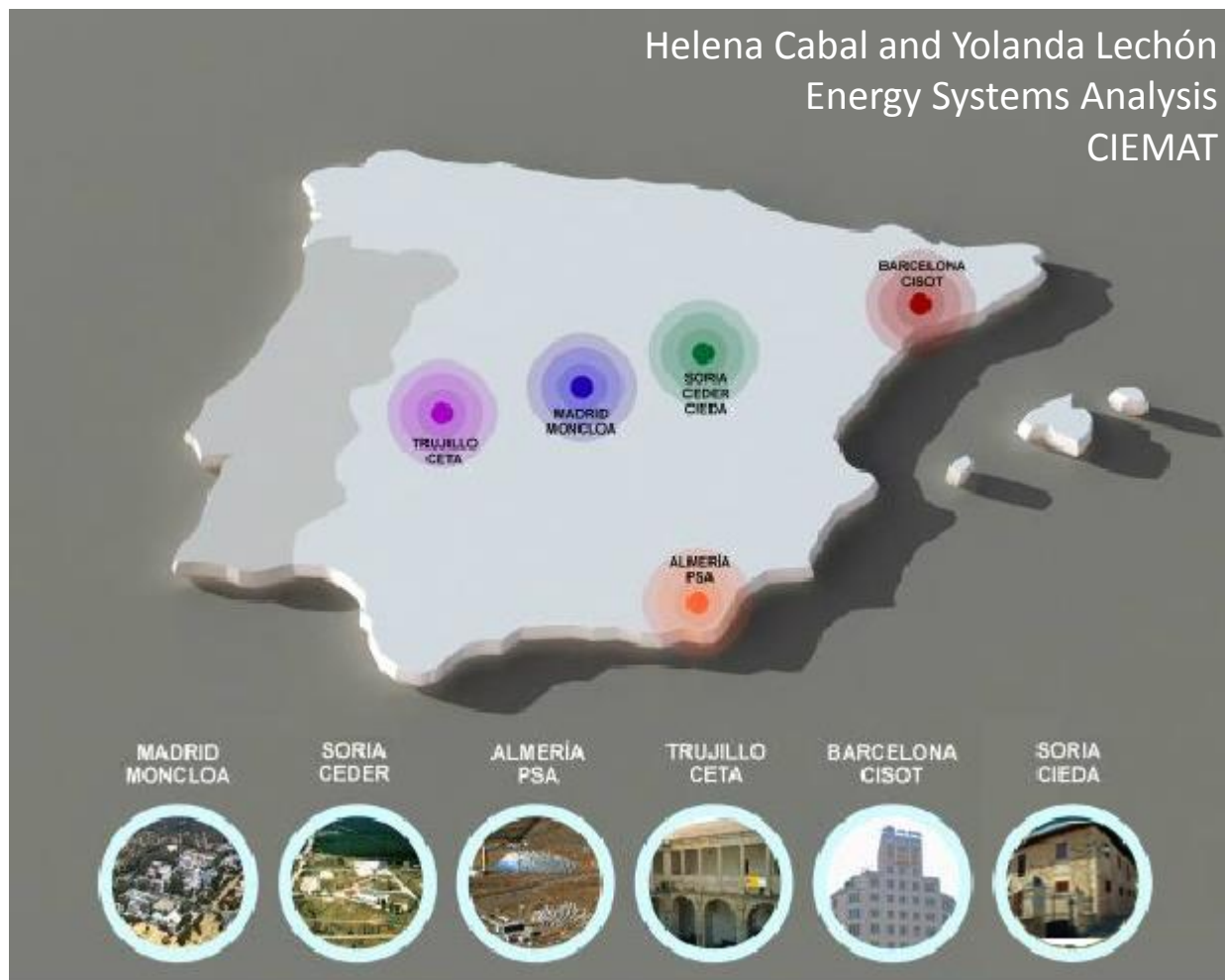


THE EFFECT OF FORESIGHT ON THE EVOLUTION OF ENERGY STRATEGIC INDICATORS USING THE TIMES-SPAIN MODEL



Objectives

- To contribute to the discussion on short term versus long term energy planning
- To learn from this first attempt and workshop

Studying the impact of the EU Framework for Energy and Climate 2030 in the Spanish energy system

