Enel Group
Comments on 2016 IRP Update

Mmabatho Palms Hotel, 31 Jan 2017

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Contents

- Brief introduction of Enel Group
- General observations
- Comments on specific topics

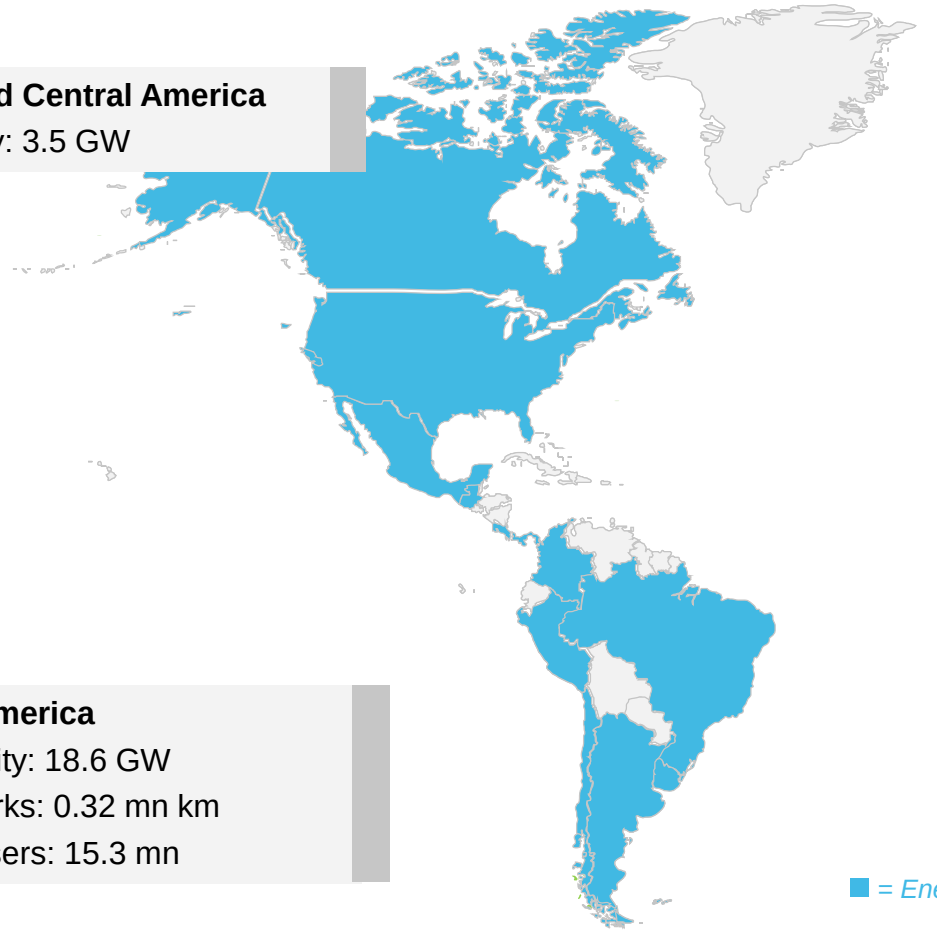
More detailed feedback on the various points being raised herein will be submitted to the Department - if required, we are available for further interaction with IRP working groups

Enel today[1]

Global diversified operator

North and Central America
- Capacity: 3.5 GW

Latin America
- Capacity: 18.6 GW
- Networks: 0.32 mn km
- End users: 15.3 mn



= *Enel presence* [2]

Italy
- Capacity: 27.8 GW
- Networks: 1.14 mn km
- End users: 31.6 mn
- Free customers: 10.5 mn

Iberia
- Capacity: 22.8 GW
- Networks: 0.32 mn km
- End users: 11.9 mn
- Free customers: 12.5 mn

Europe and North Africa
- Capacity: 14 GW
- Networks: 0.09 mn km
- End users: 2.7 mn
- Free customers: 0.1 mn

