this is the Upper Blinkwater mini-grid. The models presented below are for a village of 100 households and for an informal settlement of 250 households, producing sufficient energy for household use with additional energy for community social and economic benefit.

Model 2: Grid-tied co-operative (2b) is demonstrated for the context of an urban township with formal electricity infrastructure. The existing pilot project is the Saltuba Co-operative in KwaZakhele. It is envisaged that this model could also be implemented in a rural township or village where there is formal infrastructure. This report does not model for this option as the model is dependent on local contextual issues (for example, such as size of the village, terrain, and the roof structure of housing). There is also potential for this model to be implemented by tenants' associations in blocks of flats, social housing, or hostels.

Model 3: Community REIPPP is demonstrated below for communal land ownership in the context of former homeland areas under communal tenure (3c). There is potential for this model to be linked to land reform, through both land restitution and land redistribution programmes. Black farmers who are beneficiaries of land reform programmes can form a co-operative and partner with IPPs, for example. Land claimants who are granted land or reclaim land through a restitution claim as a community may also form such a partnership with an IPP. One example of this is the Tsitsikamma Land Trust.

Model 4: Worker-owned SSEG co-operative is demonstrated where the SSEG installation is linked to a factory (4b) where workers are employed. There are examples of SSEGs in mines, factories, and shopping centres, but these do not meet the criteria of social ownership because they are privately owned. The model presented is for a motor industry component factory (example 1) and for a factory producing inverters and smart meters for renewable energy (example 2).

Decommissioned power stations have been identified as a potential site for multi-use production including renewable energy (4a) and an example exists in the Eskom project at the decommissioned Komati plant. This does not at present meet the criteria for social ownership as used in this report and as a result, a model was not developed for this option.

2. Work programme

2.1 Mini-grid model

Mini-grids can be defined in terms of:

- Generation capacity, i.e. between 10 kW to 10 MW.
- The number of households reached. For example, mini-grids reaching 20–100 households are called microgrids and mini-grids reaching over 500 customers are called full mini-grids.
- Grid infrastructure availability. For example, provision at a site where there is no access to the national grid. (ESMAP, 2019)

For this study, a mini-grid is defined as a "set of small-scale electricity generators and possibly an energy storage system connected to a distribution network that supplies electricity to a localised group of consumers" (Porta, 2019). This system is essentially designed with a minimum 10 kW generation capacity for a group of households in a rural village or a peri-urban informal settlement where there is currently no grid access.

Mini-grids correspond to Tiers 2-4 of the Global Tracking Framework (Baum, 2017), which provides for access to 50 kWh – 2 000 kWh per household per year. Feasible energy generation technologies include solar, wind and biomass-powered generators. Contextualised studies must be conducted to ascertain demand, and supply of energy based on the source for each settlement. The technical components of mini-grids include:

- Energy generation (solar, wind, biomass)
- Inverters (AC/DC coupling)
- Storage (lithium-ion batteries)
- Management systems (charge controller, smart metering, monitoring system)

Mini-grids are key to achieving the 2030 universal access to electricity target and further meet the goal of ensuring that 45% of energy generation capacity come from renewable energy sources (ESMAP, 2019). Mini-grid systems are becoming increasingly competitive compared to the cost of traditional grid extension and offer an alternative that entirely avoids many of the challenges that new and expensive expansion of the grids require, and importantly, can operate in isolation from national transmission networks and supply relatively concentrated settlements.

With approximately 11% of households in South Africa not connected to the grid (General Household Survey, 2021), the mini-grid model is poised to address this lack of access to clean, safe, and affordable energy. The 2022 Census (Stats SA, 2023) finds that 5% of households – under 1 million – do not have electric lighting; however, 35%, or over 6 million households, do not use electricity for cooking.

The two micro or mini-grid sub-models for rural villages and urban informal settlements are outlined below.

2.1.1 Mini-grid in a rural village

Context

In this model, it is assumed that there is no existing electrical infrastructure. The mini-grid should be installed where it is too costly or difficult for Eskom or the local municipality to connect households and small businesses to the national grid.

Purpose

This model extends access to affordable energy in under-serviced villages for household use and local economic development including community and educational facilities or co-operative agribusiness or other businesses.

Technology

Technology could be solar PV, small-scale wind, or micro-hydro. Feasibility studies must be conducted to ascertain demand and supply of energy based on the source. If solar PV, then the installation could be situated on suitable rooftops (household, institutional, commercial, or industrial buildings). Alternatively, solar could be situated on a freestanding installation like the containerised microgrids developed by Eskom or the CoCT or as a free-standing 'carport' style array as in the pilot projects at Saltuba and Blinkwater.

Examples of microgrids in rural contexts include the Upper Blinkwater mini-grid in Raymond Mhlaba Local Municipality, in the Eastern Cape, powering 67 households and Eskom's Ficksburg microgrid pilot plant on Wilhelmina Farm, Ficksburg, in the Free State, powering 14 households.

Grids function well where there is a diversity of sources for generation. Therefore, a hybrid grid (solar with wind, biogas, battery storage, etc.) would be optimal.

Benefit

The energy is generally for household or community use. It is estimated that a renewable installation with a sustained maximum capacity of at least 5 kW per household can provide for approximately 645 kWh per household per month, which can cover basic needs including cooking, heating, lighting, and appliances (own data, Transition Township, 2017). The Public Affairs Research Institute (PARI) in their report ***Hungry for Electricity***, indicate from studies conducted by Earthlife Africa (2010) and Makonese et al. (2012) that the minimum threshold level of consumption for electricity is 200 kWh per household per month to meet the most basic needs (Ledger & Rampedi, 2012). The report also states that for households to leverage "meaningful socio-economic benefits from electricity" the minimum threshold of consumption is closer to 350 kWh. It is important that this model plans for a better than basic energy supply and does not reinforce 'energy poverty' and the perception that RE is an inferior energy source.

Ownership and organisation

The model assumes that ownership can be organised through any of the following: co-operatives, community trusts managed by residents, or through a community property association. The model can also accommodate social enterprises, in a small-scale social franchise ownership structure. Rural businesses can partner with the RE co-operatives and benefit from access to cheaper energy in an aggregator model of rural economic development, with the mini-grid providing a hub for small-scale rural industrialisation and commercial developments.

It is imperative that a community organisational structure is facilitated from the outset of the project's development. If there is an existing organisational structure in the community, then it would be advantageous to support or potentially develop a structure in cooperation with the existing community organisation to focus on the RE project. The community could develop a sense of ownership of the technology and plan for the energy provided to meet their needs and enable the community's social reproduction and economic development. The process for carrying out facilitation of a community organisational structure must start before the implementation of the technology and continue throughout all phases of project implementation until the community structure has developed a sense of independent decision making, a critical disposition toward the technology and community, and has created an understanding of working relationships in the community.

Economic viability

The project in Table 4 below is modelled for R6 million CAPEX to serve 100 households in either a village or an informal settlement.

Table 4: Model for micro/mini-grid for rural village SORE of 100 households

Mini-grid (Rural)		
Number of households	#	100
Household capacity allocation	kW	5
Available collective allocation	MW	0.5
Total PV CAPEX	ZAR	6 000 000
Total OPEX	ZAR/yr.	110 000
Total production from solar PV	MWh/yr.	750
Household consumption	MWh/yr.	450
Available to trade in community	MWh/yr.	300
Price per MWh	ZAR/MWh	1 200
Available to trade in community	ZAR	360 000
Levelised cost of electricity	ZAR/MW	1.028
Economic impact	ZAR	4 348 627
Carbon removed	tons	7 350
SA/local jobs	#	9
Indirect jobs	#	7

In the above example, for 100 participating households (and assuming an allocation of 5 kW per household) CAPEX of R6 million will procure a 500 kW (0.5 MW) installation which generates 750 MWh per annum. Household consumption (450 MWh) assumed that each household requires approximately 3 kW (60% of installed capacity) for basic needs, leaving 300 MWh available for shared community benefit and/or for economic activities connected to households. This would translate into revenue of approximately R360 000 per annum (at R1 200 per MWh). The contribution to the local economy would be more than R4.3 million, with the creation of 16 jobs (full-time equivalent (FTE)) and the equivalent removal of 7 350 tons of carbon from the atmosphere.

A certified installer must be contracted to handle technical faults and equipment failures. Such operational cost may vary according to the nature of the technical issue.

Training for local community members to install, operate and manage the facility, with continuous capacity building for members managing the facility, will be needed. Initially, operation and maintenance should ideally be managed with support from the contracted installer. Households too will need ongoing education to understand their own consumption better and to understand broadly how the grid works. In economically constrained communities, implementing a mini-grid on a cost-recovery basis will be detrimental to the social benefit sought by the community.

Funding

Funding requirements include:

- Capital costs.
- Training, i.e. both technical and organisational management training and mentoring, initially and ongoing, as the management might change over time.
- Running costs could include, for example, required operational and maintenance work, insurance, data and devices, labour costs, and co-operative board members' or trustees' fees.

Funding for a microgrid should be through non-conditional grants. Connecting villages in deep rural contexts likely means residents will be economically marginal, and operating such a facility on a cost-recovery basis would not be feasible. The expectation of utilising generation for own consumption while operating an installation on a for-profit basis compromises the potential social benefit that such an installation may have for a community.

The Industrial Development Corporation (IDC) could serve as strategic partner of catalytic grant funding (Industrial Development Corporation, 2023).

Replicability and/or scalability

This model lends itself to replicability through the modular nature of the technology and it is scalable to the almost two million households that could benefit from the application of mini-grid models. In rural villages that have historically been excluded from access to FBE, the state could ring fence this grant from National Treasury to support the democratisation of energy access through the development of mini-grids.

Stakeholders

If the installation is primarily for household use, then the residents should be the primary stakeholders. If there is generation capacity to power some institutional buildings (especially emergency or health services, or schools), then these actors should also be incorporated as stakeholders.

- The Department of Energy – custodian of the Integrated National Electrification Programme (INEP), which contains its non-grid electrification programme, and responsible for energy-related policies and regulations.
- Update DMRE's Non-Grid Electrification Programme with clear implementation guidelines for mini-grids to ensure affordability and sufficient access to energy services for non-grid generated electricity. Due to the elevated costs of mini-grid infrastructure, changes to the fee for the service model should be made to ensure that the monthly household costs are not borne by FBE, which could otherwise jeopardise access to the grant for households not included in the mini-grid.
- Provincial structures – who own the social infrastructure should incorporate mini-grids into provincial development plans.
- Eskom in partnership with municipalities and communities (as in the Ficksburg model).
- Social enterprise in partnership with communities.

- Municipal departments including Electricity, Integrated Development Planning, Finance, Local Economic Development, the Mayoral office, Mayoral Management Committee members and ward councillors and ward committees.
- Development practitioners – to coordinate and facilitate community participation programme.
- Funding partners – donors, private equity investors, and financial institutions. The IDC may serve as a key strategic partner with its Spatial/Special Intervention Fund and/or Township Energy Fund.
- The IDC provides for grant funding for 'small and micro business within townships, small towns, and rural areas. These include formal and informal traders, social businesses, small retailers, and manufacturing businesses' (Industrial Development Corporation, 2023)

Recommendations

Table 5 below sets out key considerations for the planning, implementation, and ongoing management of a rural mini-grid model.

Table 5: Process recommendations for a rural mini-grid

Support programmes for funding and capacity building	• Non-conditional grants directed to capital and operational expenditure for mini-grid. • Facilitation of community organisational structure responsible for mini-grid. • Support programme for renewable energy industry stakeholders.
Support programme for people/groups/institutions governing communal land	
Goal	• Implement the installation of a renewable energy mini-grid in a rural village context and support the development of a local organisational structure that will be responsible for the mini-grid and enhance social mobility and socio-economic development.
Objectives	• Identify a rural community where there is a need for electrification. • Define the geographic scope covered by the renewable energy installation and assess viability of available energy sources. • Co-design the mini-grid with the community to integrate the energy with local needs. • Facilitate organisational development with the local community. • Build the renewable energy installation. • Work with a community organisation to facilitate working relationships in the community to facilitate socio-economic development and appropriateness of the technology. • Monitor and evaluate the ongoing performance of the renewable energy installation. • Facilitate ongoing development of the community organisation.

Support programme for people/groups/institutions governing communal land	
Activities	• Identify rural community where there is existing socio-economic activity and local activism. • Define the geographic scope covered by the renewable energy installation and assess viability of available energy sources. • Co-design installation with the community. • Facilitate co-operative development with household representatives in the local community. • Build the renewable energy installation. • Work with co-operative to facilitate socio-economic development. • Monitor and evaluate the ongoing performance of the renewable energy installation. • Facilitate ongoing development of the community organisation.
Time frame	• One month (site selection, define geographic scope, assess available energy resources). • Three months (community consultation, co-design workshops, assess load demand, commence community organisational development). • Six to nine months (ongoing community organisational support, co-design workshops, size the system, system configuration). • Three months (construction, ongoing organisational support). • 12–24 months (review and monitor system performance, ongoing organisational support). • 12–24 months (in-person/online sessions, ongoing support).
Potential implementation partners	• Local or district municipality. • Eskom or local utility. • Renewable energy installer. • Co-operative development facilitator and/or community organiser.

2.1.2 Mini-grid in an urban informal settlement

Context

Energy poverty is most severely experienced by those residing in the urban informal sector whose population is estimated at between 1.1 million and 1.4 million households (SEA, 2022), with the majority using unsafe fuels such as candles, paraffin, charcoal, and firewood to meet their basic energy needs. This can expose household members and communities to injury, loss of life and property due to fires. These urban settlements are characterised by high unemployment, lack of formal tenure, insufficient public space and facilities, and poor access to municipal services. Policing services in unelectrified informal settlements put communities, especially women and children, at a greater risk.

The mini-grid modelled here is for an informal settlement for which housing subsidies and infrastructure funding may already have been approved, enabling in-situ development. The mini-grid is understood as an alternative to grid-connected electricity provision and not as a temporary measure. The MFMA permits investment in permanent infrastructure in such cases. The success of mini-grid installations in urban informal settlements lies with all tiers of government finding a workable CAPEX funding model coupled with a sustainable and community participatory operating model.

Purpose

The model aids under-serviced urban informal settlements with access to electricity for household use, such as lighting, cooking, devices, appliances, and more. Mini-grids may also supply street lighting which can assist in combating crime.

The system could potentially fit under the Department of Mineral Resources and Energy's Non-Grid Electrification Programme. Therefore, the purpose of the system is to provide a safe, relocatable, and reusable energy distribution and household energy management system as an alternative to formal electrification through a grid connection.

Technology

Technology is the same as for the rural mini-grid model above. The difference is in the extent of available infrastructure, the layout of the informal settlement, and the placing of the solar PV panels.

An example of microgrid installations in urban informal settlements include the Zonke Energy Project in Qandu Qandu informal settlement in Cape Town, which powers 16 households. Such private-public partnership pilot projects have a potential to be scaled up subject to funding.

Benefit

The mini-grid provides residents with an opportunity to be prosumers of electricity through:

- Producing energy for own use (lighting, cooking, appliances, devices, etc.), and community access to services (internet, water pumps for water harvesting).
- Mitigating against load-shedding risk.
- Providing work opportunities and skills development, inter alia, in construction, implementation, maintenance, and management.
- Positive impact on health and the environment as communities use cleaner energy as opposed to hazardous fossil-fuel-based sources such as coal, gas, and kerosene.

Importantly for municipalities and government:

- Mini-grids cost less than traditional grid expansion (Africa Minigrid Developers Associtation, 2022).
- Mini-grids enable delivery of basic services and provide support to national power systems.

Ownership and organisation

A model is proposed with a contextually suitable combination of three key stakeholders namely: community members, state and/or NGOs, and private entities. Local communities could co-operatively own, manage, operate, and maintain the system as its sole owners where the infrastructure is installed on household rooftops. External help for technical and/or financial assistance could come from state entities, donor funders or the private sector.

In instances where provision is via freestanding infrastructure with energy wheeled to households, the ownership structure could still be based on community co-operative ownership or could reflect a community majority in partnership with other institutions or organisations bringing equity or access to resources. This hybrid model leverages the individual strengths of each project partner and promotes a more collaborative approach to solving the country's energy crisis.

The development of community organisational capacity will follow a similar process as that for the rural mini-grid (see Table 5).

Economic viability

The project in Table 6 below is modelled for R15 million CAPEX for a 250-household mini-grid. It should be noted that in informal settlements, installation depends on contextual factors such as the structure of shacks, whether there is nearby infrastructure (e.g. a school roof) or land for a freestanding array as for a township grid-tied model, for example.

Table 6: Model for mini-grid for urban informal settlement of 250 households

Mini-grid (Urban)		
Number of households	#	250
Household capacity allocation	kW	5
Available collective allocation	MW	1.25
Total PV CAPEX	ZAR	15 000 000
Total OPEX	ZAR/yr.	275 000
Total production from solar PV	MWh/yr.	1 875
Household consumption	MWh/yr.	1 125
Available to trade in community	MWh/yr.	750
Price per MWh	ZAR/MWh	1 200
Available to trade in community	ZAR	900 000
Levelised cost of electricity	ZAR/MW	1.028
Economic impact	ZAR	10 871 567
Carbon removed	tons	18 375
SA/Local jobs	#	22
Indirect jobs	#	17

For 250 participating households and again assuming an allocation of 5 kW per household, CAPEX of R15 million will procure a 1.25 MW installation capable of generating approximately 1 875 MWh per annum. Household consumption (1 125 MWh) in this example is assumed at approximately 3 kW (60% of installed capacity) per household for basic needs, leaving 750 MWh available to trade in the community or supply local enterprises. This would translate into revenue of approximately R900 000 per annum if the electricity is sold at R1 200 per MWh. Economic impact in this example would be around R10.9 million, with the creation of 22 FTE jobs and the equivalent of removing 18 375 tons of carbon from the atmosphere.

Like the rural-based mini-grid, training for local community members to install, operate and manage the facility; with continuous capacity building for members managing the facility, will be needed. Initially, operation and maintenance should ideally be managed with support from the contracted installer. Households too will need ongoing education to understand their own consumption better and to understand broadly how the grid works. The iShack project is a prime example of how to recruit, train and manage community-based installations.

As electricity will presumably be intended primarily for own consumption, although with installed capacity that is bigger than current consumption, downstream economic activities may be possible through electricity generation. In economically constrained communities, implementing a mini-grid on a cost-recovery basis will be detrimental to the social benefit sought by the community.

Funding

Funding requirements include:

- Capital costs for energy generation (solar, wind, biomass, etc.), inverters (AC/DC coupling), storage (lithium-ion batteries), and management systems (charge controller, smart metering, monitoring).

- Training, i.e. both technical and organisational management training, and mentoring, initially and ongoing, as the management might change over time.

- Running costs, i.e. required operational and maintenance work, insurance, data and devices, and labour costs.

Funding may be sourced through grants or private equity. According to government, grants are available for CAPEX spend on alternative energy solutions, with equitable share available to partially fund operations (City Power, 2023). IDC as strategic partner may serve as a catalyst for grant funding. Like the iShack and Qandu Qandu projects, end users will pay a nominal fee to access the service.

Replicability and/or scalability

The mini-grid is for a community of households between 50 and 1000 and is replicable, in a village or a section of an informal settlement. Modular, replicable systems can be applied easily in different locations, reducing the cost of developing a mini-grid portfolio. Three to six years is a typical time frame before successful projects will likely need to be scaled up, with the first two years used to measure the actual load patterns and use of system characteristics (Carbon Trust & CSIR, 2017). Modular systems save costs and construction time by using standardised designs and processes.

Stakeholders

If for household use, then the residents should be the primary stakeholders. If there is generation capacity to power some institutional buildings (especially emergency services or schools), then these actors should also be incorporated as stakeholders.

- Department of Mineral Resource and Energy – custodian of the Integrated National Electrification Programme (INEP), which contains its non-grid electrification programme, and is responsible for energy-related policies and regulations.

- Provincial structures – who own the social infrastructure should incorporate mini-grids into provincial development plans.

- Municipalities – Electricity, IDP, Finance (supply chain management, revenue, CFO), LED, Mayoral office, members of the Mayoral Committee (electricity, infrastructure, ED, etc.) ward councillors/committee.

- Development practitioners – coordinate and facilitate community participatory programme.

- Funding partners – donors and private equity.

Recommendations

a) The mini-grid model is recommended for consideration by government to allocate funds towards the exploration of off-grid energy solutions by municipalities, developers, and communities.

- National electrification strategies should be backed by policy and regulatory frameworks specific to renewable energy mini-grids for rural and urban informal settlements.

- Update DMRE's Non-Grid Electrification Programme policy with clear implementation guidelines for mini-grids to ensure affordability and sufficient access to energy services for non-grid generated electricity. Due to the elevated costs of mini-grid infrastructure, changes to the fee for service model should be made to ensure that the monthly household costs are not borne by contributions from the conditional grants for Free Basic Electricity, which could otherwise jeopardise access to the grant for households not included in the mini-grid.

- Therefore, provide a separate conditional subsidy from National Treasury to municipalities to carry the costs for renewable energy generation through mini-grids.
- Allocate funding to scale-up current pilot projects.

b) There is a need to reconceptualise the recently launched Informal Settlements Upgrading Programme, the Urban Settlement Development Grant, and the Municipal Infrastructure Grant to consider the prevalence of energy poverty in many informal spatial settings. These grants could be used to promote generation of energy based on social ownership.

Table 7: Process recommendations for an urban informal settlement mini-grid

Support programmes needed	• Non-conditional grants specifically directed to capital and operational expenditure for mini-grid. • Facilitation of community organisational structure responsible for mini-grid • Support programme for renewable energy industry stakeholders.
Support programme for people/groups/institutions governing urban land	
Goal	• Implement the installation of renewable energy mini-grid in an informal settlement context and support the development of a local organisational structure that will be responsible for the mini-grid and enhance social mobility and socio-economic development.
Objectives	• Identify an informal settlement where there is a need for electrification. • Define the geographic scope covered by the renewable energy installation and assess viability of available energy sources. • Co-design mini-grid with the community to integrate the energy with local needs. • Facilitate organisational development with the local community. • Build the renewable energy installation. • Work with community organisation to facilitate working relationships in the community to facilitate socio-economic development and appropriateness of the technology. • Monitor and evaluate the ongoing performance of the renewable energy installation. • Facilitate ongoing development of the community organisation.

