

# OVERVIEW

## Economic Impact Model for Electricity Supply **EIM-ES**

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**NEW**  
**CLIMATE**  
INSTITUTE



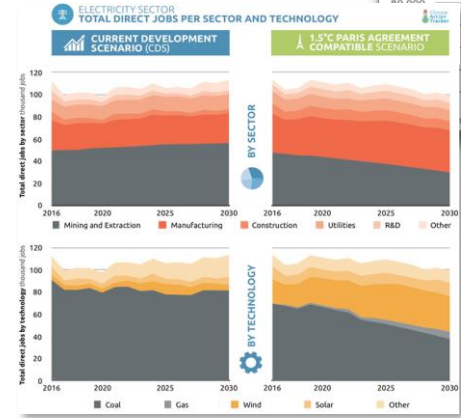
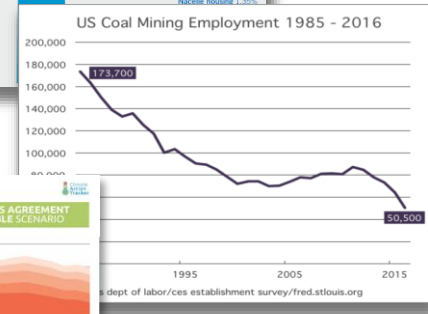
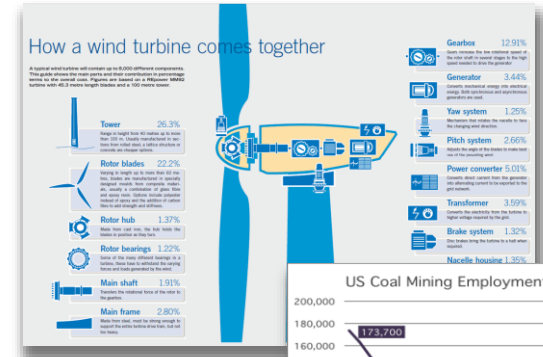
Ambition  
to  
Action

# MEASURING EMPLOYMENT AND WIDER ECONOMIC IMPACTS

Methodology and data inputs

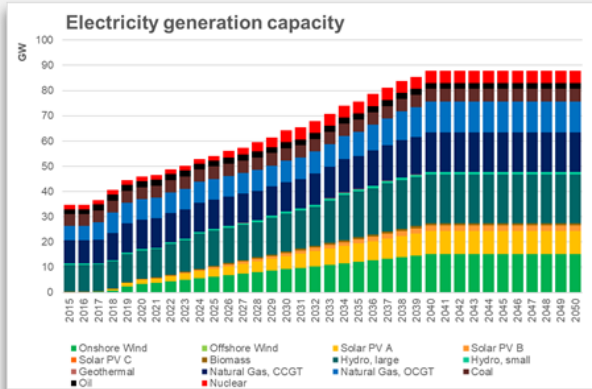
# Objectives of analysing economic impacts in the electricity sector

