

# Adequacy and market studies. Main results

## RG Continental South West



REE-REN-RTE  
Network Planning Department of REE

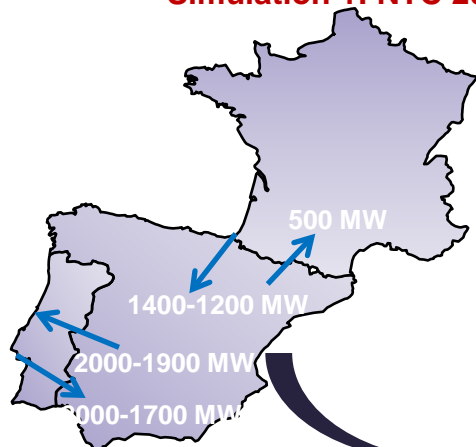
entsoe  
Reliable Sustainable Connected

# Market studies: Main results

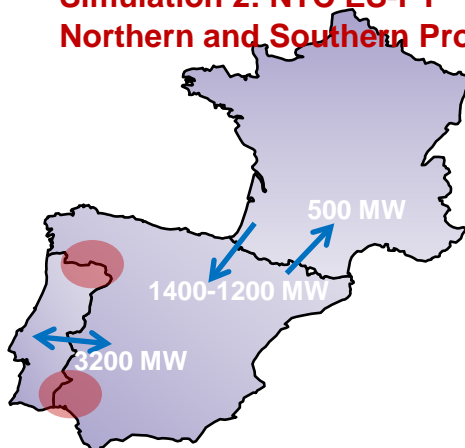
## Assessment of reinforcements benefits:

Simulations with/without reinforcement  $\Leftrightarrow$  Measure benefits of planned cross-border reinforcements

**Simulation 1: NTC 2010**

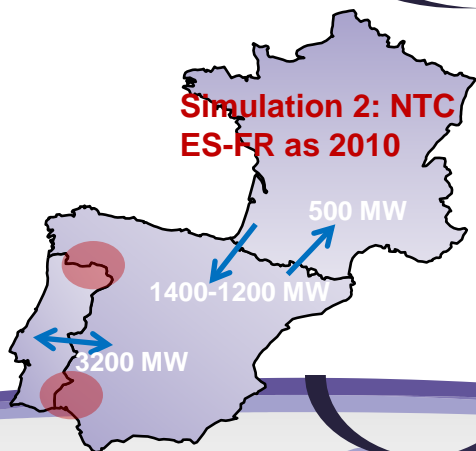


**Simulation 2: NTC ES-PT  
Northern and Southern Projects**

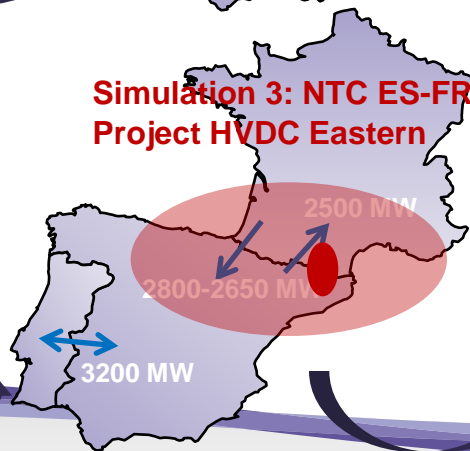


**ES-PT  
reinforcements**

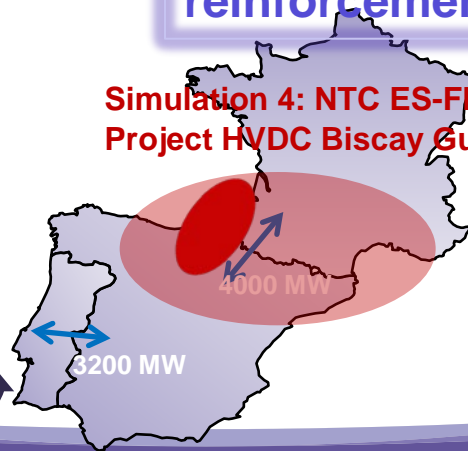
**Simulation 2: NTC  
ES-FR as 2010**



**Simulation 3: NTC ES-FR  
Project HVDC Eastern**



**Simulation 4: NTC ES-FR  
Project HVDC Biscay Gulf**



**ES-FR  
reinforcements**

# Market studies: Main Results

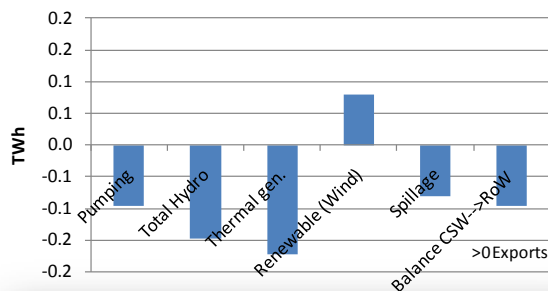
## Spain-Portugal Interconnections Projects (Northern and Southern Projects) Sc EU2020/Sc B. Main indicators