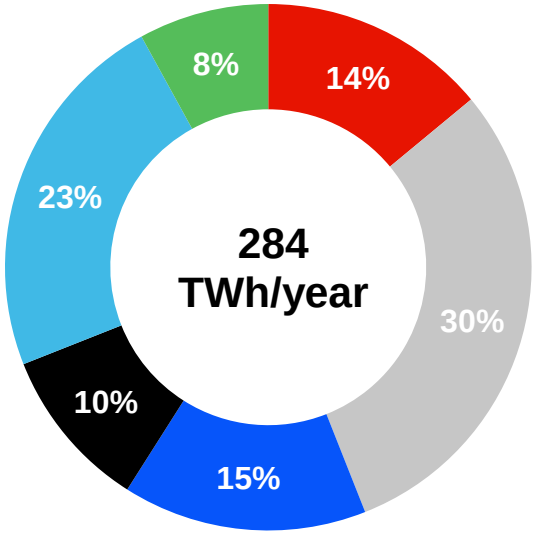
Enel Group
- Capacity: 87 GW
- Networks: 1.9 mn km
- End users: 61.5 mn
- Free customers: 23.1 mn

Sub-Saharan Africa - Asia
- Capacity: 0.3 GW

1. *As of 30th June 2016*
2. *Presence with operating assets*

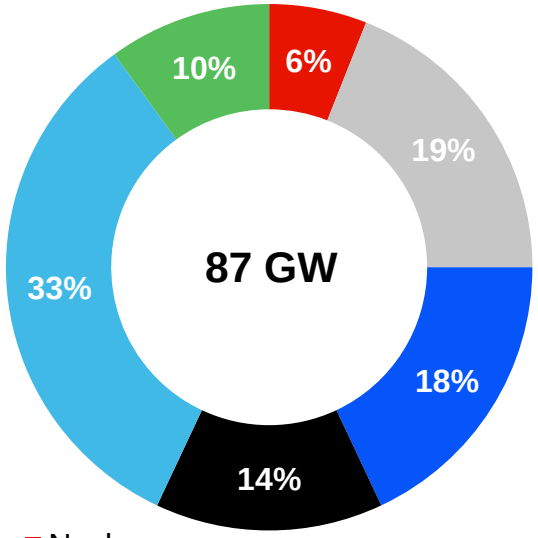
Portfolio breakdown[1]

Production mix[1]



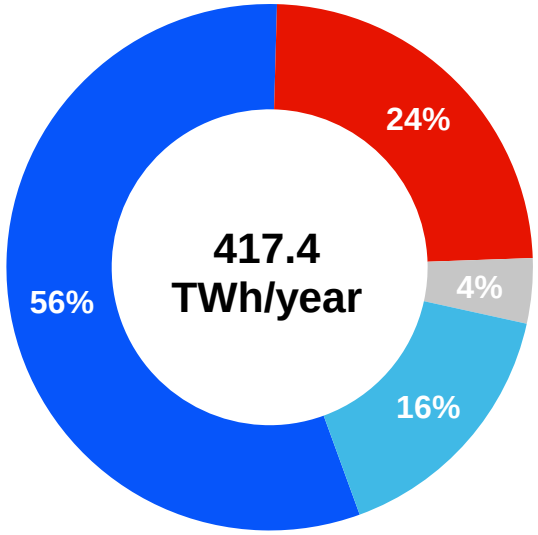
- Nuclear
- Coal
- CCGT
- Oil + Gas
- Hydro
- Other Renewables

Installed capacity[2]



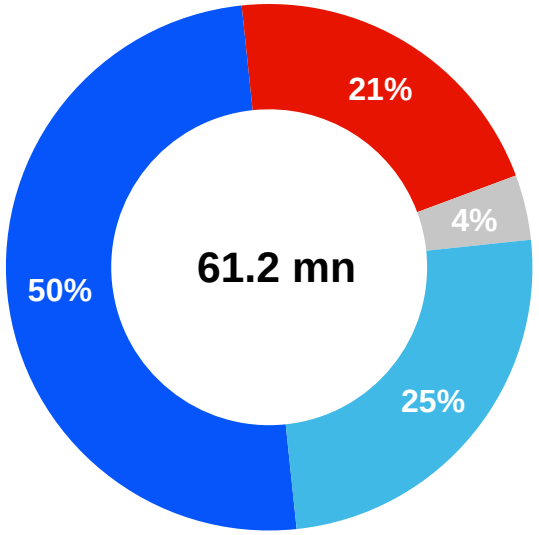
- Nuclear
- Coal
- CCGT
- Oil + Gas
- Hydro
- Other Renewables