- 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

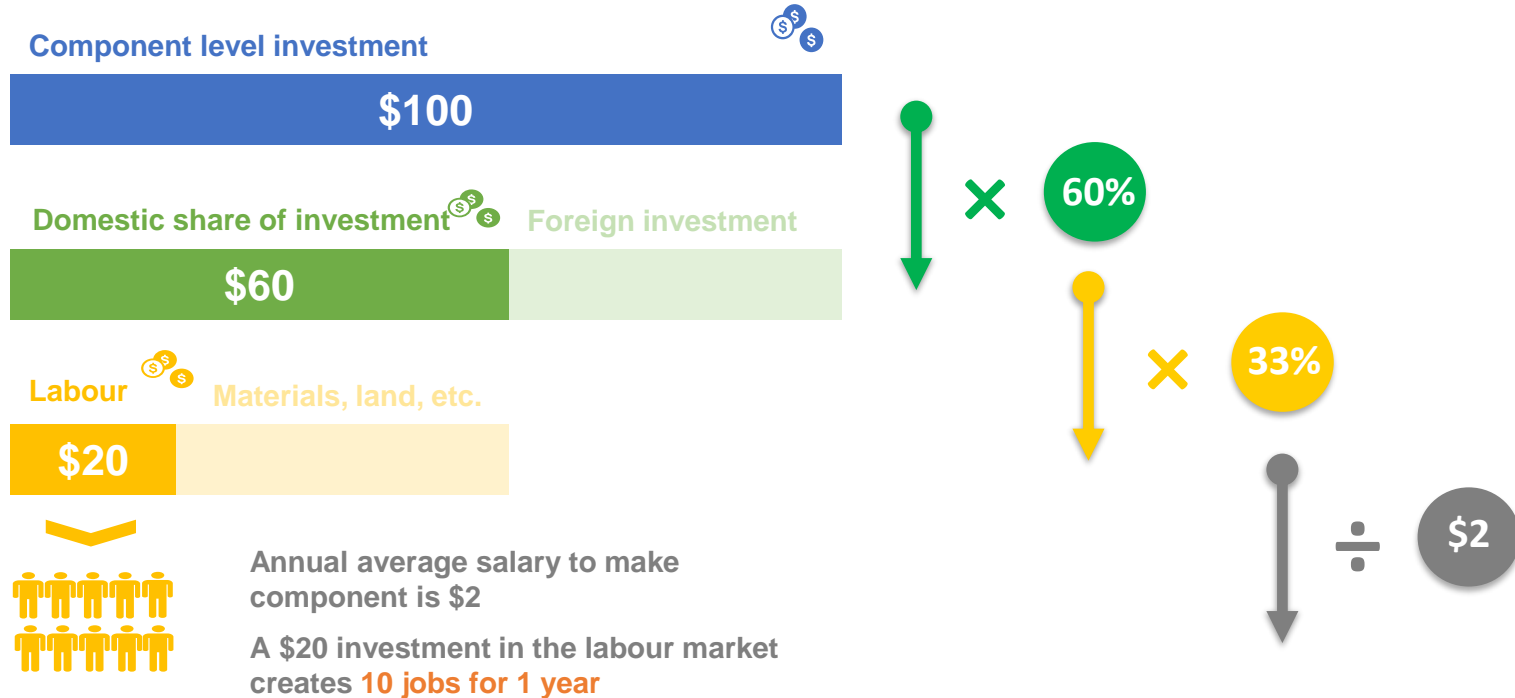


Construction



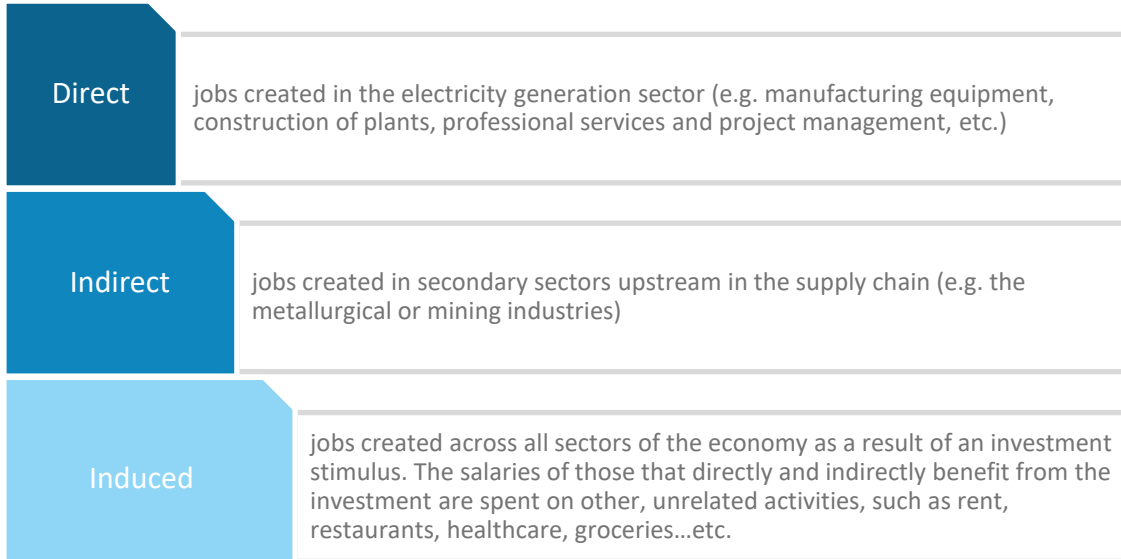
Operation & maintenance

# Employment is estimated based on investments made across sectors and salaries of the country



# 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



# 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

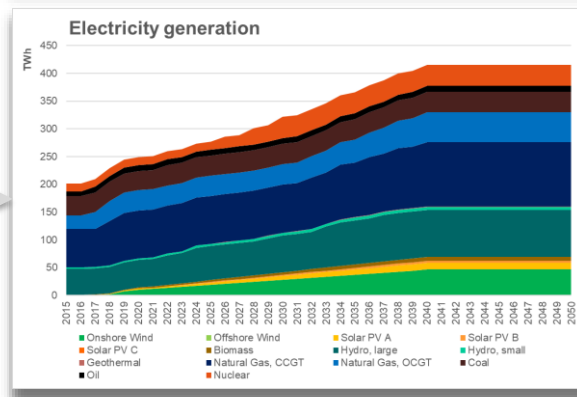
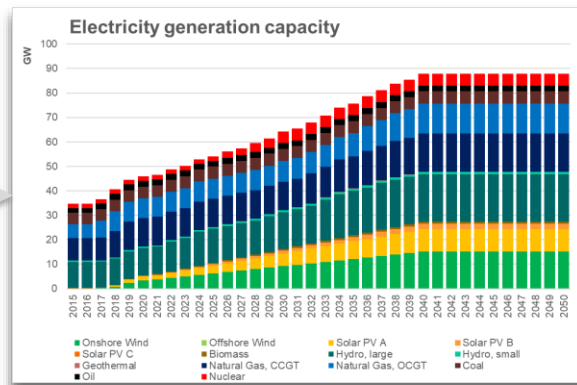
