Presidential Climate Change Coordinating Commission

Just Transition Dialogue on Employment & Livelihoods

Project Title: Quantifying Socio-Economic Benefits related to Renewable Energy Deployment in Mpumalanga Province

05 October 2021

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On behalf of consortium – CSIR, Navitas Energy, Prime Africa, and Enertrag

PRELIMINARY

Background & objectives

Background

- **Mpumalanga province is at the heart of the South African energy transition** and has two considerations:
  - It is currently the **centre of fossil fuel extraction and coal-fired power plants.** A large share of the regional value creation depends on energy and mining and the challenge of re-structuring entire industries needs to be demonstrated in line with the principles of a Just Transition
  - It has the **potential of becoming the clean energy hub** of the future
- **Eskom is currently considering re-purposing the sites of decommissioned coal fired power plants**
  - Most of Komati's units have been put under cold reserve and will be decommissioned, based on Eskom's just transition plan outlined in 2021 **Komati will be fully decommissioned in 2022 and repurposing will begin**.

Objective

The objective of the study is to **calculate and quantify the socio-economic benefits of potential renewable and clean energy projects on the re-purposing sites of Eskom coal plants**, namely employment effects, skill development needs and industrial opportunities.

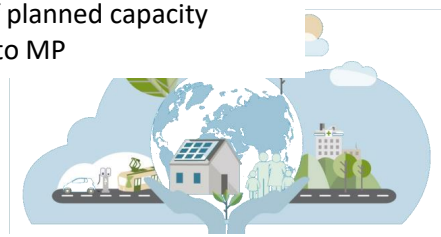
The **results of the planned study will:**

- Inform policymakers about the socio-economic implications of renewable energy deployment in Mpumalanga
- Highlight important framework conditions of how these benefits can be fully harnessed
- Be an important contribution to the ongoing policy development in the fields of national climate, energy and development policies

Scenarios

	Scenario 1: Planned re-purposing (IRP)	Scenario 2: Additional re-purposing (Accelerated)	Scenario 3: Ambitious repurposing + RE on old mining sites	Scenario 4: Super H2igh Road Scenario
Description	• Scheduled decommissioning of Komati, Camden, Grootvlei, Arnot, Hendrina until 2025. Additional decommissioning of other power stations as per IRP schedule by 2030. Repurposing of these power stations to 2030.	• Quicker decommissioning of additional coal-fired power plants in Mpumalanga. • Repurposing of these power stations to 2030.	• Quicker decommissioning of additional coal-fired plants. Repurposing of these power stations to 2030. Plus conversion of old coal mining land via RE deployment by 2030	RE capacity on re-purposing sites (see scenario 1 and 2), plus conversion of coal mining (scenario 3), plus additional RE capacity in Mpumalanga for hydrogen production by 2030
RE Technology	• Renewable energy technologies as per IRP • Battery storage capacity as per IRP	• Solar PV & Solar distributed PV • Onshore Wind • Biomass • Battery Storage	• Solar PV & DPV • Onshore Wind • Biomass • Battery Storage	• Solar PV & DPV • Onshore Wind • Biomass • Battery Storage • Hydrogen
RE capacity	As per IRP capacity additions	Based on Wright (2020) Ambitious RE Industrialisation Scenario	Based on Wright (2020) 2GT CO_2 Scenario	Based on Wright (2020) 2GT CO_2 Scenario + opportunity represented by H_2
Assumptions	• Decommissioning as per IRP plan*. Total capacity decommissioned would be approximately 10.6GW • Adherence to VRE build limits as per IRP • 15-20% of planned capacity allocated to MP	• Forced accelerated decommissioning. Total capacity decommissioned would be approximately 12.7 GW • No VRE build limits • 15-20% of planned capacity allocated to MP	• Forced accelerated decommissioning. Total capacity decommissioned would be approximately 17.8 GW • No VRE build limits • 15-20% of planned capacity allocated to MP	• Forced accelerated decommissioning. Total capacity decommissioned would be approximately 17.8 GW • No VRE build limits • 15-20% of planned capacity allocated to MP

Note: *No adjustment to be considered of current progress and planned changes discussed in subsequent plans e.g., Medium Term System Adequacy Outlook (MTSAO) and TDP



Methodology

Employment effects

- Quantify impact on coal-related employment using I-JEDI model
- Quantify potential employment from RE deployment using I-JEDI* model
- Identify Jobs/MW estimate for battery storage in literature
- Quantify net employment effects

Value creation & localisation

- Conduct literature review of current Mpumalanga green initiatives
- Produce value chains for coal and RE using a literature review to identify supply chain needs
- Quantify value creation from RE value chains using I-JEDI model

