



GLOBAL ELECTRICITY NETWORK CIGRE - FEASIBILITY STUDY

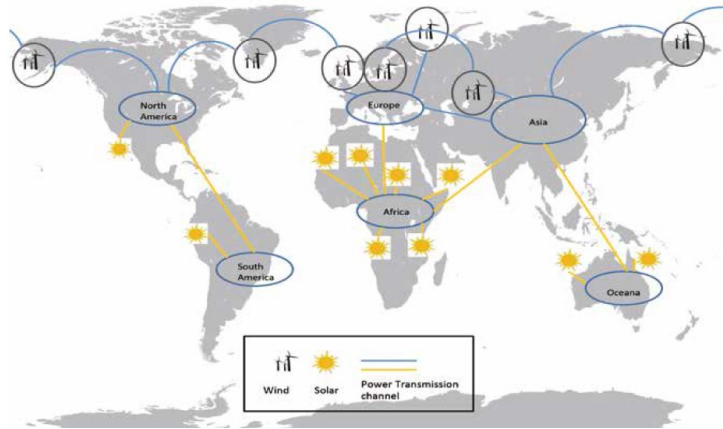
27 June 2019





Scope of CIGRE C1.35 feasibility study

To carry out the first known feasibility study for the concept of a global electricity network.



INTERCONNECTION

- Supports a balanced coordination of power supply of all interconnected countries.
- Enables clean energy transmission.
- Take advantage of diversity of clean energy.

↳ **Priority to clean energy consumption**

The study has to adopt one reference long term scenario for consumption and supply volumes, covering now and the year 2050.

Data and scenario
2050
(External sources)

Simulations
(CIGRE C1.35)

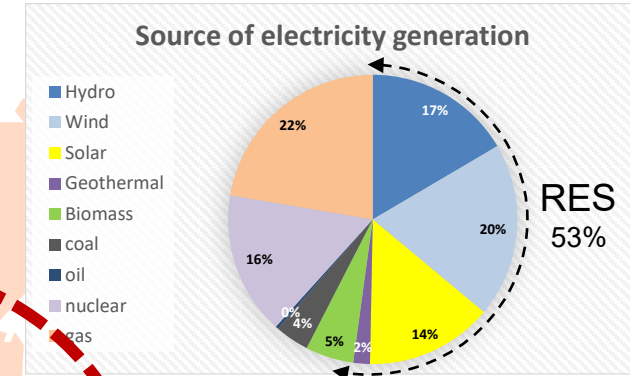
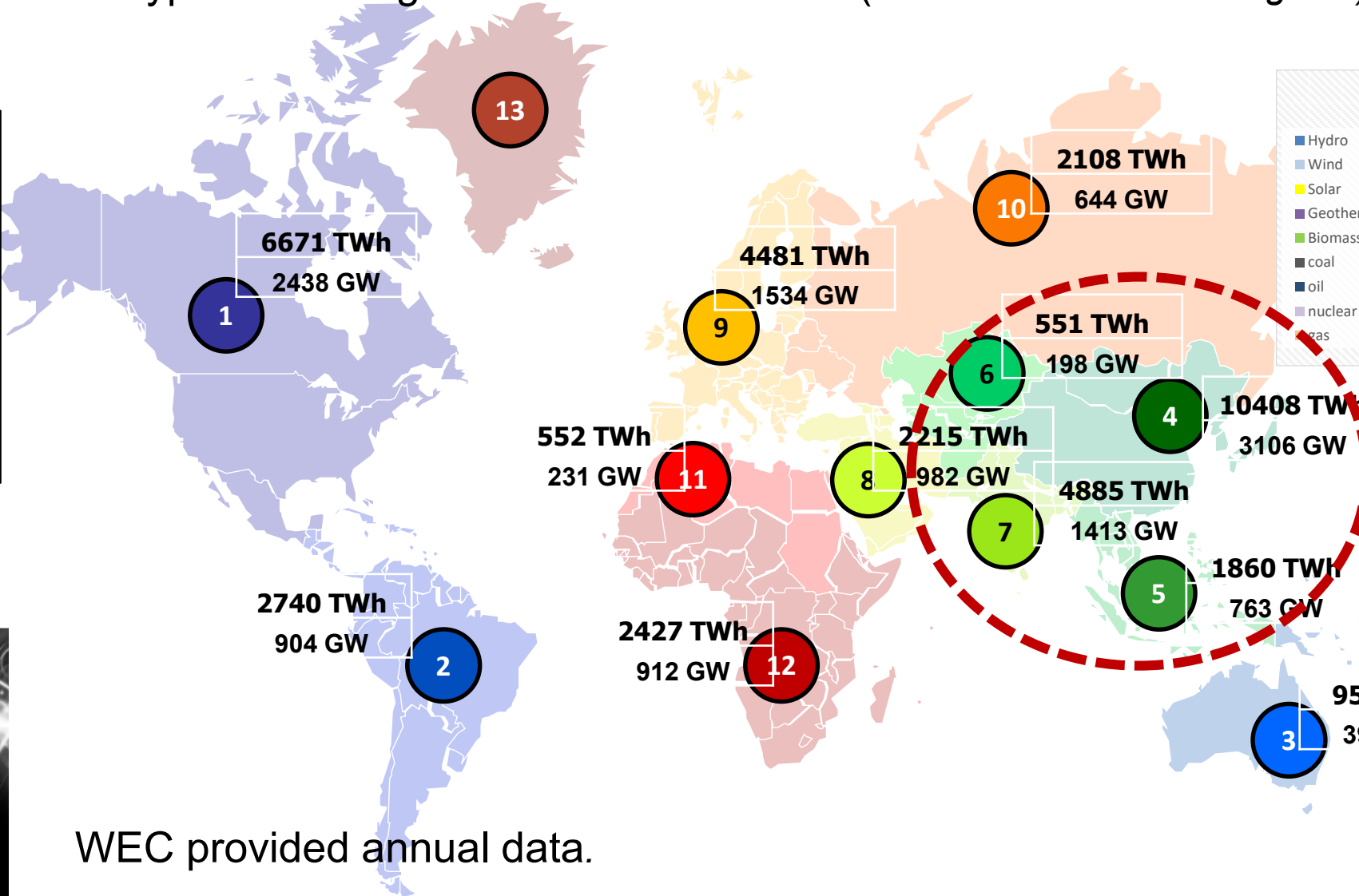
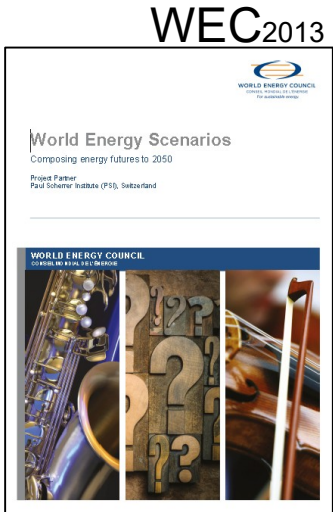
Which Global
Grid?
(CIGRE C1.35)