Input Output tables that reflect the interrelations between economic sectors of the country and include estimates of the share of investments in a sector directed to the labour market

## Salaries

Average annual salaries, including employee and employer taxes (if available), by economic sector as a proxy for the labour cost



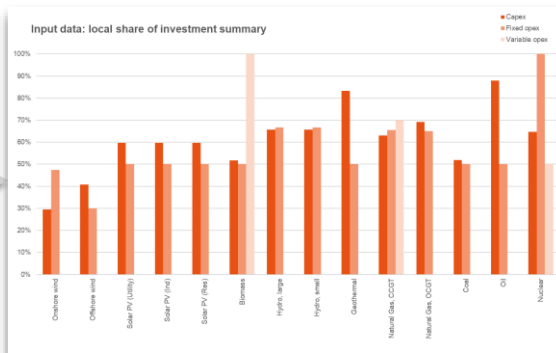
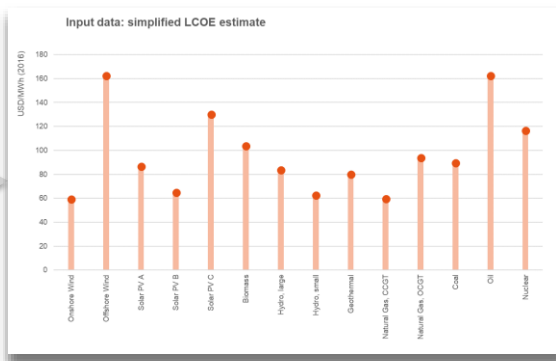
# Capacity and generation data from scenario pathways



- 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

Default technology

Investment

Local share

Tech3

Solar PV (Utility)

