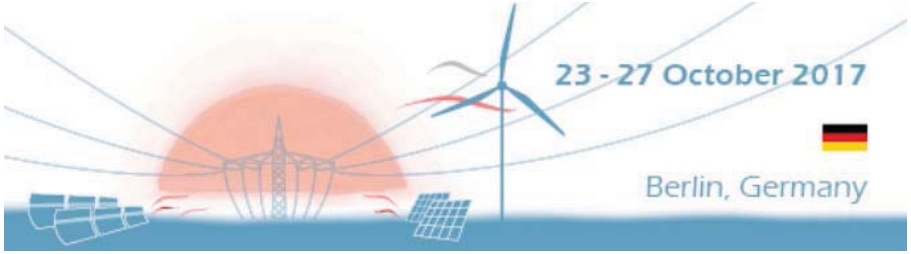


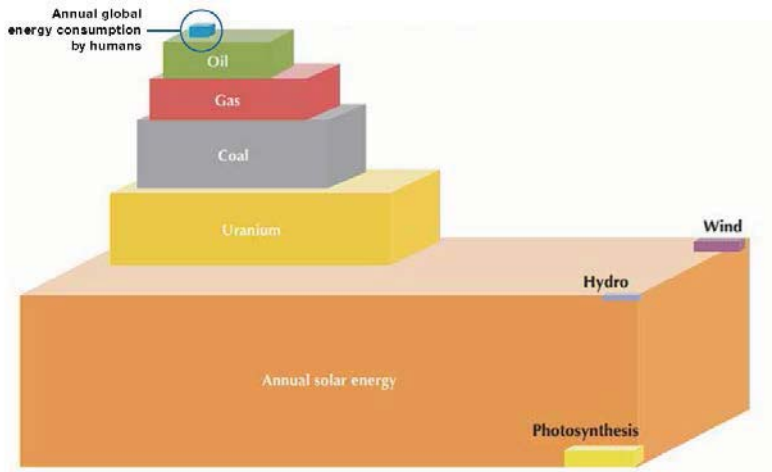
The Global Electricity Network CIGRE Feasibility study