Activities	• Identify informal settlement where there is existing socio-economic activity and local activism. • Define the geographic scope covered by the renewable energy installation and assess viability of available energy sources. • Co-design installation with the community. • Facilitate co-operative development with household representatives in the local community. • Build the renewable energy installation. • Work with co-operative to facilitate socio-economic development. • Monitor and evaluate the ongoing performance of the renewable energy installation. • Facilitate ongoing development of the community organisation.
Time frame	• One month (site selection, define geographic scope, assess available energy resources). • Three months (community consultation, co-design workshops, assess load demand, commence community organisational development). • Six to nine months (ongoing community organisational support, co-design workshops, size the system, system configuration). • Three months (construction, ongoing organisational support). • 12–24 months (review and monitor system performance, ongoing organisational support). • 12–24 months (in-person/online sessions, ongoing support).
Potential implementation partners	• Local or district municipality. • Eskom or local utility. • Renewable energy installer. • Co-operative development facilitator and/or community organiser.

2.2 Grid-tied models

2.2.1 Grid-tied urban formal township SORE

Context

The grid-tied model is demonstrated for an urban context in a formal township. There is existing infrastructure in place that could be utilised for a renewable energy installation. It is suitable for implementation in both old municipal townships and in Reconstruction and Development Programme (RDP) townships established since 1994. The assumption is that households are fairly uniform in size and income and have the same infrastructure. Homes are now owned by the residents (in old municipal townships title deed was transferred in the early 1990s; in RDP townships the beneficiaries of RDP housing policy obtained title deeds).

The modelling in this case is based on an old township, KwaZakhele, in Gqeberha. In this township there are public open spaces ('gap taps') which are available for use by residents. The modelling is for a co-operative based on households near a centrally located public open space in a township setting.

Purpose

The purpose of the project and who benefits, must be constituted by the community. When the community clearly understands the extent to which they stand to benefit either by remuneration through sale of the electricity or how they can use the generating power for their own use, then it will be their decision to form a renewable energy co-operative. Depending on generating capacity and the rate of remuneration, where the installation may be used to some degree for both functions, there is likely to be differences across the areas. Higher generative capacity and lower direct economic benefit may provide possibilities for other downstream economic activities, for example, a community kitchen and/or internet café.

Technology

The technology proposed is a grid-tied solar array distributed on household rooftops situated in a single neighbourhood. An existing example of this model is the Saltuba Co-operative in KwaZakhele, where 25 households are members of a neighbourhood co-operative.

In this model, 125 kW are installed on household rooftops surrounding the gap tap. Therefore, roughly 5 kW of PV solar will be installed at each of the 25 participating households. An additional 10 kW are installed on a freestanding installation on the gap tap for collective use by other enterprises of the co-operative.

An ideal scenario for selling the electricity would allow the generation to feed into a centrally located battery, which would then feed into a bulk meter, and subsequently into a substation. Considerations must be made whether all participating households feed into the same transformer, which might require additional wiring for the PV installation to connect to the battery.

Alternatively, a freestanding 135 kW array could be constructed off-site from the community and connect to the grid via a medium voltage substation. In this case, potentially greater generation capacity could be added due to the higher ceiling provided by medium voltage. Here, a wheeling arrangement would be ideal. However, because the array is located off-site, the generation capacity would likely not directly benefit the community.

Benefit

The potential scenarios for remunerations and other benefits have been outlined in the case of the Saltuba Pilot in KwaZakhele.

There are seven potential scenarios:

i. The community receives revenue through the direct sale of electricity to an energy trader (presuming all electricity goes to the trader).

ii. The community sells all electricity to the municipality through a feed-in tariff.

iii. The community sells all electricity to the municipality with a subsidised feed-in tariff.

iv. The community consumes the electricity it needs for each household and sells the surplus to the municipality, private off-taker, or energy trader.

v. The community uses electricity for its own use, which means it does not receive direct remuneration from the generation of electricity.

vi. The community feeds all electricity into the municipal grid and receives a credit on their household accounts to receive a reduction in their electricity bills.

vii. The community feeds all electricity into the municipal grid and receives a credit in units of free basic electricity.

The benefit to the municipality is in augmented electricity to the grid in the form of RE, at a rate which is lower than Eskom.

Outside direct remuneration for the sale of electricity, there are other potential social and economic benefits deriving from the use values of the electricity generated by the grid-tied co-operative. Perhaps the most important benefit deriving from affordable access to electricity is improvement to basic nutrition. Each kWh of electricity derived outside of household income means that other basic needs will be prioritised where they otherwise would not have been. Additionally, access to electricity means downstream economic activities become possible for households, including small businesses or local production of goods and services.

Viewing such installations as efforts toward poverty reduction, the allocation of free electricity, or in this case the free allocation of electricity infrastructure, orients socially owned renewable energy as a developmental programme. Access to sufficient electricity for households that is free and basic consequently means such allocations are not simply an expenditure, but rather an engine for socio-economic mobility. Indeed, all government allocations of electricity, whether for socially owned renewable energy installations or free basic electricity for non-generating households, must be viewed as pro-poor programmes to engender economic development and social mobility. The extent to which FBE for non-generating indigent households has not enabled socioeconomic mobility to date is merely an indication that the allocation per household has been insufficient and misallocated. It is for this reason that SORE installations should be adequately funded through conditional grants to municipalities to avoid the issues indigent households already face with the existing FBE policy.

Overall, the benefits lie in the decarbonisation and localisation of energy for household use, and provision of reliable and adequate electricity supply for municipal consumers/prosumers.

Replicable and/or scalable

The neighbourhood or gap tap co-operative model is replicable across the township. In KwaZakhele there are 120 gap taps and approximately 25 000 households. This is potentially a considerable contribution to the municipal grid from a township of this size and would enable the municipality to meet its obligations in providing consistent energy to industrial areas. Grid capacity for multiple feed-in points would require careful assessment for the specific municipality and context.

Another potential benefit in this case would be for local businesses, who could buy electricity from the township co-operative, wheeled through the municipal grid.

Table 8 below sets out the remuneration to the community, based on existing data from the Saltuba Co-operative and the data are utilised to provide input for modelling.

Table 8: Estimates for PV solar array for grid-tied urban township co-operative

Saltuba PV Solar Array Production Estimates (135 kW)	
Monthly Average for 135 KWh	Annual Average for 135 KWh
13 041	156 492

Saltuba Capital Cost of Installation (PV solar only)	
Estimated cost per kW installed (ZAR)	R12 000
kW per gap tap (kWh)	135
One gap tap (ZAR)	R1 620 000

Saltuba PV Solar Array Revenue Estimates (135 kW)		
Rates	Monthly Revenue	Annual Revenue
Wheeling rate		
Etana [Trader] (R1.20)	R15 649.20	R187 790.40
Feed-in tariff		
NERSA Approved Cape Town FiT (R0.7898)	R10 299.78	R123 597.38
Subsidised feed-in tariff		
Current NMBM Municipal Prepaid (R2.69)	R35 080.29	R420 963.48

Ownership

It is proposed that ownership is exercised through a co-operative constituted by at least one representative from each household in a neighbourhood.

Ultimately, ownership must be defined through feasibility studies and consultation with the community. Load surveys will be crucial to understand the energy demand from the community. Other research methods, such as rapid rural appraisal, will additionally provide insight into the capabilities and assets present in the community.

While external stakeholders in the implementation of the renewable energy installation will be crucial to building capacity within the community to manage the co-operative, there must be a process in which the community assumes full ownership and responsibility for the installation.

After one or two years, the community must have full ownership and responsibility of the renewable energy installation. Preferably, a technical expert, such as an installer, will maintain a relationship with the co-operative to repair any faults and assist with maintenance of the technology.

Organisation

The proposed model represents a social-public partnership between a neighbourhood co-operative or energy community and the local municipality.

The organisation of the community in relation to the renewable energy installation must be defined and must evolve through the development of the co-operative and the renewable energy installation. The community structure (i.e. the co-operative), must be first and foremost oriented toward the needs in the community as its organisational base. Therefore, the community structure's relationship to the wider community is one measure of its democratic practice. Indeed, a clear understanding of the relationship and responsibilities between external stakeholders in the project, the community structure, and people in the community, is important for establishing ownership and organisation by the community where the renewable energy technology is located.

Enabling a co-operative's sustainability through democratic practice will require continuous commitment and training from experienced organisers who can work with the community. There is no time frame for achieving this objective, but it will certainly be no less than six months to a year. The length of time involved is important for not only orienting the community toward the concepts and working practices of a co-operative but also to develop an ethos where expectations, allocation of benefit, responsibilities, working relationships, and decision-making are created and clearly understood by everyone. Facilitation of collective learning and co-creation among the community organisational structure are of utmost importance for establishing a deep sense of democracy in the community and ownership of the renewable energy technology. Internal democratic practice is vital for ensuring a renewable energy installation is socially owned, and guards against power dynamics that may privilege decision making and benefit for some members in the community over others.

In order of priority, in the ethos of a grid-tied co-operative, its democratic practice is primary while the technology comes second.

Economic viability

If economic viability is defined as profit for the community members who own the renewable energy installation, then there are scenarios where this is possible. However, there are circumstances that must be present that fosters an enabling environment to realise such profit or surplus.

If the funder for CAPEX and OPEX is conducted through loan financing (implying the funder seeks either a return on investment or cost recovery) then such installations are not defined as economically viable. The average potential revenue for the co-operative is R26 500 per month (assuming a subsidised feed-in tariff). The benefit to households represents approximately R1 040 additional income per household per month (with a subsidised feed-in tariff). This is significant in households with average income of R3 500 per month.

Table 9: Model for grid-tied township SORE based on 35 households

Grid-Tied (Gap-tap)		
Number of households	#	35
Household capacity allocation	KW	5
Available collective allocation	MW	0.18
Total PV CAPEX	ZAR	2 100 000
Total OPEX	ZAR	43 750
Total production from solar PV	MWh/yr.	263
Municipal off-take/local electricity market	MWh/yr.	263
Price per MWh	ZAR/MWh	1 200
Total Revenue	ZAR/yr.	315 000
Levelised cost of electricity	ZAR/MW	1 048
Economic impact	ZAR	1 604 621
Carbon removed	tons	2 573
SA/Local jobs	#	3
Indirect jobs	#	2

Extrapolating from the Saltuba example, but with ten more households (i.e. 35 households) participating, CAPEX of R2.1 million can procure a 175 kW (0.18 MW) installation that will produce approximately 263 MWh per annum, which if priced at R1.20 per kWh (R1 200 per MWh) will generate a revenue stream of R315 000 per annum for the lifespan of the installation (minimum 25 years). The current (November 2023) prepaid price of electricity in Nelson Mandela Bay is R2.69 per kWh (R2 690 per MWh). In terms of impact, one co-operative of 35 households, would contribute R1.6 million to the local economy, create five FTE jobs and is the equivalent of removing 2 573 tons of carbon from the atmosphere.

The economic benefit outlined above demonstrates the significant difference for each household per month if the electricity is sold with premium prices, as opposed to market competitive prices. Therefore, if the co-operative can receive remuneration through a FiT, then it should be subsidised for the renewable energy installation to be economically viable.

Funding

Funding the capital expenditure for a grid-tied co-operative, or likely any renewable energy technology in a working-class community, must be done with non-conditional grants. Expectation of repayment for loans will directly undermine the ability of working-class people to derive social benefit from such projects.

At present a grid-tied renewable energy co-operative cannot sell electricity to a local municipality through a FiT. According to Schedule 2 of the Electricity Regulation Act (2006), small scale generators, <100kW, are unregulated and unlicensed. Generators willing to export onto the grid must have a capacity above 100 kW and must obtain a license. NERSA cannot legally regulate prices for unlicensed generators. However, municipalities are legally eligible for two licenses, distribution, and trading. Therefore, if small-scale generators were to sell electricity to a municipality, then this could be achieved via a contractual relationship between the small-scale generator and the municipality. A contractual relationship between a municipality and a third party must be facilitated through a public procurement process, per the Municipal Finance Act, Municipal Systems Act, and the Constitution. At present, municipal public procurement would entail a tender process, but another format such as a standard agreement establishing rates for time of use (ToU) between municipalities and small-scale generators may be possible. Such a format would require facilitation between the National Treasury and municipalities. Alternatively, the present option available to a grid-tied co-operative is wheeling electricity on the municipal distribution grid to a trader or willing off-taker via a power purchase agreement.

FiTs should be subsidised with the intention of improving socio-economic conditions for working-class people in grid-tied renewable energy co-operatives. Without subsidies, such projects are not financially viable. If there are funds in the grant portion of the JET-IP to cover such costs, then this should be prioritised above existing public funds. Alternatively, this subsidy should be allocated as a conditional fund from the National Treasury.

However, there is a danger in redistributing funds from free basic services, already underfunded and misallocated by municipalities, to reorient them from their basis as social welfare to supporting entrepreneurial activity. More concretely, this money would be redistributed from indigent households where it is desperately needed to cover basic needs to projects that have their own generating capacity. This is disproportionately expensive compared to basic electricity provision and will ultimately deprive many more indigent households not generating electricity to a smaller number of socially owned renewable energy projects. A subsidy for a potential FiT in the future should come from its own dedicated fund outside existing allocations already afforded by the national government through the equitable share to municipalities.

Stakeholders

As direct beneficiaries of the project, the co-operative and local residents are key stakeholders.

The municipality is a key stakeholder in relation to regulatory matters and potentially also for technical and economic matters. In particular, the municipal electricity and human settlements departments are vital for establishing legal and regulatory conditions for the community's relationship to the renewable energy technology to be operationalised. If the grid-tied co-operative wishes to sell electricity to the municipality, then a relationship between the co-operative and the municipality also becomes important for the associated billing, accounting, and monitoring processes.

A relationship to a utility such as Eskom or City Power in Johannesburg is not necessary but may be advantageous for expediting a power purchase agreement. In a situation where wheeling may be the preferable scenario, either a trader or willing off-taker will be necessary for setting up a legal arrangement for sale of electricity.

A solar installer will be necessary as a technical expert to implement the renewable energy installation as well as ensure the technology is maintained. Additionally, an electrical engineer or electrician, who may or may not also be the installer, will be important for establishing the technical conditions for the renewable energy technology as well as aspects of planning and design but also capacity building for the community members to clean, maintain, and repair the technology.

The presence of a community organiser or organisation with experience in co-operative development will be crucial for the development of the community structure, such as a co-operative, that will own the renewable installation. A community organiser will facilitate the organisation and internal democratic practice of the co-operative and community. Organisationally, the co-operative must develop a concrete understanding of working relationships and allocation of benefit. Central also to democratic practice is the capacity for the co-operative to make independent decisions, which can be facilitated by a community organiser.

Funding for the technology owned by the community may come through the DMRE or National Treasury via the municipality, as well as the IDC. Therefore, these government entities will be important stakeholders.

Recommendations

a) The legal entity of the organisation must be clearly defined as well as the mechanism for receiving remuneration, whether it is a feed-in tariff or wheeling. Therefore, the community must define itself as a co-operative, community association, or energy community. The creation of an energy community as an entity in South African law is recommended.

b) The community must have clear legal right to use public land for renewable energy production. Therefore, there must be mechanisms in place for the municipality to allocate usage rights for such community projects, which implies they must be expedient and affordable. Rezoning of public open space should not be necessary if non-exclusive rights to public space are retained by the co-operative and the solar PV array can be combined with other land uses.

c) Municipal IDP and infrastructure plans will need to accommodate this model if it is to be implemented on any scale.

d) The context of the energy regime in South Africa will determine what type of benefit the community can receive from energy generation.

e) A potential FiT for small-scale generators <100kW, where they can sell electricity to municipalities can be achieved through a standardised public procurement process facilitated between the National Treasury and municipalities themselves. In this case, the community owning the SSEG can receive direct remuneration through the generation of electricity. For this to happen, the National Treasury should work with municipalities to develop a standard agreement for SSEG, <100kW, that would enable generators to sell electricity to the municipality through a public procurement process. Doing so would ensure small-scale generators selling electricity to municipalities would remain in line with requirements for public procurement by municipalities in the Municipal Finance Management Act, Municipal Systems Act, and the Constitution. If FiTs do become possible, then they should be subsidised at a premium price for socially owned renewable energy projects. Premium prices enable the renewable energy technology to provide sufficient economic benefit to the community, meet their basic needs, and increase their social mobility. Without premium prices such installations will likely not provide sufficient remuneration that would benefit the community. It is also important that the cost recovery for this potential subsidy must not punish other working-class households by increasing the retail rate for electricity, which has taken place in other contexts around the world. Cost recovery for a potential subsidised feed-in tariff should come from elsewhere.

f) At present, the community can wheel electricity through an energy trader or with an off-taker through a power purchase agreement to receive direct remuneration through generation of electricity.

g) If the sale of electricity is not feasible or viable, then the allocation of FBE units in exchange for export of electricity onto the municipal distribution grid is the best option for enhancing socio-economic mobility and advancing equality. Direct allocation of free basic electricity units to households enhances food security and improves household conditions for women and children who consequently become less burdened by unpaid housework and child malnutrition respectively (Ledger & Rampedi, 2022). Free allocation of electricity also ensures the benefits of the electricity generated reaches all members of the household and is shared more equally than is potentially the case where there is monetary remuneration.

h) As the Just Transition Framework (Presidential Climate Commission, 2022) document emphasises, 'Supporting municipalities to develop a new revenue model for electricity sales in the transition to clean electricity system' (ibid., p.21) is required. If this new revenue model can encourage not only businesses and middle-class households, but millions of township residents, to contribute energy to the grid with the incentive of receiving economic benefit, one of the main barriers will be overcome.

Table 10: Process recommendations for grid-tied township SORE

Support programme for renewable energy industry stakeholders	
Goal	• Implement the installation of renewable energy in a township neighbourhood and support the development of a local co-operative organisation that will enhance social mobility and socio-economic development.
Objectives	• Initiate and support existing community organisation through implementation of a renewable energy installation. • Enable socio-economic mobility through utilisation of sufficient electricity supply and/or remuneration through sale of electricity generated by renewable energy. • Enhance community organisation through co-operative development with a local co-operative or community organiser.
Activities	• Identify neighbourhood in township community where there is existing socio-economic activity and local activism. • Define the geographic scope covered by the renewable energy installation and assess viability of available energy sources. • Co-design installation with the community. • Facilitate co-operative development with household representatives in the local community. • Build the renewable energy installation. • Work with co-operative to facilitate the relationship with municipality or utility, if necessary, to sell electricity. • Monitor and evaluate the ongoing performance of the renewable energy installation. • Facilitate ongoing development of the co-operative.

Support programme for renewable energy industry stakeholders	
Time frames	• One month (site selection, define geographic scope, assess available energy resources) • Three months (community consultation, assess load demand, co-design workshops, commence community co-operative development) • Six to nine months (ongoing community organisational support, co-design workshops, size the system, system configuration) • Three months (construction, ongoing organisational support) • 12–24 month (review and monitor system performance, ongoing organisational support) • 12–24 months (in-person/online sessions, ongoing co-operative support)
Potential implementation partners	• Local or district municipality • Department of Mineral Resources and Energy • National Treasury • Community/co-operative organiser and facilitator • Eskom or municipal utility • RE installer and/or electrical engineer

2.3 Community REIPPP models

2.3.1 Communal land ownership

Context

This model is applicable to those rural areas in South Africa which are under communal land ownership. The land holding is through traditional authorities (TA) or through communal property associations (CPA).

Some of these areas are situated in the poorest and most rural provinces of South Africa. However, the asset of land, which is held under communal ownership or state land administered through traditional authorities, can serve as the basis for economic and developmental benefit if it is appropriated for renewable energy projects.

In this model, the CPA or TA would partner with an IPP in terms of the current REIPPP programme, or partner with an IPP to sell to a private off-taker.

Purpose

The development of viable forms of SORE which contribute to the national energy supply through the REIPPP programme or is wheeled through the Eskom grid to industrial or mining companies.

Technology

Wind or solar (or another technology) project. RE technology can be across all scales, but of primary interest is grid-tied utility-scale renewable energy projects.

Benefit

Energy provision to the national grid is an obvious benefit to society. If the electricity generated is sold to Eskom as part of the REIPPP programme, as per the current bid window, for a set number of years at a set rate, there will be direct economic benefit to the community shareholders. If the electricity is sold to a private off-taker, the benefit is reduced demand on the national grid. Shareholding and land lease benefits can both exist at the same time for a community (provided it owns land that can be leased to the IPP).

The current REIPPP programme could be revised to incentivise a higher percentage of local ownership as well as make special provision for communal land partners. The latter tend to require a more time and resource-intense project development process, resulting in slightly higher project development costs and bidding price consequently. To date, the REIPPP programme despite lobbying for change from the industry, does not appreciate such higher social value projects. In the latest bidding rounds though, local ownership, as well as the ED scorecard overall, has lost in importance for compliance. This policy development needs to be reversed or otherwise balanced if government is to argue that it possesses political will to implement socially owned renewable energy projects.

There is also a community benefit that can accrue through land lease income, possibly combined with a small portion of shares via sweat equity and/or land ownership, and/or the percentage of community benefit allocated in terms of the current REIPPP programme (national average 9.8%) to a community trust. The current REIPPP programme could be revised to incentivise a higher percentage of local ownership. Local ownership in the REIPPP programme is defined as project shares that are allocated to an entity representing previously disadvantaged residents/communities in a 50% radius around the project site or who reside within the relevant district municipality.

Ownership and organisation

Ownership will rest with the CPA or TA or similar representative entity through a trust, co-operative or company. A CPA is recommended as a CPA is designed to hold land. If there is not already a CPA holding the land in question, then one cannot establish a CPA for purposes of the project but would need to create a special purpose trust or even a section 21 company. If there is an existing CPA, and no evidence that the CPA is functioning optimally, it would still be advisable to create a separate special entity for the project to ensure that the principles listed above are incorporated in the constitution of the new entity.

Because it was not possible under colonialism and apartheid rule for black people to own land, all communal land in South Africa remains state land. This is the land in the former homelands or Bantustans. While the land is state land, the Interim Protection of Informal Land Rights Act (IPILRA) applies on the land and the consent of the land rights holders is thus required when any land rights may be deprived through a lease for example.

Communal land falls largely under the jurisdiction of various traditional authorities. While they often assert the right to make decisions over the land under their jurisdiction, this is not legally correct, and the courts have confirmed that. The consent of the actual rights holders – the community members – is required when communal land is to be leased as required by IPILRA (Wicomb, 2023).

Economic viability

Capital cost and operational cost for community land and/or shareholders in projects is low or non-existent. Community shareholding, however, usually requires third party financing.