### Generation

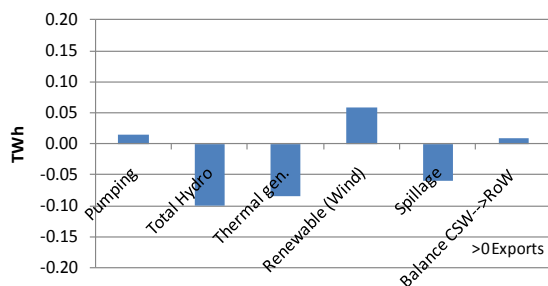
### RES Integration (Spillage avoided)

### Congestion

Variation Generation SIMU 2 vs SIMU 1. Sc EU2020



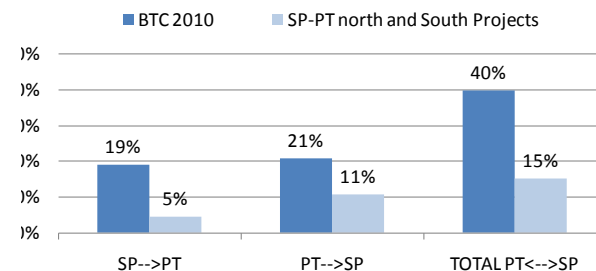
Variation Generation SIMU 2 vs SIMU 1. Sc B



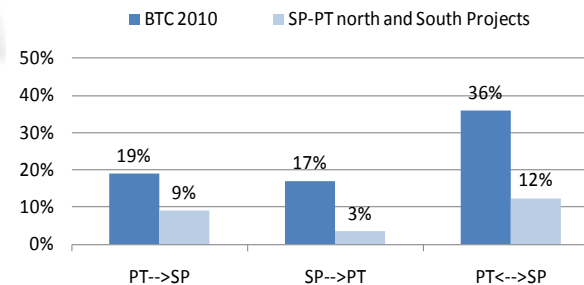
Low impact in generation breakdown.

SP-PT North South projects avoid aprox. 80.000 MWh and 60.000 MWh renewable spillage, in sc EU2020 and sc B, respect.

Sc EU2020. SP-PT Interconnections Projects (North and South)



Sc B. SP-PT Interconnections Projects (North and South)



% Hours of congestion is reduced 25%  
Energy exchange increases aprox 22%  
(Average of both scenarios)

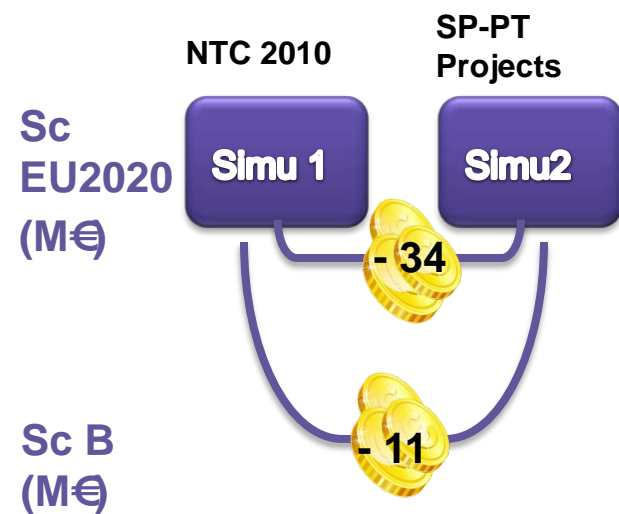
# Market studies: Main Results

## Spain-Portugal Interconnections Projects (Northern and Southern Projects) Sc EU2020/Sc B. Main indicators

*Social Economic  
Welfare (\*)*

CO2 emissions

Conclusions



*Moderate reductions of CO2 emissions (<<1%) with respect to NTC 2010, because of low impact in generation breakdown and moderate spillage avoided*