Gérald Sanchis
Secretary of CIGRE C1.35

Berlin – 24 October 2017

Renewable Energy Sources in the World

2015
23950 TWh
5700 GW

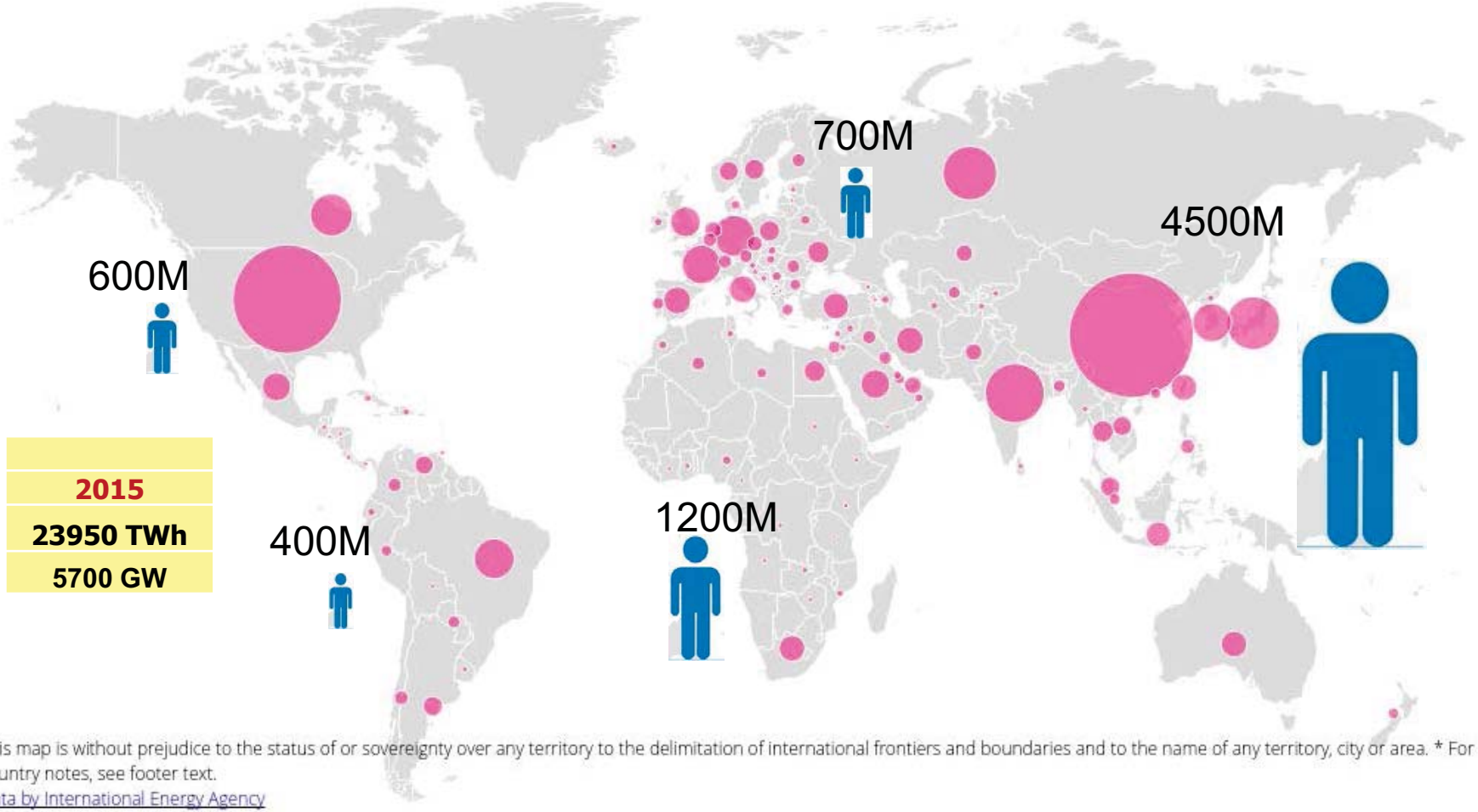


Arctic Circle Wind Energy	3000 TWh
Equatorial Solar Energy	9000 TWh
Concentrated Energy Bases in all Continents	500000 TWh
Distributed Energy Bases in all Continents	110000 TWh