| Technology  | Cost Item                 | Cost Category          | Value Input | Share Input | Value | Unit       | In-country Share Manual | Sector In-country Share | In-country Spend | Sector  | Labour Share of Spend | Labour Share Override | In-country Labour Spend |
|---|---------------------------|------------------------|-------------|-------------|-------|------------|-------------------------|-------------------------|------------------|---|-----------------------|-----------------------|-------------------------|
| <b>Total capex and opex input fields - leave blank if using detailed cost item inputs</b>   |                           |                        |             |             |       |            |                         |                         |                  |   |                       |                       |                         |
| Tech3   | Total                     | Capex                  | 1,100       |             |       | USDk/MW    |                         |                         |                  |   |                       |                       |                         |
| Tech3   | Total                     | Opex/Fixed             | 26          |             |       | USDk/MW/yr |                         |                         |                  |   |                       |                       |                         |
| Tech3   | Total                     | Opex/Variable          | -           |             |       | USD/MWh    |                         |                         |                  |   |                       |                       |                         |
| <b>Detailed cost item input fields - if using total capex and opex cost inputs, data in the value input column will not be used</b> |                           |                        |             |             |       |            |                         |                         |                  |   |                       |                       |                         |
| Component number  | Select default technology |                        |             |             |       |            |                         |                         |                  |   |                       |                       |                         |
| 1   | Solar PV                  | PV module              |             | 34%         | 375   | USDk/MW    | 70%                     | 82%                     | 282              | D27: Electrical equipment                         | 19%                   | na                    | 50                      |
| 2   | Solar PV                  | Inverter               |             | 8%          | 86    | USDk/MW    | 100%                    | 82%                     | 86               | D27: Electrical equipment                         | 19%                   | na                    | 12                      |
| 3   | Solar PV                  | Racking/Mounting       |             | 9%          | 102   | USDk/MW    | 0%                      | 77%                     | -                | D25: Fabricated metal products                    | 24%                   | na                    | -                       |
| 4   | Solar PV                  | Installation           |             | 12%         | 136   | USDk/MW    | 70%                     | 87%                     | 95               | D41T43: Construction                              | 26%                   | na                    | 24                      |
| 5   | Solar PV                  | BOS, grid connection   |             | 17%         | 189   | USDk/MW    | 50%                     | 82%                     | 94               | D27: Electrical equipment                         | 19%                   | na                    | 18                      |
| 6   | Solar PV                  | Developer cost         |             | 12%         | 133   | USDk/MW    | 90%                     | 89%                     | 119              | D65T75: Professional, scientific and technical ac | 51%                   | na                    | 81                      |
| 7   | Solar PV                  | Land                   |             | 0%          | 3     | USDk/MW    | 20%                     | 87%                     | 1                | D68: Real estate activities                       | 7%                    | na                    | 0                       |
| 8   | Solar PV                  | Fees and contingencies |             | 9%          | 97    | USDk/MW    | 20%                     | 85%                     | 19               | D54T06: Financial and insurance activities        | 18%                   | na                    | 4                       |
| 9   | Solar PV                  | Maintenance            |             | 45%         | 12    | USDk/MW/yr | 50%                     | 82%                     | 6                | D27: Electrical equipment                         | 19%                   | na                    | 1                       |
| 10  | Solar PV                  | Operation              |             | 55%         | 14    | USDk/MW/yr | 50%                     | 93%                     | 7                | D35: Electricity, gas, steam and air conditioning | 14%                   | na                    | 1                       |
| 11  | Solar PV                  |                        |             |             |       |            | 50%                     | 0%                      | -                |   |                       | na                    |                         |
| 12  | Solar PV                  |                        |             |             |       |            |                         | 0%                      | -                |   |                       | na                    |                         |
| 13  | Solar PV                  |                        |             |             |       |            |                         | 0%                      | -                |   |                       | na                    |                         |
| 14  | Solar PV                  |                        |             |             |       |            |                         | 0%                      | -                |   |                       | na                    |                         |
| 15  | Solar PV                  |                        |             |             |       |            |                         | 0%                      | -                |   |                       | na                    |                         |

| Technology              | Fuel           | Cost Category | Average plant efficiency | Value | Unit    | In-country Share | Sector In-country Share | Total Spend | Sector | Labour Share of Spend | Labour Share Override | In-country Labour Spend |
|-------------------------|----------------|---------------|--------------------------|-------|---------|------------------|-------------------------|-------------|--------|-----------------------|-----------------------|-------------------------|
| <b>Fuel cost inputs</b> |                |               |                          |       |         |                  |                         |             |        |                       |                       |                         |
| Tech3                   | Not applicable | Fuel          | 100%                     | -     | USD/MWh | 100%             | 0%                      | -           |        |                       | na                    |                         |

| Technology | Summary of costs        |  |  |       |            |  |         |     |     |  |  |     |
|------------|-------------------------|--|--|-------|------------|--|---------|-----|-----|--|--|-----|
| Tech3      | Capex                   |  |  | 1,100 | USDk/MW    |  | Summary | 60% | 657 |  |  | 169 |
| Tech3      | Opex/Fixed              |  |  | 26    | USDk/MW/yr |  | Summary | 50% | 13  |  |  | 2   |
| Tech3      | Opex/Variable           |  |  | -     | USD/MWh    |  | Summary | 0%  | -   |  |  | -   |
| Tech3      | Fuel                    |  |  | -     | USD/MWh    |  | Summary | 0%  | -   |  |  | -   |
| Tech3      | Load factor             |  |  | 28%   |            |  |         |     |     |  |  |     |
| Tech3      | Lifetime                |  |  | 25    |            |  |         |     |     |  |  |     |
| Tech3      | Discount rate           |  |  | 10%   |            |  |         |     |     |  |  |     |
| Tech3      | Capital recovery factor |  |  | 0.11  |            |  |         |     |     |  |  |     |
| Tech3      | LCOE                    |  |  | 80.01 |            |  |         |     |     |  |  |     |