Table 11: Community REIPPP on communal land

Community REIPPP programme		
Percentage ownership	percent	10%
Available collective allocation	MW	10

Community REIPPP programme		
Total PV CAPEX	ZAR	R120 000 000
Total OPEX	ZAR/yr.	R2 200 000
Total production from solar PV	MWh/yr.	15 000
Price per MWh	ZAR/MWh	R1 200
Revenue attributable to community	ZAR/yr.	R18 000 000
Community share of surplus		R16 050 000
Rental	ZAR/yr.	R250 000
Levelised cost of electricity	ZAR/MW	R1,028
Economic impact	ZAR	R86 972 539
Carbon removed	tons	147 002
SA/Local jobs	#	174
Indirect jobs	#	135

In the above example, it is assumed that a community owning 250 hectares of farmland would rent the land to a private operating company participating in the REIPPP programme while also acquiring a 10% (R120 million) stake in the 100 MW solar installation operated by said operating company (i.e. the equivalent of owning a 10 MW installation). This would generate approximately 15 000 MW per annum. At the price of R1 200 per MWh (R1.20 per kWh) this represents revenue attributable to the community share of R18 million per annum (NPV R149 million). The community share of the operational surplus would be approximately R16 million per annum (NPV R132 million), while revenue from rentals paid by the private operator at R1 000 per hectare would amount to R250 000 per annum (NPV approximately R2 million). Impact is estimated to be approximately R87 million value added to the local economy, the equivalent of 147 000 tons of carbon removed from the atmosphere and more than 300 FTE jobs.

Capital cost of RE installation is generally born by a private investor. If the REIPPP programme is used, viability is determined by agreement on price for a set period between Eskom and the IPP. This is set to change in the future, in an open energy market with a Central Purchasing Agency, although legacy REIPPP projects will still have sovereign guarantees.

Funding

Grant funding is needed for a capacity building programme for community and industry stakeholders (detailed below). Government programmes in support would be important and not very costly. Assessment of IPP partner readiness amongst communal land representatives and support programme (donor/government led) would be needed.

Stakeholders

Key stakeholders include:

- Industry – RE developers
- Government – Independent Power Producer Procurement Programme Offices, DMRE, Land, TC/TA, provincial and local government

- Community – CPA, TA and other representing entities that own land (have claims for land).

Recommendations

a) Awareness and education for the RE industry and communal landowners are needed to ensure RE project land partnership opportunities and benefits are understood.

b) An incentivised procurement environment would support the effort significantly. Other incentives can also be explored, with investors and/or electricity off-takers.

c) Support programmes are needed that enable effective partnership creation between the private sector, renewable energy actors, and people/groups/institutions governing communal land.

    i. Financial innovation with financing institutions

    ii. Support programme for participating stakeholders.

d) To facilitate capacity support, research is needed around the current capacity of people/groups/institutions governing communal land to effectively govern access and use of the land and their readiness to partner with private sector in the development of renewable energy projects. Such research needs to include renewable energy feasibility studies and should inform the development of an appropriate capacity support programme that builds relationships and skilled practitioners.

e) Develop and implement tailored private sector partnering support programmes to assist with rapid and effective project development.

f) REIPPP policy to be reviewed, and consideration given to percentage of share ownership by the community partner, and suitability for communal land-based projects to bid successfully.

g) The current REIPPP programme should be revised to incentivise a higher percentage of local ownership as well as make special provision for communal land partners. The latter tend to require a more time and resource-intense project development process, resulting in slightly higher project development costs and bidding price consequently. To date, the REIPPP programme, despite lobbying for change from the industry, does not appreciate such higher social value projects.

h) In the latest bidding rounds, local ownership, as well as the ED scorecard overall, has lost in importance for compliance. This needs to be reversed or otherwise balanced if government is to argue that it possesses political will to implement socially owned renewable energy projects.

i) There is the need for a much more ambitious land redistribution programme in South Africa, and social ownership of renewables should be incorporated into a revamped land redistribution process.

j) Department of Agriculture and Land Reform programmes should include support to agrivoltaics (combination of PV solar with agriculture) to support land reform beneficiaries in sustainable farming methods and contribute to electricity production.

k) Further research and consultation are needed to identify appropriate sites for a pilot of this model.

Table 12: Process recommendations for REIPPP programme

Support programmes needed	• Support programme for people/groups/institutions governing communal land. • Support programme for renewable energy industry stakeholders.
Support programme for people/groups/institutions governing communal land	
Goal	• Support effective partnership creation between private sector, renewable energy actors and people/groups/institutions governing communal land.
Support programme for people/groups/institutions governing communal land	
Objectives	• Analyse the current capacity of people/groups/institutions governing communal land to effectively govern access and use of the land and their readiness to partner with the private sector in the development of renewable energy projects. • Develop appropriate capacity development programme that builds relationships and allows for identification of best-in-class participants. • Develop and implement tailored private sector partnering support programme to assist with rapid and effective project development.
Activities	• Develop tool to assess capacity of governance of people/groups/institutions governing communal land. • Assess and analyse the capacity and identify capacity gaps. • Co-design with the people/groups/institutions ideas for how to build upon their capacity. • Curate and implement a broad-based capacity building programme, preliminary suggestions for topics included: • Governance and fiduciary requirements. • Legal perspectives on land reform. • Training on leadership in wounded contexts. • Identify best-in-class participants with relevant land resources and co-design with them ideas for how to best support them in fostering commercial partnerships with private sector (could be for renewable energy only or offer support agnostic to type of industry). • Curate and implement private sector partnership programme, preliminary suggestions for topics included (to be confirmed by activity e): • Strengthening governance and fiduciary performance • Healing and building community relationships. • Assessing commercial opportunities. • Building a business plan. • Financing options available. • Support on legal, technical, financial, social, and environmental questions.

Support programmes needed	• Support programme for people/groups/institutions governing communal land. • Support programme for renewable energy industry stakeholders.
Support programme for people/groups/institutions governing communal land	
Time frames	• Three months (research, development, piloting) • Six to nine months (field work, analysis) • Three months (interviews, co-design workshops) • 12 months (in-person/online sessions, ongoing support) • One month (co-design workshops) • 12 months (in-person/online sessions, ongoing support)
Potential implementation partners	• Legal Resource Centre • PLAAS • SCAT Trust • INSPIRE

Support programme for renewable energy industry stakeholders	
Goal	Support effective partnership creation between private sector renewable energy actors and people/groups/institutions governing communal land.
Objectives	Analyse the current capacity of private renewable energy companies to effectively partner with people/groups/institutions governing communal land. Develop appropriate capacity development tools/programme to professionalise social performance skills and allows for identification of best-in-class participants. Develop and implement a tailored programme to assist companies to effectively engage and partner with people/groups/institutions governing communal land on renewable energy project development.
Activities	Develop tool to assess readiness of renewable energy companies to develop projects on communal land. Assess and analyse the capacity and identify capacity gaps relevant to more effective partnering with communities, especially communal land partnerships. Co-design with the companies and industry associations ideas for how to improve relevant readiness. Curate and implement readiness programme. Identify best-in-class participants with relevant project development interests and co-design with them ideas for how to best support them in developing projects on communal land. Curate and implement communal land partnership programme.

Support programme for renewable energy industry stakeholders	
Time frames	Three months (research, development, piloting) Three months (field work, analysis) One month (interviews, co-design workshops) 12 months (in-person/online sessions, ongoing support) One month (co-design workshops) 12 months (in-person/online sessions, ongoing support)
Potential implementation partners	Legal Resource Centre INSPIRE Banking sector

2.3.2 Worker SORE model for factory or commercial building

Context

The project is proposed for a small- or medium-sized factory in the manufacturing sector in an urban or rural environment with existing electricity supply. It is modelled for a solar rooftop installation and/or a solar installation on a factory parking lot. It could be adapted for green field manufacturing development that is situated in an urban or rural environment. Trade union representatives pointed out that this model would ideally work in a collaborative partnership with local government (NUMSA, 2023). It echoes perspectives from municipal workers that socially owned renewable energy models should not impinge on the ability of local government to generate revenue from energy production (Ntuli, 2023).

Additionally, current poor energy availability has prompted many companies to add additional energy generation capacity (NUMSA, 2023). The cost of diesel and its low energy efficiency as an energy fuel, pushed up the running costs of companies, especially affecting newly established companies (Madwara, 2023). NUMSA regional officials concurred that supplementary energy generation through fossil fuels affected the viability of smaller manufacturing companies and added that this was particularly true in rural towns (NUMSA, Interview with NUMSA regional officials on worker SORE, 2023).

This model is further considered in the context of the potential impact of the CBAM which has come into effect on 1 October 2023 with potential punitive charges being implemented from October 2026. A Presidential Climate Commission report points out that the key sectors to be impacted by CBAM are cement, fertilisers, iron and steel, aluminium, and electricity, and that the steel industry alone employs as many as 28 000 workers (Presidential Climate Commission, 2023). CBAM holds the potential to not only affect industries such as steel production, but also to impact downstream companies that manufacture components using steel inputs. A knock-on effect is therefore possible in important manufacturing industries such as the automotive industry. Approximately 684 400 workers are directly employed in the affected industries (own calculation based on industry reports).

In the short term, National Treasury has been providing tax rebate incentives to companies transitioning to renewable energy until 2026. In addition, limited grant financing is available to support economic development in key industries through provincial economic development departments that could supplement costs in transitioning to renewable energy.

A potential pilot is a grid-tied solar PV array on a factory rooftop/car park of a medium-sized factory in the manufacturing industry in Nelson Mandela Bay Municipality as modelled below.

Purpose

The purpose of the project is to support the energy transition in the manufacturing industry by securing a stable electricity supply and protecting jobs and workers' income. The project holds potential to protect against punitive pressure because of CBAM and therefore on the viability of companies in the manufacturing industry.

Technology

The technology proposed is a solar PV array on rooftop/or carpark of an existing factory. Should sufficient land be available it could also be a free-standing array. The proposed model is embedded generation, i.e. it is generating directly for the factory on which it is situated. It is also grid-tied to wheel surplus to other industries or feed in surplus to the municipal grid. The project model could be adapted in future to provide a hybrid grid with a combination of solar and wind, and possibly green hydrogen, as is being planned for the Coega Industrial Development Zone (IDZ).

The model is replicable across similar-sized factories in other industries but is not automatically scalable because of the variability in the industrial processes that determine the energy needs of an existing factory and its future production forecasting and plans.

The voltage required by industry varies between 11 kV in large factories and 240–380 volts in smaller establishments (Eskom, 2021). It is assumed that there is grid capacity and compatibility to sell surplus production into the grid.

Benefit

The model provides the following benefit from both renewable energy production and ownership:

- Supports decarbonisation and reduces demand on national grid.
- Facilitates a secure energy supply and avoids additional costs to companies as many factories use diesel to manage energy availability to production. This could represent about 50%–60% of total energy costs (Interview respondent MM).
- Factory benefits from purchase of RE at a cheaper rate than from the grid (this is modelled below) and from substantial savings by switching away from diesel as a supplementary fuel.
- Localisation of energy supply for industrial production.
- Worker ownership provides direct income to members through sale of energy to both factory and grid/third party off-takers, and/or return on investment to union investment company.
- If implemented in a rural context and/or adjacent to an under-served urban community, surplus energy could increase energy access through an agreement with the municipality.
- In the long term, cheaper energy could protect jobs.
- Worker ownership could help to balance power relations between companies and trade unions.

Potential risks

There are of course also risks to this model and these include:

- Potential negative impact on municipal income if autonomous grid and municipality is an energy provider. A SAMWU official pointed out that whilst the union is not in general opposed to socially owned renewable energy as conceptualised in this report, consideration needs to be given to the impact of municipal revenue and as a result, municipal worker jobs, especially in the energy department (Ntuli, 2023).
- Greater energy availability and lower costs could also push towards greater automation and AI-driven production and consequently, job losses.

- Worker ownership of a key factor of production could be considered too much of a risk by factory owners and the model could become unworkable because of poor labour relations and conflict (Madwara, 2023).
- Capacity of workers and trade unions, based on past experience, to manage co-operatives (NUMSA, Interview with NUMSA regional officials on worker SORE, 2023).

Ownership

The proposed ownership model is through a worker-owned co-operative where all members hold an equal share. Co-operative membership will need to be tied to employment at the factory. Additional variations could include majority shareholding by workers with equity held by a trade union investment company and/or the company in question. Sole ownership resting with a trade union rather than employed workers could be result in the following dilemmas:

- might inhibit democratic right of workers to join another union; and
- if the majority union changes hands, it could cause conflict amongst different unions linked to the same factory.

Setting up the ownership structure will need competent legal input to ensure democratic worker participation rather than illusory worker participation.

Worker ownership of RE could be conditional to accessing state grants for industrial development and would need to be negotiated at NEDLAC.

Economic viability

The model contributes to the viability of manufacturing by reducing the effect of costs through ad hoc inputs such as diesel and securing constant electricity supply. It also reduces the cost of electricity through Eskom or a local municipality during peak hours because the factory will be drawing on its own energy production.

The viability of this model could be boosted through the effect of state incentives to support the shift to RE and to protecting industry and jobs against the impact of CBAM. The model holds the potential for negotiating low interest loans through development banks.

At start-up, in addition to the installation costs, consideration is needed, inter alia, for the costs of conducting an Environmental and Social Impact Assessment (ESIA), rental costs (if needed for land and roof space), legal costs to set up an appropriate ownership vehicle, application costs for necessary regulatory approvals by NERSA, and training and mentoring of co-operative leadership and membership.

Ongoing costs to be planned for include maintenance costs, insurance costs against equipment failure, technical support by certified industrial electricians, and further co-operative leadership and membership development training,

Energy costs to industry in Nelson Mandela Bay Municipality in 2023/24 is R3.66 per kilowatt-hour for medium businesses (Nelson Mandela Bay Municipality, 2023).

The table below sets out some input data (Madwara, 2023; Stemmet, 2023) for the model and compares that against a United States manufacturing standard (Sage Advices, 2019) for electricity consumption in a medium-sized factory.

Table 13: Input estimates for modelling factory needs of 1 000 m^2

Factory 1	Factory size in m^2	1 000.00
	Average cost per month	R89 000.00
	KWh per month	24 305.65
	KWh per annum	291 667.80
	KWh per m^2 per annum	145.83
US average energy usage per m^2	KWh per m^2 per annum	95.10
	KWh per annum	190 200.00
	KWh per month	15 850.00
	Monthly costs	R58 037.95

Table 14: Model for worker-owned factory SSEG of 1 000 m^2

Worker-owned SSEG		
Size of installation	m^2	1 000
Capacity per m^2	kW	0.10
Available collective allocation	kW	100
Total PV CAPEX	ZAR	R1 200 000
Total OPEX	ZAR/yr	R22 000
Total production from solar PV	kWh/yr	150 000
Factory off-take	kWh/yr	150 000
Price per MWh (factory)	ZAR/MWh	R2 500
Municipal off-take/local electricity market	kWh/yr	-
Price per MWh (grid)	ZAR/MWh	R1 200
Total revenue	ZAR/yr	R375 000
Levelised cost of electricity	ZAR/MWh	R1 028
Economic impact	ZAR	R869 725
Carbon removed	tonnes	1 470
SA/Local jobs	#	1.74
Indirect jobs	#	1.35

The model above is for a small factory of 1000 m^2 of 25 workers with embedded solar PV providing for most of the energy needs of the factory. The generation capacity (100 kW for CAPEX of R1.2 million) of the installation is limited due to the limited roof space available (1 000 m^2). Nevertheless, the installation can produce up to 150 000 kWh per annum, which is 51% of the current electricity usage (291 667 kWh per annum). The factory currently pays an average of R3.66 per kWh, partly due to having to use diesel generators during load-shedding. If the worker-owned SSEG agreed to a price of R2.50 per kWh (i.e. R1.16 less than the current cost) this would represent a revenue stream of R375 000 per annum. Local economic impact would be approximately R870 000 with three FTE jobs created and the equivalent of removing 1 470 tons of carbon from the atmosphere.

Table 15: Input estimates for modelling factory needs of 2 000 m²

Factory 2	Factory size in m²	2 000
	Average cost per month	R50 000.00
	KWh per month	13 654.86
	KWh per annum	163 858.32
	KWh per m² per annum	81.93
US average energy usage per m²	KWh per m² per annum	95.10
	KWh per annum	190 200.00
	KWh per month	15 850.00
	Monthly costs	R58 037.95

Table 16: Model for worker-owned factory SSEG of 2 000 m²

Worker-owned SSEG Model 2		
Size of installation	m²	2 000
Capacity per m²	KW	0.1
Available collective allocation	kW	200
Total PV CAPEX	ZAR	2 400 000
Total OPEX	ZAR/yr.	44 000
Total production from solar PV	kWh/yr.	300 000
Factory off-take	kWh/yr.	163 858
Price per MWh (factory)	ZAR/MWh	2 500
Municipal off-take/local electricity market	kWh/yr.	136 142
Price per MWh (grid)	ZAR/MWh	1 200
Total revenue	ZAR/yr.	573 015
Levelised cost of electricity	ZAR/MWh	1 028
Economic impact	ZAR	1 739 451
Worker-owned SSEG Model 2		
Carbon removed	tons	2 940
SA/Local jobs	#	3.48
Indirect jobs	#	2.70

In the second factory above, the available roof area is 2 000 m^2 which means that a 200-kW installation (CAPEX R2.4 million) can generate 300 000 kWh per annum, which is almost double the existing usage (163 358 kWh per annum). This means that 136 142 kWh can be wheeled through the municipal grid to a third party, sold to the municipality, or to an IDZ/SEZ. Assuming that the factory is prepared to pay R2.50 per kWh (R2 500 per MWh) and the municipality R1.20 per kWh (R1 200 per MWh), the installation can earn revenue of up to R573 015 per annum.

It is important to note that in this model too, context matters. The energy intensity needed for production will vary across factories as would the available rooftop and/or land space. These types of variables will influence the levelised cost of electricity for each project area.

Funding

When modelled as a fully worker-owned renewable energy co-operative, it is assumed that grant funding will be through the state via support for a just energy transition. Additional equity could be raised through trade union investment companies and through negotiating low interest loans through development banks that hold funding for a just energy transition. Skills development funding might be possible through appropriate Sector Education and Training Authorities (SETAs) for ongoing co-operative leadership development. NUMSA (2023) pointed out that worker and local government partnerships could support the economic viability of a worker SORE.

Stakeholders

A range of stakeholders will need to be brought into productive conversation. These include:

- Workers at the factory
- Trade unions (local, regional, and national leadership and leadership of trade union investment companies)
- Appropriate industry associations
- Development finance bodies
- Municipality
- Provincial government (especially the function of economic development and planning)
- National government, including DTI, Treasury, DRME, Energy in Presidency.

Possible sites for a pilot include medium-sized automotive component companies or other manufacturing companies in Nelson Mandela Bay Municipality.

General recommendations

a) Review conditions for grant funding from state to companies transitioning to renewable energy.

b) Establish conditions for grant funding that enable worker ownership for renewable energy.

c) Develop an integrated planning process across different tiers of government and across relevant departments.

d) Support trade unions and their federations to develop popular education programmes around a just transition and specifically a just energy transition that will reach the shopfloor.

Table 17: Process recommendations for worker SORE

Training and development programmes needed	
Goal	• Develop curriculum frameworks for all sectors and facilitate integration with existing curricula in colleges and universities.

Objectives	• Develop support programmes for:
	  ◦ Workers and management in the factory
	  ◦ The National Association of Automotive Component and Allied Manufacturers (NAACAM)
	  ◦ The National Union of Metalworkers of South Africa (NUMSA)
	  ◦ Renewable energy industry stakeholders

Activities	
Develop support programmes for workers and management in the factory	• Analyse current capacity of amongst workers to establish, manage and lead the co-operatives • Develop a curriculum framework and implementation plan • Offer a programme with partners in colleges and universities • Work to integrate programme into curriculum innovation in colleges and universities
Develop support programme for the NAACAM	• Analyse current capacity of NAACAM to provide support (locally manufactured inputs, and training to participating stakeholders) • Develop a curriculum framework and implementation plan • Offer programme with partners in colleges and universities
Develop support programme for National Union of Metalworkers of South Africa (NUMSA)	• Analyse current capacity of NUMSA to provide support (social and solidarity economy, co-operative establishment, management and leadership) • Develop a curriculum framework and implementation plan • Offer programme with partners in colleges and universities

Training and development programmes needed	
Develop support programme for renewable energy industry stakeholders	• Analyse current capacity of RE industry stakeholders to provide support (locally manufactured inputs, and training to installers) • Develop a curriculum framework and implementation plan • Offer programme with partners in colleges and universities • Work to integrate programme into curriculum innovation in colleges and universities
Time frame	• Months planning and curricula • Implementation ongoing
Potential implementation partners	• Nelson Mandela University • PE College • DHET • DSI
Resources	• SETA Funding (merSETA) • National Skills Fund

Financing	
Goal	• Support alignment of funding for energy security in key industrial sectors between national and provincial economic development planning, and between government and industry led funds
Objectives	• Facilitate alignment between the NAAMSA-supported Automotive Industry Transformation Fund (AITF) of R6 billion and government initiatives • Develop a funding and business plan for the initiative
Activities	
Facilitate alignment between the NAAMSA-supported AITF and government	• Establish information meeting with NAAMSA • Establish information meeting with trade unions • Establish information meeting with government • Alignment of funding across government and industry • Facilitate a negotiated agreement between workers representatives, industry, and government
Develop a funding and business plan for the initiative	• Elect/nominate a working group • Develop funding and business plan in the working group • Facilitate a negotiated agreement of the funding plan

Time frame	Six months
Potential implementation partners	• National Treasury • DTIC • AITF
Resources	• Existing AITF fund • JET-IP

RE localisation	
Goal	• Support the development and incubation of locally made renewable energy components
Objectives	• Facilitate research and innovation and technology transfer to support localisation of RE inputs • Develop and incubate RE component manufacturers
Activities	
Facilitate research and innovation and technology transfer to support localisation of RE inputs	• Technology transfer agreements with Germany and China • Research funding to CSIR and universities for RE innovation • Research working groups to include trade unions as partners
Develop and incubate RE component manufacturers	• Local content parameters for RE • Support to existing RE manufacturers • Bulk orders of RE components
Time frame	3–5 years
Potential implementation partners	• National Treasury • DTIC • AITF • DSI and CSIR
Resources	• Existing AITF fund • JET-IP

3. Comparison and assessment of SORE models

The key driver of revenue and other impacts when it comes to renewable energy (in this example solar PV but applicable to other technologies as well) is the installed capacity, as measured in either kW or MW. For this exercise, installed capacity is assumed to depend on either the area available (e.g. factory rooftop) or a defined household allocation in kW (e.g. mini-grid and grid-tied). The factory rooftop areas used in the models are based on two manufacturing plants located in Nelson Mandela Bay. Household allocation is based on the existing 5-kW Saltuba pilot installation, which occupies the size of a small carport, meaning that it can be installed on a typical RDP house rooftop or easily fit in with various types of public open space (walkways, bus-stops, playgrounds, parks, etc.). The model assumes that average household consumption is based on 3 kW generation capacity, meaning that if each household receives a 5-kW allocation there will be 2 kW surplus generation capacity, or up to 40% of production, available for trade on local markets or for value-adding developmental activities of various kinds.