**Interconnection projects Spain-Portugal provide:**

- some integration of renewable and reduction of their spillage*
- savings between 11 and 34 M€*
- lower congestion in the interconnection and the energy flow increases*

\* Variation of the variable generation costs

# Market studies: Main Results

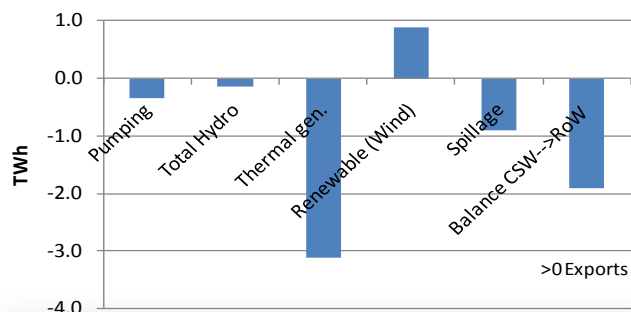
## Spain-France Interconnections Projects (Eastern Project) Sc EU2020/Sc B. Main indicators

### Generation

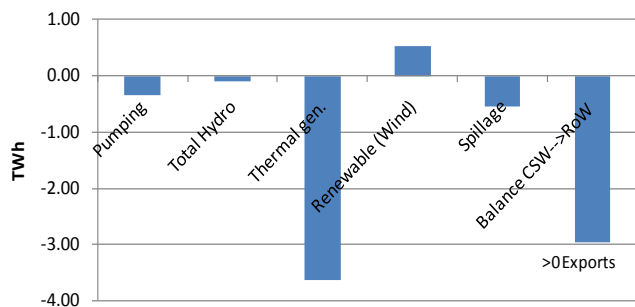
### RES Integration (Spillage avoided)

### Congestion

Variation Generation SIMU 3 vs SIMU 2. Sc EU2020

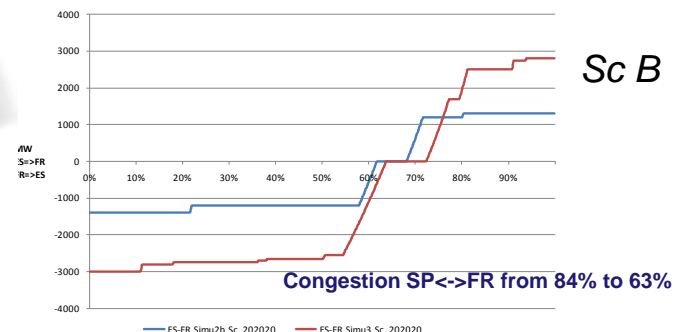
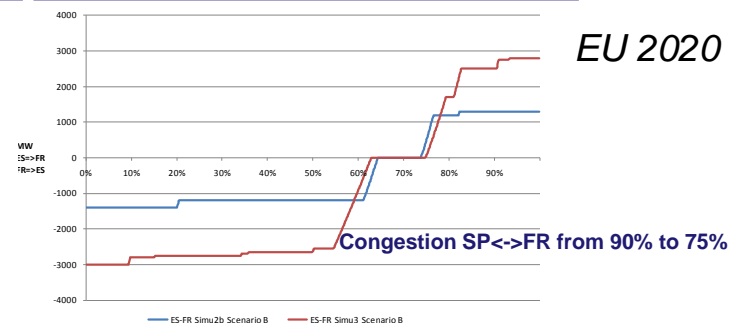


Variation Generation SIMU 3 vs SIMU 2. Sc B



*The Eastern project implies a great impact in generation breakdown*

Eastern project allows a significant reduction on the renewable spillage aprox.  
~ 900.000 MWh and  
~ 500.000 MWh  
renewable spillage, in  
sc EU2020 and sc B,  
respect.