* Source: Liu, Zhenya, 《Global Energy Interconnection》

Location of the demand

Total Electricity Generation (TWh) 2015

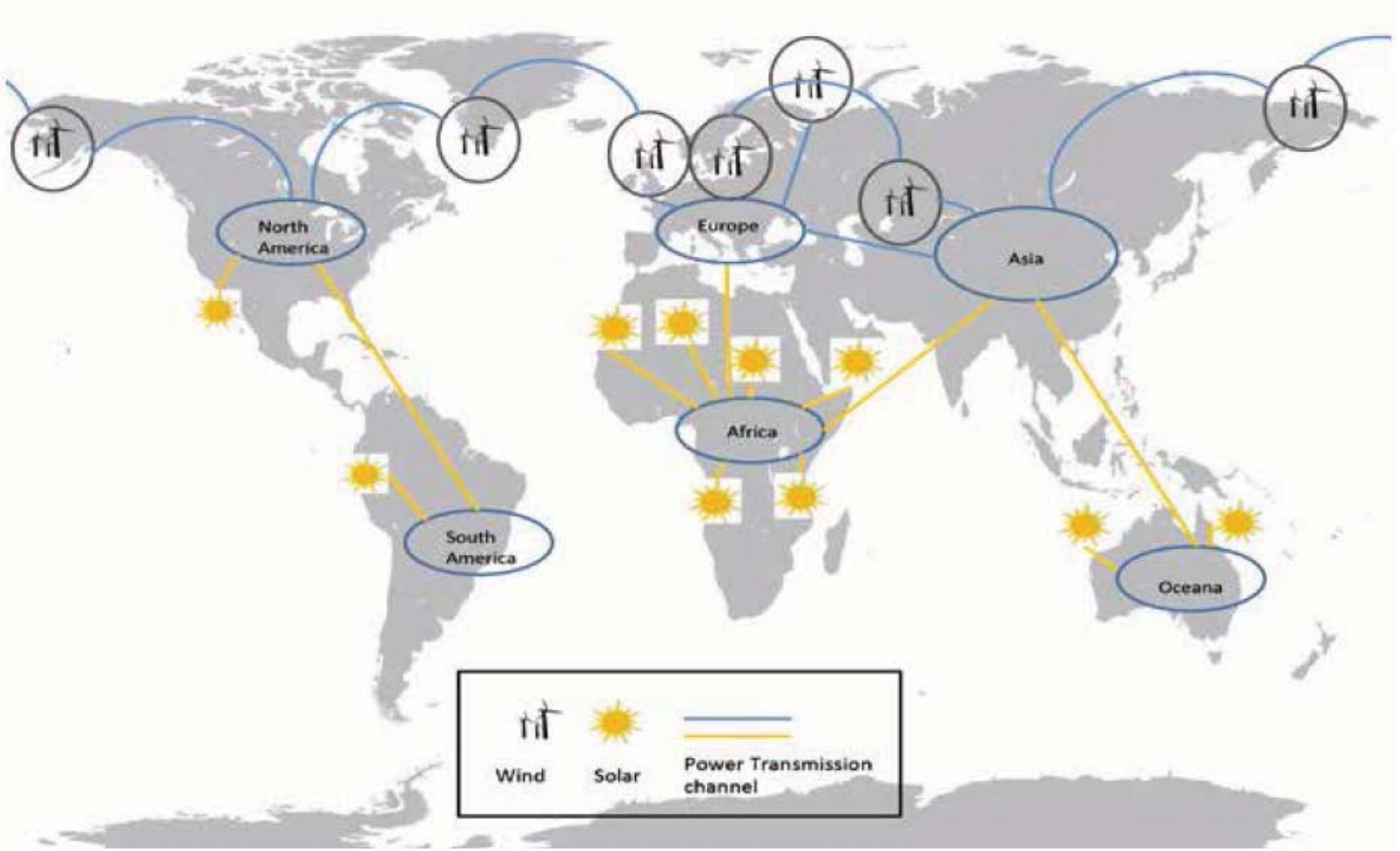


2015
23950 TWh
5700 GW

This map is without prejudice to the status of or sovereignty over any territory to the delimitation of international frontiers and boundaries and to the name of any territory, city or area. * For country notes, see footer text.

Data by International Energy Agency

Opportunity for interconnections ?



Opportunity for interconnections ?

- In 2016, CIGRE (International Council on Large Electric Systems) launched a WG to carry out the first known feasibility study by grid experts from countries of all continents, on the technical challenges, potential benefits, economic viability, fit with global energy policies and environmental impact for **the concept of a global electricity network.**

- The WG should adopt **one reference** long term **scenario** for consumption and supply volumes, which **shall be credible, prudent, consistent** with the global climate protection goals of 2 ton CO_2 equivalent emissions per person and per year.

- The WG C1.35 should use as much as possible available data from past international studies.

Why a global grid ?

- To take advantage of the diversity of **consumption** load patterns:
  - Due to the different time zones,
  - Due to the different seasons.

- To take advantage of the high potential **RES** basins in the world
  - Due to the location.
  - Due to the generation capacity of PV according to the time of the day.

- To decrease the reserve capacity in each region by pooling reserves across regions.