Input data for electricity generation: forecast by 2050

Sources: WEC hypothesis on generation and demand (C1.35 model with 13 regions).

2050
39850 TWh
13500 GW



44% demand

WEC provided annual data.





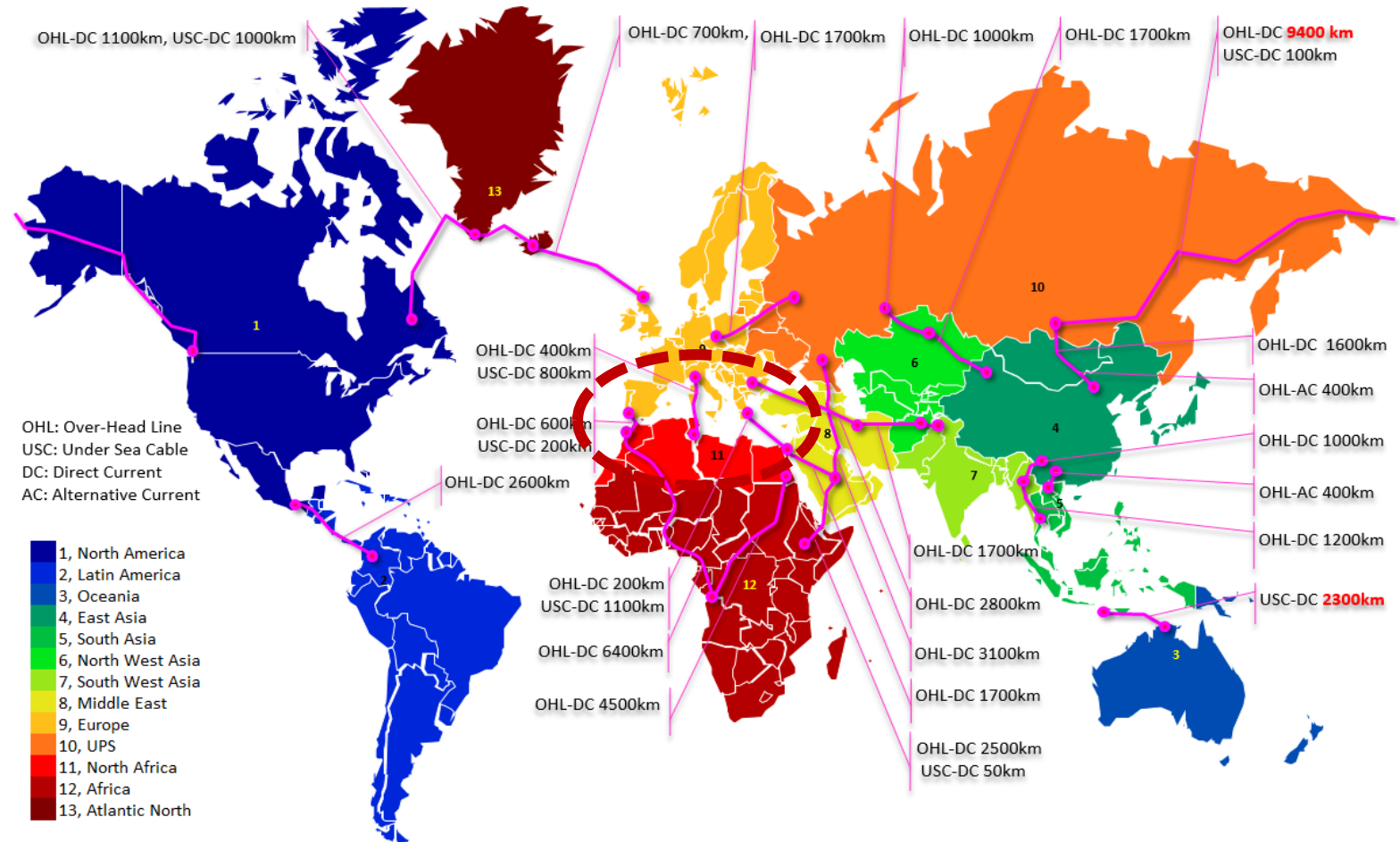
Interconnections selected by C1.35

- Modelling limited to “main Corridor” between neighbors of the 13 zones.
- Developed regions considered as copper plate → end points close to their border.
- Others need internal reinforcements → end points at main load center.
- Preferential paths based on

©GoogleEarth:

- USC never bellow 2000m depth
- OHL following channels of communication (road, track, rivers, valley,...) or easy access topography