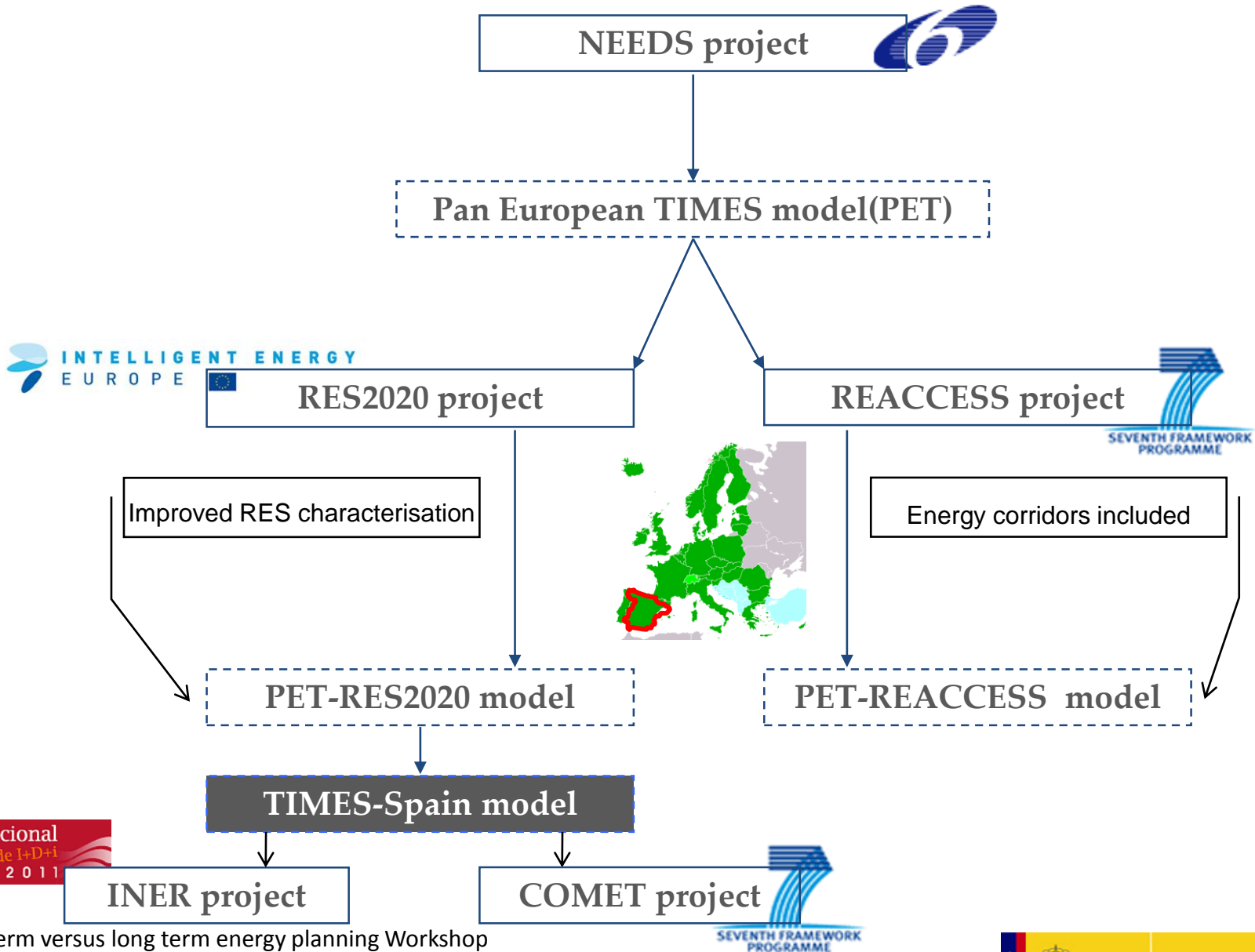
Through the analysis of three scenarios

Using the national energy model, TIMES-Spain

Overview

- TIMES-Spain model
- Scenario definition
- Results
- Conclusions

TIMES-Spain



Plan Nacional de I+D+i 2008-2011

Short term versus long term energy planning Workshop
28th-29th April 2016
London, UK