Skill requirements and gender considerations

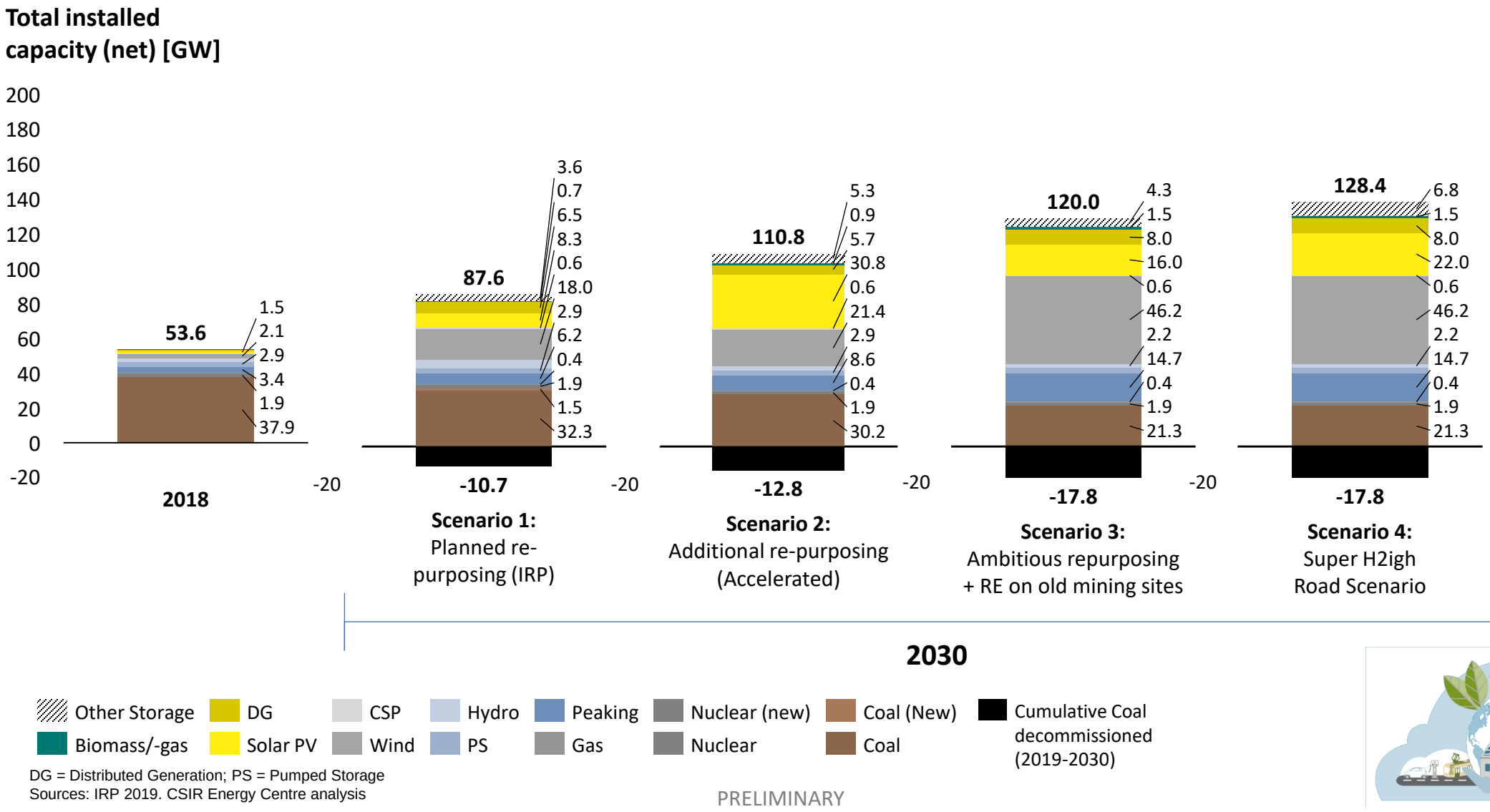
- Collected skills data and gender balances from relevant parties (i.e., Eskom, MQA)
- Conduct interviews with experts to assess RE skill requirements
- Analyse potential skills that can be transferred
- Mechanisms on how women in MP can be part of RE sector

Cross-cutting

- Engagement with other institutions (NBI, TIPS, Eskom, Mpumalanga Provincial Government etc.)
- Steering committee comprising consortium member leadership and industry
- Workshop format to develop recommendations and policy levers
- Engagement with CoBenefits Council for guidance and key inputs

*International Jobs and Economic Development Impacts (**I-JEDI**)

Key assumptions – National installed capacity, 2030 and decommissioning, 2019-2030