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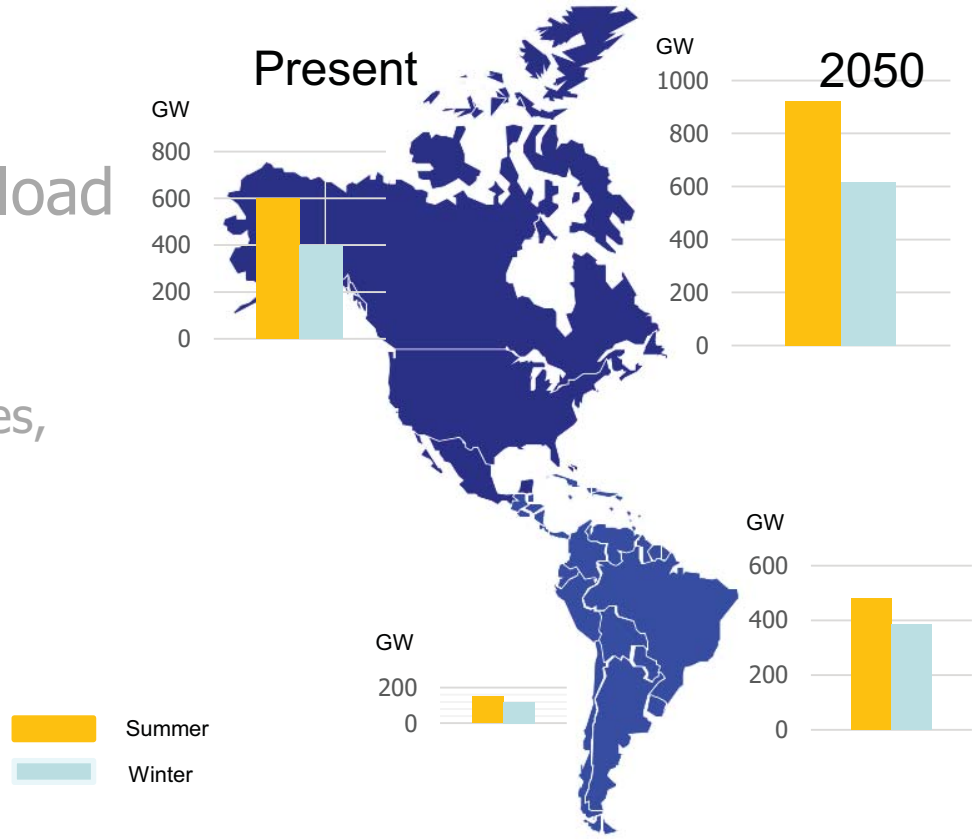