Distributed energy[1]



- Italy
- Iberia
- Eastern Europe[3]
- Latin America

Customers (power + gas)[2]

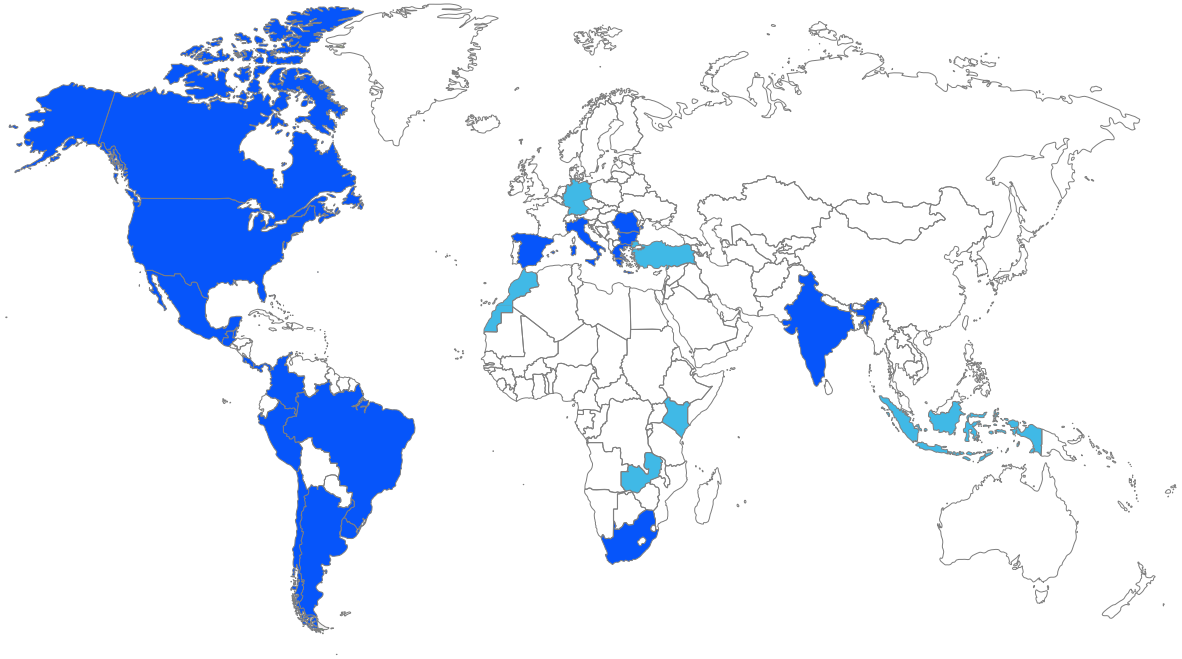


- Italy
- Iberia
- Eastern Europe[3]
- Latin America

1. Data as of 31st December 2015 2. Data as of 30th June 2016
3. Eastern Europe includes Russia, Slovakia, Romania, France, Belgium, Bulgaria, Greece

Enel Green Power

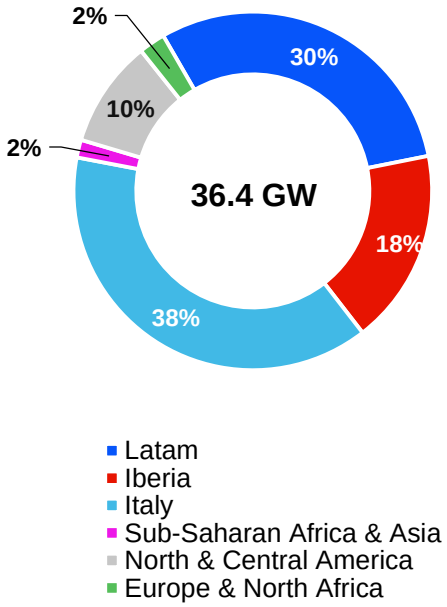
A Global leader



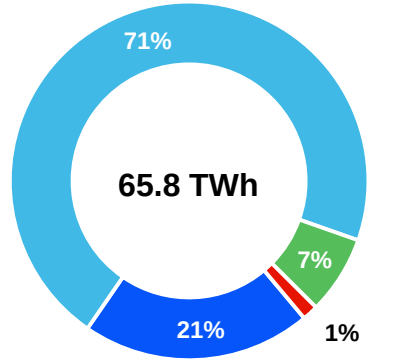
Countries with installed capacity

Countries with awarded capacity or other developments

Installed capacity by geography[1]