Optimisation model

Technology rich

1 region

Time horizon 2050

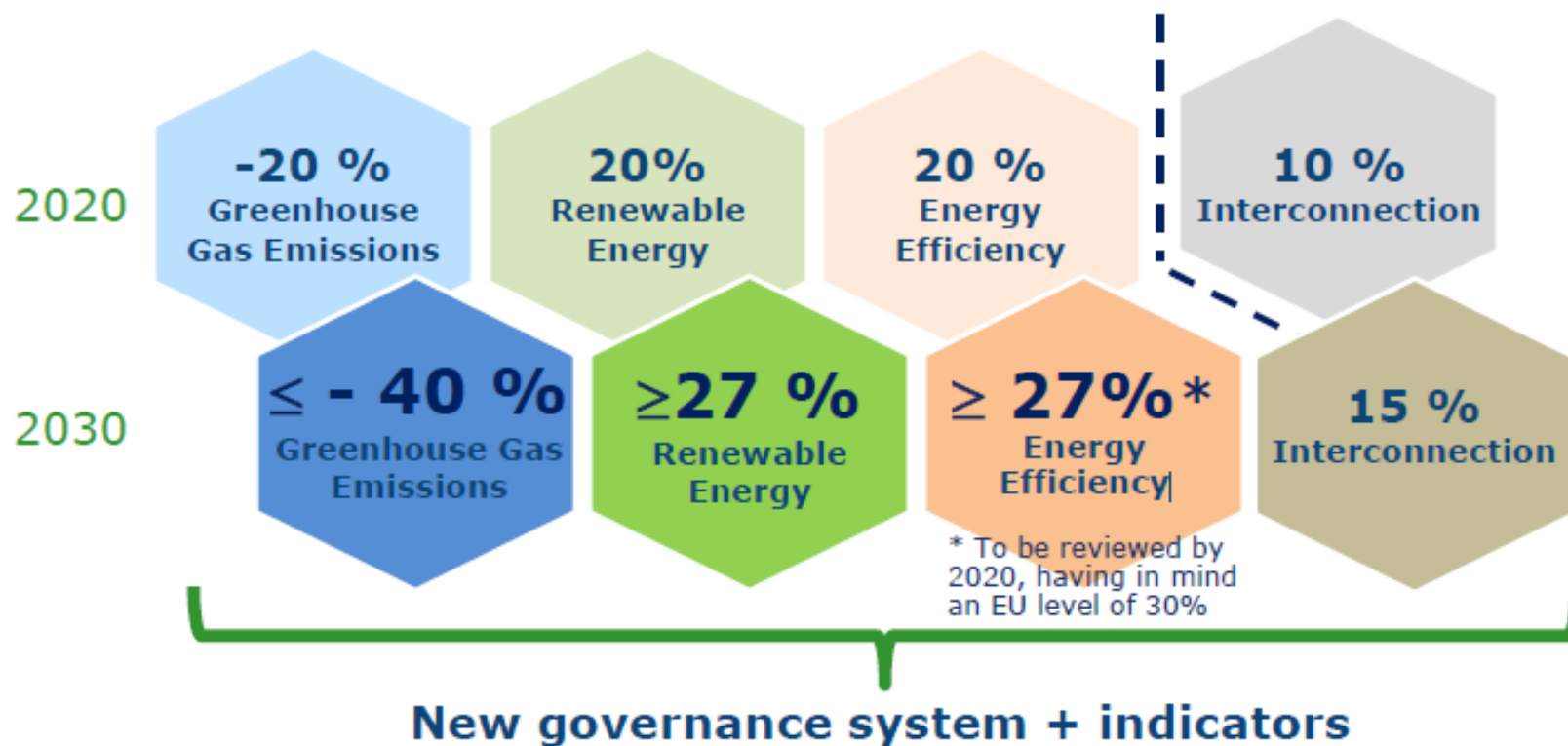
12 Time slices

Interconnections with France and Portugal for electricity exchange

Scenario definition. Framework

European
Commission

Agreed headline targets 2030 Framework for Climate and Energy



Scenario definition. Assumptions for Spain

GHG emissions

2020 : 21% reduction on total emissions compared to 2005
2030: 27%-30% reduction on total emissions compared to 2005

2020 : 10% reduction on nonETS emissions compared to 2005
2030: 15%-20% reduction on nonETS emissions compared to 2005