Length by technology

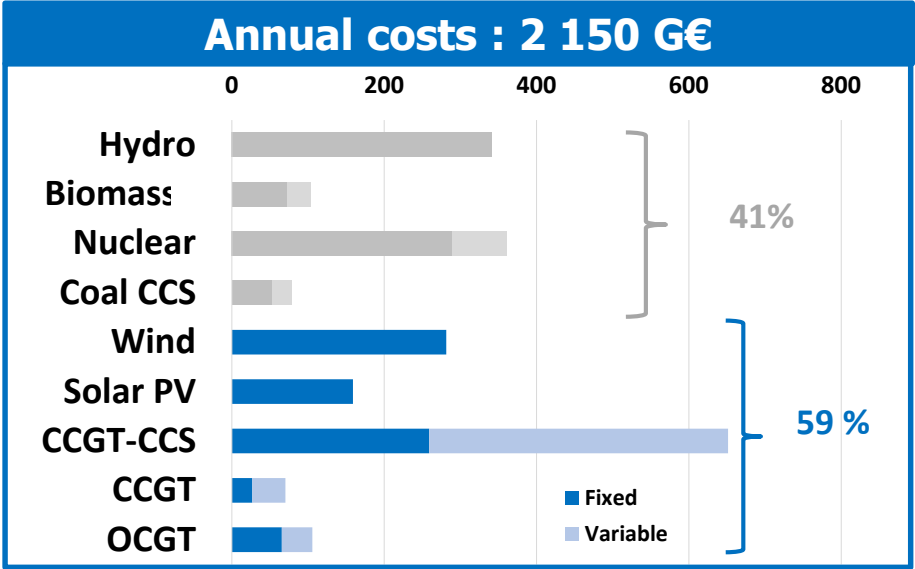
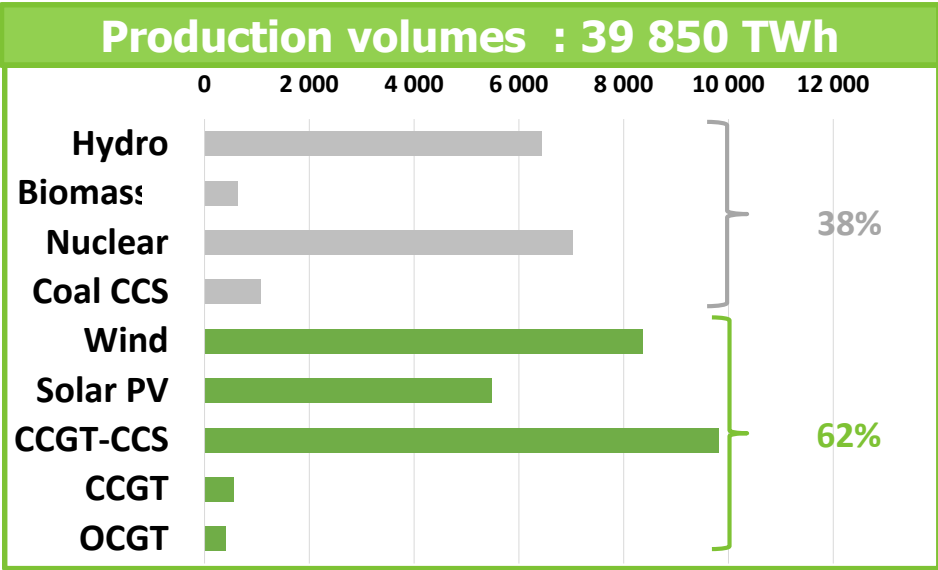
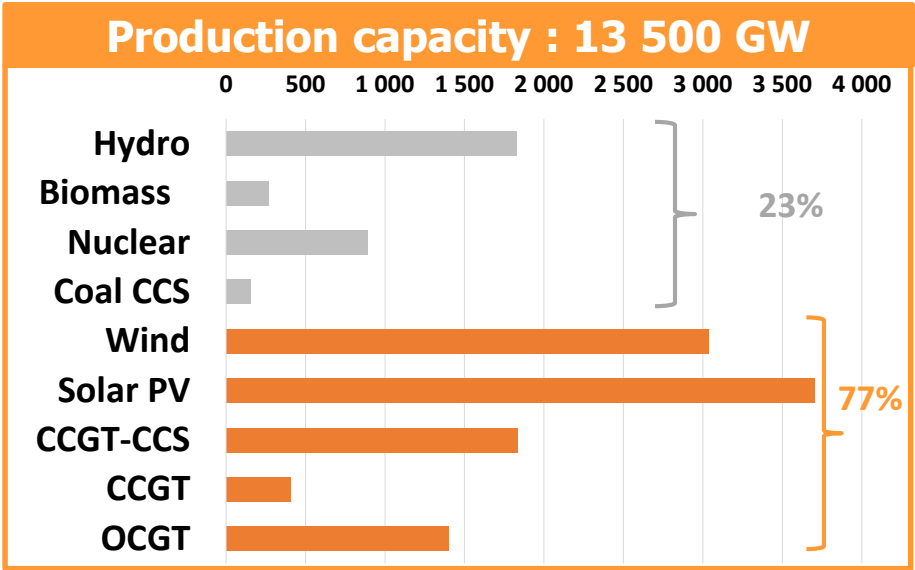