The congestion decreases  
The energy exchange increases almost  
twice in both scenarios



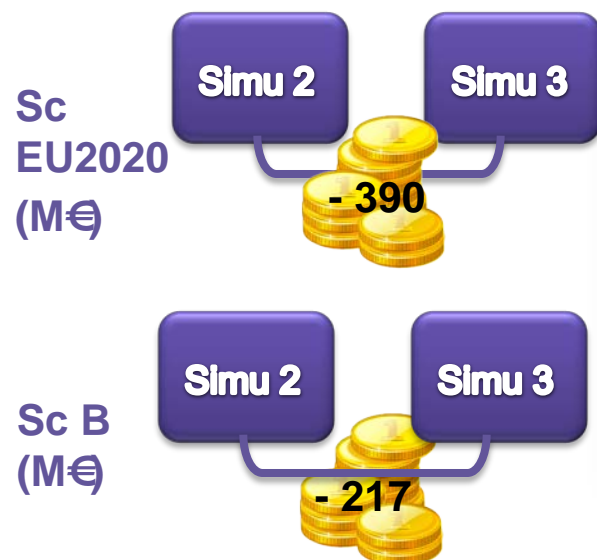
# Market studies: Main Results

## Spain-France Interconnections Projects (Eastern Project) Sc EU2020/Sc B. Main indicators

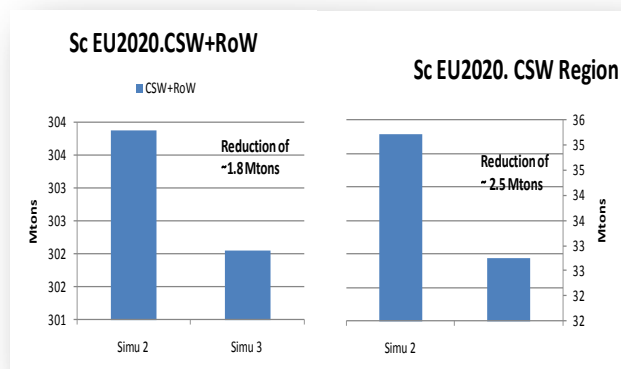
*Social Economic  
Welfare (\*)*

CO2 emissions

Conclusions



*Reductions of CO2 emissions  
in comparison to simulation 2*



*In Sc B → the CO2 reductions in CSW +RoW are lower than in Sc EU2020. For CSW Region the CO2 reduction are similar than in sc EU2020*

*Interconnection Eastern project Spain-France provide:*

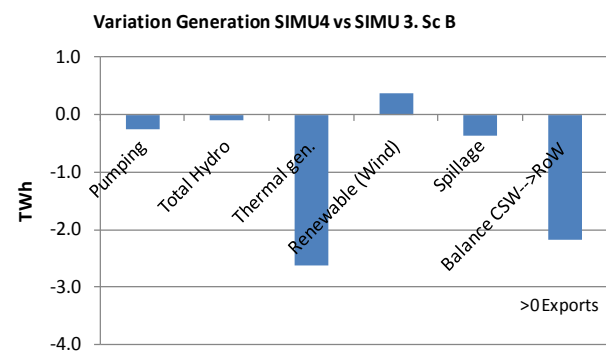
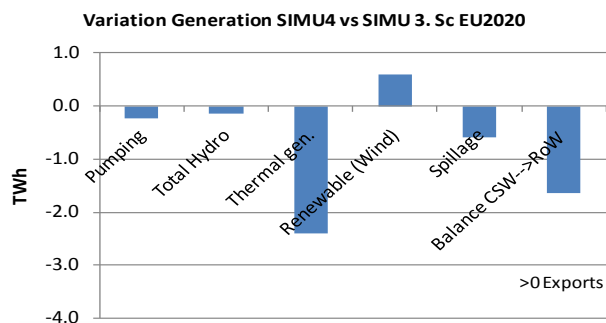
- Great integration of renewable and reduction of their spillage*
- Effects in the gen. breakdown*
- Important savings*
- Great reduction of congestion in the interconnection and the energy flow increases*
- Still congestion expected in 2020 with planned projects*

\* Variation of the variable generation costs

# Market studies: Main Results

## Spain-France Interconnections Projects (Western Project) Sc EU2020/Sc B. Main indicators

### Generation

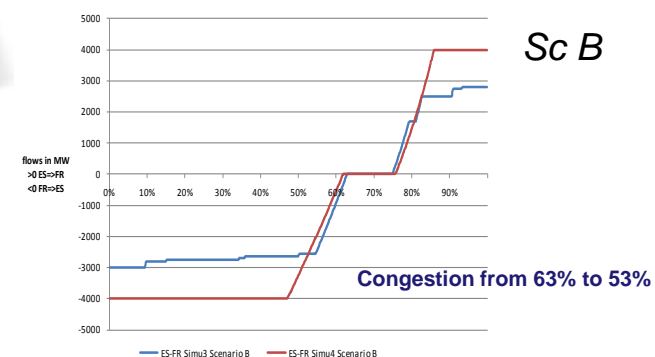
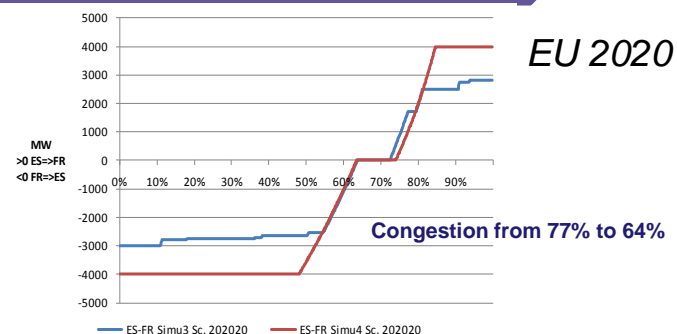