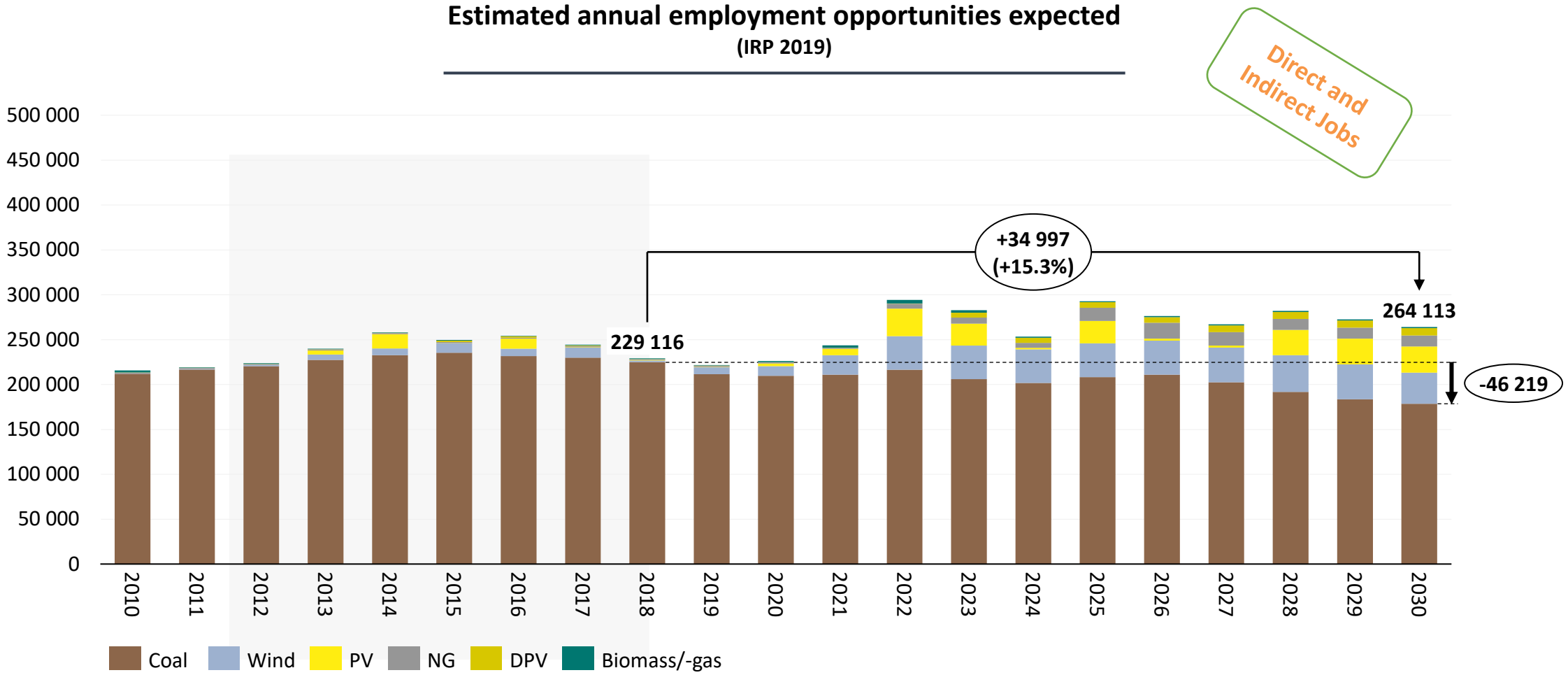


DG = Distributed Generation; PS = Pumped Storage
Sources: IRP 2019. CSIR Energy Centre analysis

PRELIMINARY

Source: IRP2019; Wright & Calitz (2020), CSIR & Meridian; IHS Markit; own calculations;

National level jobs created by renewable energy



At a national level net jobs are positive after coal decommissioning and implementation of planned RE projects in the IRP2019. However, how much of these will be in Mpumalanga?