Net production by technology[1]



1. As of 30th September 2016

Enel Green Power in South Africa

Where we are:

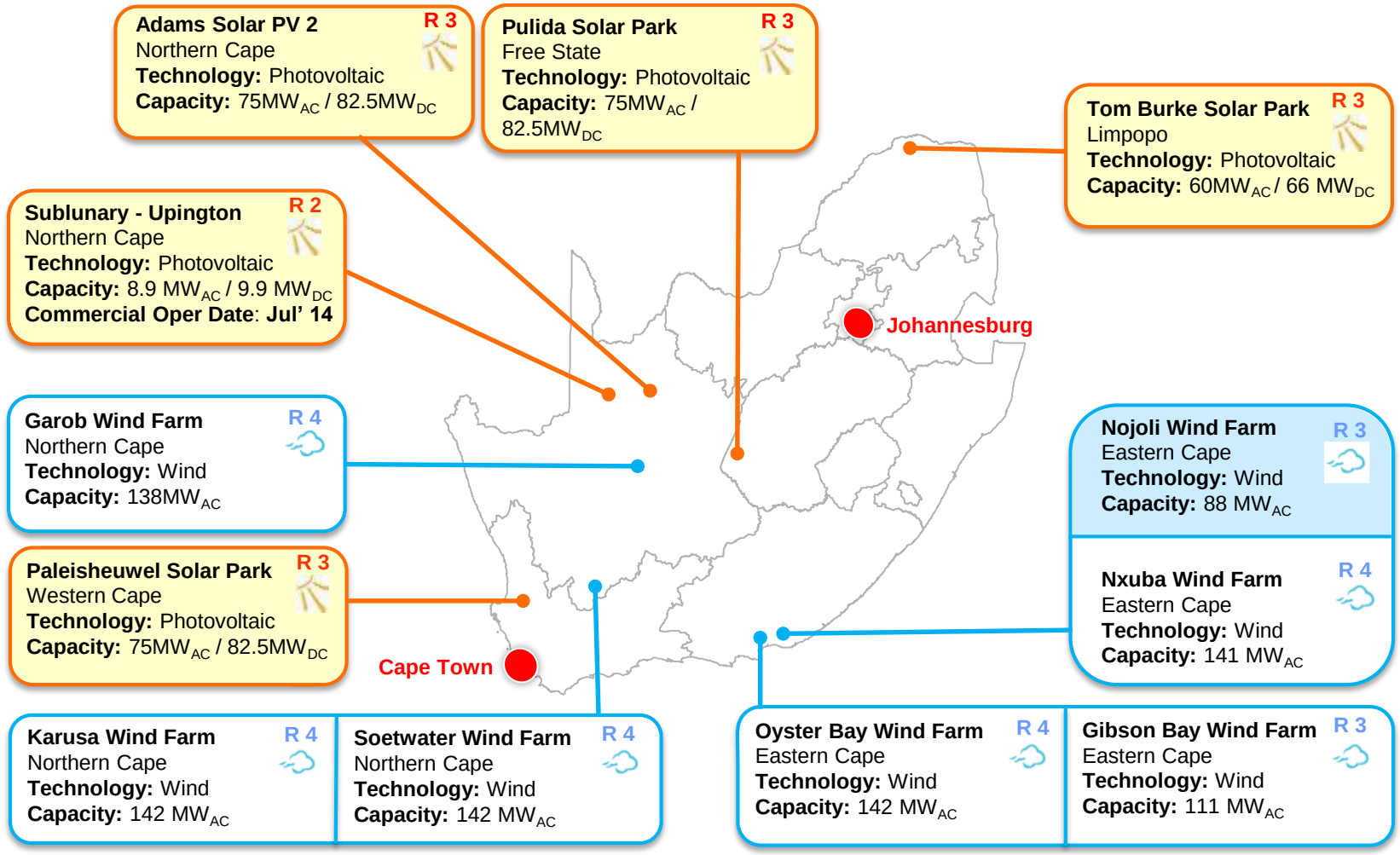
South Africa

411 MW in operation

111 MW under construction

705 MW awarded

R20+ Bn investment



General Observations

- IRP update is a fundamental tool for identifying the least cost power generation mix and to ensure long term secure supply
- Scenario results are very sensitive to input data - important to include accurate, updated and independently verified assumptions
- The plan should provide policy certainty to investors
- No mention is made of the grid capacity constraints and impact thereof
- Role of renewable energy and other sources such as gas needs to be emphasized – no constraints should be imposed
- New generation cost assumptions need to reflect latest market data – EPRI references seem outdated

