Bridging the gap:

role and perspective of the Italian corridor

Dii 2nd DESERT ENERGY CONFERENCE

Panel on long distance transmission solutions

Cairo, November 2nd , 2011

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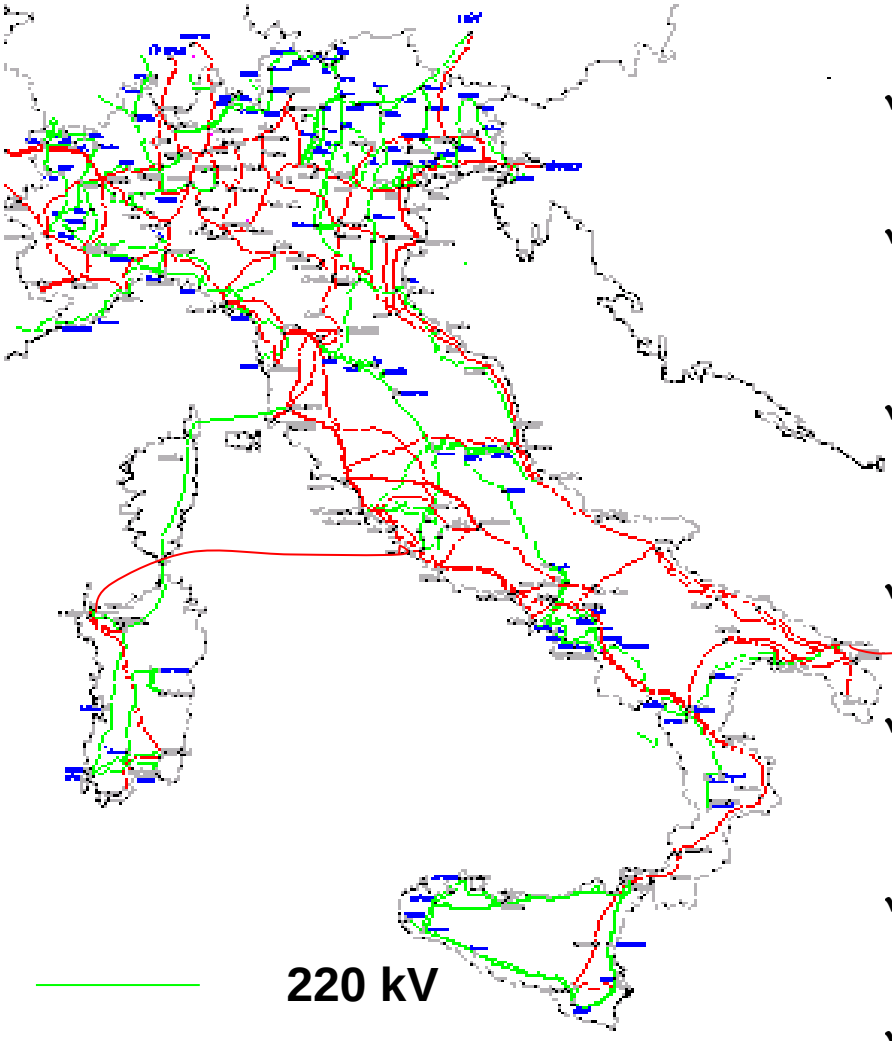
Terna (Italy)