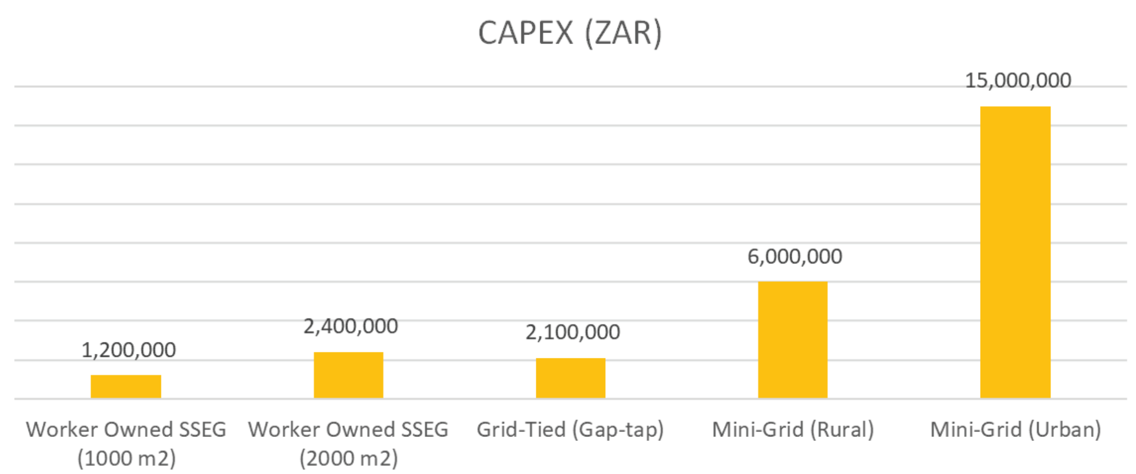
In the above scenarios (i.e. worker-owned SSEG, mini-grid and small-scale grid-tied installations) the resultant installation size is below 2 MW. This is in contrast with the community land IPP and ward-level, grid-tied installations, which at above 10 MW capacity are several orders of magnitude larger and therefore shown separately, both for ease of illustration and because they demonstrate impact at scale.

The graphs presented below compare models in the work programme to establish what potential impacts a model has when assessed against other models.

3.1 Installed capacity and capital expenditure

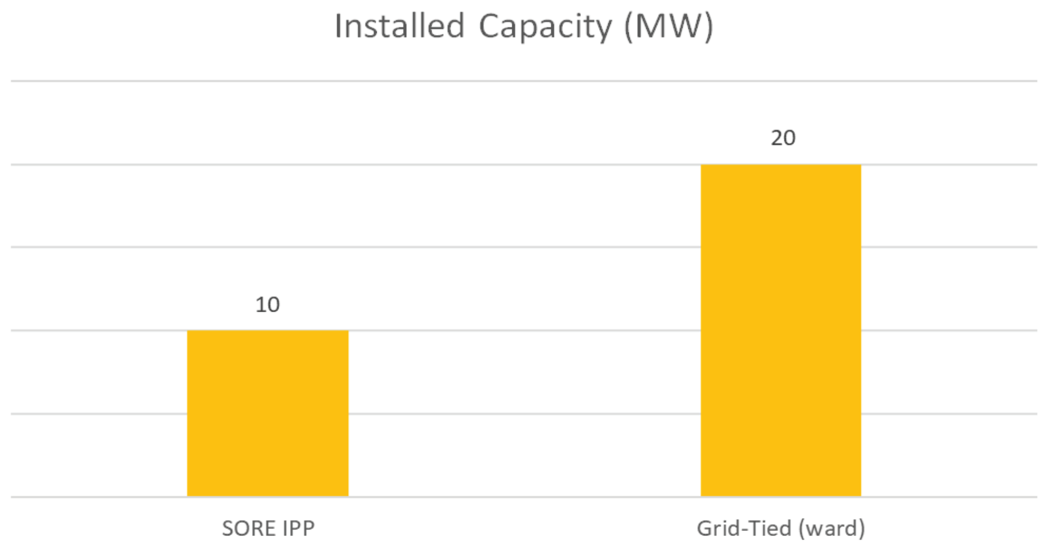
The graph below shows the range of installation sizes modelled, from 100 kW (0.10 MW) in the case of the 1 000 m² worker-owned SSEG up to an urban mini-gird serving 250 households (1.25 MW).

Figure 7: Installed capacity – below 2 MW



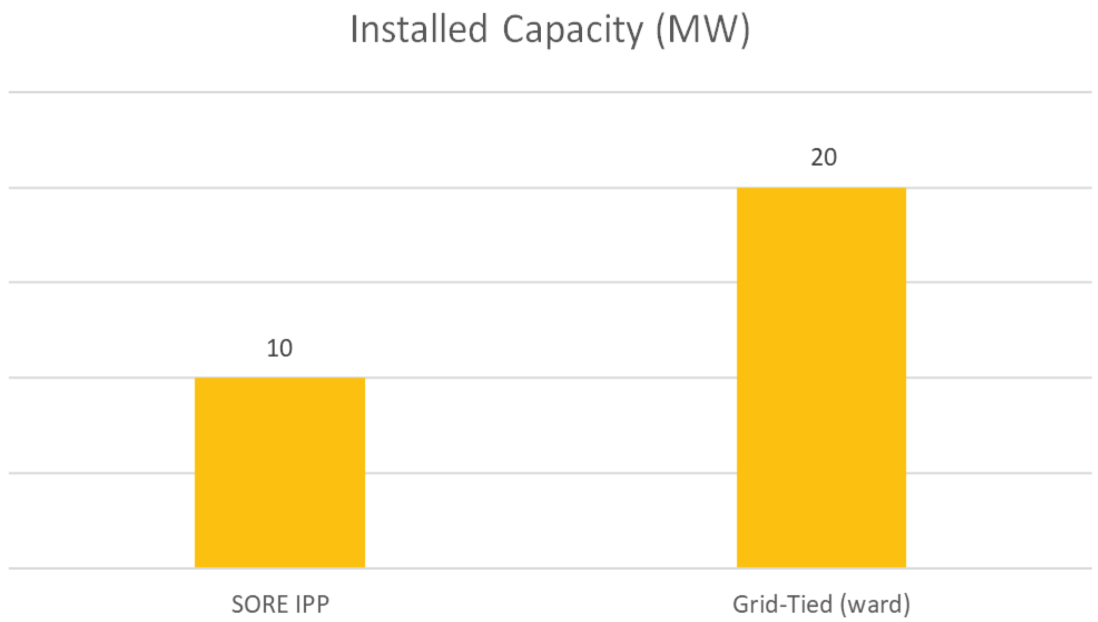
CAPEX is estimated to be approximately R12 000 per kW installed, based on current (November 2023) prices, and again there is a range correlated to installed capacity above. For example, CAPEX of R 1.2 million for the 1 000 m² worker-owned SSEG is used to install a 100 kW (0.10 MW) PV solar array on the factory rooftop. Similarly, the installation of a 500 kW (0.5 MW) mini-grid is estimated to cost around R6 million. The graph below shows the range of CAPEX for the various examples below 2 MW installed capacity.

Figure 8: Capital expenditure – below 2 MW



This exercise considers two examples based on installations above 2 MW capacity, namely the community land IPP and grid-tied production at ward level. In terms of the community land IPP, the assumption is that the community lease a portion of land to a REIPPP partner while simultaneously acquiring a 10% share in the REIPPP project. In terms of grid-tied energy production at ward level, the calculations are based on a 5kW allocation per household and assuming 4 000 households in the typical township ward.

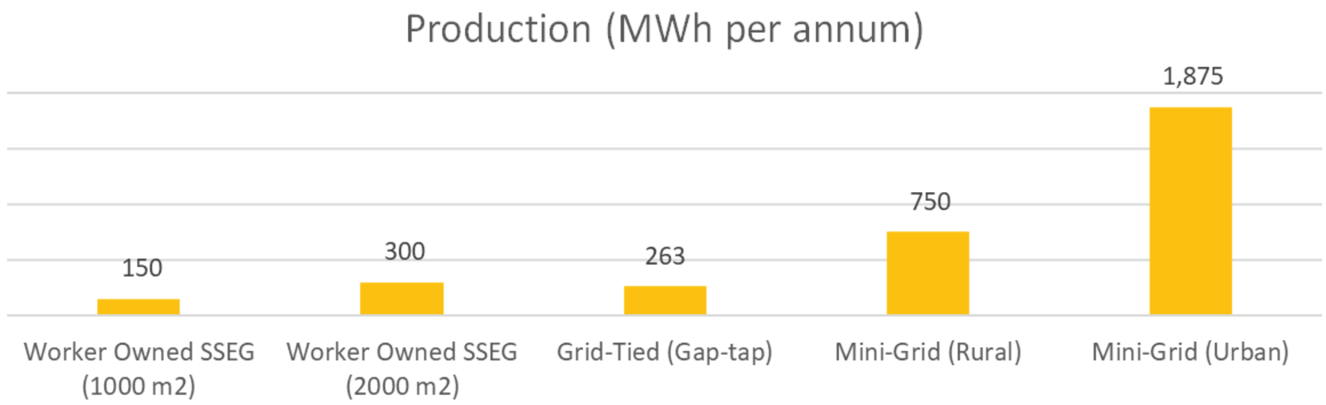
Figure 9: Installed capacity above 2 MW



3.2 Energy production and revenue

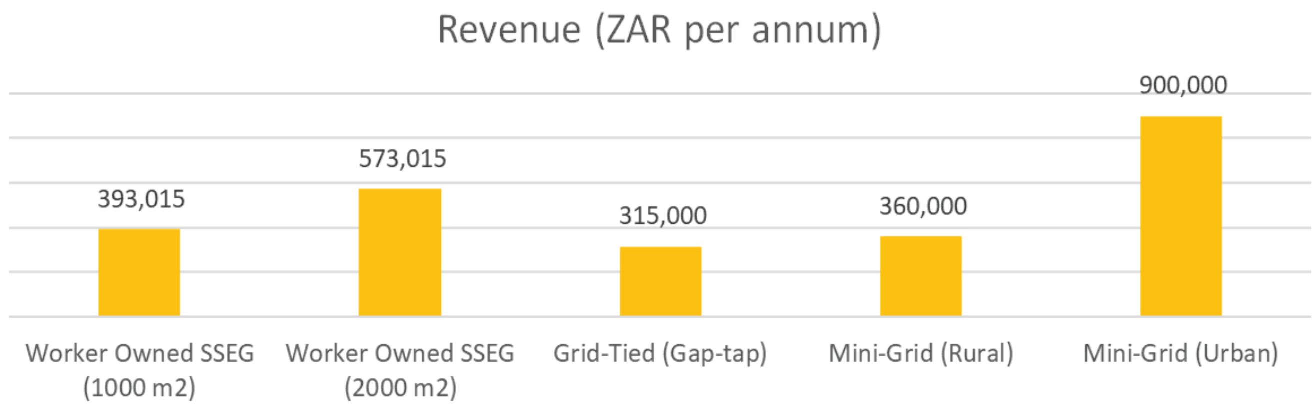
Given the installed capacity shown above, it is assumed that each facility will generate approximately 1500 MWh per MW installed per annum. This results in estimated production ranging between 150 MWh (worker-owned SSEG 1 000 m^2) and 1 875 MWh (urban Mini-grid) per annum, as shown in the graph below.

Figure 10: Production – below 2 MW



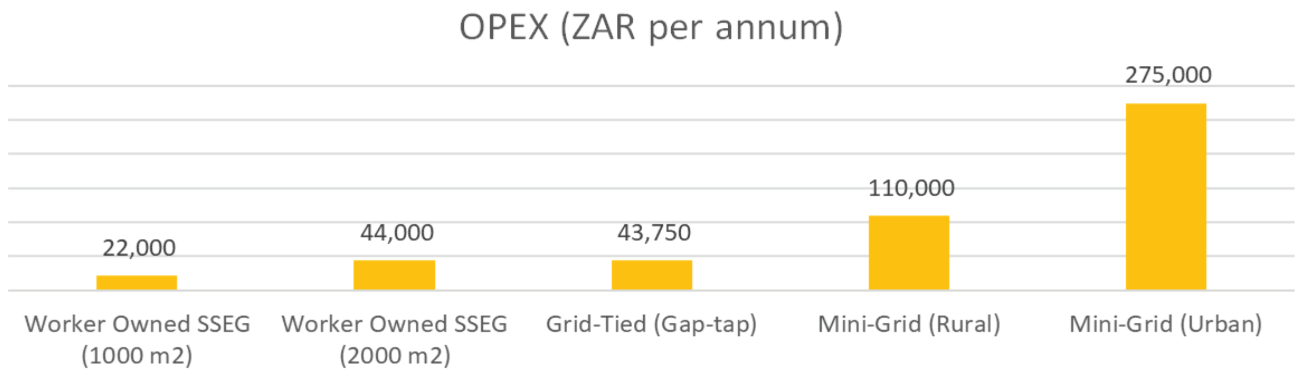
For the purposes of this work programme, revenue is calculated at between R1 200 and R2 500 per MWh, depending on the model and any off-take agreements, although in practice, the price of electricity may vary considerably according to context and location. In the case of the mini-grids, the amounts shown exclude the value of the electricity delivered directly to households and represent the surplus available to power local economic development activities.

Figure 11: Revenue – below 2 MW



Operational expenses for installations below 2 MW are shown in the graph below. While these remain estimates and are expected to vary by context and location, they nevertheless consistently show an operational surplus. Of note is that while approximately two-thirds of production for both mini-grids is consumed directly by households, a significant surplus remains available for developmental or other activities in the community.

Figure 12: OPEX – below 2 MW

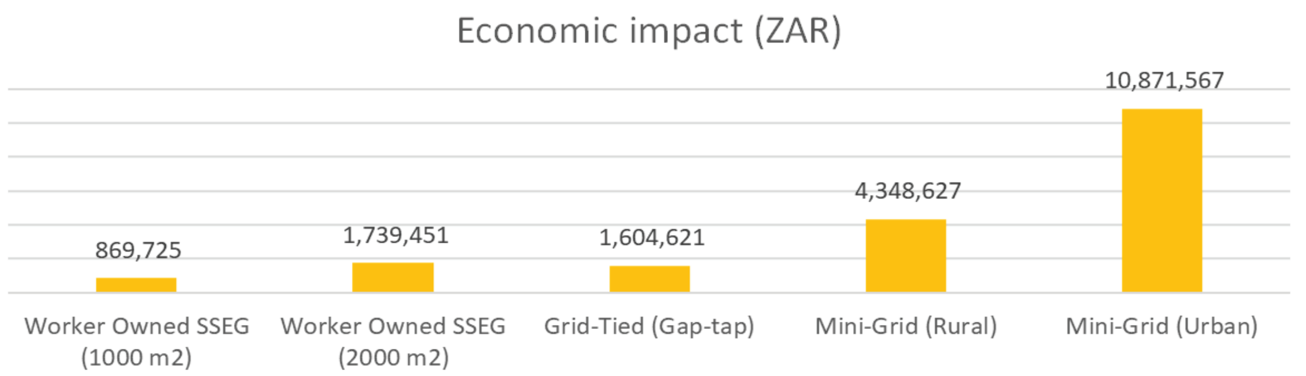


In addition to surplus generated from operations there is a contribution to the local and national economy in terms of research, design and development, manufacturing, transport, installation, commissioning, and operational expenditure. The model makes the following assumptions to determine local impact.

Table 18: Assumptions to determine local impact

Steps in the process of implementation of SORE	% Cost	% that could be done locally
Research, design, and development	5%	70%
Manufacturing	70%	45%
Transport, installation, commissioning	25%	90%

Figure 13: Economic impact



If SORE installations are brought to scale, as in the community land REIPPP and grid-tied co-operative models, the benefits are significant. The graphs below show revenue per annum for installations above 2MW and economic impact for installations above 10 MW.

Figure 14: Revenue per annum – installations above 2 MW

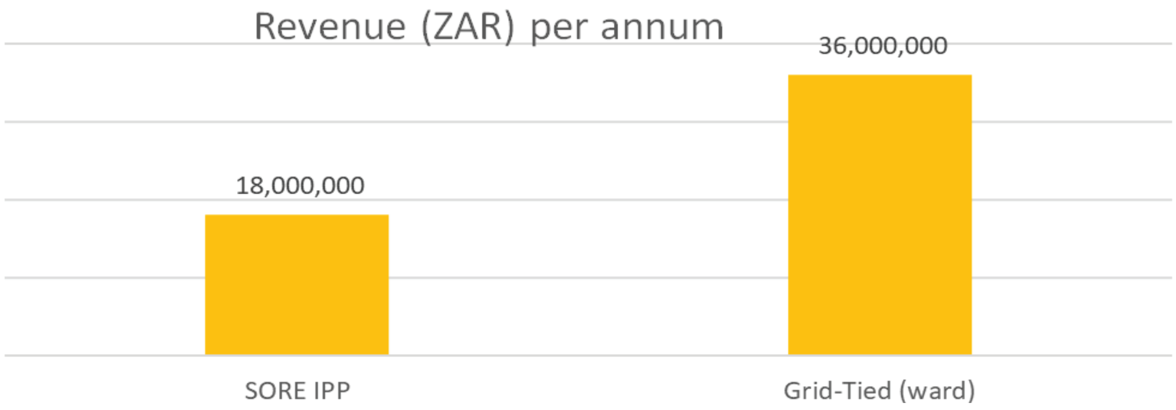
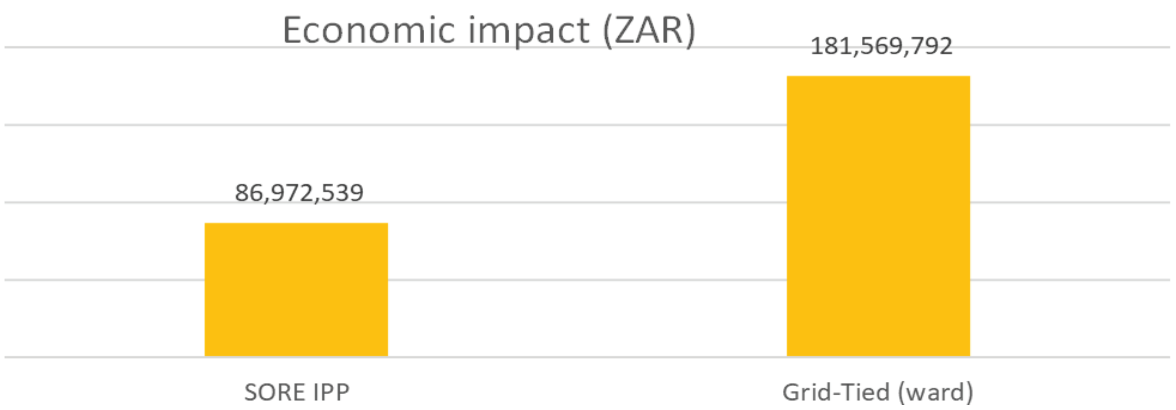


Figure 15: Economic impact – installations above 10 MW



Viewed in the context of the global imperative of reducing carbon emissions and meeting international obligations, the impact of the SORE models is considerable, as the graphs below illustrate.

Figure 16: Carbon removed – installation less than 10 MW

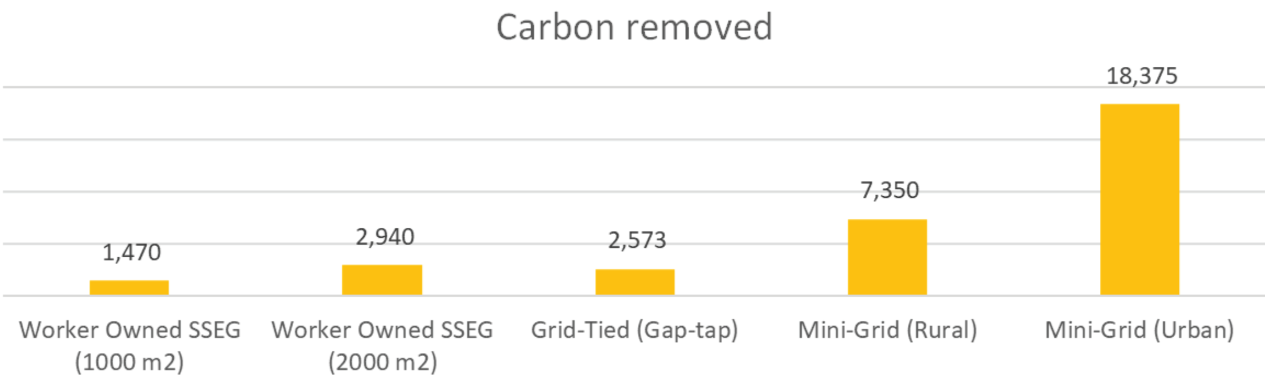
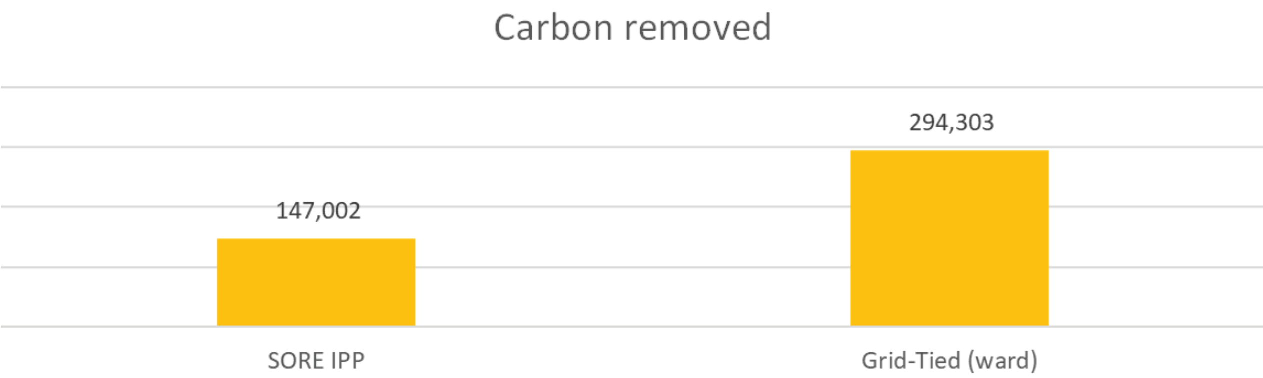


Figure 17: Carbon removed – installation above 10 MW



4. Recommendations

This section highlights feedback and recommendations pertaining to all models. The recommendations are categorised according to financing, regulations, technical feasibility and scalability, and social ownership.