Sector

# Macroeconomic data

New capacity

Generation

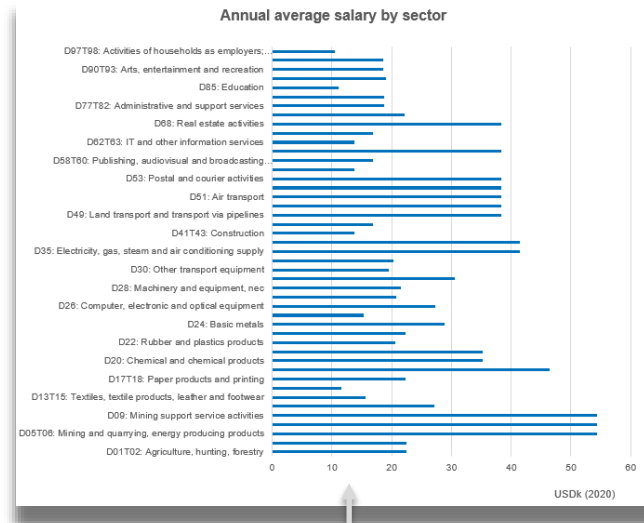
Investment

Local share

Sector

Input Output

Salaries

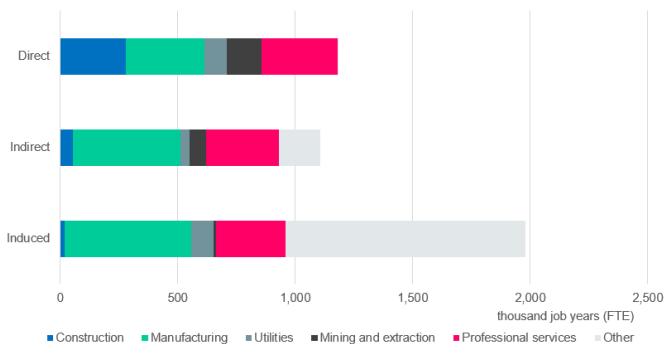


# ECONOMIC IMPACT INDICATORS

Illustrative results

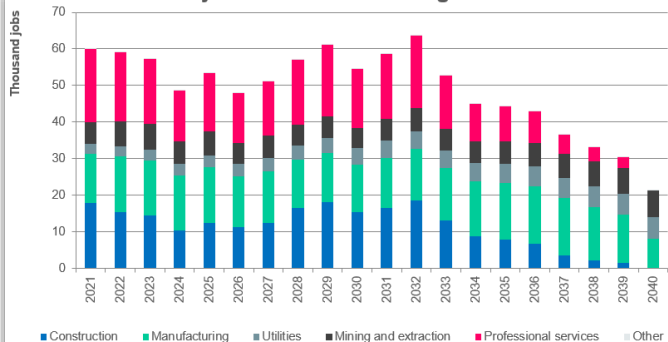
# A range of different indicators of employment impacts

Summary of Job Creation

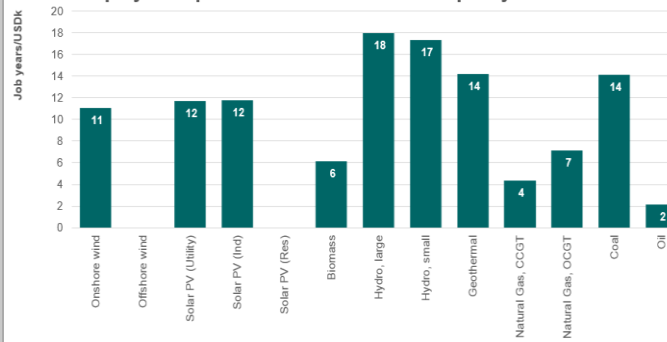


- Model estimates **direct, indirect and induced employment** and can compare results across scenarios
- Direct employment results calculated over **time**, by **technology** and **sector** of the economy
- Employment impact for different technologies can be compared **per MW**, **per GWh** and **per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