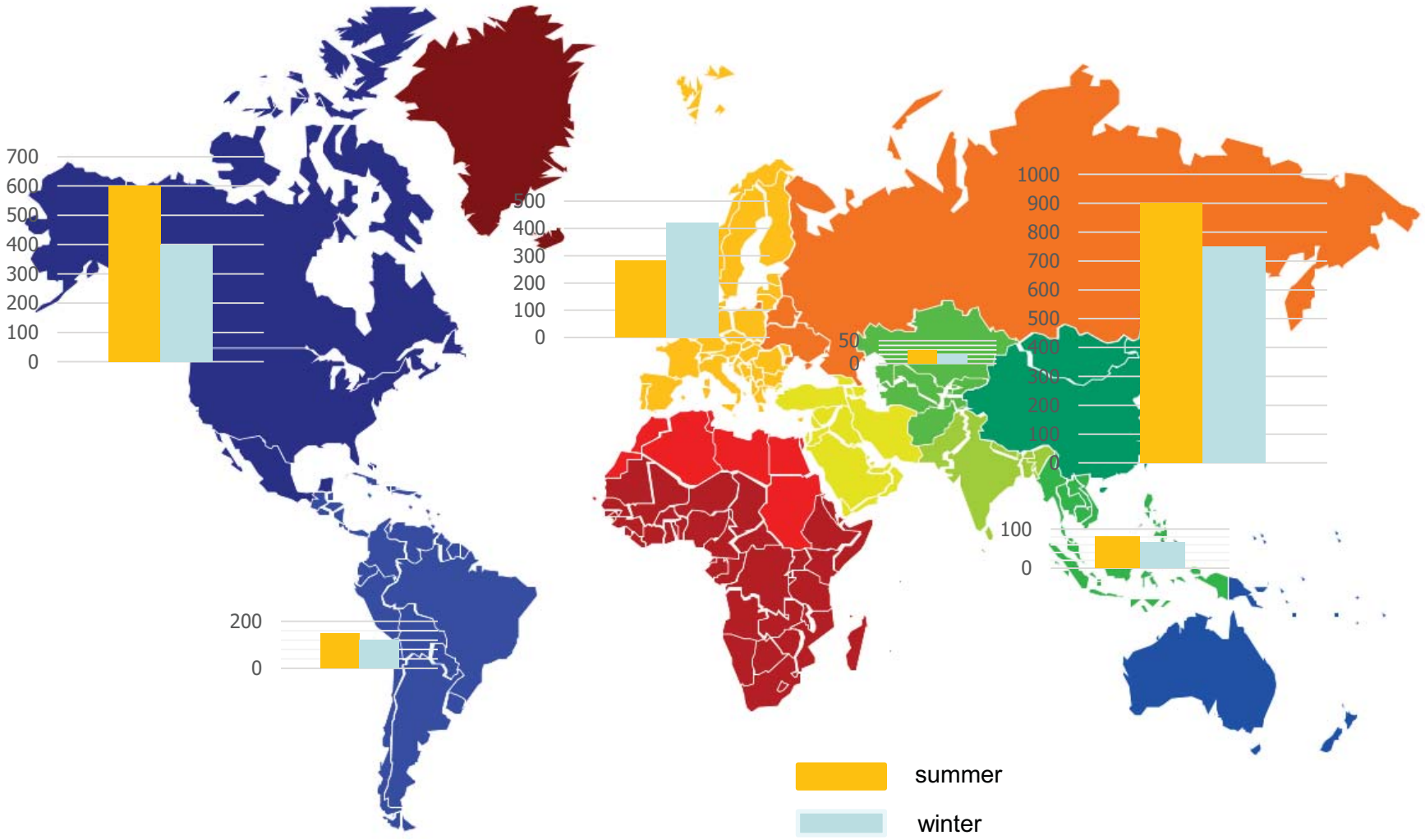
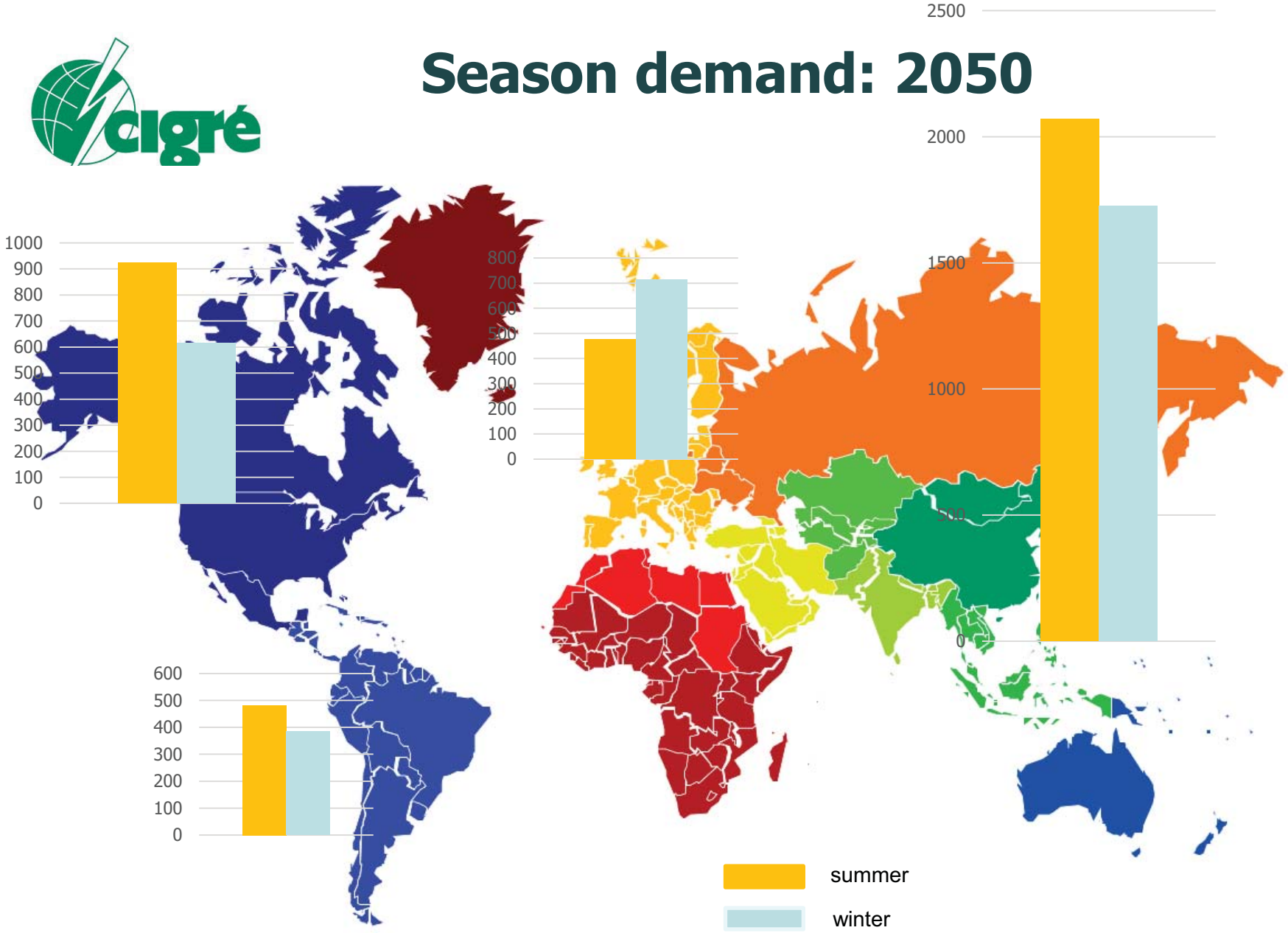