Renewable energy share

2020 : 20% share
2030: 27% share

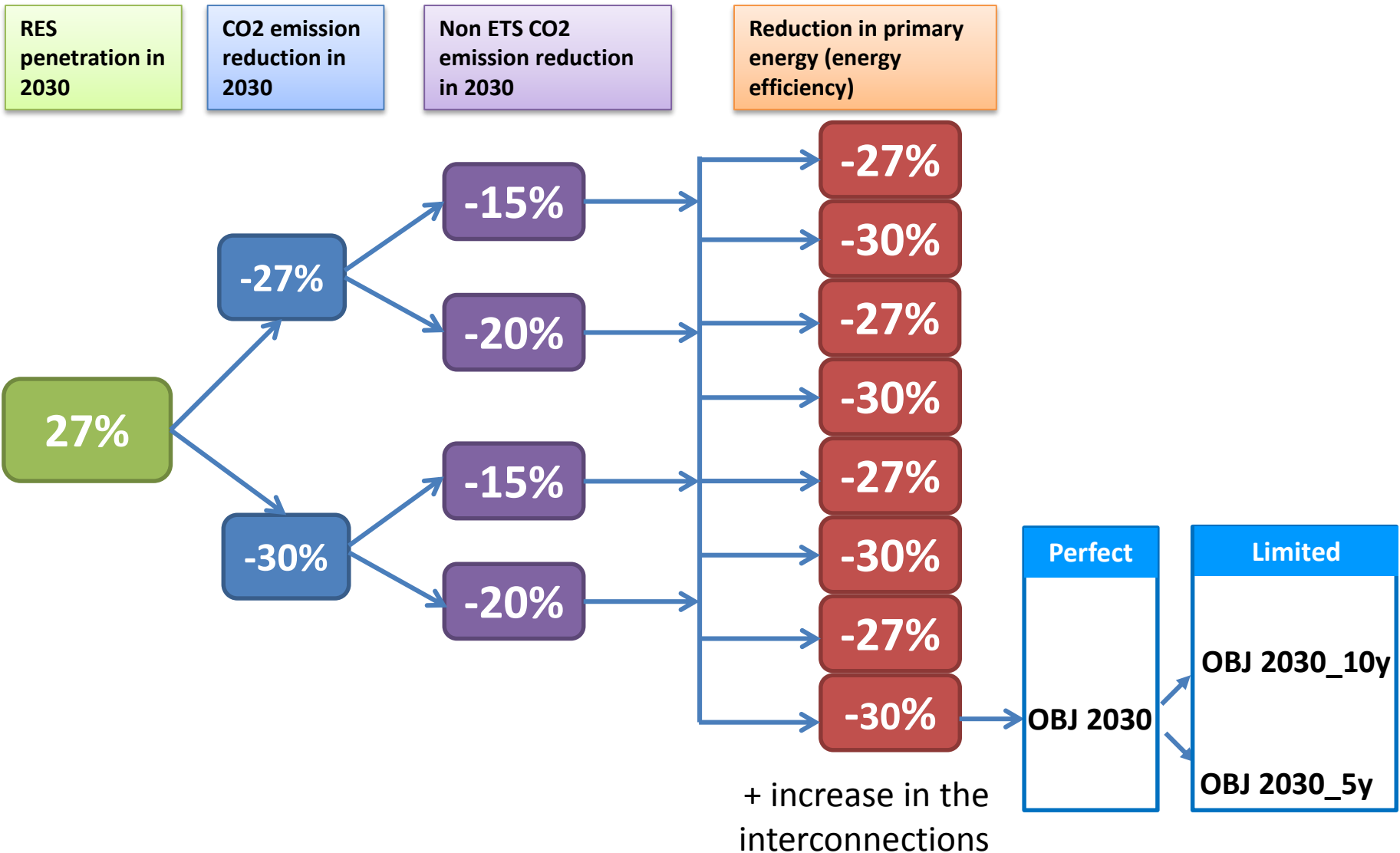
Electricity interconnection

2020 : 10% increase in the total installed capacity
2030: 15% increase in the total installed capacity