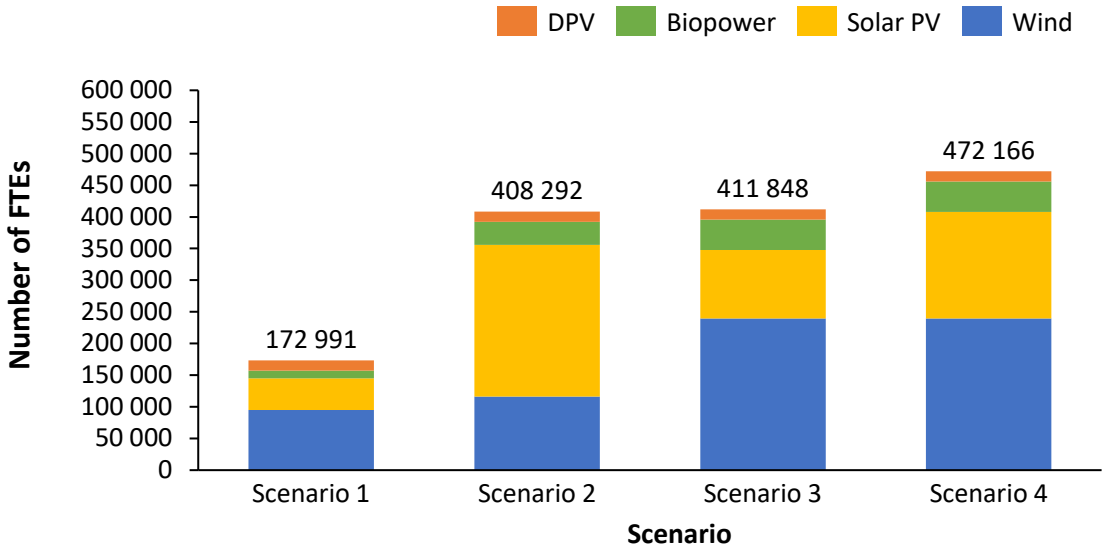
PRELIMINARY

Key assumptions - Mpumalanga share of national capacity

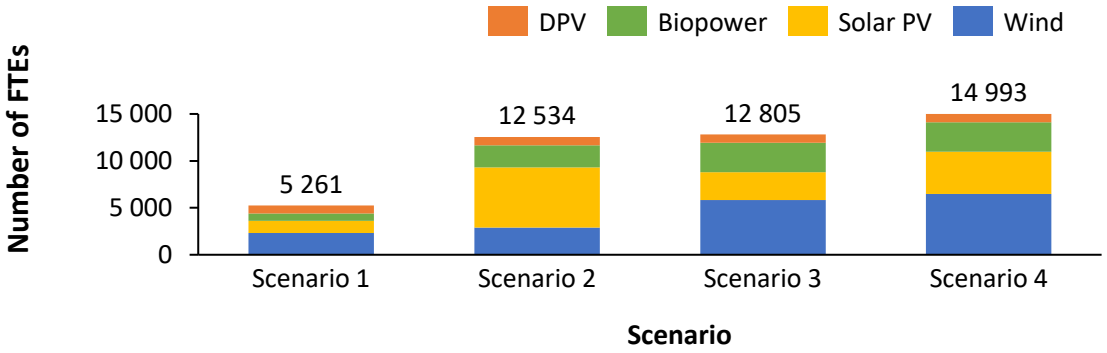
Province	Wind	Solar PV
Limpopo	0%	5%
North West	0%	10%
Northern Cape	24%	30%
Western Cape	20%	5%
Eastern Cape	30%	5%
Free State	10%	15%
Kwa-Zulu Natal	0%	0%
Gauteng	1%	10%
Mpumalanga	15%	20%
Total	100%	100%

Preliminary findings - Employment effects

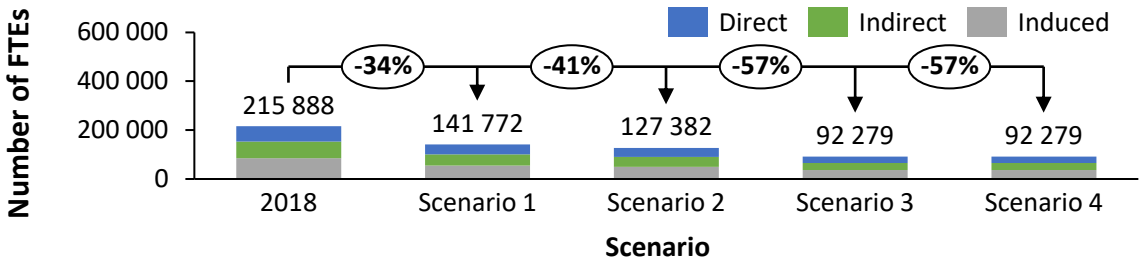
Construction total FTE jobs in Mpumalanga, 2019-2030