Total Jobs by Sector - All Technologies



Employment per USDk invested in new capacity



# Results dashboard for each scenario

Direct employment for scenario by year

Technology comparison indicators

Direct investment for scenario by year

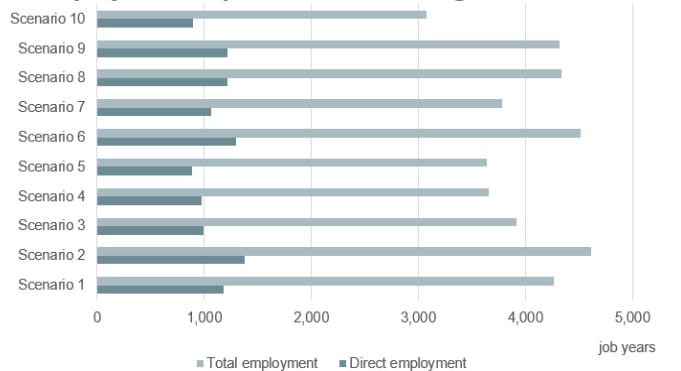
Direct, indirect and induced impacts



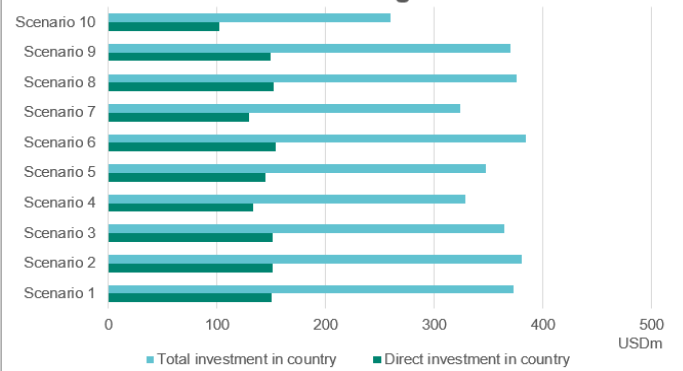
All results by technology and sector

# Comparison of headline scenario results

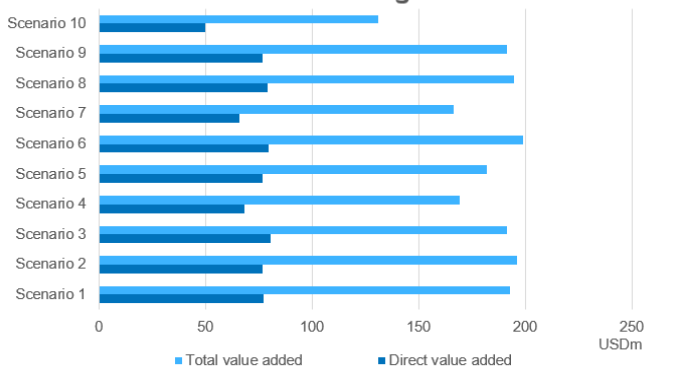
### Employment impacts over modeling horizon