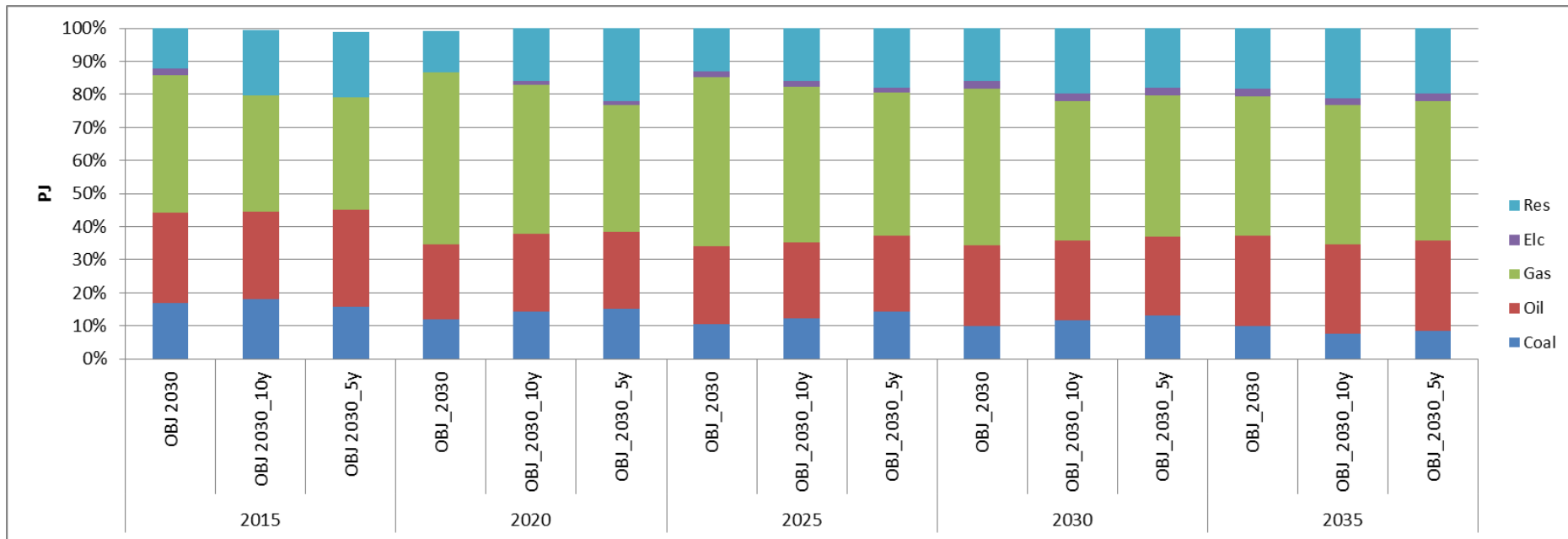
Efficiency

2020 : 20% increase
2030: 27% increase

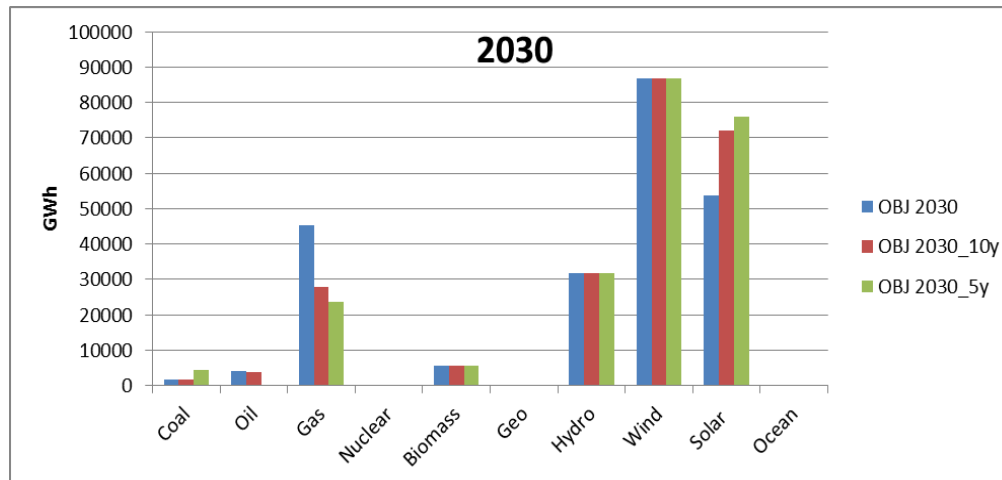
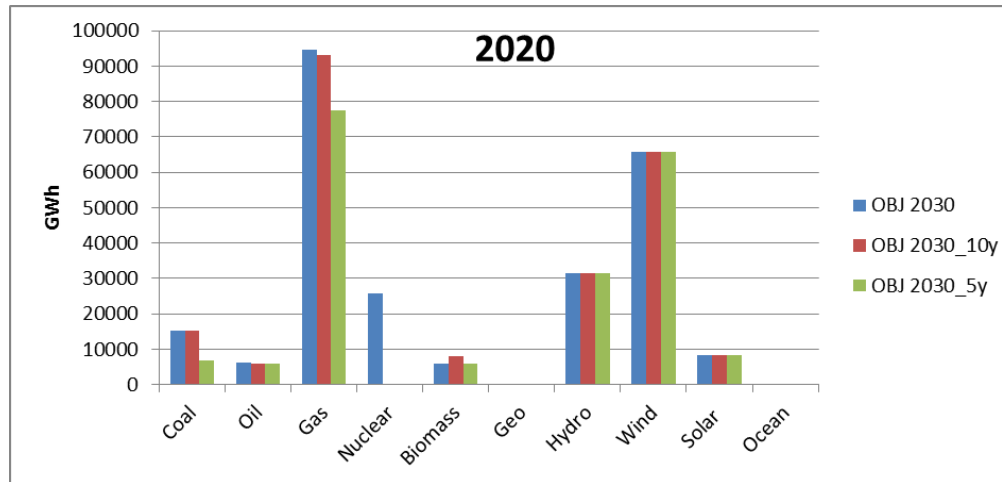
Scenario tree