O&M cumulative FTE jobs in Mpumalanga, 2019-2030



Cumulative O&M FTE coal jobs per scenario in Mpumalanga, # of FTEs

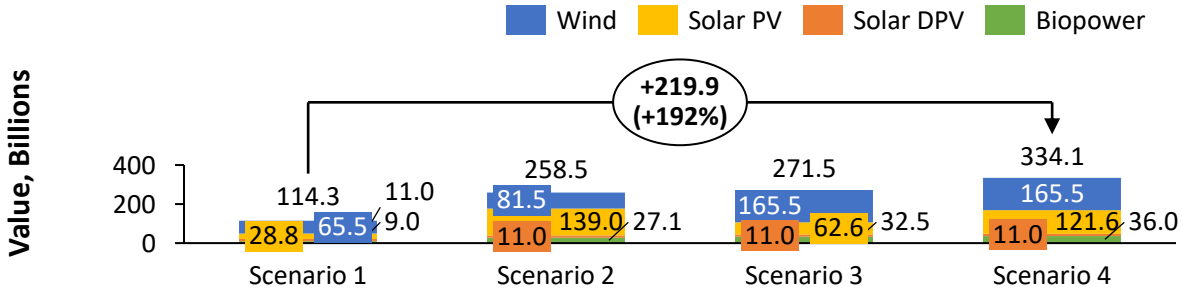


Additional insights

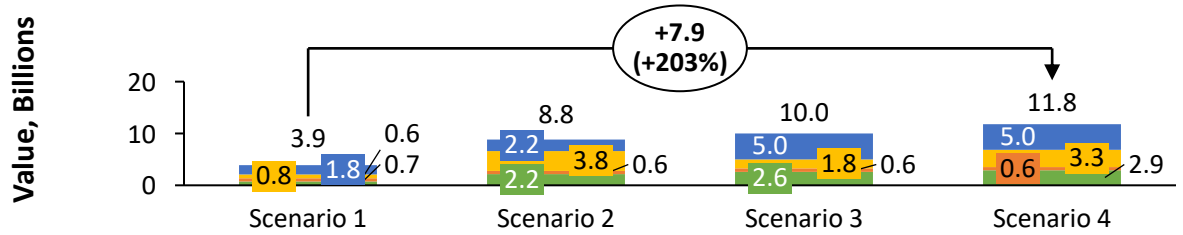
Potential job losses:	**Direct job losses related to Eskom power stations:** 6,537 in scenario 1 to 10,903 in scenario 3&4
	Direct job losses related to coal mining: 4,826 in scenario 1 to 8,049 in scenario 3&4
Potential job gains:	Biomass creates the most jobs on a per/MW basis
	Battery storage: Based on US estimations there is potential employment of 95-118 thousand jobs for scenario 1 to 162-216 thousand jobs under scenario 4
Net employment:	**Net annual employment in Mpumalanga is positive due to high construction numbers**, permanent O&M jobs are limited
	At a national level, the job losses in the coal value chain by 2030 can be adequately replaced by renewable energy. However, **the decommissioning results in net job losses in Mpumalanga by 2030**
	Battery storage and increased RE for H_2 presents an opportunity to increase the net employment in the province

Preliminary findings - Value creation and localisation

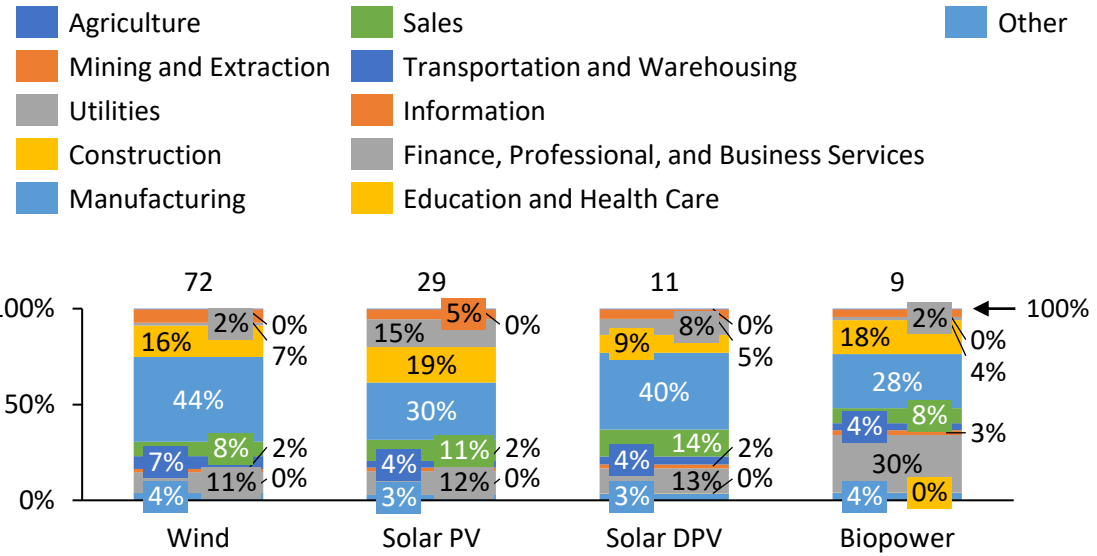
Construction gross output value in Mpumalanga (direct & indirect), 2019-2030



O&M cumulative gross output value in Mpumalanga (direct & indirect), 2019-2030



Share of total gross output (construction & O&M) by sector, (direct & indirect), 2019-2030 - Scenario 1 example