Specific Comments

Economic parameters

- Macro economic assumptions do not reflect the real situation of the market - penalizing those technologies where extensive industrial localisation has been already started
  - Exchange rate is set at Jan 2015 level (11,55 R/$). It would be preferable to identify an average value for the last year
  - CPI scenario should be made available

Fuel costs

- Scenario curves and indexation should be provided to ensure transparency
- Cost correction factors to reproduce the link between fuel volumes and import infrastructure costs should be considered. E.g.:
  - Current assumptions do not show sensitivity on how the regasification fee (relevant part of gas cost) is going to vary in relation to the expansion of the local gas market (power plants and downstream)

Existing and committed Generation fleet

- Independent verification is needed for costs, EAF, committed new build dates, environmental retrofits and retirements. E.g.:
  - Eskom plant performance curve in base case assumes a flat 80% EAF profile from 2020 to 2045. Is this in line with current refurbishment and retirement scenarios?
  - Is the same availability applied to new-build units and units close to retirement?
  - How have BW4 and BW4.5 projects commissioning dates been estimated given the uncertainty and delays on financial close timing?
- The role of non-Eskom plants is not clear. Captive power plants dispatch should be considered differently from grid connected units unless there are long term PPAs in place with a clear view on dispatch profiles

Specific Comments…contd

New Generation Technology Cost

- Total cost assumptions should reflect more recent market data and scale factors depending on project size:
  - Results of BW 4.5 should be used as reference for weighted average price of PV and Wind
  - CCGT and OCGT cost are very sensitive to scale factors depending on project size and configuration
  - How is the risk of cost overrun for long delivery time technologies such as nuclear and coal being considered?
- Learning rates:
  - Curves have been formulated only for PV, Wind and Nuclear. What about other technologies?
  - Curves should be independently verified taking into account market evolution
- CO2 cost does not seem to be included in the model despite the proposed Carbon Tax legislation

New Generation performance assumptions

- Assumptions for CCGTs and OCGTs are leading to negative impact on LCOE along with an under-utilization of infrastructures:
  - CCGT mid-merit load factor is assumed at 48% but reduced to 27% in base case. These units are designed to perform at best at load factors in the range of 50-60%, if not baseload, with clear positive impact on the tariff
  - CCGT efficiency is assumed at 48% while more recent models can perform above 60%.
  - OCGT efficiency is assumed at 31% while more recent models can perform above 40%.

Specific Comments…contd

Caps on Renewable and Grid flexibility

- Renewable energy constraints to be removed because based on outdated assumptions (IRP2010)– any constraints to be backed by practical analysis. Furthermore, by placing a cap on additional capacity, the lower volume will negatively affect the ability to localize the manufacturing of renewable components.
- Renewable penetration might be enhanced introducing flexible forms of technology that are able to provide margin reserves to follow the load variations, such as gas fired generation and/or battery energy storage solutions
- A discussion on dispatching and scheduling rules in performing the tariff scenario is also not included

Integration with other planning documents

- IEP draft still refers to 2010 IRP assumptions. Is the plan to finalise IRP first and IEP afterwards?
- No mention is made of the GUMP being drafted and to the interest declared with Gas to Power Information Memorandum to create a local gas market in the short-medium term. This should be considered in policy adjustment phase.
- No mention is made of the Transmission Development Plan and required upgrades to accommodate additional capacity or add flexibility to the system
- It is not clear how will small-scale embedded generation be factored into the IRP

Demand forecast model

- The multiple regression model is, by definition, a static model. We would recommend using an autoregressive model more suitable for a demand forecast analysis.
- In forecasting demand for transport sector the R2 adjusted is 0,74. Moreover the regression parameter for this sector is the mining index: Is there an explanation or this?

Thank you