Season demand: now

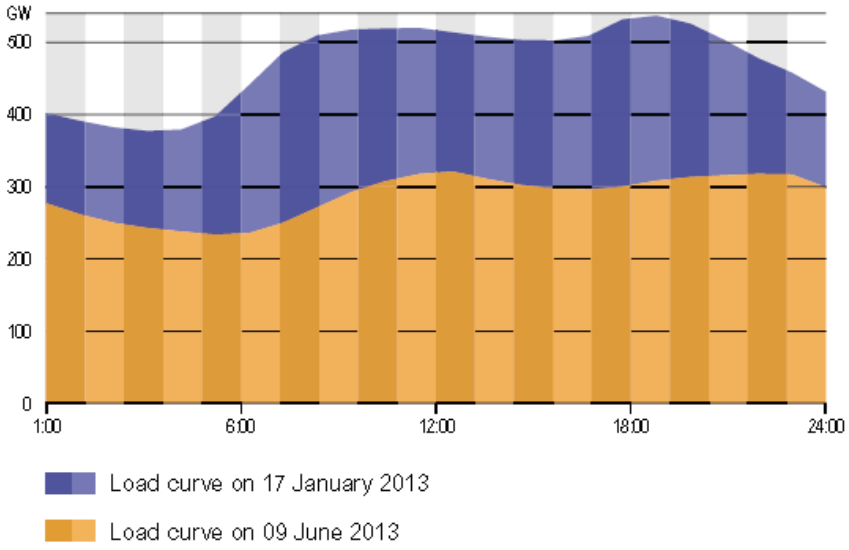


Season demand: 2050

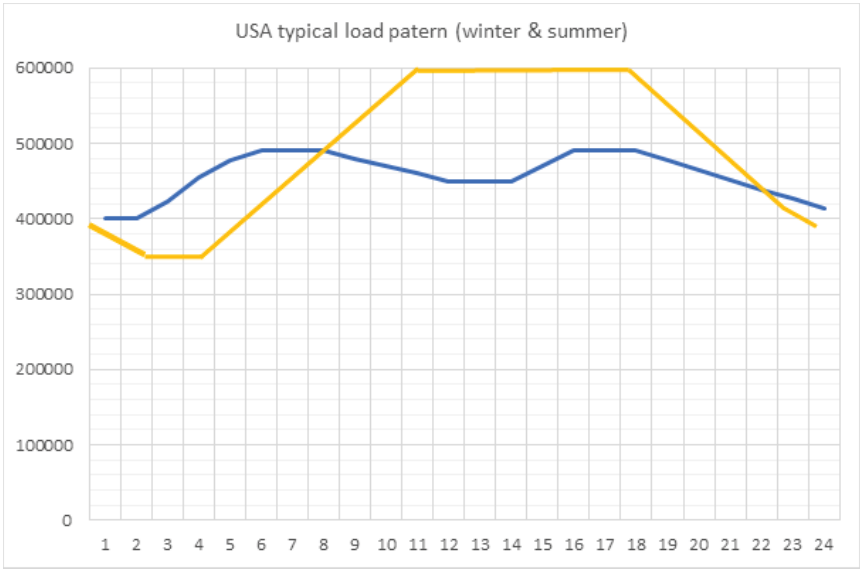


The demand variation with time zones

Europe

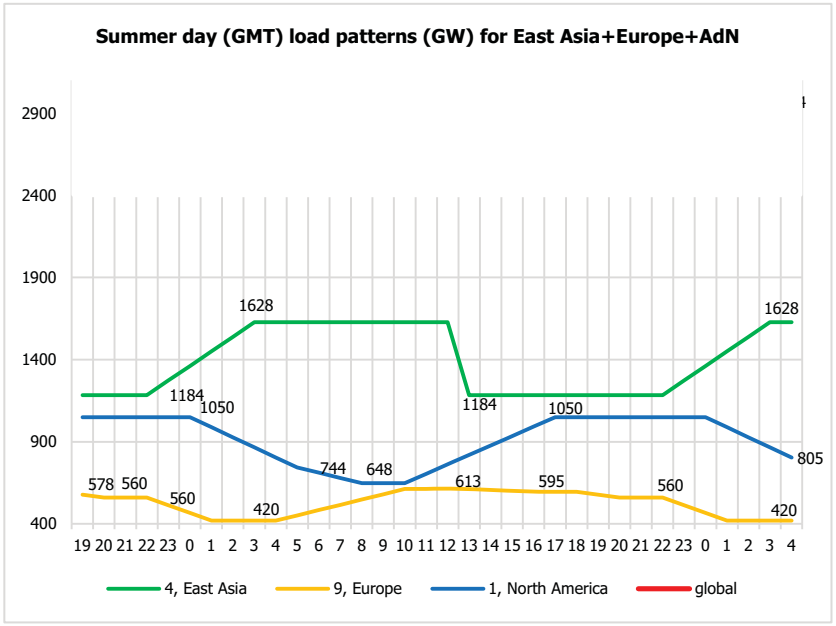


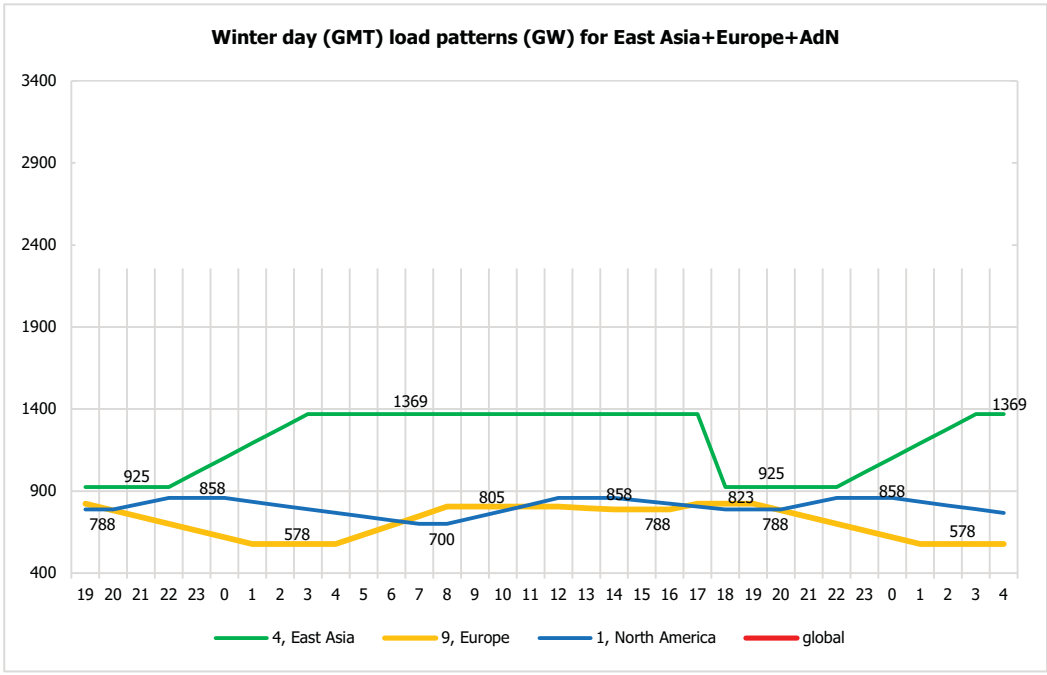
USA



Similar load patterns but with a time shift of 6-8 hours.