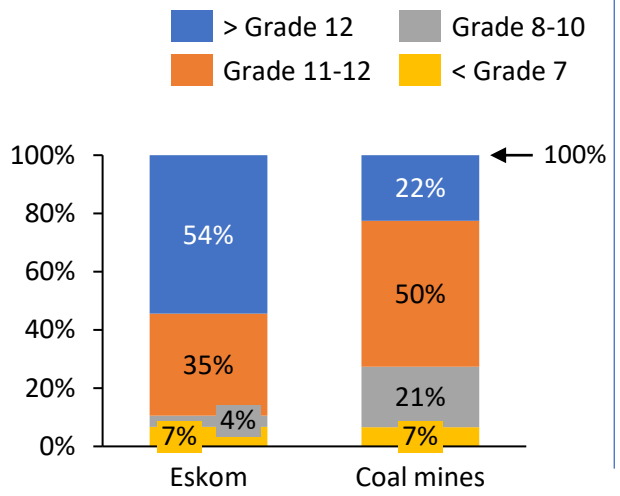


Additional insights

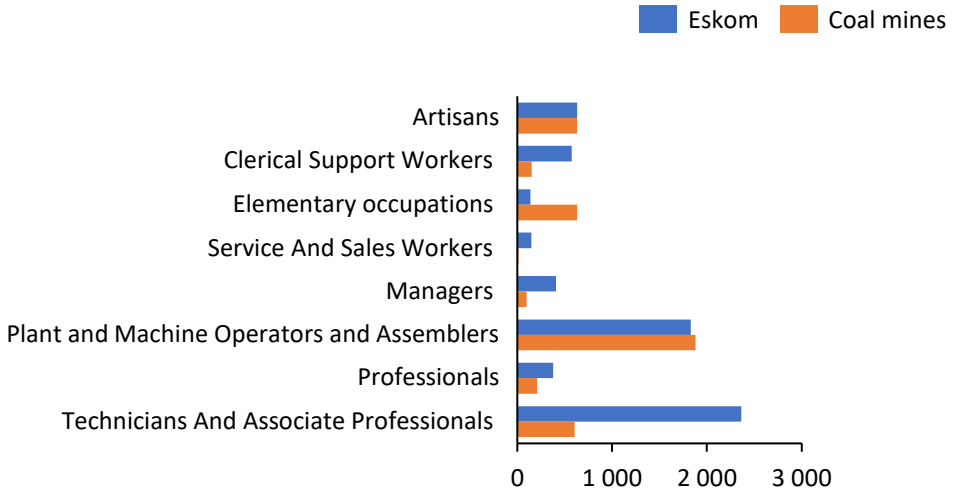
Value creation from localisation:	Renewable energy total **gross output value between 2019 and 2030 increases from R114 billion in scenario 1 (IRP) to R334 billion in scenario 4**
	Marginally **increasing the local content to higher levels results in R357 billion gross output value** for scenario 4, an increase of R23 billion.
	Share of value is driven by manufacturing (28-44%); and construction (9-18%), however the shares **vary among the different technologies**
Value chains:	There are **a few similarities within the coal and clean technology value chains** – namely in extraction of raw materials; beneficiation of mining materials; transportation, and electrical balance of plant
Green economy development:	There is a **focus on greening the economy in Mpumalanga evidenced by the different projects and initiatives that are currently planned** and donor interest (EU commission, GIZ, World Bank, BMU, UK Pact etc.)
	However, the **appetite from investors is still lacking.** The national transmission constraints may increase the business case for developing RE in MP

Preliminary findings - Skills and gender considerations

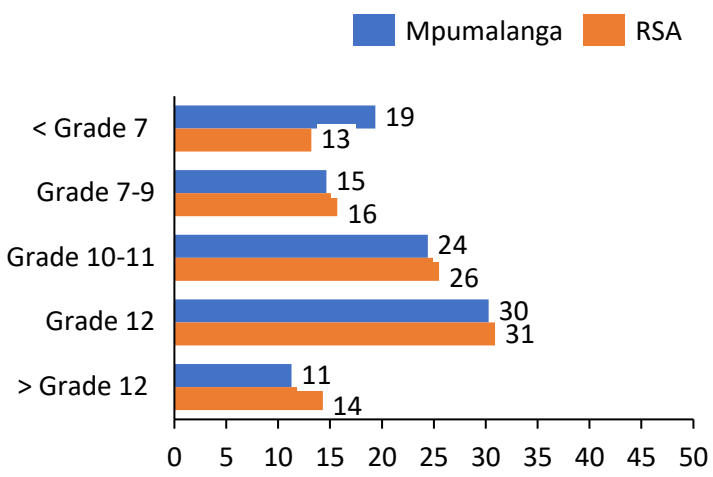
Education level (%)



Job occupation



Education level (%)



Gender Considerations:

Males dominate the old energy sector and women who are entering this sector have a higher level of education compared to men. Women in Eskom and coal mines have the skills and capacity to enter the RE sector