	DC OHL	DC USC	AC OHL	Total
km	85 801	15 100	1 600	102 501
%	83%	15%	2%	100%



Isolated zones

Interconnection : 0 GW / 0 G€

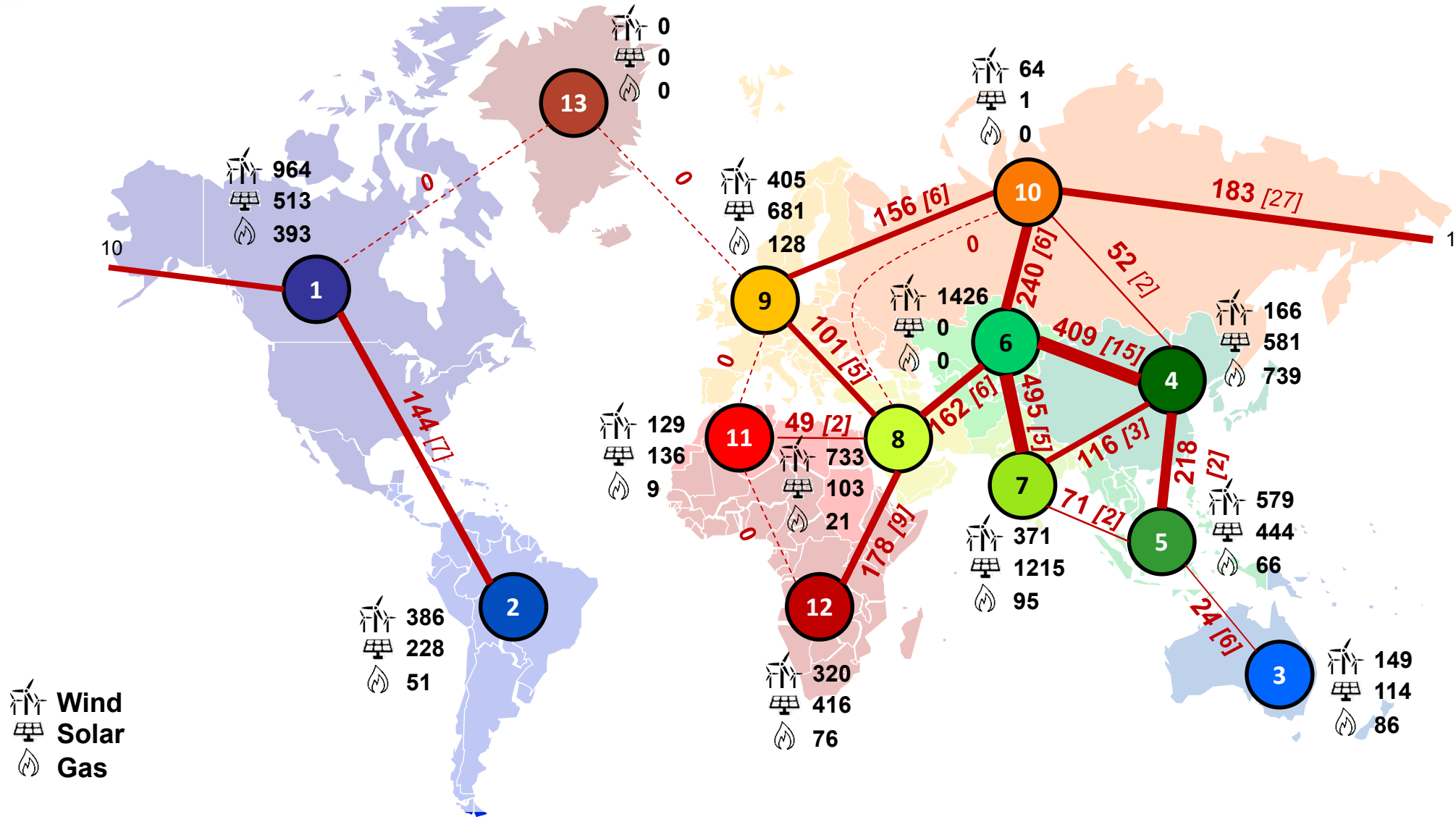


- Total cost = 54 €/MWh (70% fixed costs, 30% variable costs)
- RES share = 53%
- CO2 emissions = 850 Mt/yr