*The Eastern project implies a great impact in generation breakdown*

### RES Integration (Spillage avoided)

SP-FR projects allow a significant reduction on the renewable spillage  
~600.000 MWh and  
~400.000 MWh (in sc EU2020 and sc B, respect.)

### Congestion



% Hours of congestion is reduced 11%  
and the energy exchange increases approx  
35% (average of both scenarios)

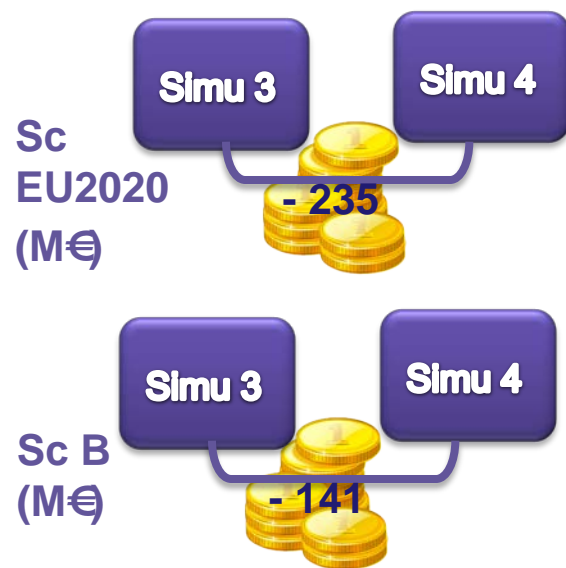
# Market studies: Main Results

## Spain-France Interconnections Projects (Western Project) Sc EU2020/Sc B. Main indicators

*Social Economic  
Welfare (\*)*

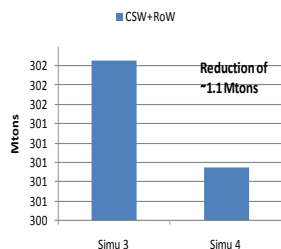
CO2 emissions

Conclusions

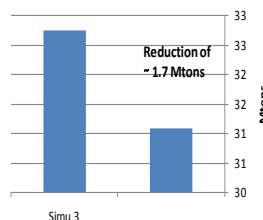


*Sc UE2020 → Great reductions  
of CO2 emissions in  
comparison to simulation 3*

Sc EU2020.CSW+RoW



Sc EU2020. CSW Region



*In Sc B → the CO2 reductions in  
CSW + RoW region are almost  
neutral*

*Interconnection Western  
project Spain-France provide:*

- Great integration of renewable and reduction of their spillage*
- Effects in the gen. breakdown*
- Important savings*
- Great reduction of congestion in the interconnection and the energy flow increases*
- Still congestion expected in 2020 with planned projects*