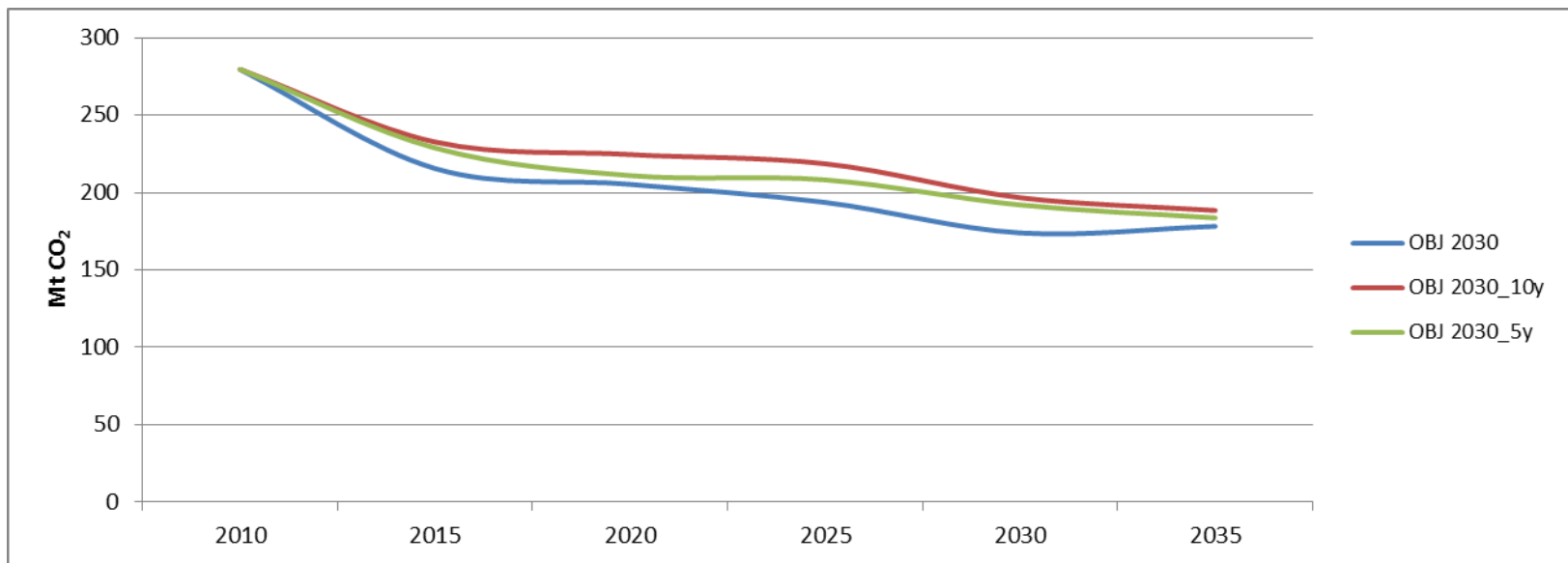
Results. Primary energy



Results. Electricity generation

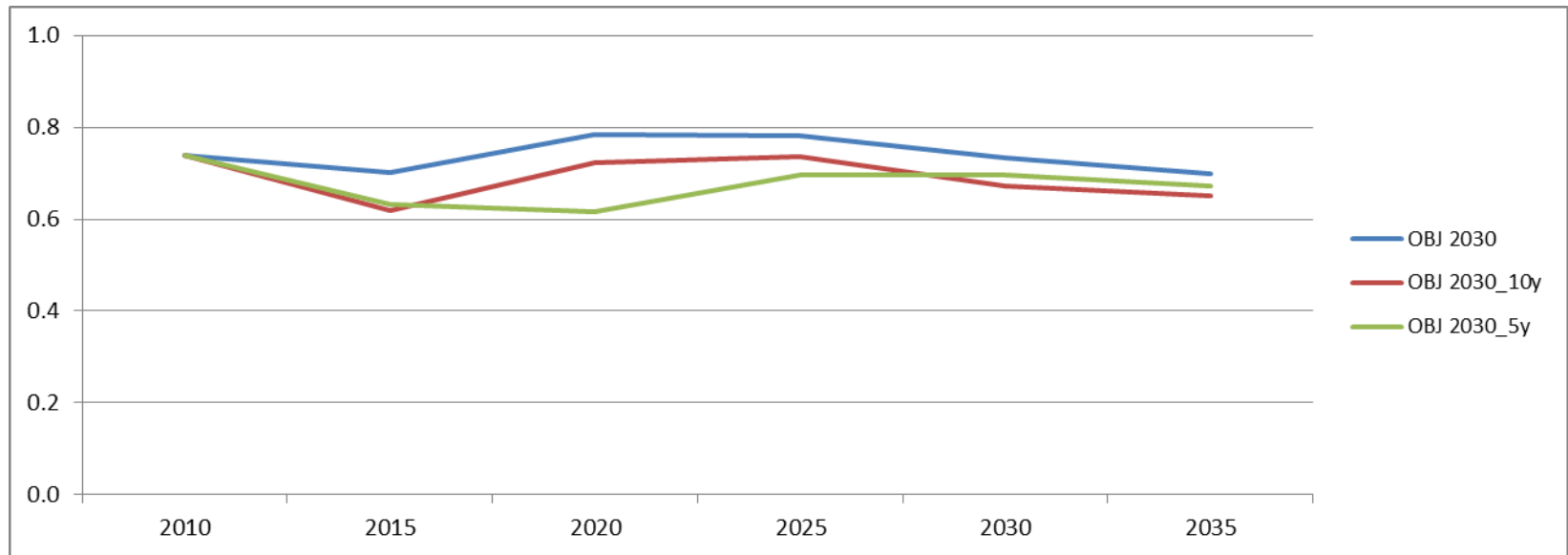


Results. CO2 total emissions



Results. Energy independence

Energy independence index



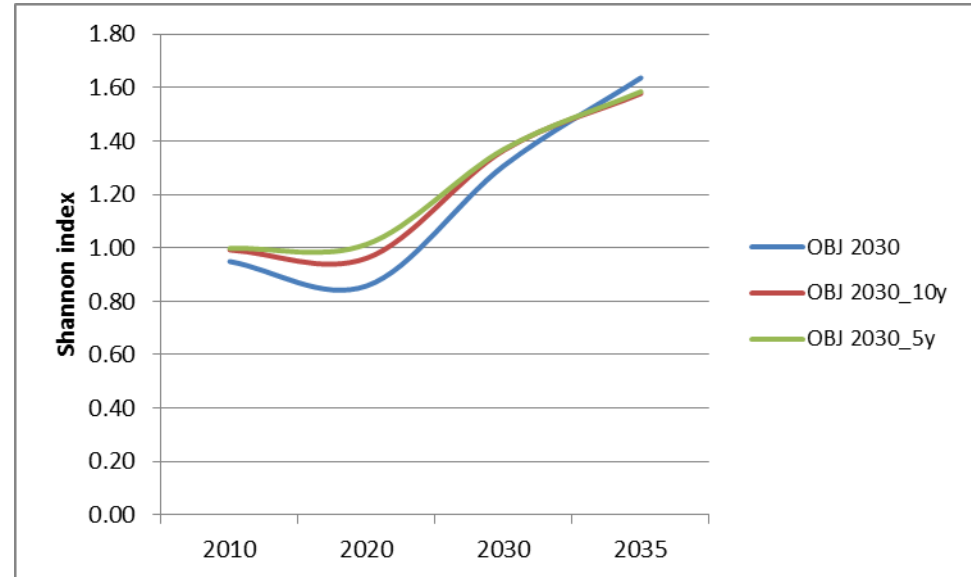
Results. Diversity

Source diversity in the national energy matrix

Shannon index

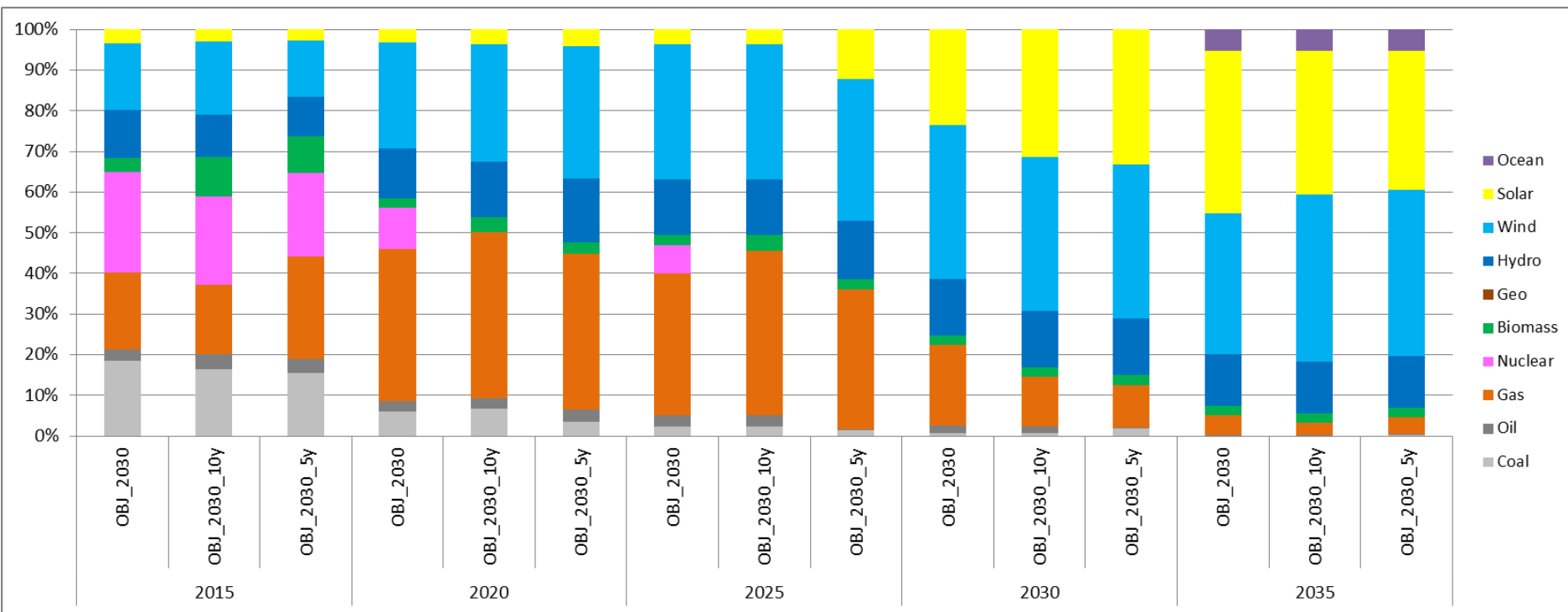
$$H = - \sum_{i=1}^S \pi_i \ln \pi_i$$

Π =share of fuel in total primary energy consumption



Results. Share of non-fossil in electricity

Participation of the non-fossil sources to the electricity generation



Conclusions