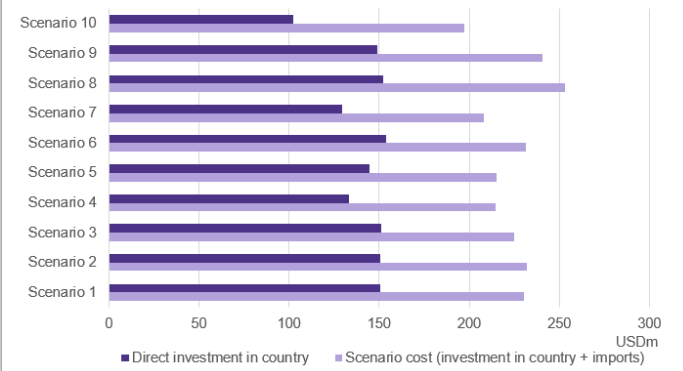
### Investment over modelling horizon



### 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



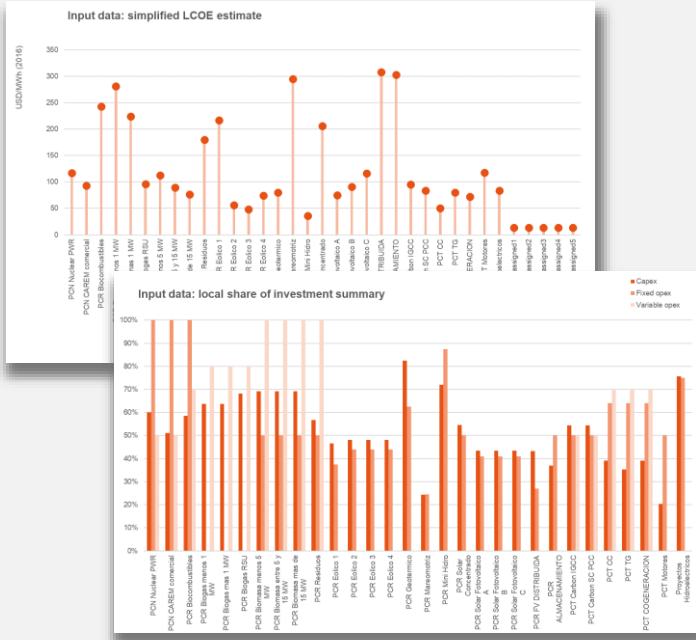


# Employment assessment of scenarios in Argentina

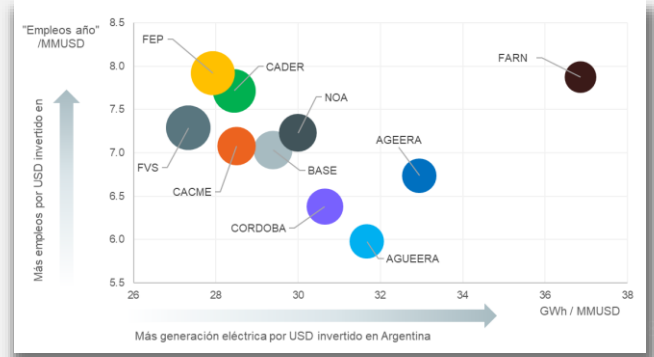
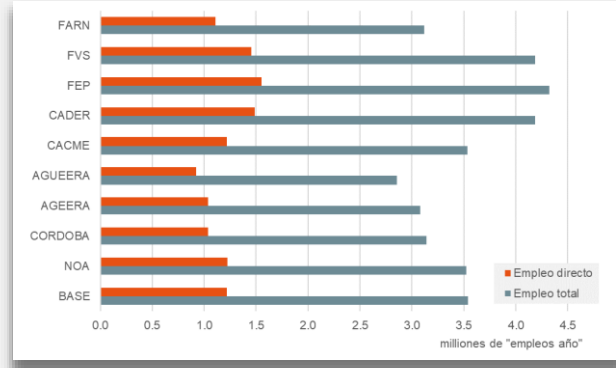
## INPUTS



Scenarios developed by 10 stakeholders

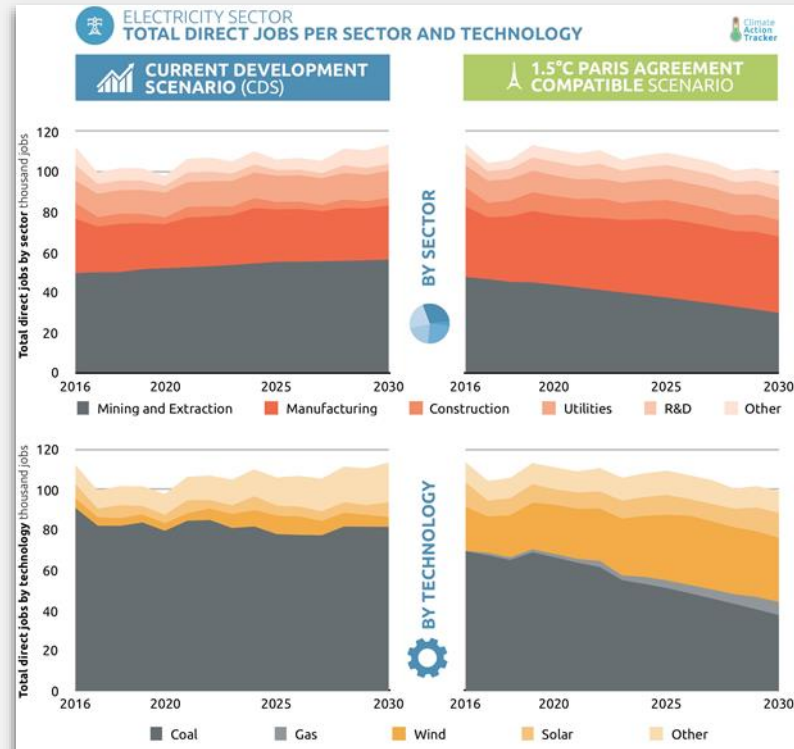
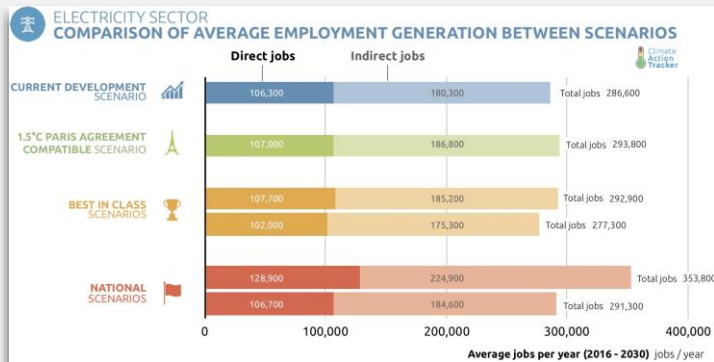
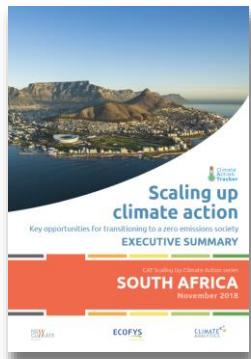