Women have a higher unemployment rate in the province and being homemakers is one of the contributing factors. Stats SA, 2017 data shows that women who have minor children and have a lower level of education are limited in entering the work force

RE sector as a new sector provides an opportunity for women to participate as there is no “male industry’’ perception like the old energy industry. Although the RE sector is currently male dominated, leading organisations in the sector are providing mentorship and coaching for women to take leadership roles

Potential policy interventions

Employment effects

- Implement policies requiring renewable energy development in Mpumalanga
- Regional procurement as a command/control interim approach, while preparing for a medium-term market activation through incentives for local RE generation
- Grid development is required to facilitate RE in Mpumalanga and elsewhere
- Expedite nodal pricing model for grid costs by the (future) ITSMO to better reflect the value of proximity to load centres and reduced grid connection/expansion costs

Value creation and localisation

- Achieving localisation and foster value creation from RE will require a co-ordinated effort from all parties through a focused RE industrialisation plan and supporting policies
- Local content for components should be diversified to include components where South Africa has a competitive advantage
- Dedicate Special Economic Zones for the manufacturing of key components

Skills and gender considerations

- RE skill development programs should be delivered through TVET colleges
- Childcare facilities should be provided close to training centres
- Entrepreneurial development for women

Conclusion and next steps

- Developing RE is only part of the solution to reduce the impact of job losses
- An industrialisation strategy for Mpumalanga focusing on RE and clean technology manufacturing should be considered
- There needs to be a mechanism for recognising on-the-job training experience (mining especially) rather than formal qualifications
- TVET colleges are providing training qualifications on trade; but we need more focused qualifications for RE
- The RE sector is not perceived as being male-dominated, therefore there is an opportunity for women to enter. This will require skilling and creating an enabling environment such as childcare availability

Next steps

- Continued engagement with stakeholders to finalise policy interventions
- The project is due to be completed and finalised during to October
- The report will be published at the end of October/beginning of November

BACKUP

Project execution and structure

Project consortium

The study is carried out by a combination of public sector and private sector research entities, with collaboration from others working in the field:

International Partners

Supported by:

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

based on a decision of the German Bundestag

INTERNATIONAL CLIMATE INITIATIVE (IKI)

Work packages

- **Work Package 1:** Introduction and background – Policy Landscape & Related Work
- **Work Package 2:** Detailing the Methodological Approach
- **Work Package 3**: Quantification of Employment Effects
- **Work Package 4**: Quantification and Description of Skill Gaps & Gender-inclusive Career Opportunities
- **Work Package 5**: Green Economy Growth and Quantification of Local Value Creation
- **Work Package 6:** Policy recommendations - Employment and Skill Development

WP3: Quantification of employment effects

	Requirements as per ToR	Description of Approach and Methodology	Data requirements/sources
WP3: Quantification of employment effects	• Quantification of RE employment effects based on sophisticated input-output models or general equilibrium models • Employment effects calculated for direct, indirect an induced employment • Employment effects calculated for different segments of the RE value chain • This methodological approach should also allow for modelling different shares of local content and the impact on local job creation in Mpumalanga	• **Determine the job losses per scenario** – Based on the scenarios, a year on year, unit by unit, breakdown of the decommissioning schedule based on the IRP 2019 will be established. – The capacity that will be decommissioned per scenario will be modelled in the I-JEDI model to get the projection of jobs losses per scenario • **Determine the job creation per scenario** – For each scenario the job creation will be modelled using the I-JEDI model per technology type. – The results will be provided along the value chain for each technology so that the evolution of jobs can be seen for construction versus the operations and maintenance jobs – For scenario 3 and 4, the selection of old coal mines to be repurposed will be identified, as well as how much RE deployment is possible on the viable land. – For scenario 4, a qualitative analysis will be conducted to assess the potential job creation from other clean technology. • **Determine the net jobs created/lost per scenario**	• Detailed decommissioning schedule per power plant unit • Renewable energy potential by source for each power station repurposing site • Land availability for RE development • Transmission capacity for Mpumalanga • Details on employees per power plant to do the job losses and potential transition assessment
WP3: Green economy growth and quantification of local value creation	• Description of ongoing initiatives related to green economic growth and green economic clusters • Shortly analyse the current industry policy for clean energy technologies along the entire value chain. • Quantification of provincial value creation along the RE value chain in line with the four scenarios outlined above. • Localization and value creation potential needs to be quantified for the major RE technologies	• Description of ongoing initiatives related to green economic growth and green economic clusters • High level analysis of industrial policies for clean energy along the entire value chain of solar PV, wind, storage and biomass in Mpumalanga and broader South Africa • Quantification of provincial value creation along the RE value chain in line with the four scenarios. Localization and value creation potential will be quantified for the major RE technologies outlined in the scenarios. There will be a two-part approach for this: – **Establishing the current value chain in Mpumalanga for major RE technologies as defined in the scenarios** – **Establishing and assessing the potential level of localisation for major RE technologies as defined in the scenarios in Mpumalanga** • Assess the value that can be added into the province with increased levels of localisation. To establish the potential levels of localisation the industry associations will be used to provide input. • The I-JEDI model detailed in WP3 can provide estimates of gross value added to the regional economy at different levels of localisation across the technology value chains.	• List of potential stakeholders to engage on green initiatives in SA, more specifically in Mpumalanga • Detailed decommissioning schedule per power plant unit • Renewable energy potential by source for each power station repurposing site