The demand variation with time zones





2050 load patterns in **Europe**, **North America**, **East Asia and the addition.**

Why a global grid ?

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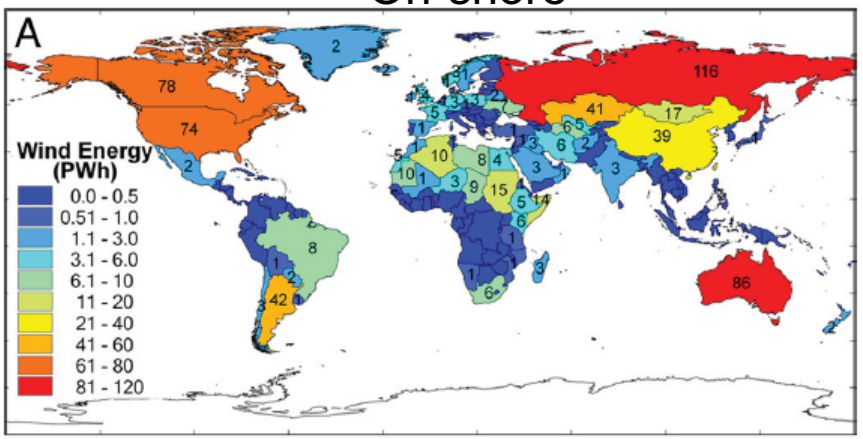
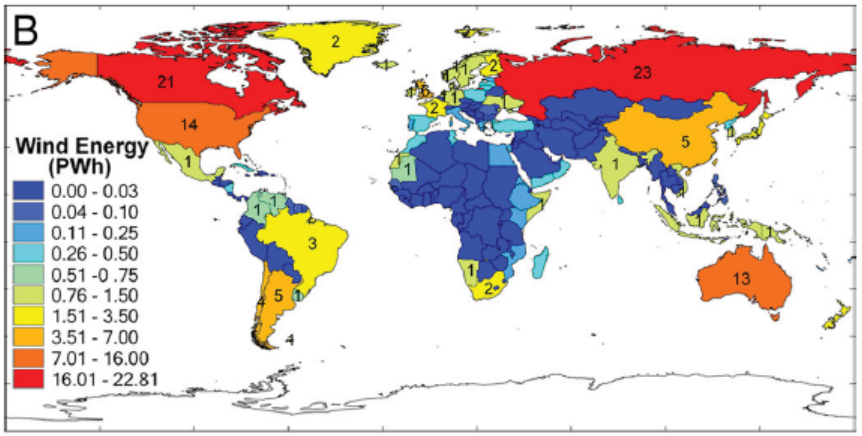
Wind potential worldwide

On-shore



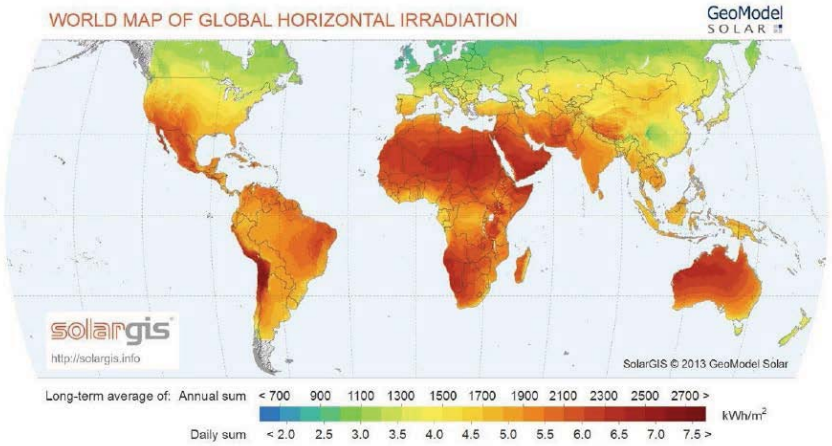
Off-shore



Annual potential per country.