## RESULTS



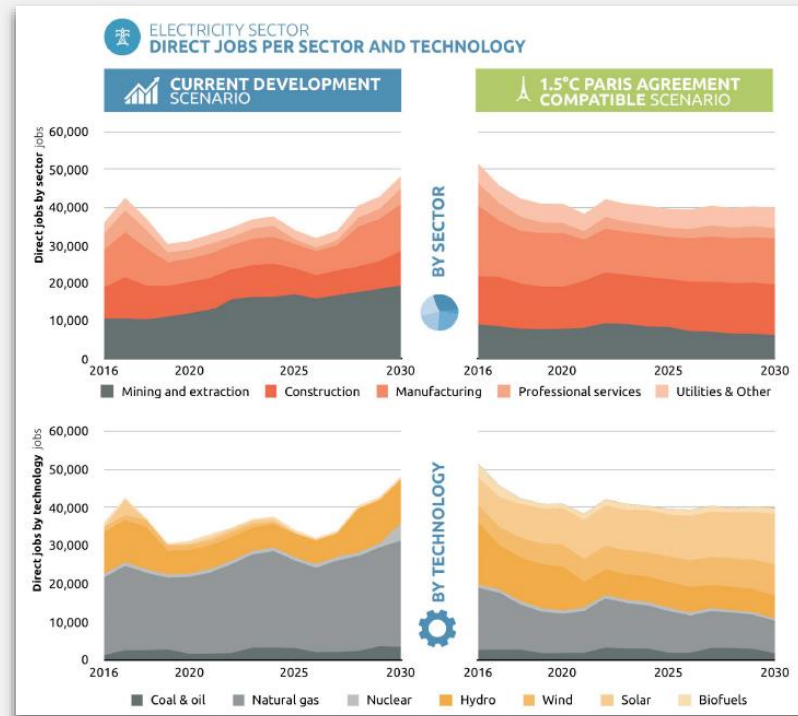
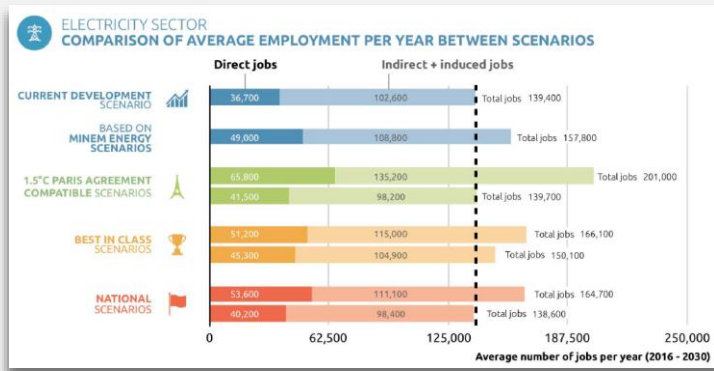
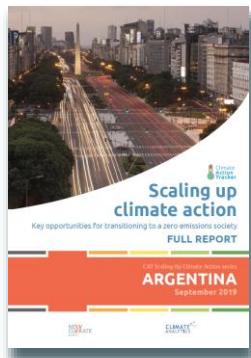


# Employment assessment of pathways in South Africa





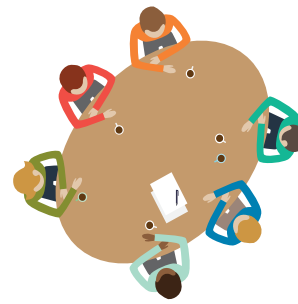
# Employment assessment of pathways in Argentina



# DISCUSSION

# 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 (45 sectors), which applies to:
  - Input Output tables
  - Sector allocation for component parts
  - Labour share of investments
  - Salaries

# QUESTIONS / COMMENTS / FEEDBACK

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