Reference case with interconnections

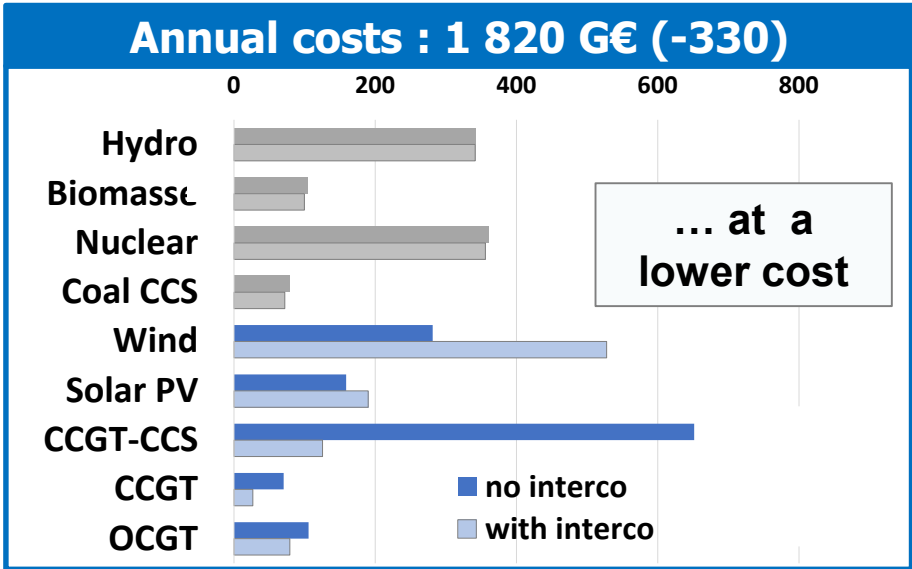
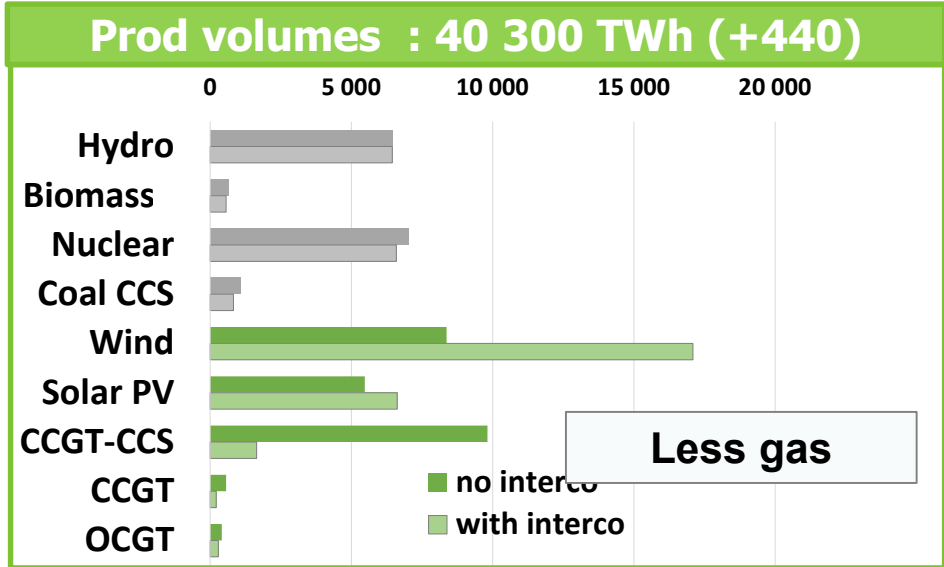
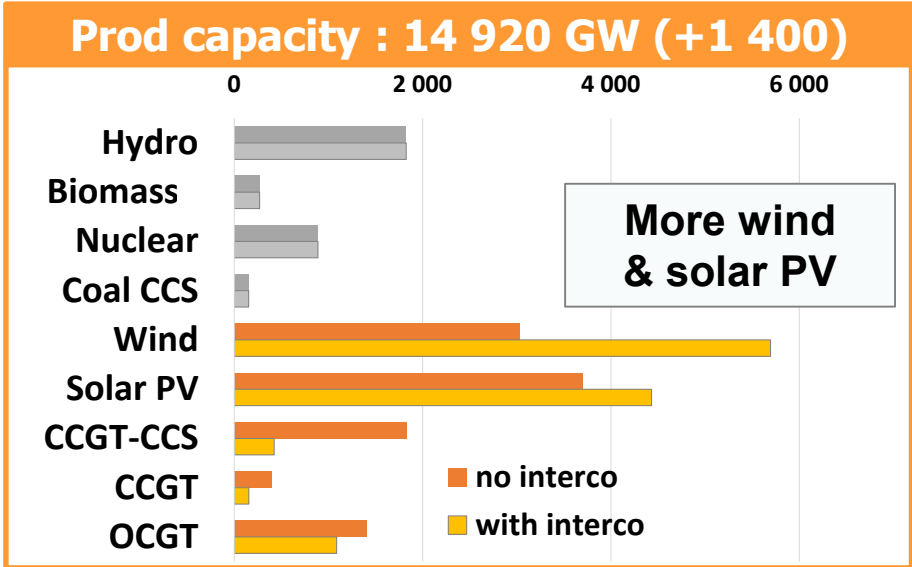
Installed capacities in GW and costs [G€/y] for interconnections