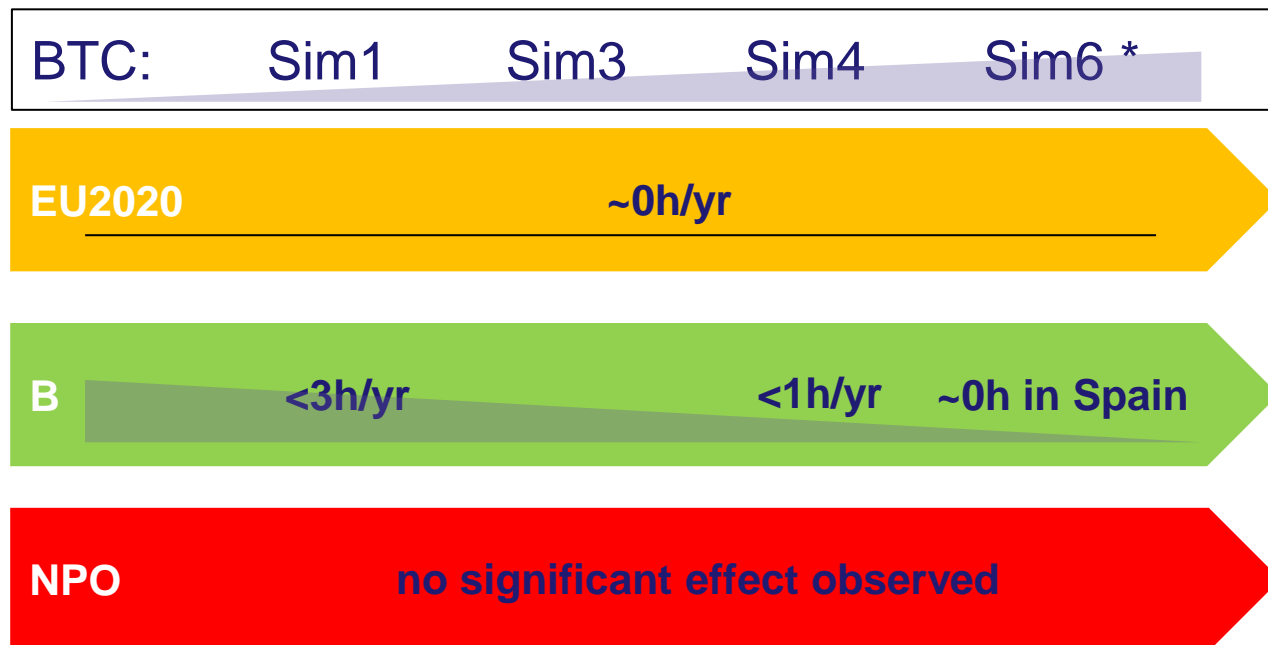
\* Variation of the variable generation costs



# Adequacy studies: Main Results

The generation adequacy indicators in the CSW region are in general low or very low in all scenarios, even with low interconnection capacities as of 2010. Simulations were performed considering the probabilistic support of the neighbor systems.

Loss of Load Expectation



\*Simu6: NTC SP-FR: 6 GW

Tools

RESERVAS

ANTARES

Results

LOLE (h/yr)

LOLP (%)

EENS (GWh/yr)

# Market and Adequacy studies: General conclusions

Interconnections within the region allow **higher exchanges** of energy in both directions

**Seasonal behaviour** of flows have been detected



The CSW region always will be an **exporting region** to the rest of Europe (very rare hourly exceptions), 80 to 110 TWh. **Spain and Portugal will be net importing systems** (low relative values)

**Scenario EU2020** provides higher benefits, higher congestions, higher spillages, and higher exchange of flows

CBA shows that all planned **interconnections could be profitable for the system in less than 10 years**, and Eastern Reinforcement ES-FR even in **less than 5 years**

Interconnections within the region reduce around **4.0 MtonsCO<sub>2</sub>/y in CSW RG** (average of both scenarios), and a lower value for the whole EU: 3.1 MtonsCO<sub>2</sub>/y in Scen EU2020 and almost neutral in Scen B (NTC 2010 vs NTC2020)

# Market and Adequacy studies: General conclusions

The **new interconnection projects have a significant impact on the congestion** of the borders.

- ES-PT projects will reduce congestion in 2015 from 36-40% (without) to 10-15% (with)
- ES-FR projects will reduce congestion in 2020 from 84-94% (without) to 45-64%(with)
- ES-PT projects don't affect ES-FR border, but ES-FR projects increase slightly ES-PT congestion

The **copper plate** analysis shows that

- 0% congestion in the borders gives **310-550 M€increase in Socio-Economic Welfare over NTC 2020 situation**, almost half of it could be obtained with 6GW ES-FR (+2GW over 2020 planned value), however congestion would still be 28-45%
- 0% congestion is not cost effective as the cost of the reinforcement vs the benefit obtained would not be profitable
- **Qualitative assessment : 10% congestion on FR-ES could be obtained with 8-10 GW ; economic viability of such a project not proven**

Sensitivity analysis: The **Nuclear phase out** implies higher imports of Germany. This simulation **has a low impact in the CSW region**, slightly affecting congestion and energy flows, and slightly reducing the benefits of interconnection projects in our region.

The generation adequacy indicators in the CSW region are in general low or very low in all scenarios, even with low interconnection capacities as of 2010.