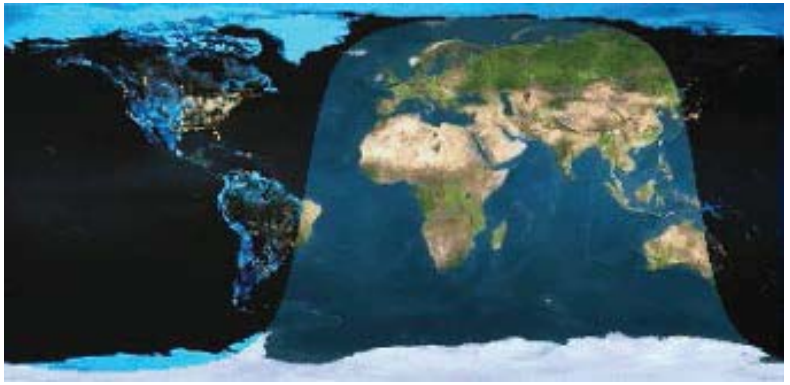
Solar potential worldwide

- Annual potential



Source: SolarGIS

- Daily effect



Tasks of the WG CIGRE C1.35

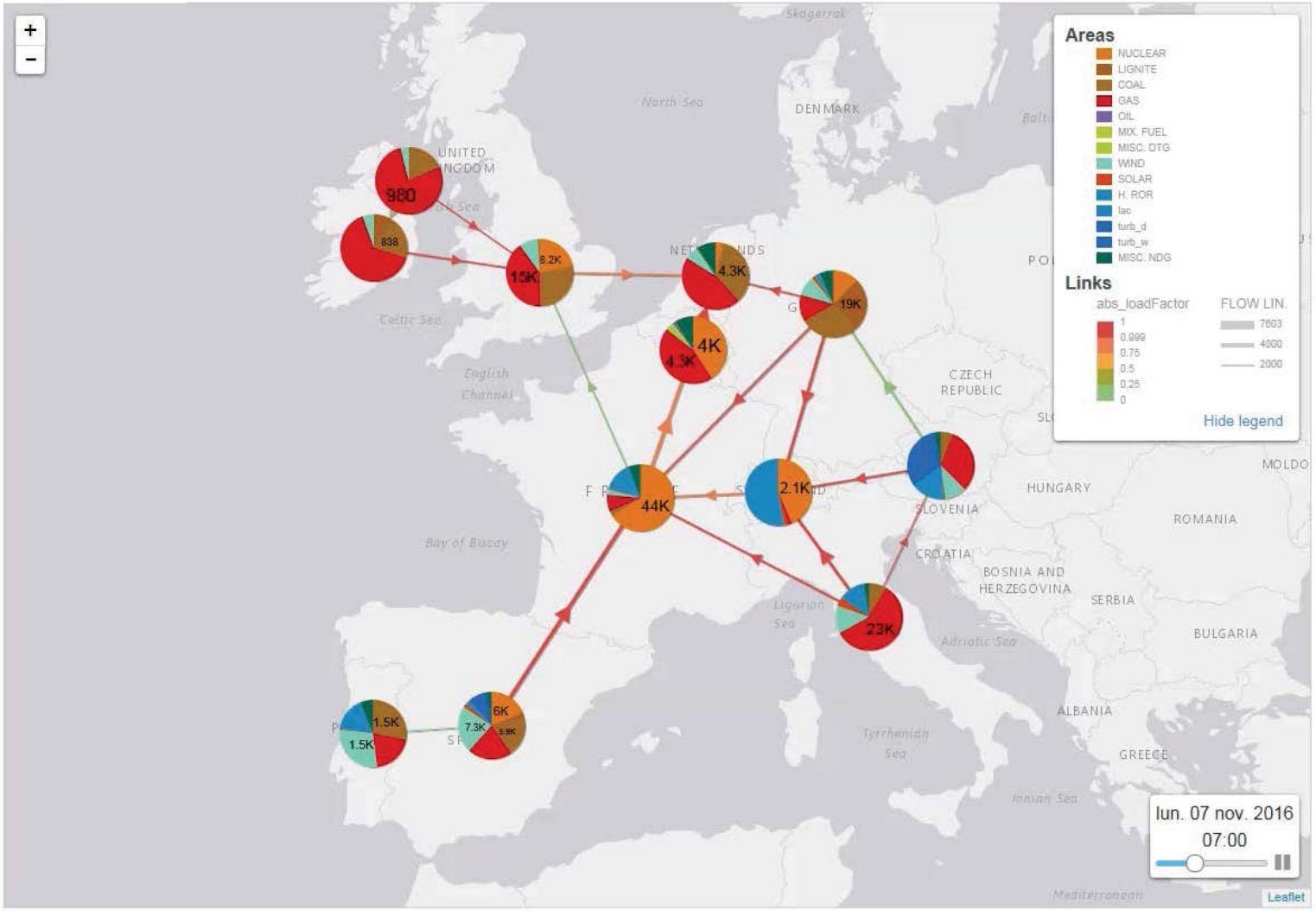
- Data gathering and adjustment of input data
  - Hypothesis: by 2050, adequacy of each zone/continent (no needs for interconnections)
  - Use of energy data coming from WEC study (World Energy scenarios 2050).
    - Ajustment necessary for adequacy.

- Load flow simulation with investment loop
  - The feasibility study should demonstrate an increase of the net social welfare from the interconnectors, by replacement of generation capacities.

- List of profitable interconnections between zones/continents.

Tasks of the WG CIGRE C1.35

example of simulation in Europe (Antares tool)



Regions used by CIGRE C1.35

➔ **Achievement by end of 2018.**