WP4: Quantification and description of skill gaps and gender-inclusive careers opportunities

Requirements as per ToR

- Analysis and quantification of skills of workers along the RE value chain
- Analysis and quantification in terms of skill levels.
- The skill requirement should be matched with available skills in the province and with available training facilities in Mpumalanga and South Africa.
- Recommendation should be made for the necessary skilling of workers and to localize certain training facilities in Mpumalanga.
- Quantitative analysis of existing gender representation and imbalances along different skill profiles in Mpumalanga's and South Africa's power sector
- Potentially comparison between gender balance in "old" energy economy (coal and mining) and new renewable energy economy (e.g. wind, solar)
- Qualitative analysis of existing (social, institutional, regulatory) obstacles and facilitators to gender-inclusive career development

Description of Approach and Methodology

- The methodology used will align to the previous COBENEFITS analysis of skills and job creation through renewable energy (RE). For the current assignment, project team will follow the proposed plan:
  1. Baseline Assessment
     - Collect data from Eskom, Minerals Council and MQA and analyse the current staffing structure which includes gender balances from coal-fired power plants and coal mines
     - Analyse skill level in the Mpumalanga Province
  2. Consult with experts and develop a skills analysis for staffing requirements on an RE value chain (i.e. manufacturing; development; construction and installation; operations and maintenance)
  3. Compare skills required for RE value chain and coal fired plants and coal mines and training needs
     - Literature reviews and interviews with industry experts (SAPVIA, SARETEC)
  4. Gender barriers and opportunities in RE through expert interviews
     - In consultation with WE connect: connect and empower women working in the energy industry
  5. Road map to gender inclusive RE sector
     - Training facilities-(data source: outputs from WP3)
     - Socio-economic development requirements from the RE sector

Data Requirements/sources

- Detailed decommissioning schedule per power plant unit
- Renewable energy potential by source for each power station repurposing site
- Details on employees per power plant to do the skills assessment

WP5: Green economy growth and quantification of local value creation

Requirements as per ToR

- Description of ongoing initiatives related to green economic growth and green economic clusters
- Shortly analyse the current industry policy (in South Africa and Mpumalanga) for clean energy technologies along the entire value chain.
- Quantification of provincial value creation along the RE value chain in line with the four scenarios outlined above.
- Localization and value creation potential needs to be quantified for the major renewable energy technologies

Description of Approach and Methodology

- Description of ongoing initiatives related to green economic growth and green economic clusters
- High level analysis of industrial policies for clean energy along the entire value chain of solar PV, wind, storage and biomass in Mpumalanga and broader South Africa
- Quantification of provincial value creation along the RE value chain in line with the four scenarios. Localization and value creation potential will be quantified for the major RE technologies outlined in the scenarios. There will be a two-part approach for this:
  - **Part One: Establishing the current value chain in Mpumalanga for major RE technologies as defined in the scenarios**
    - Map out the current value chains for the major renewable energy technologies
    - Assess the level of localization in the value chains
    - Establish a base case of value added by different technologies under the 4 scenarios, using the national estimate of local content currently in the I-JEDI model.
  - **Part Two: Establishing and assessing the potential level of localisation for major RE technologies as defined in the scenarios in Mpumalanga**
    - Map out the current value chains for the coal power sector and coal mines in Mpumalanga.
    - Engage with stakeholders in the value chains to ascertain what components and services from the coal sector are transferable to the RE technology value chains with a focus on locally designated components
    - Assess the business case for manufacturers and service providers to establish their businesses in Mpumalanga to increase the localisation. Highlight what interventions can lead to an improved localisation.
- Assess the value that can be added into the province with increased levels of localisation. To establish the potential levels of localisation the industry associations will be used to provide input.
- The I-JEDI model detailed in WP3 can provide estimates of gross value added to the regional economy at different levels of localisation across the technology value chains.

Data Requirements/sources

- List of potential stakeholders to engage on green initiatives in SA, more specifically in Mpumalanga
- Detailed decommissioning schedule per power plant unit
- Renewable energy potential by source for each power station repurposing site