- Model 1 (mini-grid) has potential for multiple social benefits in addition to access to electricity, as well as local economic benefit through use of energy for stimulation of business and enabling economic inclusion.
- Model 2 (township co-op) has potential for significant local economic benefit, some local job creation as well as significant implications for job creation in the broader manufacturing of RE components, as well as environmental benefit in terms of the country's commitments to reduction of carbon emissions.
- Model 3 (community land REIPPP) has potential for significant economic benefit to rural communities.
- Model 4 (worker-owned IPP/SSEG) has implications for job retention in transitioning industries as well as potential for job creation in new RE industries.

4.1 Funding for viability

Recommendations and considerations on facets of funding for socially owned renewable energy initiatives include:

- Unlocking funding sources for SORE projects. The proposition entailed seeking financial support from National Treasury and municipalities.
- Concerns about accountability were raised in relation to loan agreements, exemplified by the instance of the Komati plant in Mpumalanga. It was highlighted that the affected communities were not included in discussions concerning the loan agreement.
- A proposition emerged regarding increased corporate social investments in SORE projects. However, it was also emphasised that these investments should come with specific requirements and responsibilities towards the communities they aim to benefit.
- The potential for trade union investment arms and pension funds to be used for Model 4 and for REIPPP public-private partnerships as well as the potential of land assets to be leveraged for Model 3, require further investigation and consultation.
- The lack of transparency in loans from international finance institutions was highlighted, with an observation that such agreements are often not discussed in parliamentary settings. This lack of public oversight raised concerns about the country's obligations without adequate representation.
- The discourse noted inadequacies in funding allocation for social ownership within the framework of the JET-IP. This inadequacy was seen as a significant obstacle to achieving a meaningful just transition.

Collectively, these perspectives on finance underscored the complexity of securing funding for socially owned renewable energy initiatives, highlighting the need for careful consideration of funding sources, mechanisms, and transparency to ensure effective and equitable implementation.

4.2 National and municipal regulations

The discussions regarding regulations encompassed various dimensions of policy, governance, and legal frameworks that affect the realisation of socially owned renewable energy initiatives, include the following recommendations and considerations:

- A challenge was brought up in relation to a long-standing unfulfilled promise of a rooftop solar roll-out by the government. This promise, made 15 years ago, was not pursued due to political interests, underlining the importance of robust regulations to prevent such instances.
- The need for regulations that cater to co-operatives' needs was emphasised. The lack of a supportive environment for co-operatives, both in terms of rules and government financial backing, was identified as a barrier to success.
- The discussion highlighted the importance of a proactive industrial policy from the government, encompassing protective tariffs, taxes, and fostering local transition industries.
- An analysis of the national and municipal regulatory landscape identified various issues and potential reforms. These include:
    - The existing national legislation was not designed for decentralised systems, prompting the need for adjustments to better align with social renewables.
    - The Electricity Regulation Act and NERSA needed to be revamped for compatibility with social renewable models.
    - The revenue model of municipalities, largely dependent on reselling electricity, could resist the introduction of social renewables unless innovative incentives were introduced.
    - The Municipal Systems Act and distribution licenses posed further challenges for implementation in villages and rural areas.

- Empowerment and consultation were stressed to ensure inclusivity and knowledge parity among stakeholders.

- The possibility of redirecting the FBE subsidy towards supporting socially owned renewables was suggested.

- Land access issues were noted, with various types of land ownership posing potential hindrances. Tenure arrangements and vulnerability to eviction were concerns for communities with land access but no ownership. On the other hand, land reform and land restitution programmes, as well as communal land ownership in rural areas, can potentially be linked to social ownership of RE to benefit beneficiaries of these programmes.

- Regulatory limitations on loans for SORE were raised. Government austerity policies were seen as obstacles to progress.

- The Minister of Finance should mandate the Fiscal Finance Commission and the Revenue Collector to identify potential sources of funding for pilots and full roll-out of socially owned renewable energy in South Africa. The two mentioned structures must work in close collaboration with the Presidential Climate Commission.

Stakeholder engagements underscored the intricate web of regulations, policies, and challenges that must be navigated to enable effective social ownership of renewable energy projects. The consensus emerged that tailored and progressive regulations are essential to ensuring equitable and sustainable outcomes. The discussions surrounding SORE projects were rich and multifaceted, addressing various aspects related to community engagement and benefits. Projects should address community problems, involve the youth, and prioritise technical training. Overall, the findings highlighted the need for holistic, community-centred approaches, emphasising education, collaboration, and flexibility to ensure the success of socially owned renewable energy projects and to foster a just and sustainable transition to cleaner energy sources. There is an urgent need to ensure significant work to speed and scale up renewable energy generation in South Africa, and this has the potential to be combined with social ownership. An ambitious, country-wide programme which goes beyond a few small pilot projects is required. We urgently need a massive investment, training, skills, jobs, and implementation programme to develop and build socially owned renewable energy at a massive scale across the country.

4.3 Developing capacity

For Models 1 and 2, it is imperative that municipalities are capacitated to partner in the implementation of SORE for residents of rural villages, townships, and informal settlements.

For Model 2, which is grid-tied to the municipal grid, the municipal electricity department is a key partner. Dedicated training programmes for municipal electricity departments as well as officials in other related departments (IDP, economic development, accounts) are recommended.

Capacity building is also required for Model 1 where appropriate, with rural municipalities, district municipalities, and traditional authorities,

For all models, it is recommended that a generic Modelling Tool – based on the spreadsheet used in this report – is developed as an accessible 'toolbox' and made available for stakeholders to both understand and design the projects to be implemented. This will build capacity especially among community and labour stakeholders, as social owners, to understand exactly what benefits will accrue to them and to manage expectations.

4.4 Establishing a community of practice

It is proposed that the PCC considers facilitating the development of a community of practice, which will bring stakeholders directly involved in the SORE projects together on a regular basis, to share best practices and create new knowledge and advance the establishment of viable socially owned renewable energy projects. Such reflexive learning could happen through local, regional, and national meetings and workshops, and be facilitated through in-person as well through web-based collaborative platforms.

4.5 Way forward for pilot projects

The modelling for each of the models above has indicated benefit in terms of access to energy; financial benefit in terms of savings on energy or revenue from sale of energy, rental of land or shareholding in REIPPP; economic benefit to community in terms of multiplier effect on support for local businesses, industrial or agricultural production; employment in terms of job retention and job creation; and social benefit in terms of time saving (in particular for women), education and access to information (in particular, for youth and students/scholars); and health and safety (crime prevention, access to clean water). Some of these are more easily measured than others; hence it is difficult to conduct a quantitative comparison on benefit.

For ease of illustration the comparison and impact for each model are divided into two groups, namely below (Worker SORE SSEGs, Grid-Tied Gap-Tap, Mini-grids) and above (Community REIPPP and Grid-Tied Ward) 2 MW installed capacity.

The first recommendation is that immediate support is given to two models:

- Model 2 (Township Grid-Tied Co-operative) a social-public partnership; and
- Model 4 (Worker Factory SSEG), a social-private partnership.

The motivation for the former is that there is an existing pilot with a relationship between the social entity and the municipality. The motivation for the latter is that it is important to win the buy-in of organised labour by proving the benefit of RE for their membership.

It is further recommended that additional research and consultation be funded to identify appropriate contexts/sites for the piloting or supporting of Models 1a (Rural Mini-grid) and 3c (Community Land REIPPP) using the process set out in the work programme for each model above.

5. Conclusion

The transformative potential of renewable energy in South Africa has not been realised. It is concluded from the above research project that policymakers, municipalities, civil society stakeholders need to be more ambitious in realising this potential. Government can play a significant role in enabling, coordinating, and obtaining resources for the just transition to renewable energy. Ordinary citizens should be enabled to participate in this transition, not as passive beneficiaries of government services, but as economic actors. The transition from fossil fuel will then become a transition to a transformed, inclusive, and more equal economy.

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ANNEXURES

Annexure 1: Summary of regulatory frameworks

Table 19: Summary of national regulatory frameworks for socially owned renewables

Policy/ Regulation	Relevancy	Lead Authority	Authority Focus
Constitution of the Republic of South Africa No.108 of 1996.	Part B of Schedule 4 refers to electricity and gas reticulation and implies that energy matters, generally and renewable energy in particular, are by default national matters administered by the Department of Mineral Resources and Energy.	Department of Justice and Constitutional Development	Assigns legislative and executive functions of the three spheres of government – national, provincial, and local.
National Energy Act No.34 of 2008	Places an obligation on the minister to ensure that diverse energy resources are available in sustainable quantities and at affordable prices in South Africa. The act also defines the role of the National Energy Development Institute (SANEDI) in the development of appropriate skills and capabilities in the energy sector.	Department of Mineral Resources and Energy	Custodian of policy and planning for the energy sector focusing on energy security through diversifying the country's energy mix to include renewable energy sources.
Electricity Regulation Act (Act No.4 of 2006), as amended in 2021, including Electricity Regulation Amendment Bill of 2022	Empowers NERSA to regulate prices and tariffs including powers pertaining to the implementation of the national government's energy policy. NERSA licenses the electricity provision function. The act also established an enabling environment for IPPs to enter the market, as well as procurement of new generation capacity. Defines municipality that has executive authority and rights to reticulate electricity within its boundary.	Department of Mineral Resources and Energy	Custodian of policy and planning for the energy sector focusing on energy security through diversifying the country's energy mix to include renewable energy sources.

Policy/ Regulation	Relevancy	Lead Authority	Authority Focus
The Public Finance Management Amendment Act 29 of 1999 and respective Provincial and Municipal Finance Management Acts	Funding of renewable projects and programmes and oversight on procurement processes. Renewable energy incentives are contained in the Draft Taxation Laws Amendment Bill which addresses the expansion of the renewable energy incentive and roof solar tax incentive.	National Treasury	Regulates financial management in the national government and provincial governments to ensure that all revenue, expenditure, assets and liabilities of those governments are managed efficiently and effectively and to provide for the responsibilities of persons entrusted with financial management in those governments.
National Development Plan	Increasing the electricity generation reserve margin through development of 10 GW of additional electricity capacity by 2019 against the 2010 baseline of 44 GW. Five of the 10 GW are to be sourced from RE, with an additional 2 GW to be operational by 2020.	National Planning Commission	Responsible for national planning, national priorities and directing the course of national development.
National Infrastructure Plan 2050 presented to Cabinet in July 2021 and gazetted for public comment	By 2050, electricity demand is projected to increase by 30%. Installed generation capacity will need to more than double, from 53 GW in 2018 to between 133 GW and 174 GW by 2050, depending on the energy mix at that time. By 2030, 25 GW will have to be added to installed capacity.	Department of Public Works and Infrastructure	Guides the critical shift towards more dynamic infrastructure delivery mechanisms and capabilities.
Environmental Impact Assessment (EIA) 2010, under the National Environmental Management Act (NEMA) (Act 107 of 1998) and amendment Act (Act 62 of 2008)	An EIA is required for RE generation projects which (i) are greater than 10 MW, (ii) with the facility covering at least one hectare, and (iii) with transmission power of greater than 33 kV.	Department of Forestry, Fisheries and Environment	Environmental authorisations of RE projects in terms of the National Environmental Management Act (NEMA)

Source: Own composition as derived from Mauger & Barnard (2018); GIZ and DMRE (2015); and Glazewski (2006).

Table LR 1: Overview of legislative electricity mandate for municipalities in South Africa

Policy/Regulation	Relevancy	Lead Authority	Authority Focus
Constitution of the Republic of South Africa No. 108 of 1996.	Assigns municipalities the responsibility for administering services to communities in a sustainable way, including electricity reticulation and streetlights.	Department of Justice and Constitutional Development	Assigns legislative and executive functions of the three spheres of government – national, provincial, and local.
Municipal Systems Act 32 of 2000	Defines municipalities as service authorities that have the right to decide who distributes electricity in their area and the right to appoint a suitable service provider in terms of a service delivery agreement.	National Treasury	Regulates financial management in the national government and provincial governments to ensure that all revenue, expenditure, assets, and liabilities of those governments are managed efficiently and effectively and to provide for the responsibilities of persons entrusted with financial management in those governments.
Municipal Finance Management Act 56 of 2003	Governs municipal tariffs, setting of municipal tariffs and procurement of services. Section 33 of the MFMA stipulates that a municipality can only enter into a contract imposing financial obligations on the municipality beyond a three-year period if there has been public consultation and approval by the municipal council	National Treasury	Regulates financial management in the national government and provincial governments to ensure that all revenue, expenditure, assets, and liabilities of those governments are managed efficiently and effectively and to provide for the responsibilities of persons entrusted with financial management in those governments.
Municipal Fiscal Powers and Functions Act 12 of 2007	Regulates the levying of municipal surcharges.	National Treasury	Regulates financial management in the national government and provincial governments to ensure that all revenue, expenditure, assets, and liabilities of those governments are managed efficiently and effectively and to provide for the responsibilities of persons entrusted with financial management in those governments.

Policy/Regulation	Relevancy	Lead Authority	Authority Focus
The Electricity Regulation Act (No.4 of 2006) and the Electricity Regulation Amendment Act (No.28 of 2007), as amended 6 October 2021, Amendment to Schedule 2.	Defines municipality that has executive authority and rights to reticulate electricity within its boundary. The licences issued by NERSA for municipal electricity distributors (providers) list the supply areas for each licensee. Exemption from licences as per 2021 amendment.	Department of Mineral Resources and Energy	Custodian of policy and planning for the energy sector focusing on energy security through diversifying the country's energy mix to include renewable energy sources.
Electricity Regulation Act, 2006. New Generation Regulations of 2011 (published as GNR. 399 in Government Gazette No.34262 dated 4 May 2011)	Provides regulations targeted specifically at government structures and outlines the rules for the procurement and new generation capacity of electricity by organs of state.	Department of Mineral Resources and Energy	Custodian of policy and planning for the energy sector focusing on energy security through diversifying the country's energy mix to include renewable energy sources.

Source: Own composition derived from National Treasury (2022) and SALGA (2018, 2017).

Table 20: Renewable energy scenarios for municipalities

Scenario	Description	What should you have?	What should you do?
Scenario 1 Procuring electricity from SSEG Community-owned/ managed SSEG (Models 1, 2, 4)	An existing customer that has connected to the municipal grid installs an electricity generating system (i.e. solar photovoltaic panels, mini wind turbines or biogas) with a maximum production capacity of 1 MW or less and sells the excess electricity that they have not been able to use to the municipality.	SSEG policy which specifies what the distributor allows, does not allow, and the application process for customers to seek permission to install. SSEG by-law or amendment of the Municipality's Electricity Supply By-Law to make the policy legally binding on customers (Sustainable Energy Africa, 2021) REFIT NERSA	In terms of the Electricity Regulation Act (2006), any person who owns or operates a generation facility is required to obtain a generation licence to be issued by NERSA unless otherwise exempt as per Schedule 2 of the Act. Generation activities <100 MW do not require licensing but do require registration with NERSA.

Scenario	Description	What should you have?	What should you do?
Scenario 2 Procuring electricity from an IPP Community shareholding or worker-owned/ managed IPP (Models 1, 2, 3, 4)	IPP would like to set up an electricity generating facility for the primary purpose of selling it to the municipality at a rate that is competitive in comparison to the Eskom bulk tariff.	Section 34 Determination naming a municipality as a buyer in a municipal IPP procurement programme. Ministerial consent under regulation 5 of the New Generation Regulations - Minister of Mineral Resources and Energy – approving authority. Municipality as the applicant must develop a feasibility study. Registration in terms of Schedule 2 of ERA. NERSA will require a Cost of Supply study for any change to the tariff structure that arises from procurement of electricity from IPPs. A PPA – if more than three years – subject to MFMA section 33 requirements.	Any generation facility of more than 100 MW will need a licence from NERSA. This may require a Deviation or Determination (or Ministerial Consent). The main steps of the MFMA section 33 process are: a) public participation; b) the soliciting and consideration of the views and recommendations of the National Treasury, the relevant provincial treasury and DMRE and COGTA; and c) the approval of the Municipal Council. Specific requirements apply to each of these steps.
Scenario 3 Generating renewable energy for own use N/A	A municipality installs a renewable energy system on existing infrastructure or buildings. This size of installation is designed to supplement the electricity use of the infrastructure but may also have excess energy to feed into the grid during less-busy periods.		Undertake a feasibility study inclusive of different types of ownership and investment/ financing options. Conduct the procurement process in line with municipal SCM regulations.

Scenario	Description	What should you have?	What should you do?
Scenario 4 Generating renewable energy for sale N/A unless community partnership for distribution/ installation/ servicing	A municipality may decide to install a renewable energy plant for the specific purpose of generating electricity and feeding into the electricity grid. This could be in the form of a waste-to-energy project, solar farm, wind farm or other type of renewable energy installation.	The NERSA will require a Cost of Supply study for any change to the tariff structure that arises from procurement of electricity from own build New Generation Capacity. Section 34 Determination on which a municipality may establish new generation capacity. Ministerial consent under regulation 5 of the New Generation Regulations - Minister of Mineral Resources and Energy – approving authority. Municipality as the applicant must undertake a feasibility study. Registration in terms of Schedule 2 of ERA. MFMA section 33 requirements if contract is longer than three years.	Any generation facility of more than 100 MW will need a licence from NERSA. This may require a Deviation or Determination (or Ministerial Consent). Undertake a feasibility that complies with regulation 5(2) of New Generation regulations. The main steps of the MFMA section 33 process are: a) public participation; b) the soliciting and consideration of the views and recommendations of the National Treasury, the relevant provincial treasury and DMRE and COGTA; c) the approval of the Municipal Council. Ensure a budget allocation for the installation in the Medium-Term Expenditure Framework (MTEF). Conduct a procurement process in line with municipal SCM regulations.
Scenario 5 Wheeling of private sector electricity Model 2	An IPP wants to sell electricity to a customer who is connected to the municipal grid. In this scenario, the IPP requests access from the municipality to 'wheel', or transport, electricity through the grid to another entity or customer.	NERSA will require a Cost of Supply study. Wheeling electricity policy or guidelines	Conduct a detailed Cost of Supply study. Establish an overall strategy for wheeling, including the aims and long-term implications of wheeling. Draft a generic connection and use-of system agreement. Revise the billing system to accommodate wheeling charges and third-party sales.

Scenario	Description	What should you have?	What should you do?
Scenario 6 Increasing energy access and reducing energy poverty Model 1: Mini-grid community-owned	A municipality provides a basket of renewable and alternative energy services to households that do not have access to grid-connected electricity. This applies to informal settlements or rural areas where there is no grid infrastructure. In grid-connected areas where households are poor.	Free Basic Electricity Policy Indigent Policy (Free Basic Services/ATTP)	Conduct community surveys to gain an understanding of existing energy behaviour and financial affordability. Select alternative technologies that are appropriate for the community. Conduct stakeholder consultation. Pilot combinations of alternative technology.
Scenario 7 Operating a storage facility N/A	A municipality invests in electricity storage facilities, such as large-scale batteries and pump-storage schemes, to store excess electricity for use at times of peak demand or in the event of load-shedding.		The steps to follow with storage facilities are the same as those for generation facilities.

Source: SALGA, 2018, Renewable Energy Scenarios for municipalities in South Africa; National Treasury, MFMA, 2022 Circular 118: Regulatory Framework on Procurement for New Generation Capacity Summary Report.