Reference case with interconnections

Overall Interconnections : 2 600 GW / 104 G€/yr

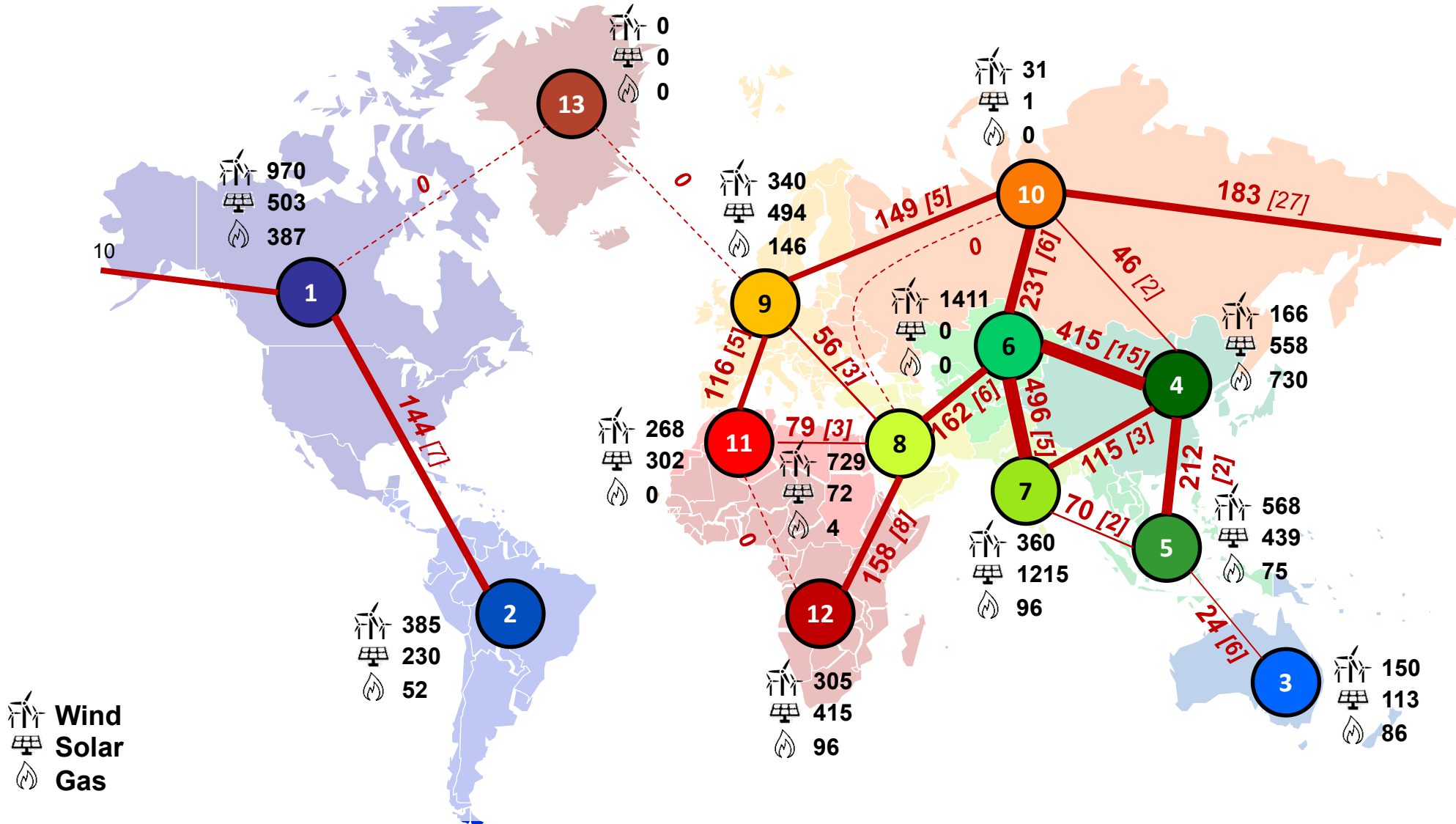


- Total cost = 48 €/MWh (-6 €/MWh)
- RES share = 76 % (+23 %)
- CO2 emissions = 343 Mt/yr (-510)



Lower interconnexion costs between Europe and N-Africa

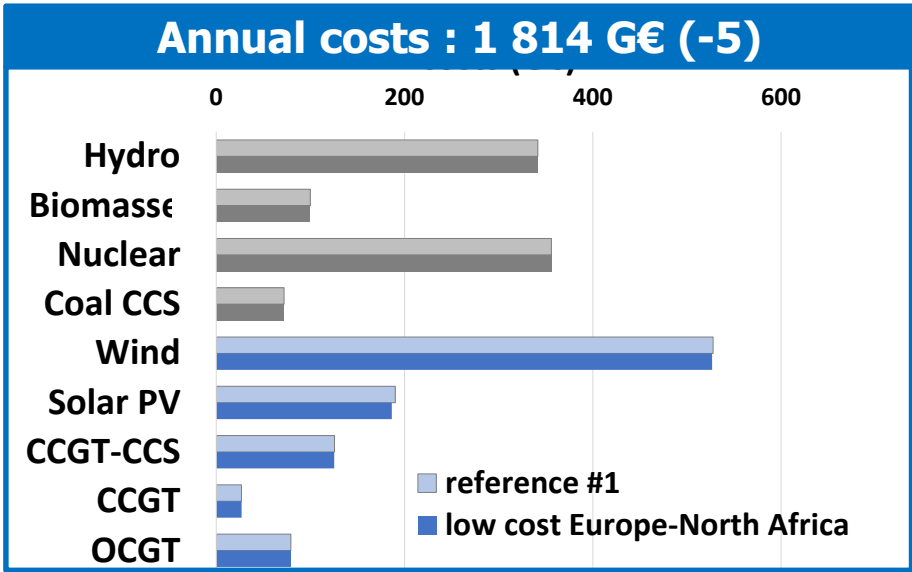
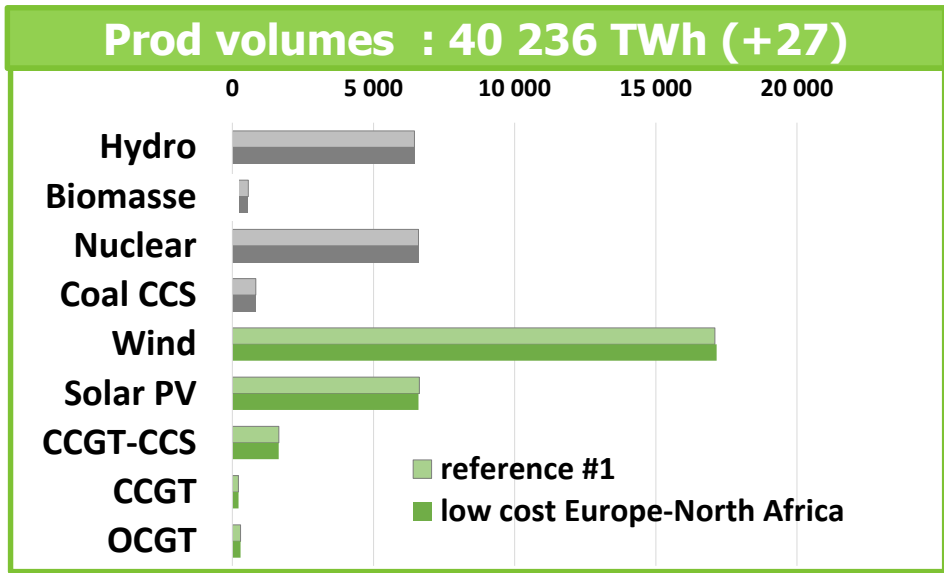
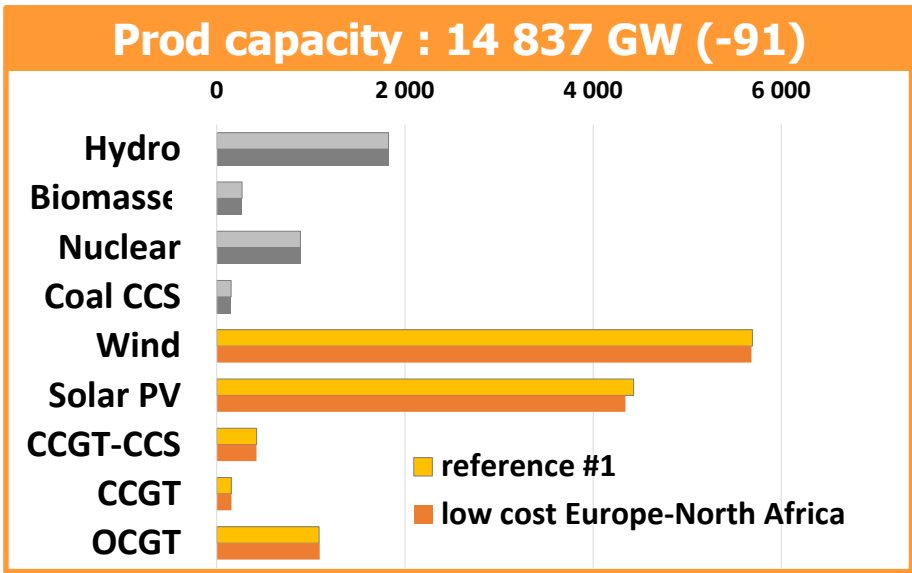
Installed capacities in GW and costs [G€/y] for interconnections





