OVERVIEW

Economic Impact Model for Electricity Supply

EIM-ES

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MEASURING EMPLOYMENT AND WIDER ECONOMIC IMPACTS

Methodology and data inputs
Objectives of analysing economic impacts in the electricity sector

• To create a transparent tool that facilitates an analysis of the factors which drive employment and wider economic impacts in the electricity sector to support planning and policy decision-making

• To analyse the sustainability of jobs across sectors over time

• To compare employment and wider economic impacts between different scenario pathways and against the current situation
We focus our analysis on direct employment based on investment data

Investments across all supply-side technologies

Component level investment disaggregation

- Planning
- Professional services
- Preparation of site
- Construction
- Operation & maintenance
Employment is estimated based on investments made across sectors and salaries of the country

Component level investment

Domestic share of investment $60
Foreign investment $40

Labour $20
Materials, land, etc.

Annual average salary to make component is $2
A $20 investment in the labour market creates 10 jobs for 1 year
We also quantify the indirect and induced economic impacts drawing on economic multipliers

A full economic analysis considers different categories of employment and investment that extend beyond the electricity generation sector to all areas of the economy.

**Direct**
- jobs created in the electricity generation sector (e.g. manufacturing equipment, construction of plants, professional services and project management, etc.)

**Indirect**
- jobs created in secondary sectors upstream in the supply chain (e.g. the metallurgical or mining industries)

**Induced**
- jobs created across all sectors of the economy as a result of an investment stimulus. The salaries of those that directly and indirectly benefit from the investment are spent on other, unrelated activities, such as rent, restaurants, healthcare, groceries...etc.
Key data inputs required in the model

- **New capacity**: New capacity added to the system by technology and year; where only total capacity projections are available then assumptions related to capacity retirements are required.

- **Generation**: Electricity generation by technology and year; where output data is unavailable default load factor assumptions can be used to derive estimates of output from the total capacity data.

- **Investment**: Investment costs by technology broken down into component parts; where detailed disaggregated data is unavailable capex, fixed opex and variable opex can be allocated using default assumptions.

- **Local share**: Estimate of the share of the total investment in a component part spent in the domestic market.

- **Sector**: Sector of the economy corresponding to the component part activity based on sector granularity of the Input Output table.

- **Input Output**: Input Output tables that reflect the interrelations between economic sectors of the country and include estimates of the share of investments in a sector directed to the labour market.

- **Salaries**: Average annual salaries, including employee and employer taxes (if available), by economic sector as a proxy for the labour cost.
Capacity and generation data from scenario pathways

- Data can cover up to 35 technology types
- Model runs up to 10 scenarios at once
- Electricity generation data can be calculated from the capacity information using default load factors or input based on independent modelling results
Investment data for different technologies

- Investment costs by technology broken down into **component parts**
- Each component part requires an assumption on the **local share** of investment as well as the **economic sector** it corresponds to
### Solar PV (Utility)

#### Technology and Cost Item

<table>
<thead>
<tr>
<th>Technology</th>
<th>Cost Item</th>
<th>Value Input</th>
<th>Share Input</th>
<th>Unit</th>
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<tr>
<td>Tech3</td>
<td>Total</td>
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#### Value and Share

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<th>Investment</th>
<th>Local Share</th>
<th>Sector Share</th>
<th>Default technology</th>
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#### Summary of Costs

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<th>Technology</th>
<th>Summary of costs</th>
<th>Value Input</th>
<th>Share Input</th>
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#### Sector

<table>
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<tr>
<th>Sector</th>
<th>Labour Share of Spend</th>
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<th>In-country Labour Spend</th>
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<tr>
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</table>

### Notes

- Ensure all cost items are included in the Value and Share columns.
- Use the default technology as a reference for cost calculations.
- Adjust the Labour Share parameters as necessary for each sector.
Macroeconomic data

New capacity
Generation
Investment
Local share
Sector
Input Output
Salaries
ECONOMIC IMPACT INDICATORS

Illustrative results
A range of different indicators of employment impacts

- Model estimates **direct, indirect and induced employment** and can compare results across scenarios
- Direct employment results calculated over **time**, by **technology** and **sector** of the economy
- Employment impact for different technologies can be compared **per MW**, **per GWh** and **per USD** invested
Results dashboard for each scenario

- Direct employment by year
- Technology comparisons for new capacity
- Direct investment by year
- Direct, indirect, induced impacts

All results by technology and sector
Comparison of headline scenario results

Illustrative results

- Employment impacts over modeling horizon
- Investment over modelling horizon
- Value added over modelling horizon
- Total cost vs direct domestic investment
APPLICATIONS OF EIM-ES TO SUPPORT SCENARIO ANALYSIS
Published and ongoing application of EIM-ES
Employment assessment of scenarios in Argentina

INPUTS

Scenarios developed by 10 stakeholders

RESULTS

Input data: simplified LCOE estimate

Input data: local share of investment summary
Employment assessment of pathways in South Africa
Employment assessment of pathways in Argentina

**Electricity Sector**

**Comparison of Average Employment per Year between Scenarios**

- **Current Development Scenario**
  - Direct jobs: 36,000
  - Indirect + induced jobs: 100,000
  - Total jobs: 136,000

- **1.5°C Paris Agreement Compatible Scenarios**
  - Direct jobs: 30,000
  - Indirect + induced jobs: 90,000
  - Total jobs: 120,000

- **Best in Class Scenarios**
  - Direct jobs: 18,000
  - Indirect + induced jobs: 65,000
  - Total jobs: 83,000

- **National Scenarios**
  - Direct jobs: 11,000
  - Indirect + induced jobs: 40,000
  - Total jobs: 51,000

**Average number of jobs per year (2016 - 2030)**

**Electricity Sector**

**Direct Jobs per Sector and Technology**

- **Current Development Scenario**
  - Direct jobs by sector
- **1.5°C Paris Agreement Compatible Scenario**
  - Direct jobs by sector

**By Sector**

- Mining and extraction
- Construction
- Manufacturing
- Professional services
- Utilities & Other

**By Technology**

- Coal & oil
- Natural gas
- Nuclear
- Hydro
- Wind
- Solar
- Biofuels
Challenges and limitations
Considerations for the accuracy and interpretation of results

- Cost data collection across all electricity generation technologies
- Default breakdown of investment costs to component parts
- Technology learning curves are uncertain
- Estimates of future local share of investment are uncertain
- Input output tables typically out-dated and not available for all countries
- Using the model requires intermediate Excel knowledge / experience

- Cost estimates (per MW/GWh) are scaled linearly
- Input Output tables provide a static description of economic sector relationships and relative prices
- Economic sectors in the model are relatively aggregated (36 sectors), which applies to:
  - Input Output tables
  - Sector allocation for component parts
  - Labour share of investments
  - Salaries
QUESTIONS / COMMENTS / FEEDBACK

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