Table 21: List of energy-related provincial policies

Province	Custodian Department (s)	Relevant Policy/Reports	Natural Resources
Eastern Cape	Department of Economic Development Environmental Affairs and Tourism Sustainable Energy Forum (sector development structure)	Eastern Cape Sustainable Energy Strategy (2012) Bio Energy Support Plan	Wind, solar, biomass and biofuels RE Manufacturing
Free State	Department of Economic, Small Business Development, Tourism and Environmental Affairs	Free State Green Economy Strategy (2014)	Solar and hydro

Province	Custodian Department (s)	Relevant Policy/Reports	Natural Resources
Gauteng	Gauteng Department of Agriculture and Rural Development (for EIA) Department of Economic Development Gauteng Growth and Development Agency Energy Office (proposed sector development structure)	Gauteng Integrated Energy Strategy (2010) Green Strategic Programme for Gauteng (2011)	Solar and biofuel
KwaZulu-Natal	Department of Economic Development, Tourism and Environmental Affairs Sustainable Energy Forum (*sector development*) Renewable Energy Development Hub (*sector development*)	Green Economy Strategy for KwaZulu-Natal Province (2012) - *unofficial*	Wind, solar, biomass and biofuel
Limpopo	Department of Economic Development, Environment and Tourism	Limpopo Green Economy Plan (2013)	Solar, biomass RE Manufacturing
Mpumalanga	Department of Economic Development, Environment and Tourism Bio Energy Cluster (sector development structure)	Provincial Growth and Development Strategy (2004)	Biofuel, biomass
North West	Department of Economic Development, Environment, Conservation and Tourism	Renewable Energy Strategy (2012)	Biofuel, biomass, hydro and solar RE Manufacturing
Northern Cape	Department of Economic Development and Tourism Northern Cape Economic Development, Trade and Investment Promotion Agency Renewable Energy Centre of Excellence (*sector development structure*)	Northern Cape Provincial Spatial Development Framework (2012)	Wind, hydro and biomass

Province	Custodian Department (s)	Relevant Policy/Reports	Natural Resources
Western Cape	Department of Environmental Affairs and Development Planning GreenCape (sector development structure)	White Paper on Sustainable Energy (2010) Greentech Report (2010)	Solar and wind RE Manufacturing

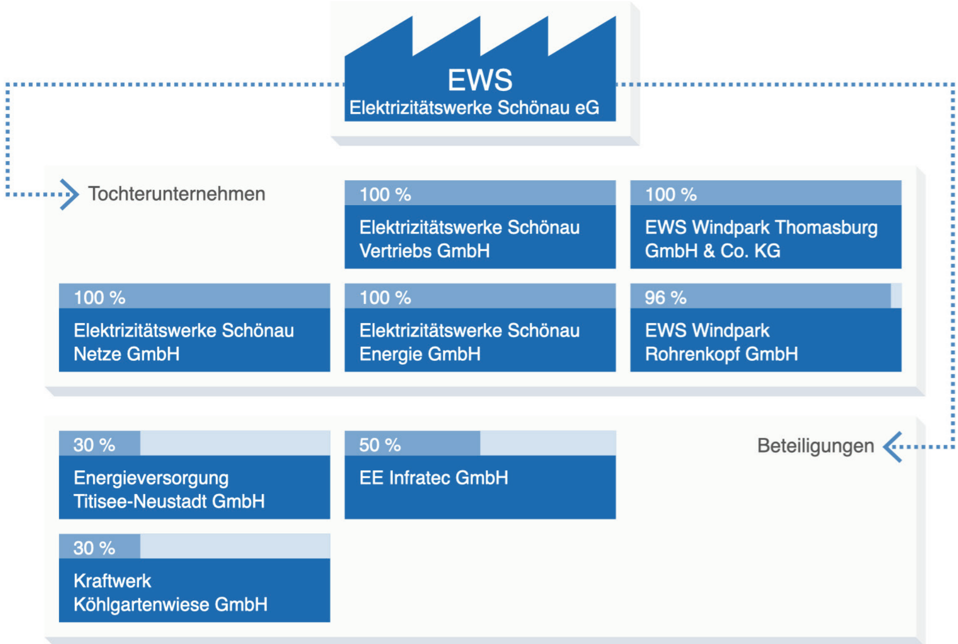
Source: Own compilation

Annexure 2: International case studies Global North

Table 22: Case Study Germany: National co-operative – Elektrizitätswerke Schönau (EWS), Baden-Württemberg

Case Study Questions	Elektrizitätswerke Schönau (EWS), Baden-Württemberg, Germany
What about the social and economic context gave rise to the initiative?	Schönau is a small town in the southern Black Forest in South-West Germany (state of Baden-Württemberg) and has around 2 400 inhabitants. Economically, Schönau is known for its historically grown brush industry and tourism. Politically, it can be considered as traditionally conservative, which is often the case in rural areas of Baden-Württemberg.
What is the initiative about? What is its purpose, ideology, or objectives? What services does it provide? What technology/ies for renewable energy is used in the initiative? Where does it fit in the energy value chain? (transmission; grid capacity; storage; distribution)	Schönau became a pioneer of the energy transition in Germany already in the early 1990s and has since gained national and international visibility. The municipality is a pioneer of an innovative, ecologically-oriented, decentralised and civic energy supply that is also operated by a co-operative run by citizens of the community. It operates a local grid, runs several decentral renewable energies (wind and solar) and highly efficient combined heat-and-power systems, and sells green electricity and bio-gas Germany-wide.

Case Study Questions	Elektrizitätswerke Schönau (EWS), Baden-Württemberg, Germany
How and when did the initiative start? How is it organised - membership and intersectional issues; services; ownership; management and member participation; connection to other initiatives/networks?	As a reaction to the Chernobyl nuclear reactor catastrophe in 1986, a self-help group was formed by concerned citizens in the community that developed into the citizens' initiative (BI) "Parents for a Nuclear-Free Future, EfaZ", by the so-called "energy rebels" pioneers Ursula and Michael Sladek. After failing attempts to cooperate with the local monopolistic electricity provider, the initiative prepared itself to buy into the local electricity grid by forming a commercial organisation (GbR) operating as a co-operative, collecting funds, and by supporting small-scale renewable energy production through PV and biogas. By winning a local public referendum in 1991 and 1996 against the decision of the community council, they managed to become the holder of the concession contract to operate (as monopolist) the local electricity grid. The formation of the Elektrizitätswerke Schönau (EWS), with more than 650 members and massive fundraising efforts, succeeded in buying the local grid from the monopolist in 1996. The initiative was strongly supported by the local churches. In 1999, it supplied PV modules on the roof of a local Protestant church establishing a so-called "Schöpfungsfenster" (creation window). It became a well-known symbol that also convinced formerly critical community members and was hailed by local Catholic priests (Schönborn et al., 2014). Throughout the 1990s, Schönau became a symbol of the anti-nuclear movement that radiated far beyond the region. Technicians, artists, philosophers, and scientists held "Schönau electricity seminars" and supported the work of the electricity rebels. The expert for energy co-operatives, Burkard Flieger (2011) writes: "EWS Schönau, since reorganised by the administrative body into a co-operative, is one of the most credible consumer co-operatives in Germany in terms of eco-power supply. It provides its knowledge for the purchase and supply of eco-power to end consumers." Since 1997, the EWS operates the local grid based on renewable energies without nuclear energy and is owned by citizens on the basis of a co-operative. It sells green electricity throughout Germany to nowadays 230 000 customers countrywide. It is thus not restricted in its operations to the confines of the small community of Schönau but became an electricity provider throughout Germany. Thus, it is not only a local community initiative, but it developed into a green electricity provider with a high authenticity and a strong local and participatory approach. Through its "Sonnencent" (solar cent) initiative, it also supports local initiatives Germany-wide and world-wide to establish decentralised renewable energy solutions based on democratic participation.

Case Study Questions	Elektrizitätswerke Schönau (EWS), Baden-Württemberg, Germany
	In 2009, the EWS was formally turned into a co-operative with nowadays 10 417 members and 78 employees (as of 2021). The EWS is a holding of several smaller 100%-owned companies including those that generate electricity such as a wind farm (Windpark Rohrenkopf), the grid operation in Schönau, as well as a retailer of electricity. In addition, the holding also has shares with numerous other electricity-generating companies, most of them by 100% from renewable sources (see figure)  Source: EWS (2022). Geschäftsbericht 2021, p.49 The daughter companies are organised as companies of limited liabilities (GmbH) which must survive economically by themselves even though they benefit from the collaboration in the holding combining generation, transmission, and sales (retail). The EWS is well connected to the 900 other German energy co-operatives and is a member of the German association of co-operatives (Deutscher Genossenschafts- und Raiffeisenverband e. V. with 5,200 member co-operatives).
How was the initiative financed at inception? Sources of re-financing? What are members' contributions?	Starting with private money from the founding members of the citizen's initiative, the fundraising campaigns to establish itself as a formally recognised organisation and as a buyer of the local grid were tremendously successful. The latter raised 8.7 million DM to buy the local grid in the municipality of Schönau in 1996. EWS hands out shares of €1,000 each held by about 10,000 members. Members hold about 410,000 shares equalling a total equity of €42 million (on average, each member holds four shares of a total of €4,000). The central goal of the co-operative is to serve the interests of its members, but not to maximise profits. However, profits are possible and can be issued to members or be re-invested.
At what scale is the initiative working/could the initiative work?	EWS works on both levels, the local/municipal level with the grid operation and by running several renewable electricity plants as well as the national level where it sells green electricity to more than 200,000 customers. It also sources its electricity internationally, e.g. from Scandinavian hydropower plants.

Case Study Questions	Elektrizitätswerke Schönau (EWS), Baden-Württemberg, Germany
What is the role of the state? Orientation to state?	State regulations were crucial for the establishment of the current business model, namely the generation and sales renewable electricity Germany-wide. The Liberalisation of the electricity market to allow independent power producers to freely trade and sell electricity in the market helped. Also, the Renewable Energy Act (EEG) was highly instrumental because of its priorities given to renewable energies such as the generous and long-lasting feed-in tariffs.
Orientation to local economy? How is the initiative connected to inputs required and industry behind inputs?	Through the formation of local companies (such as the ones running a wind farm) and the support of local renewable energy production plants, the EWS supports the local economy.
Orientation to commons?	How far the decisions reflect the will of the members of the co-operative, or the customers is an open question in this case. However, business reports do not report about major criticisms or fundamental questioning of the co-operative model.
What barriers did initiative experience, and how did initiative overcome these? What are the continued challenges? What are plans for future?	In the beginning, the initiative had to fight against the monopolistic electricity provider and grid owner in the region, but through strong campaigns they garnered also political support to win the local referenda in the 1990s in the community. It also raised a substantial financial and discursive support from various actors in Germany that supported the idea of local nuclear-free electricity generation and transmission. Today, the EWS is campaigning for legal structures to support energy sharing in small-scale energy neighbourhoods so that renewably generated electricity can be shared among neighbours without feeding it into the official grid and buying it back. The direct trade of electricity would allow for cheaper exchange without the grid-surcharges and for more efficient use of the electricity generated locally. In the future, EWS seeks to foster its engagement towards 100% carbon-neutral solutions in municipalities, companies, and other organisations.
What specific municipal policies helped/hindered? New/changed policies?	The decision by the municipality to give the concession contract to the EWS supported by a majority in the referenda was essential for the initiative to get going locally. The opening up of the electricity market for trade via a stock exchange (housed in Leipzig) helped the EWS to become a national retailer of green electricity and opened up an entire new business field for them which is now the dominant one for the holding.

Case Study Questions	Elektrizitätswerke Schönau (EWS), Baden-Württemberg, Germany
What membership education programme exists? What existing technical knowledge/skills to support the initiative is there? What general education/ advocacy programmes? What membership capacity is assumed? How have communities of practice been developed?	EWS regularly holds "Schönauer Stromseminare" (electricity seminars) and numerous public talks in other cities and regions to spread the word and to help local initiatives to form.
Other information	
Notes for SA context	Role of energy-related catastrophies (Chernobyl) Localised political campaigning EEG framework Legal frameworks for co-operatives

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Table 23: Case study Spain: National co-operative – Som Energia

Case Study Questions	Case Study: Spain, Catalonia, Renewable Energy Som Energia Co-operative
What about the social and economic context gave rise to the initiative?	The Spanish electricity market is characterised by considering electricity as a commodity, and consequently, the supply is cut off when energy bills are not paid, without considering specific social situations and family composition. Technology relies on big plants, mostly dependent on fossil fuels, and controlled by a few companies. Regulations are complex and based on techno-scientific knowledge, so it is difficult for users to properly understand the energy market and make decisions to choose the best energy offer. Moreover, 95% of Spain's electricity, 99.7% of the distribution and 79.5% of the commercialisation is generated by just five companies. Currently, politics and regulations are being criticised since they hinder the development of new renewable energies and self-consumption installations. They also contribute to Spain having the second-highest electricity prices in Europe and are not tackling an increasing rise in energy poverty. This regime combined with a broader context embedded in an economic crisis and an awakening of activism in civil society have made the emergence of a variety of energy-related initiatives possible, such as citizens' co-operatives, policy advocacy associations, social enterprises, projects dedicated to retrofitting energy efficiency measures or other means.
What is the initiative about? What is its purpose, ideology, or objectives? What services does it provide? What technology/ies for renewable energy is used in the initiative? Where does it fit in the energy value chain? (transmission; grid capacity; storage; distribution)	Som Energia arose in 2010 as the first renewable energy co-operative to operate in both parts of the cycle: in the production, developing new small-scale renewable energy projects; and in the commercialisation, supplying electricity from renewable sources. It has the political aim of doing something to create a post-fossil fuel economic order and experiment with new forms of grassroots democracy. Its goal is to produce 100% of members' consumption via new renewable production projects. It is owned by the co-operative and financed by its members who built their business model around retailing green-certified electricity to discontented and politicised customers in an energy regime which is dominated by five big energy producers. By 2017, the co-operative had financed six solar parks, a biogas plant, and a hydroelectric power station with a capacity of close to 4.5 MW. Spain's first citizens' wind turbine is still in the process of construction. Because of its fast growth and the difficulties of finding adequate projects, the co-operative can currently only cover 3% of the electricity needs of their members by their own power plants.

Case Study Questions	Case Study: Spain, Catalonia, Renewable Energy Som Energia Co-operative
How and when did the initiative start? How is it organised – membership and intersectional issues; services; ownership; management and member participation; connection to other initiatives/networks?	Started as a small initiative focused on people at the University of Girona but soon spread to Barcelona and the rest of Catalonia. More than 30% of their members live in other parts of Spain. Grown from 300 members when it was founded in 2010, to more than 55,000 members and 90,000 consumers. Sixty-five local groups of highly-motivated activists and politically conscious people, all of them volunteers, organise conferences, debates, and regular meetings across the country. In these meetings, they defend and explain how to promote a new culture of energy consumption based on responsibility and democracy, on renewable energies, energy efficiency and savings. These groups have emerged from the bottom-up, they do not have a set agenda and all of them function with a horizontal decision-making structure. Each group has its own regular meetings, and they all meet at different times during the year, for training or for strategic planning purposes. Apart from these physical encounters, there are also digital platforms and tools to stay in touch, share, discuss and debate throughout the year. Broadly speaking, activists define the strategy and run the co-operative, discussing, and taking positions in the many spaces and means of participation. The board of the co-operative is composed of activists, and makes its final decisions based on these democratic discussions from the grassroots.

Case Study Questions	Case Study: Spain, Catalonia, Renewable Energy Som Energia Co-operative
How was the initiative financed at inception? Sources of re-financing? What are members' contributions?	To become a member requires a refundable deposit of €100 into the co-operative's social capital account. In 2016, for the first time since its creation, the co-operative reported profits instead of losses. Some EU funding via Intelligent Energy Europe was received. The first-time investment in shared capital was offered, members already lend €800,000 to Som Energia to finance projects of energy generation. In October 2017, the period for investment in share capital opened again and within seven days about 1,500 members invested €5 million. With this money more PV-Installations were financed. The lowest contribution is €100, the highest contribution during the first week is €5,000 and after the first week €100,000. With the limit set during the first week, Som Energia is making sure that also small investments can be done. The interest rate is 1.75%. Generation kWh started in 2015, after the Spanish government cut the feed-in tariffs. Generation kWh's aim is to produce electricity and invest in renewables as a collective. Energy shares, which are €100 each, can be purchased by each member to (partially) offset their specific annual consumption. To provide an example: A typical household with an average annual electricity consumption of 2,400 kWh needs to invest €900 to cover 70% of its energy demand for 25 years. Every €100 contribution is equivalent to 170–200 kWh per year which is going to be discounted from the energy bill with Som Energia. After 25 years, the initial investment is to be returned. In the meantime, the investor had savings on his energy bill for 25 years. The project bore fruit in May 2016, as the first collectively owned solar field started to provide energy to about 1,300 households. More than 2,700 people participated in this fundraising action and together they collected more than €2.5 million which will be invested in even more community-owned power plants. This investment allows the co-operative to be independent from bank loans. Instead, they invest their members' money directly in new generation projects.
At what scale is the initiative working/could the initiative work?	Country-wide: Strong regional base in Catalonia but groups in many other regions of Spain.
What is the role of the state? Orientation to state?	A government supervised system certifies the renewable origin of the energy. Som Energia collaborates with over 300 municipalities of which 160 contracted Som Energya directly as their electricity supplier and others used calls for tender to get contracted by Som Energia. Som Energia also collaborates with small villages. Villages with less than 500 inhabitants can contract Som Energia without paying the €100 entrance fee.

Case Study Questions	Case Study: Spain, Catalonia, Renewable Energy Som Energia Co-operative
How have social and economic ecologies developed around the initiative? Global or local network links?	Every member can share its membership with five people so they can have a contract and get energy from the co-operative, without having to pay the entrance fee of €100. This helps to provide access to green electricity from Som Energia for people with lower income. Members of Som Energia which are in precarious situations will not get charged for their electricity consumption for one year. Beyond fulfilling their legal responsibilities of not letting vulnerable households go dark – which many other energy suppliers do not take care of – the co-operative wants to be proactive and fight energy poverty together with municipalities. Som Energia members are individuals, industrial clients, and municipalities. In 2017, 40 people were currently employed and hundreds of volunteers are collaborating in the local groups. The co-operative is also a platform for various ecological movements, such as those against fracking and nuclear energy. This is achieved mainly by supporting existing organisations, such as creating new spaces for discussion.
Orientation to local economy? How is the initiative connected to inputs required and industry behind inputs?	Renewable electricity bought from the market and sold to members, but also some own generation with the long-term goal to be self-generating renewable energy from solar and wind.
What barriers did initiative experience, and how did initiative overcome these? What are the continued challenges? What are plans for future?	No green energy subsidies from state. Nine months to get a permit to operate. The Spanish energy system has a minimum purchase of 100 kWh in the daily market and 1,000 kWh in the future market. This is problematic for smaller players who get penalised later for 'wrong' predictions (higher deviation cost price). Since November 2013, Som Energia has been struggling with other energy co-operatives to bring down a new government law subjecting all operators of PV installations to pay a kind of "sun tax". Som Energia is currently looking for pilot projects such as small-scale PV installations with battery storage for self-consumption. These pilot projects should show that small-scale energy production and consumption is still possible, even without governmental funding.

Case Study Questions	Case Study: Spain, Catalonia, Renewable Energy Som Energia Co-operative
What membership education programme exists? What existing technical knowledge/skills to support the initiative is there? What general education/ advocacy programmes? What membership capacity is assumed? How have communities of practice been developed?	Each group has its own meetings and is autonomous. It sets its own agenda, depending on the interests of the people involved, and the opportunities offered in their local context. Some groups are more involved in commercial activities to increase the number of members of the co-operative whilst others focus on membership education around the social and solidarity economy or ecological issues; talks in neighbourhood associations or in schools; others develop projects in their own local territories (engaging and promoting local commerce, initiatives against fuel poverty); others are more focused on policy advocacy activities (demonstrations, reports to inform policies, etc.). Through the development of these activities, all those interviewed expressed that they have discovered the social perspective and consequence of energy, shifting from technical interests (like engineering projects) to social and political issues (fuel poverty, energy sovereignty, etc.). Furthermore, regarding first-order learning, they remarked how much they have learnt in relation to capabilities such as communication, working in groups, creating influence, or acquiring a good level of IT skills and social network management. The co-operative consists of sections and local groups. Each local group is independent to act, attract new members and organise information campaigns. Because the local groups constitute the co-operative from below, they can create their own statutes and procedures and are not obliged to implement centrally decided rules. The groups are guided by a shared set of ethics.
Other information	Benefitted from contacts with other RES co-operatives. Management of co-operative is based on volunteer work with a small office and management. Largely managed via web.

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Table 24: Case Study Germany: Mieterstrom tenant-owned RE at Bürgerenergiegenossenschaft BENG, Munich

Case Study Questions	Tenant electricity (Mieterstrom) at Bürgerenergiegenossenschaft BENG, Munich, Germany
What about the social and economic context gave rise to the initiative?	In 2017, the federal government issued a law to boost 'tenant electrictiy' (in German "Mieterstrom") to harvest the huge potential of rooftop PV in Germany, in urban areas. This potential was calculated as 14 TWh of renewable energy if all suitable rooftops of about 3.8 million households in multi-party buildings were used for PV modules. The energy generated could supply electricity to more than the 3.8 million households whose consumption is roughly 10 TWh annually. By comparison, if all suitable rooftops on German houses, including the ones on privately owned houses, German rooftops could supply 104 TWh (of 129 TWh total annual consumption). The law developed different legal options for using the electricity, either for consumption by the tenants of the house and/or for feeding electricity into the grid. It foresaw a special support scheme for the highly efficient local use of the electricity by the tenants. Ownership of the PV installations will in most cases be with a renewable energy providing company or even large suppliers. However, there are numerous 'civic energy' co-operatives ("Bürgerenergie"), owned by citizens, that operate these PV installations and own them. Via these co-operatives, tenants could also acquire shares and thereby own at least parts of the PV installations on their rooftop. The case presented here studies this arrangement. This initiative was formed already in 2011 and made use of the new opportunities with a particular focus on involving the tenants in the civic energy models financing the PV modules on their rooftop.

Case Study Questions	Tenant electricity (Mieterstrom) at Bürgerenergiegenossenschaft BENG, Munich, Germany
What is the initiative about? What is its purpose, ideology, or objectives? What services does it provide? What technology/ies for renewable energy is used in the initiative? Where does it fit in the energy value chain? (transmission; grid capacity; storage; distribution)	The case of BENG in Munich is a citizens-owned co-operative that generates electricity in the metropolitan area of Munich, Bavaria, from PV models that are installed on public buildings such as schools and kindergartens, privately owned commercial companies, or private residential buildings with multiple tenants. The vision and values behind the foundation was to create decentralised energy markets close to where electricity is being used in mostly urban areas that should be 100% renewable and therefore advancing climate mitigation. Energy supply should be made more resilient through local structures and through democratic control by users (prosumer model) and widespread ownership by citizens. The initiative works closely with the municipalities in which they run their projects. BENG was founded in 2011 as a co-operative. It currently (as of 2023) has more than 400 members and runs 40 "citizen solar installations" ("Bürgersolaranalagen") with more than 1.25 MWp. Technically, the electricity generated from the 40 PV projects is being either fed into the grid to obtain the full feed-in tariffs under the German Renewable Energy Act ("EEG") or via the tenant electricity ("Mieterstrom") model given the households in the houses where it has been produced (excess electricity is being fed into the grid). One of the latter is located in Max-Bill-Str. in Munich with 53 kWp and an annual electricity production of about 50 000 kWh (roughly enough for 12 four-person households), established in 2018; the other is located in Caramanico Str. in Kirchheim close to Munich; established in 2017, it has 58 KWp and provides 60,000 kWh (fulfilling energy demands of 16 four-person households). It roughly supplies 40% of the tenants' energy demand. The rest of the electricity needs are supplied through a cooperating company that supplies electricity from renewable sources ("Polarstern").
How and when did the initiative start? How is it organised - membership and intersectional issues; services; ownership; management and member participation; connection to other initiatives/networks?	In 2002, a group of local citizens in Munich and surrounding towns (Ebersberg, Starnberg) got together to form an initiative to build and operate PV modules on local rooftops of schools and residential houses and other buildings. In 2011, it was formally turned into a formally recognised co-operative under German law ("eG – eingetragene Genossenschaft"). The co-operative is run by a board consisting of three people under the control of an oversight board ("Aufsichtsrat") consisting of eight people. All 400 members are regularly informed about ongoing activities and projects and can actively participate in the annual general assemblies of the co-operative. Unlike most tenant electricity models, it is a special characteristic of this civic energy co-operative that it seeks to involve tenants benefiting from the tenant electricity model into the co-operative (Flieger et al., 2018, p.87).