- Meeting the targets leads to an increase in renewable technologies penetration and consequently a decarbonisation of the electricity system. Also gas technologies play a relevant role until 2030. Energy dependence barely improves due to the still high dependence on oil and, not so high, on gas. Source diversity in the national energy matrix increases
- Main differences when using perfect or limited foresight have been found on primary energy. Coal and oil consumption is higher in the second ones while perfect foresight scenario relies more on gas. Regarding the power system, it is similar in all the scenarios but also gas technologies have a higher participation in the perfect foresight. Renewable technologies develop the same in 2020 but in 2030 production is higher, mainly due to the solar ones, in the limited foresight ones
- These results are preliminary, more in depth work is needed

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Energy Systems Analysis
CIEMAT



THANKS FOR YOUR ATTENTION

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MADRID
MONCLOA



SORIA
CEDER



ALMERÍA
PSA



TRUJILLO
CETA



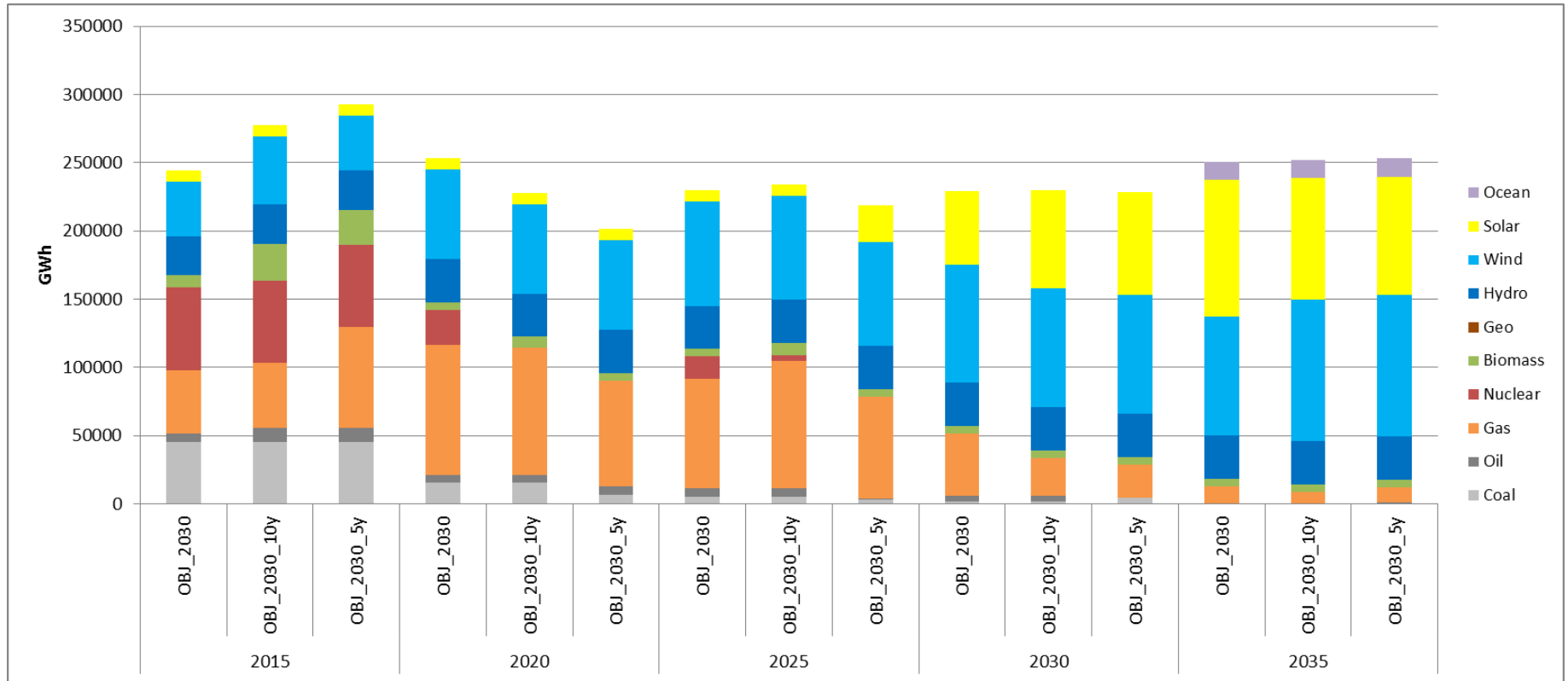
BARCELONA
CISOT



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CIEDA



Electricity generation



Results. GHG emissions from electricity

Electricity sector greenhouse gas (GHG) emissions