Lower interconnexion costs between Europe and North Africa

Overall Interconnections : 2 662 GW (+64) / 107 G€/yr (+3)

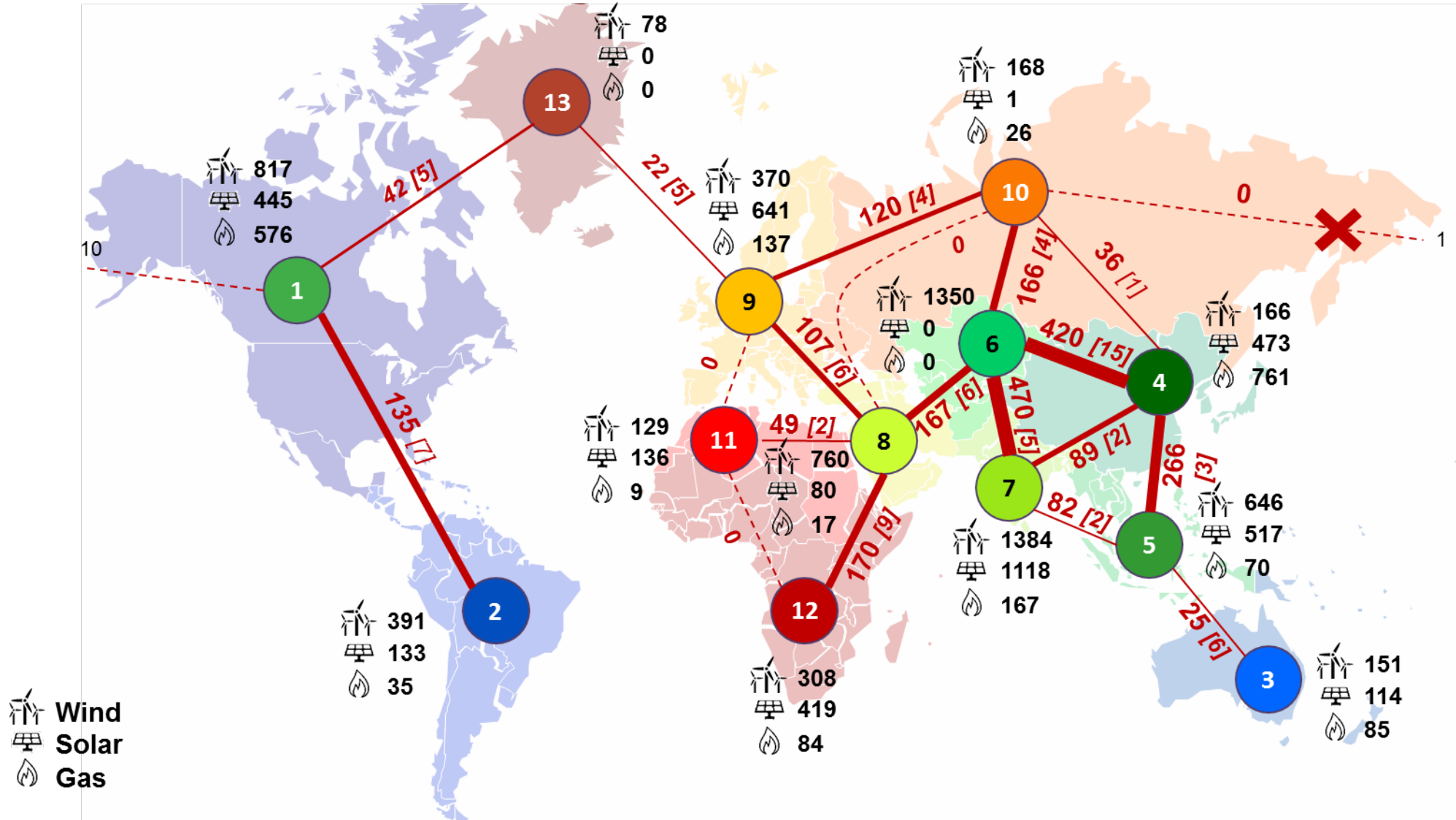


- Total cost = 48 €/MWh (+ 0 €/MWh)
- RES share = 76 % (+0 %)
- CO2 emissions = 342 Mt/yr (+0)