Case Study Questions	Tenant electricity (Mieterstrom) at Bürgerenergiegenossenschaft BENG, Munich, Germany
How was the initiative financed at inception? Sources of re-financing? What are members' contributions?	Members sign shares of €100 each. For new projects, existing member and new members are invited to acquire more shares so that for each project like a new PV installation, 10% capital comes from the co-operative and 90% would be funded through bank loans to be reimbursed based on the earning of the plant.
At what scale is the initiative working/could the initiative work?	The co-operative is active only locally in the metropolitan area of Munich where its 40 projects are located.
What is the role of the state? Orientation to state?	The BENG co-operative collaborates with a housing construction company that is owned by the Bavarian municipalities. It also states on its website that it closely cooperates with the local municipalities where the projects are being established.
How have social and economic ecologies developed around the initiative? Global/local network links?	No information available
Orientation to local economy? How is the initiative connected to inputs required and industry behind inputs?	No information available, but the main focus of the BENG initiative is citizens and private households rather than businesses.
Orientation to commons?	No information available.
What barriers did initiative experience, and how did initiative overcome these? What are the continued challenges? What are plans for future?	In interviews, members of the BENG co-operative state that it was difficult to convince house owners to embark on the project and to get their consent to establish PV modules on their rooftops. In addition, the tenant electricity model is legally as well as technically demanding since it requires additional meters, protection equipment, cables, etc. Contracts are also complex since numerous parties (the tenant, the co-operative, the external electricity provider, and the landlord) need to be involved. The Energy Industry Act ("Energiewirtschaftsgesetz") also demands from electricity providers (here the co-operative) to fulfil numerous bureaucratic requirements which make the business model less attractive (Moser et al., 2021, p.8)

Case Study Questions	Tenant electricity (Mieterstrom) at Bürgerenergiegenossenschaft BENG, Munich, Germany
What membership education programme exists? What existing technical knowledge/skills to support the initiative is there? What general education/ advocacy programmes? What membership capacity is assumed? How have communities of practice been developed?	Members of the BENG initiative are also active in a Germany-wide initiative to support the foundation of energy co-operatives at https://www.energiegenossenschaften-gruenden.de. It also offers coaching and consultancy.
Notes for SA context	Legal background is essential (also for the failure of the model). Citizens need to and can be activated to change electricity provision locally. Participation and energy democracy as strong motivating factors and drivers of change (also based on a strong societal discourse about climate change).

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Table 25: Case Study Germany: Worker-owned PV solar module (Volkswagen Plant in Emden)

Case Study Questions	Case Study: German PV Module owned by workers (Volkswagen Plant Emden)
What about the social and economic context gave rise to the initiative? What is the initiative about? What is its purpose, ideology, or objectives? What services does it provide? What technology/ies for renewable energy is used in the initiative? Where does it fit in the energy value chain? (transmission; grid capacity; storage; distribution) How and when did the initiative start? How is it organised - membership & intersectional issues; services; ownership; management and member participation; connection to other initiatives/networks?	This case builds on the German Renewable Energy Act's (as of 2000) provisions with a feed-in tariff granted also for small-scale renewable energy producers granted for 20 years after connection of the plant to the grid. The tariff depends on this connection date and the specific tariff set by law. At the Volkswagen plant in Emden (Northwestern Germany), the formal worker's council (all are members of the "IG Metall" Trade Union) initiated the establishment of a co-operative ("Volkswagen Belegschaftsgenossenschaft für regenerative Energien am Standort Emden eG") that started in 2008 building PV panels on the roofs of the production halls. It extended the PV capacities in 2009 and 2017. The initiative came into being when the management of the Volkswagen plant in Emden started to rent out the rooftop spaces to other commercial companies installing and running PV modules commercially. It was the workers' council that then developed the initiative to allow the employees of the plant to benefit from the PV possibilities arising. Today, it has a capacity of 1,100 kWp, enough to provide electricity to 225 four-persons households. The website (https://vw-solargenossenschaft.de/%C3%9Cberblick/ (in German only) claims that it is the biggest PV installation owned by a workers' co-operative ("Belegschaftsgenossenschaft") in Europe. The electricity is fed into the electricity grid of the Volkswagen plant via formally going through the general electricity grid with the tariffs paid by two electricity retailing companies. The Volkswagen AG company supported the initiative by providing 25-years rental contracts for the rooftop space and by facilitating the connection to the plant's electricity grid. In the 2022 report, it says that since installation in 2008 till 2022, the modules produced about 6,476,303 kWh that included emission reduction as compared to fossil-fuel-based electricity production by 3,886 t CO_2. Economically, the co-operative is profitable since it was able to generate a profit of €38,769 in 2022 which allows it to issue a dividend of about 5.97% to be paid to the shareholding members of the co-operative. Since 2017, the co-operative has 357 members which are staff members of Volkswagen AG holding 64,971 shares. Since the beginning, the co-operative is run by its 357 members (in 2017) which are staff members of Volkswagen AG holding 64,971 shares of between €200 to €10,000 each. The most popular amount of share is between €500 to €700 (held by 38% of the members). In total about €650,000. The co-operative is managed by a board that is elected by the members of the co-operative. A Supervisory Body Aufsichtsrat) oversees the work of the board. The co-operative has been consulted at its inception by the German association of co-operatives (Deutscher Genossenschafts- und Raiffeisenverband e. V. with 5,200 member co-operatives, among them 914 in the energy sector (2022).

Case Study Questions	Case Study: German PV Module owned by workers (Volkswagen Plant Emden)
How was the initiative financed at inception? Sources of re-financing? What are members' contributions? At what scale is the initiative working/could the initiative work? What is the role of the state? Orientation to state? Orientation to local economy? Orientation to commons?	The co-operative is partly funded by the workers buying shares at different rates (s.a.). The investment in the PV modules have been financed externally by bank loans. The loan taken up in 2008 has already been fully paid back from earnings from the electricity sales. Another loan has been taken up 2017 with about €350,000 still to be paid back (as of 2022). It is a local initiative linked to a large car manufacturing plant. The management of the plant was supportive, but not enthusiastically and the idea has not yet spread a lot neither within the company nor beyond in other larger production plants.
What barriers did initiative experience, and how did initiative overcome these? What are the continued challenges? What are plans for future?	One challenge mentioned in the latest report is the bad weather that produced a low energy harvest in 2022. The other challenge might arise once the first PV installations exceed their 20 years' period of subsidised tariffs. However, by then, the entire investment will be written off and if the technology is still functional, earnings will still be possible, even though the prices earned per kWh will be significantly lower.
What specific municipal policies helped/hindered? New/changed policies?	No specific municipalities relevant.
What membership education programme exists? What general education/advocacy programmes? What membership capacity is assumed?	No information available.

Sources:

Volkswagen Belegschaftsgenossenschaft eG, 2023. Available at: https://vw-solargenossenschaft.de

DGRV The German Co-operative and Raiffeisen Confederation, 2022. ***Energy Co-operatives in Germany. State of the Sector 2022 Report***. Available at: https://www.dgrv.de/wp-content/uploads/2022/07/DGRV_Survey_EnergyCo-operatives_2022.pdf

On the role of trade unions in the German energy transition:

Kalt, T., 2022. Agents of transition or defenders of the status quo? Trade union strategies in green transitions. ***Journal of Industrial Relations***, ***64***(4), 499-521.

Prinz, L. & Pegels, A., 2018. The role of labour power in sustainability transitions: Insights from comparative political economy on Germany's electricity transition. ***Energy Research & Social Science***, ***41***, 210-219. https://doi.org/https://doi.org/10.1016/j.erss.2018.04.010

Table 26: Case Study Italy: Rural village co-operative – Villanovaforru and Ussaramanna municipalities, Sardinia

Case Study Questions	Villanovaforru and Ussaramanna municipalities, Sardinia
What about the social and economic context gave rise to the initiative?	In the context of the liberalisation of the European energy market in the early 2000s and with the call for citizen energy initiatives, e.g. through the European Commission's Intelligent Energy Europe Program, and the work of the European federation of citizen energy co-operatives "REScoop.eu" (founded 2012), energy co-operatives also in Italy emerged. Today, REScoop.eu is a network of 1,900 European energy co-operatives and their 1.25 million citizens who are active in the energy transition. It runs several EU-funded research and development projects and supports and connects co-operatives in the Member States.
What is the initiative about? What is its purpose, ideology, or objectives? What services does it provide? What technology/ies for renewable energy is used in the initiative? Where does it fit in the energy value chain? (transmission; grid capacity; storage; distribution)	Launched in 2020, the community energy of the village of Villanovaforru (656 inhabitants) manages a 44 kW PV installation on the roof of the school's gymnasium and is composed of 45 households and a hotel. The community energy of Ussaramanna (512 inhabitants) is composed of 56 households and four small businesses and manages two PV installations – on the city council and on the social centre buildings – with a total capacity of 71 kW. The new co-operatives installed the PV panels, and the profits come from the energy created. All the members can buy the energy, get a share of the profits, and they collectively decide where to invest and how to set prices.
How and when did the initiative start? How is it organised - membership and intersectional issues; services; ownership; management and member participation; connection to other initiatives/networks?	Both initiatives emerged through the initiative of the municipality with the help of the Italy-wide co-operative "énostra" that supports local initiatives like the two on the island of Sardinia with a five-step process ending up in the establishment of a local energy co-operative. In 2020, the mayors of Villanovaforru and Ussaramanna approached ènostra for a feasibility study to determine the possibility of creating an energy community in their municipalities. The municipalities funded a feasibility study that identified suitable sites for building PV installations, mapped the local energy needs, and assessed the interest among residents. Ènostra organised meetings with local residents to inform them about the project, collected declarations of interest for the formal registration of the community, and supported the local governments in various administrative processes. In July 2021, the energy communities were officially established, and by January 2022, both municipalities had installed the PV plants. Currently, the PV installations are connected to the grid and provide energy to local buildings, with excess energy fed back to the grid and benefits shared among community members while awaiting final administrative permission to share energy among members. Decisions in both energy communities are made in the General Assembly, where each member, including the municipality, has one vote.

Case Study Questions	Villanovaforru and Ussaramanna municipalities, Sardinia
How was the initiative financed at inception? Sources of re-financing? What are members' contributions?	Initial funding for the feasibility study was provided by the municipalities through the initiative of the mayors of both towns. "We're all so accustomed to paying someone else to manage our energy supply that they couldn't believe that becoming a member was not only free, but every household was likely to make €130 a year from what they sold to the grid." (Wright, 2022) With their initial concerns allayed, Sideri says locals were excited to be "the hero of their own story." Within three months of the meeting, 55 households and five local businesses had signed up. By November, the panels had been installed, paid for with EU money.
What barriers did initiative experience, and how did initiative overcome these? What are the continued challenges? What are plans for future?	Despite the great interest, not all neighbours of Villanovaforru and Ussaramanna are members of the energy community. The current Italian law for energy communities requires members of an energy community to be connected to the same low-voltage station of the PV plant, and there is more than one station both in Villanovaforru and in Ussaramanna. Identifying members connected to the same low-voltage station has been a bureaucratic challenge, but upcoming changes in the law, including the upgrade of spatial limitation to medium-voltage stations and the mandatory publication of these stations' pertinence areas, are expected to address this. Other obstacles include funding for installations and connecting plants to the network, with distributors sometimes imposing additional requirements that increase time and costs (e.g. realisation of new power lines segments to avoid congestions). Bureaucracy and financing were also major obstacles in Villanovaforru and Ussaramanna, with Marco pointing out that ***"the bureaucratic process is a new ground for everyone, and it was a leap in the dark at first".*** The mayors of both municipalities hope to expand the energy communities once the new law is approved, giving all neighbours the opportunity to join. Thanks to smart meters installed through the EU-funded LIFE LOOP, an EU-funded project in which REScoop.eu, ènostra and other partners aim to connect local authorities and their citizens to work together around community energy projects, community members will optimise energy consumption and sharing by understanding their usage and adapting to real-time production. Moreover, in the context of the LIFE LOOP project, Villanovaforru, Ussaramanna, and ènostra plan to conduct a feasibility study for new generation plants and storage systems. Additionally, the mayors hope to create a consortium of energy communities within the next two years to lower management costs and broaden the project's scope, given their proximity and shared vision for energy democracy.

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Table 27: Case Study Spain: Cooperativa Elèctrica d'Alginet (CEA) in the Valencia region

Case Study Questions	Valencia, Cooperativa Elèctrica d'Alginet (CEA)
What about the social and economic conte xt gave rise to the initiative?	Community-owned electricity distribution co-operatives were born as early as the 1920s and 1930s, when dozens of electricity co-operatives spread all over Spain to provide affordable electricity to secondary, neglected localities. Some of these historical community-owned co-operatives arose in association with small hydropower facilities, which they owned (very similarly to the windmills owned by Danish farmers today); other community-owned electricity co-operatives simply raised local funds to connect a locality with the distant regional grid. Twenty-one co-operatives which survive today in small localities in the regions of Valencia and Catalonia, and which, altogether with some municipality-owned utilities and other community-owned co-operatives sparsely scattered all over Spain, constitute a glaring exception to the virtual absence of community energy initiatives in the country. The big five utilities, which distribute electricity to majority of urban and rural localities in Spain under a model of regional monopoly. Though tiny in terms of the number of customers in comparison with the five big incumbents, the 21 community-owned electricity distribution co-operatives arguably remain by far the strongest niche of community energy initiatives in the Spanish electricity sector. Most interestingly, in the mid-2010s, some of them started to retail green-certified electricity to their local customers. A few of them also built their own solar generation plants as an experiment in renewable generation. Moreover, in late 2018 some community-owned and some renewable co-operatives joined forces to establish ***Unión Renovables***, a lobby created to defend their common interests against the largest incumbent utilities. For CEA and the rest of the electricity distribution co-operatives, the liberalisation of the Spanish electric sector in 1997 opened up fresh opportunities. By 2008 Spain had become the largest solar market worldwide, and a world leader in concentrated solar power technologies. In the same period, domestic production of photovoltaic products grew from €72 to €645 million, and imports from €34 million to €5.4 billion. Instances of fuel poverty increased considerably after 2008. The early 2010s witness a policy U-turn which public authorities and big incumbents presented as a response to the 'tariff deficit' and which ultimately brought to a halt new investment in renewables and, especially, in solar. By late 2014, for instance, the political economy of the electricity sector in Spain had barely altered. The five largest electric utilities continued to enjoy a position of overwhelming domination, as they supplied electricity to a total of 28.8 million delivery points. Renewable electricity co-operatives largely abstained from building community-owned solar plants and windmills, or even community-embedded retail co-operatives. Recurrent restrictions on the amount of power delivered by Iberdrola resulted in blackouts and restrictions in load-shedding exercises for CEA's customers (after change in support by state to keep prices low for consumers).

Case Study Questions	Valencia, Cooperativa Elèctrica d'Alginet (CEA)
What is the initiative about? What is its purpose, ideology, or objectives? What services does it provide? What technology/ies for renewable energy is used in the initiative? Where does it fit in the energy value chain? (transmission; grid capacity; storage; distribution)	CEA distributes and retails electricity to approximately 6,000 local customers as well as to a limited number of regional public bodies and was established in the late 1920s in the wake of the explosion in community-owned electricity distribution co-operatives. The main purpose of CEA was delivering affordable electricity to the households. It expanded from conventional business segments to embrace energy generation and telecommunications. Aimed to expand the activities of the co-operative beyond the mere supply of low-priced electricity. By 2015 CEA started to retail green-certified renewable electricity to its local customer base. The first step was the construction of an electric substation. The substation, finalised in 2012, allowed CEA to bypass Iberdrola and connect Alginet to the semi-public national grid. Roll-out of smart metres across the entire CEA grid in 2008. Once deployed, smart metres revolutionised the billing process. Costs dropped, and several sources of human error were eradicated: human readings, estimated bills, and discrepancies between customers and CEA concerning impromptu lofty bills. Also, the information about consumption supplied by the smart metres allowed CEA to offer better advisory services, especially as far as energy efficiency is concerned (transmission and distribution).
How and when did the initiative start? How is it organised – membership and intersectional issues; services; ownership; management and member participation; connection to other initiatives/networks?	As far as social outreach is concerned, the new board soon increased the range and amount of grants and subsidies to social groups in Alginet. Such allowances had traditionally focussed on social and sports clubs. Soon, other organisations started to receive financial assistance from CEA, including music clubs, a local festivity group, the Easter brotherhoods, and local writers who experienced difficulties in seeing their works published. A discount for retirees was set up. In 2011, CEA inaugurated a programme that subsidises primary and secondary school textbooks as well as the expenses involved in end-of-course trips; in 2013, it instituted a food subsidy for the neediest; and in 2016, it started to sponsor a 'co-operative village' in India. All these subsidies were met with warm approval by the affiliates and the population of Alginet. Affiliates began to show an earnest interest in the calendar and modalities of delivering the subsidies, as reflected in a higher turnout in the annual assemblies in which such proposals are approved. These programmes were set up with the goal of ensuring that no one in the community was left behind, particularly given the scale and depth of the economic crisis. The allowances were designed to ensure that beneficiaries would spend the amount involved in the largest possible number of local shops, thus boosting the local economy.
How was the initiative financed at inception? Sources of re-financing? What are members' contributions?	Members raised capital. Membership fee.
At what scale is the initiative working/could the initiative work?	Local community level. Has lobbying links through national organisation.

Case Study Questions	Valencia, Cooperativa Elèctrica d'Alginet (CEA)
What is the role of the state? Orientation to state?	Legislative framework.
How have social and economic ecologies developed around the initiative? Global/local network links?	See above – cross-subsidies to community initiatives. Link with pressure group with renewable energy co-operatives.
Orientation to local economy? How is the initiative connected to inputs required and industry behind inputs?	Support for local development (agricultural) and services to members.
What barriers did initiative experience, and how did initiative overcome these? What are the continued challenges? What are plans for future?	In late 2017, to build a PV facility in the grounds of the substation. Indeed, this project was conceived more as a project of environmental awareness than in terms of its contribution to the co-operative's generation mix. Despite the self-proclaimed commitment to renewable production amongst CEA staff and the board, more PV projects failed to materialise due to their insufficient financial returns.
What specific state (national policies helped/hindered? New/changed policies?	The unfair treatment of community-owned electricity distribution co-operatives vis-à-vis profit-oriented private utilities stems from the imposition of the same requirements to organisations of a very diverse nature. Thus, Spanish regulations request the same financial requisites and volumes of information from the small electricity distribution co-operatives as from the big five distribution utilities.

Case Study Questions	Valencia, Cooperativa Elèctrica d'Alginet (CEA)
What membership education programme exists? What existing technical knowledge/skills to support the initiative is there? What general education/ advocacy programmes? What membership capacity is assumed? How have communities of practice been developed?	This consensus implies that the central challenge for contemporary societies is the over-consumption of resources and, ultimately, their depletion. Accordingly, the response must build on a wide-ranging strategy of education and environmental awareness in two directions: more efficient uses of energy and the attenuation of the negative impacts of electricity generation by means of a long-term, complete shift to renewables. Launched a campaign against 'energy vampires' to incentivise the substitution of inefficient domestic appliances, stand-by consumption, and other sources of waste.
Other information	An implication of this growing awareness is that fuel poverty has been identified as a systemic problem of the electricity regime in Spain.

Source:

Cuesta-Fernandez, I., Belda-Miquel, S. & Calabuig Tormo, C., 2020. Challengers in energy transitions beyond renewable energy co-operatives: community-owned electricity distribution co-operatives in Spain. ***Innovation: The European Journal of Social Science Research***, 33:2, 140–159. doil: 10.1080/13511610.2020.1732197

Annexure 3: International case studies Global South

Table 28: Case Study Brazil: RevoluSolar – Rio de Janeiro favela in Babilônia and Chapéu Mangueira

Case Study Questions	RevoluSolar – Rio de Janeiro favela in Babilo¨ nia and Chapéu Mangueira
What about the social and economic context gave rise to the initiative? What is the initiative about?	RevoluSolar conducted a survey in 2015 which showed that most households did not access energy through clandestine connections. Residents experience poor electricity services – high costs, frequent outages, and slow repairs. 80% of workers in the favelas are self-employed and lost income during Covid. The initiative builds on the history of collective action in the favelas and the culture of self-management, and cooperation.
What is its purpose, ideology, or objectives? What services does it provide?	The organisation RevoluSolar builds longer-term structural solutions to problems in low-income communities through solar energy installations, on-the-job training, and children's workshops. The organisation implements their community-based energy model through co-operatives.
What technology/ies for renewable energy is used in the initiative?	26 kWp solar PV energy system installed on the Residents' Association rooftop (177 m^2). Total power generated is < 200 kW. The power generated will benefit at least 34 local families with cheaper energy bills. Other residents will also benefit from this initiative through a Solar Cycle methodology (installations + job training + children's workshops).
Where does it fit in the energy value chain? (transmission; grid capacity; storage; distribution)	Energy from the rooftop solar plants is sold into the grid with residents receiving an energy credit that reduces their electricity bills.
How and when did the initiative start?	RevoluSolar is a non-profit organisation and has worked in Rio's favelas since 2015. It started as result of the union and experience of some volunteer solar energy technicians and engineers with leaders from the Morro da Babilônia. Validating the rental model (default rate < 10%).
How is it organised – membership and intersectional issues; services; ownership; management and member participation; connection to other initiatives/networks?	Volunteer residents installed the first solar plant and educated members of the 34 households who formed the co-operative. Next there is the transition to self-management by the co-operative. RevoluSolar then leaves move on to install solar panels in other communities. They call their model the solar cycle: installation, energy efficiency, professional training, and cultural and educational activities. To be part of the co-operative that receives the solar energy, it is necessary to comply with certain requirements; one of them is to be up to date with the bills from the energy provider.