No interconnection between Russia and North America

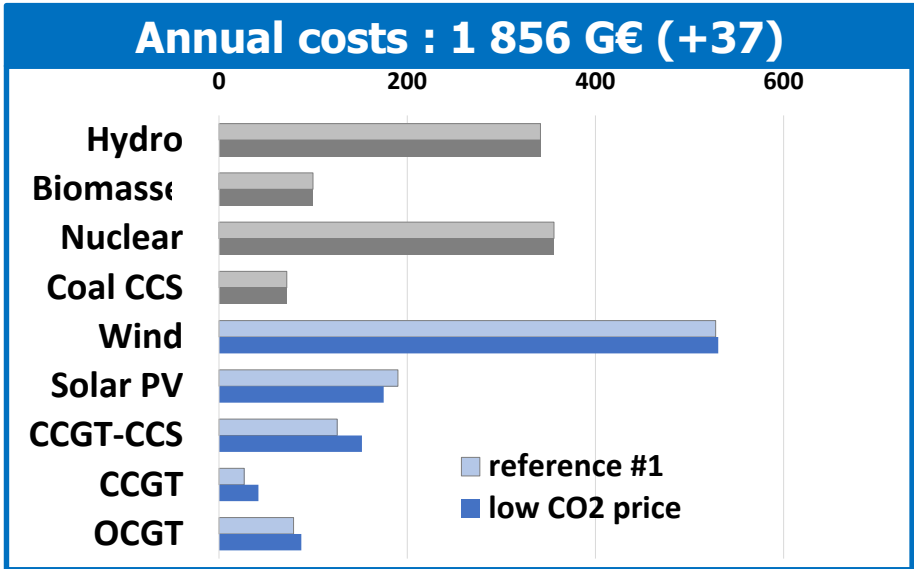
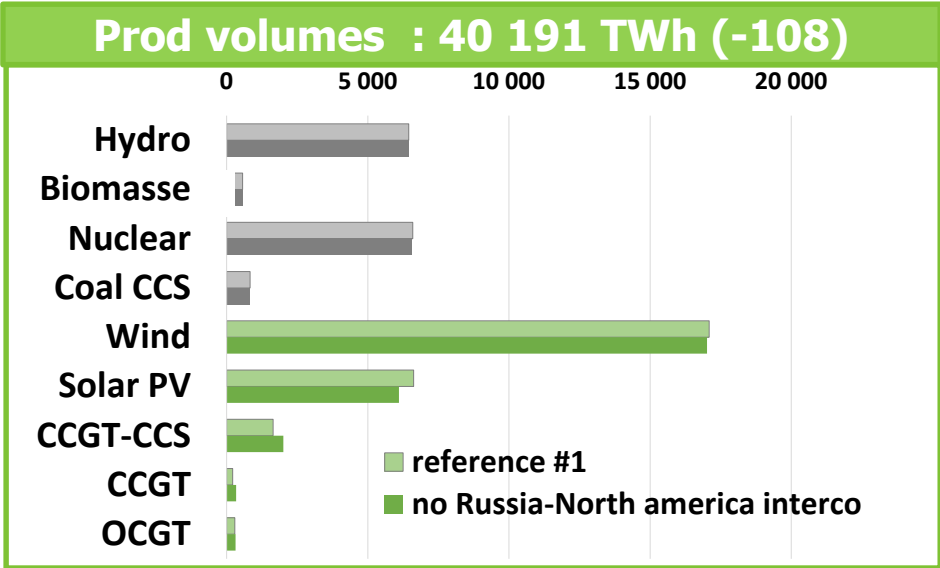
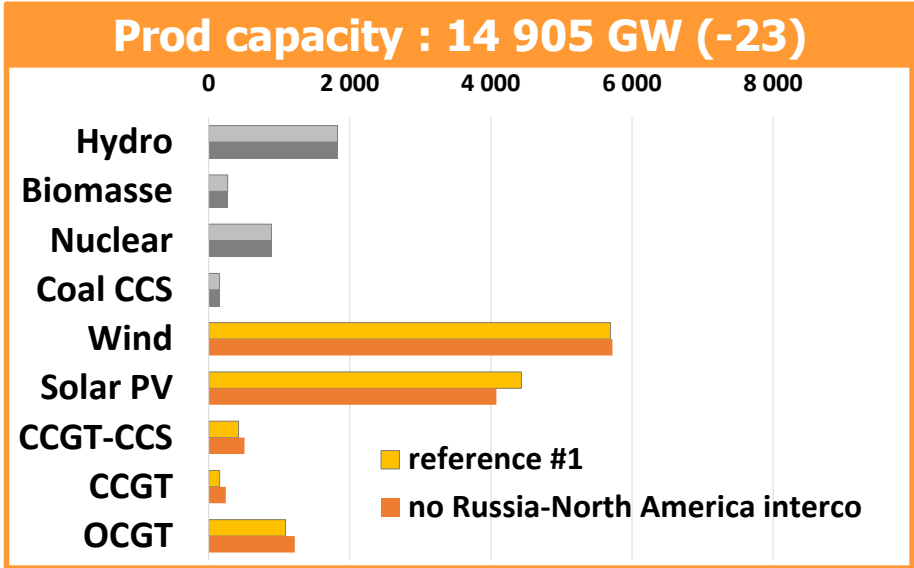
Installed capacities in GW and costs [G€/y] for interconnections





No interconnection between Russia and North America

Overall Interconnections : 2 367 GW (-231) / 83 G€/yr (-21)



- Total cost = 49 €/MWh (+ 0,5 €/MWh)
- RES share = 75 % (-1 %)
- CO2 emissions = 412 Mt/yr (+70)



Conclusion

- With this feasibility study, CIGRE has finalised the first known quantitative feasibility study for the concept of a global electricity network.
- Although with several and strong assumptions, it has provided a possible geographical and technical configuration and preconditions for its feasibility considering technology and economical aspects.

Possible follow-up

- Trade-off between alternative solutions (storage, demand-response, ...) and transmission.



- All details on the CIGRE C1.35 feasibility study, soon in the CIGRE Technical Brochure and in the CIGRE website.

Thank you for your attention.