Case Study Questions	RevoluSolar – Rio de Janeiro favela in Babilö nia and Chapéu Mangueira
How was the initiative financed at inception? Sources of re-financing? What are members' contributions? At what scale is the initiative working/could the initiative work? What is the role of the state? Orientation to state? Orientation to local economy? Orientation to commons?	Project initiated through 100% grant financing via RevoluSolar. (approximately US$ 1million). Inception funding comes from RevoluSolar through the Institute for Climate and Society (iCS), a philanthropic organisation that supports projects and institutions that aim to strengthen the Brazilian economy and the geopolitical positioning of the country, in addition to reducing inequality by tackling climate change and providing sustainable solutions. Part of the co-operative's savings is redirected into a community fund, from which the local workers installing and managing a solar plant is paid. Over time the fund will generate a surplus that can contribute to the financing of new installations. RevoluSolar is receiving further philanthropic funding to initiate similar projects in remote regions of the Amazon. Replication, looking to build 200 kW – 2 MW solar plants. The model suggests the following as a feasible financing model for co-operatives in the favelas: 30% grants + 30% equity + 40% debt, with loan repayment: i=8%, grace period=2y, repayment period=10y (constant amortisation). Co-operative rents rooftop space in local communities and prioritises space where a solar plant can be installed as one array. (Possibly cheaper this way?) What is dominant model of energy production and distribution in Brazil? Private?
What barriers did initiative experience, and how did initiative overcome these? What are the continued challenges? What are plans for future?	Not specifically outlined.
What specific municipal policies helped or hindered? New/changed policies?	Not clear.
What membership education programme exists? What general education/ advocacy programmes? What membership capacity is assumed?	The electricians and solar installers from the community, trained by Revolusolar, carry out the installations and provide the maintenance of the solar plant. RevoluSolar offer professional courses for electricians and solar installers and have already trained more than 30 residents of Babilônia and Chapéu Mangueira as electricians and solar energy installers. They run children's workshops about environmental sustainability and renewable energy. iCS as a funder has helped RevoluSolar develop processes and systems and document the lessons learned from this pilot project in RioDe Janeiro's favelas to guarantee input for the replication of the model.

Case Study Questions	RevoluSolar – Rio de Janeiro favela in Babilö nia and Chapéu Mangueira
How have communities of practice been developed? How have social & economic ecologies developed around the initiative? How is the initiative connected to inputs required and industry behind inputs? What existing technical knowledge/skills to support the initiative is there?	RevoluSolar and its partners could be considered a community of practice. Trained solar electricians in local community. Initiative supports downstream local economy development, primarily small businesses that suffered because of interrupted and expensive energy access. RevoluSolar is an effort of volunteer solar energy engineers.

Sources:

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RevoluSolar, 2022. Projects – Babilonia et Chapeu Mangueira. Available at: https://revolusolar.org.br/babilonia-e-chapeu-mangueira/

Table 29: Case Study Puerto Rico: Coopeguanacaste, Belen Solar Power Plan

Case Study Questions	Coopeguanacaste, Belen Solar Power Plant
What about the social and economic context gave rise to the initiative?	Coope Guanacaste began in 1965 as a rural electrification co-operative. It was facilitated by the US Alliance for Progress Program which provided advisors and an initial $3,000 loan. Beyond distribution, the co-operative also generates electricity through mini-hydro, solar PV, and wind farms, as well as fossil fuels. A residential PV installation program is provided as a service to households in the co-operative.

Case Study Questions	Coopeguanacaste, Belen Solar Power Plant
What is the initiative about? What is its purpose, ideology, or objectives? What services does it provide? What technology/ies for renewable energy is used in the initiative? Where does it fit in the energy value chain? (transmission; grid capacity; storage; distribution)	The purpose of building renewable generation capacity is to generate profit through sale of electricity and to meet Costa Rica's planned target for carbon neutrality. The generation plants were also intended to reduce the co-operative's dependence on incumbent generators in the wholesale market. From the outset, one of the main goals was for the co-operative to democratically govern local infrastructure, natural, and financial resources. The co-operative provides a social PV program for off-grid indigent households. Coopeguanacaste owns and maintains the infrastructure in its distribution network. The co-operative also owns renewable power plants, consisting of two wind farms, two mini-hydro power plants, and one solar power plant. The co-operative owns the entire value chain in its distribution network.
How and when did the initiative start? How is it organised - membership & intersectional issues; services; ownership; management and member participation; connection to other initiatives/networks?	The co-operative opened its first hydroelectric power plant in 2008. As of 2015, there were 70,000 members and 400 direct employees in the co-operative. Financial, technical, and managerial training were provided by various external actors. Initially US advisors through the Alliance for Progress worked alongside local leaders, but eventually the co-operative hired trained personnel. There are three ownership structures in the co-operative: assets, mini-hydro power plants, and social PV programme. The infrastructure, distribution network, telecom technologies and administrative facilities belong to the co-operative members (A member is anyone in the concession area that owns an energy meter… end users are the owners of the assets). Co-operative members can make input into new investments and network upgrading… There are delegate elections every three years. There is one delegate for every 100 members. Delegates meet once a year. Delegates elect board members in charge of asset management.
How was the initiative financed at inception? Sources of re-financing? What are members' contributions?	An initial $3,000 loan (30-year period, 1% interest, 10-year grace period) from the US Alliance for Progress Program. The co-operative allocates 6% of yearly revenues from non-regulated businesses toward social programmes (US$2 million in 2015).
At what scale is the initiative working/could the initiative work?	The area in blue on the western peninsula of Costa Rica is the co-operative's concession area.

Case Study Questions	Coopeguanacaste, Belen Solar Power Plant
What is the role of the state? Orientation to state?	The political dimension of the electricity market in Costa Rica is a barrier to the co-operative. The trend in market privatisation and conflicting policies from the national regulator are considered as threats to the co-operative's survival.
How have social & economic ecologies developed around the initiative? Global/Local network links?	The co-operative has persisted for 50 years under the strength of social structures that make up the enterprise. Providing social services through PV installation on off-grid indigent households, donations, and credits for medical equipment, and scholarships. Environmental investments like a reforestation programme of 25,000 trees in five years. Installing 500 bridges and semi-isolated cable for wildlife protection from electric lines.
Orientation to local economy? How is the initiative connected to inputs required and industry behind inputs?	The electricity from the distribution network facilitates the tourism industry, agro-industry, and residential consumption (28,000 households). The co-operative has provided complementary commercial businesses: selling energy efficient appliances at subsidised rates, wholesale airtime for prepaid mobile phones, cash sales in electric materials/components, high speed internet/digital TV. Inputs for its various projects are acquired/implemented with partnerships to international businesses. The Belen Solar Power Plant was facilitated through a consortium consisting of Panasonic, Juanilama Parque Solar, and NTT Data.
Orientation to commons?	The co-operative's function is not only to generate and distribute electricity, but it does so through its commercialisation. The co-operative commodifies electricity.
What barriers did initiative experience, and how did initiative overcome these? What are the continued challenges? What are plans for future?	The co-operative is currently fighting pressure to open up the electricity market in Costa Rica (international companies undercutting the co-operative). The co-operative plans to further develop its generation capacity. It also seeks to upgrade the PV system from three light bulbs to six, one mobile phone charging point to three, refrigerator, and possibly two TV screens. Offering access to micro-financing to co-operative members.
What specific municipal policies helped / hindered? New/changed policies?	

Case Study Questions	Coopeguanacaste, Belen Solar Power Plant
What membership education programme exists? What existing technical knowledge/skills to support the initiative is there? What general education/ advocacy programmes? What membership capacity is assumed? How have communities of practice been developed?	International and international institutions have provided training for co-operative employees. There is roughly one co-operative employee per 10 square kilometres to serve 185 members. Technicians maintaining the network are 25% of co-operative workforce. The Costa Rican Institute of Electricity provided the technical capacity to design, build electric lines and transformers. The Nacional Bank of Costa Rica supported the co-operative with training and financial advice. US advisors worked alongside local leaders for the first year of operation.

Table 30: Case Study Indonesia: Community revenue through feed-in tariff

Case study questions	Ibeka Community Revenue through feed-in tariff
Focus	Cinta Mekar + Kamanggih: provide rural electrification and generate revenue through sale of electricity to residents in the community. IBEKA is a non-profit organisation whose aim is to provide resources and build capacity for communities to generate electricity and economic empowerment for their self-sufficiency. IBEKA finances community micro hydro power plants and builds social, technical capacity for villagers to generate revenue through sale of electricity to the grid while maintaining the infrastructure. IBEKA has ongoing projects in 88 villages across Indonesia. Through IBEKA's work in communities, the organisation helped trigger policy changes to create a feed-in tariff for electricity. Cinta Mekar was, in effect, the first CRE project that benefited from the FiT. Before that, other projects producing electricity had been unable to legally supply villagers or sell its production to the grid.
Origins	Cinta Mekar (1999) + Kamanggih (1999) + IBEKA (1992)

Case study questions	Ibeka Community Revenue through feed-in tariff
Democratic membership control	The Mekar Sari Co-operative is composed of villagers in the community where the installation is located. Consists of 450 members. Manages a 120 KW hydro power plant. "Monitoring activities, as a self-management project, is done by the community. It is coordinated by Koperasi Mekar Sari. The activities, for instance, are to monitor the plant reliability by checking the environment condition along the river because if there is any problem there, it can influence the water's flow rate that then affects power plant performance and electricity supply production. To resolve conflict and communicate problems, the community uses the mechanism of Koperasi Mekar Sari's Meeting (Rapat Anggota). Supervision to the co-operative's management is conducted by the Supervisory Body which consist of community representatives through auditing and performance assessment once every three months." "Ownership is built by providing equity and legal rights over the project, and by involving community right from the project's construction to its operation and management (thus also providing a more psychological sense of ownership)."

Table 3: Prioritization of Profit Use in the Community

	Degree of Prioritization	
	During the first 17-months	After the first 17-months
Electrification for poor households	62.5%	0%
Education for kids from poor families	8%	65%
Health care	8%	16%
Seed capital for income-generating activities	10%	7.5%
Village infrastructure	4%	4%
Village operational contribution	2.5%	2.5%
Cooperative operational cost	5%	5%

Source: Ibeka, 2007 and 2008

Ownership and economic participation	Community benefits through sale of electricity to the grid and through new productive activities to generate financial sustainability by recovering costs from feed-in tariff, operational costs. Co-operatives generate revenue through sale of electricity into the main grid by way of feed-in tariffs. PLN, as regulated, purchases all excess power produced by the plant. In Cinta Mekar, the Micro Hydro Power Plant is 50% owned by Mekar Sari Co-operative (which is comprised of local villagers), and the other 50% by the private company PT HIBS (Hidropiranti). HIBS bears operational costs. 40% of the $650–$1,100 monthly revenues go to (HIBS) Hidropiranti and 40% to Mekar Sari co-operative while 20% is set aside for maintenance, repairs and replacement. Project funded at the cost of USD $225,000 UNESCAP: $75,000 (grant) HIBS: $75,000 Yayasan Ibeka: $75,000 Both UNESCAP and HIBS contributed $75,000 each to cover the investment cost of the power plant. Ibeka contributed $75,000 for micro-hydro dissemination, social preparation, and a training facility provided for the village community.

Case study questions	Ibeka Community Revenue through feed-in tariff
Members education	Community members are trained with technical capacity to maintain operation of energy installation. Community developed a sense of ownership from the inception phase of the project which was facilitated by IBEKA during the critical two-year phase from its origin. In practice, only a few co-operative members know how to operate the facilities. IBEKA is the sole source of information for villagers.
Other issues (markets; youth; ++)	The threat of climate change is rapidly transforming the efficacy of micro hydro power plants in the Indonesian context. UNESCAP, as one of the project's major funders, elected this project to be part of its 5P programme (Pro-Poor Public-Private Partnership). The project is championed as proof that public-private partnerships can be successful. Conflicts with local government (corruption, bribes). Threat from local government to take over co-operative. The co-operative has not been successful in renegotiating in higher off-take tariffs in the power purchase agreement with PLN which pays almost a three times higher tariff for similar community hydro plants.

Sources:

https://prospernet.ias.unu.edu/wp-content/uploads/2012/09/Micro-Hydro-Power-Plant-UGM-case-1.pdf

https://www.tandfonline.com/doi/full/10.1080/13549839.2017.1394830

https://iesr.or.id/en/pustaka/cinta-mekar-micro-hydro-power-plant-giving-power-to-the-people

https://energyaccess.duke.edu/energy-access-through-wind-turbines-my-experience-with-ibeka/

https://stepsproject.wordpress.com/2015/03/05/the-real-5p-model-in-cinta-mekar/

Table 31: Case Study India: Panchayat/Village Owned – Odanthurai, Tamil Nadu

Case Study Questions	Odanthurai, Tamil Nadu
What about the social & economic context gave rise to the initiative?	The village lacked access to water supply, housing, roads. Addressing these needs required electricity, which was expensive. In 2006, the village decided to buy a 350 KW windmill, which produced 645,000 units of electricity.

Case Study Questions	Odanthurai, Tamil Nadu
What is the initiative about? What is its purpose, ideology, or objectives? What services does it provide? What technology/ies for renewable energy is used in the initiative? Where does it fit in the energy value chain? (transmission; grid capacity; storage; distribution)	The initiative began out of efforts to improve the overall welfare of the village. The reforms taking place after 1996 are credited to the panchayat's newly elected president, Rangaswamy Shanmugam. Initially, 2 KW solar systems were installed in two villages. Subsequently, the panchayat implemented a government program Solar Powered Green House Scheme where 3 Lakh houses would be constructed with solar powered lighting systems. Biomass gasifiers help supply pumped water to the village. The windmill produces 645,000 units of electricity while the demand from the villages is only 450,000 units. The surplus electricity is sold to the state electricity board and the revenues are used to pay off the loan for the windmill. The windmill is located on a wind farm in Maivadi, 140 km away from the panchayat.
How and when did the initiative start? How is it organised - membership & intersectional issues; services; ownership; management and member participation; connection to other initiatives/networks?	The president of the panchayat, Rangaswamy Shanmugam, implemented the wind power scheme for the 8,000 residents in his constituency. Residents receive the electricity provided by the windmill for free.
How was the initiative financed at inception? Sources of re-financing? What are members' contributions?	The panchayat pooled its own money and acquired a loan from a nationalised bank. The cost of the windmill was INR15.5 million. The panchayat had an electricity savings of INR4 million. Each month the panchayat council paid INR165,000 as an instalment and receives INR1.9 million from selling its surplus electricity. The loan was estimated to be paid off in six to seven years.
At what scale is the initiative working/could the initiative work?	The Gram Panchayat, village level, is the lowest level of governance in India.
What is the role of the state? Orientation to state?	The Panchayat Council undertook the initiative to introduce renewable energy following initial research done by the council as well as taking advantage of state programmes utilising solar power for streetlights and houses.
How have social & economic ecologies developed around the initiative? Global/Local network links?	Former residents who had left the village for the city are now returning. The village has managed to build a water purification plant.

Case Study Questions	Odanthurai, Tamil Nadu
Orientation to local economy? How is the initiative connected to inputs required and industry behind inputs?	A lending service has now developed in the panchayat where residents can take out low-interest loans. Due to the decrease in the cost of electricity, the panchayat could afford to build houses for all its residents, all roads have been asphalted.
Orientation to commons?	
What barriers did initiative experience, and how did initiative overcome these? What are the continued challenges? What are plans for future?	When the panchayat sought to set up the windmill, there was no precedent for such an initiative. The project was not initially sanctioned, but the gram panchayat took the case to court. The court ruled against the government and allowed the development to continue.
What specific municipal policies helped / hindered? New/changed policies?	The state electricity board allows the power that is produced by the windmill to be banked. When the windmill produces power, it is fed to the grid and credited to the panchayat's account as a power producer. Odanthurai can then draw their power as needed while the rest is sold back to the grid.
What membership education programme exists? What existing technical knowledge/skills to support the initiative is there? What general education/ advocacy programmes? What membership capacity is assumed? How have communities of practice been developed?	Information not available.
Notes for SA context	A potential model for CORE under decentralised municipal governance.

Source:

Priyadharshini, B., 2022. Inspiring self-powered village – Odanthurai. EcoIdeaz. Available from: https://www.ecoideaz.com/innovative-green-ideas/inspiring-self-powered-village-odanthurai

Subramaniam, G., 2023. What happened to Tamil Nadu's model renewable energy village? MongaBay. Available from: https://india.mongabay.com/2023/07/odanthurais-renewable-energy-model-holds-valuable-lessons/

Annexure 4: Stakeholder Survey Tool

Introduction

Social Ownership Model Stakeholder Consultation

NELSON MANDELA UNIVERSITY

Page 1: Introduction and Purpose **Page 1 of 10**

Purpose of the Project

Nelson Mandela University (NMU) is commissioned by the Presidential Climate Commission (PCC) to undertake an initial Scoping and Consultation on Social Ownership Models in the Energy Transition across different regions in South Africa. The project has completed a literature review of possible models. It is now consulting through this survey and other forms of research to hear feedback on the potential of the Socially Owned Renewable Energy Models for a just transition. The information from these survey consultations will be used to develop a work programme with detailed proposals to pilot models that are viable and best able to contribute to diverse ownership in a just energy transition.

Stakeholder Consultation

You can participate by continuing to complete the survey as a first form of consultation with various stakeholders. Further feedback workshops will be set up with stakeholder groups, and there will be an opportunity to participate in an online webinar on the final work programme proposals.

Contact Persons

Principal Investigator: Prof Janet Cherry (Email: Janet.Cherry@mandela.ac.za)
Technical Lead: Prof Darelle van Greunen (Email: Darelle.vanGreunen@mandela.ac.za)
Representative Presidential Climate Commission: Mr Devan Pillay (Email: devan@climatecommission.org.za)

Consent

Social Ownership Model Stakeholder Consultation

NELSON MANDELA UNIVERSITY

Page 2: Consent **Page 2 of 10**

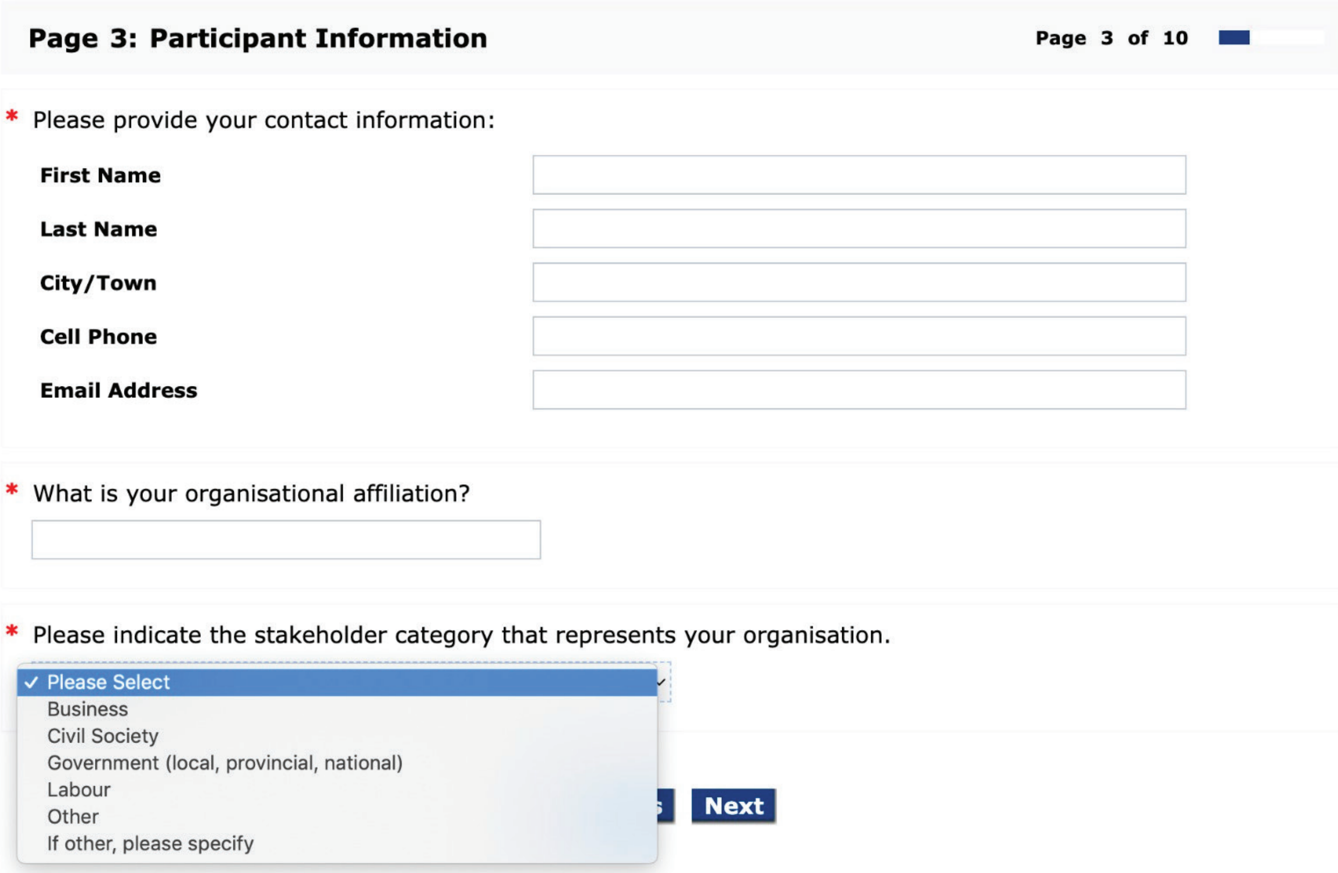
* In compliance with the Protection of Personal Information Act (POPIA), NMU undertakes not to share your personal information with external parties. Information may, however, be used internally by NMU for this research and its reporting purposes.

Please indicate that you accept the conditions of completing the survey.

- ✓ Please Select
- Yes
- No

Previous **Next**

Participant Information



Page 3: Participant Information **Page 3 of 10**

* Please provide your contact information:

First Name

Last Name

City/Town

Cell Phone

Email Address

* What is your organisational affiliation?

* Please indicate the stakeholder category that represents your organisation.

✓ Please Select
Business
Civil Society
Government (local, provincial, national)
Labour
Other
If other, please specify

Next

Open ended questions per model

Would this model benefit your members / constituency and if so, how?

What forms of ownership would best support this model (e.g. cooperative, not for profit Trust, PTY Ltd, any other)?

What issues should be considered to support members' active participation?

Is this model technically viable? If not, what is required to make it so?

Is this model economically/financially viable? If not, what is required to make it so?

Is this model fundable? If so, what funding models are applicable?

Is this model scalable/replicable? If not, what is required to make it so?

Will current regulations enable this model? If not, what regulatory changes are required?

How does the model contribute to a just transition?

Would you/your organisation be interested in implementing a pilot of such a model?

PRESIDENTIAL
CLIMATE COMMISSION
TOWARDS A JUST TRANSITION

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