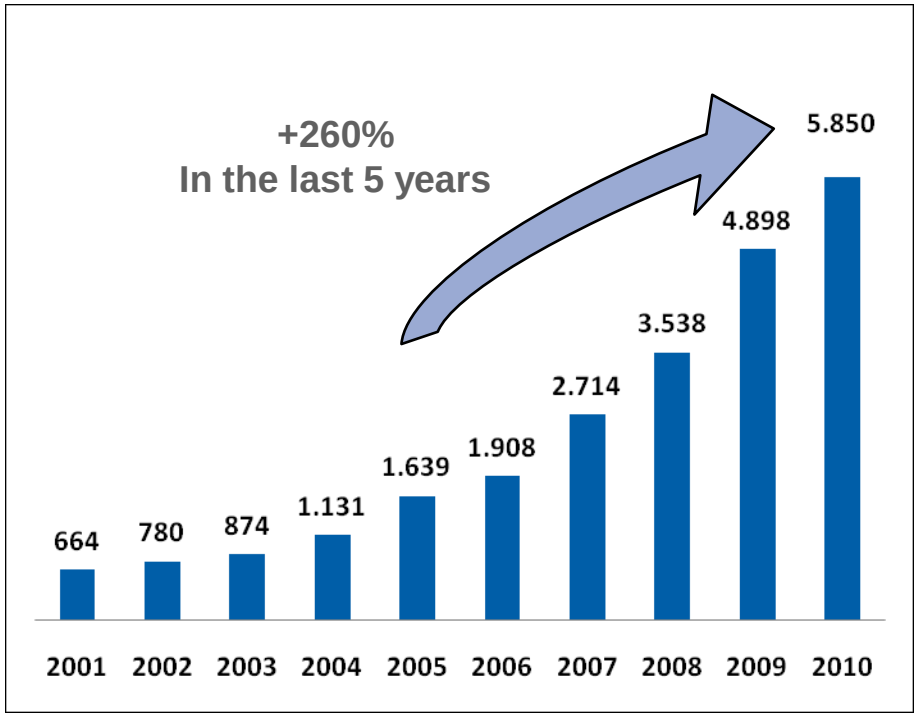
Terna and the Italian Transmission System



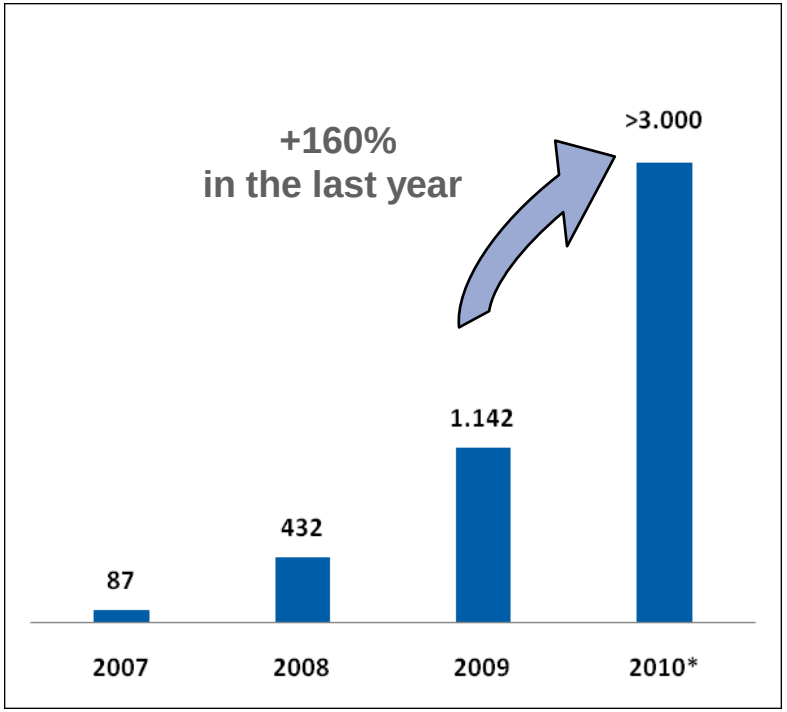
- ✓1st independent TSO operator in Europe and 7th in the world
- ✓Primary owner of the National High Voltage Electricity Transmission Grid
- ✓Terna is responsible for grid planning, development and maintenance as well as for energy transmission and dispatching
- ✓Over 62.500 km of EHV and HV lines *1.122 km underground cables, 917 km subsea cables, 11.261 km operated to 380 kV*
- ✓Over 390 transforming and switching stations, with t*ransforming capacity 122 GVA*
- ✓n.18 interconnection lines in operation *with France (4), Switzerland (9), Austria(1), Slovenia (2), Greece (1), Corsica (1)*
- ✓326 TWh the 2010 energy demand (+1,8% vs 2009)
- ✓56.425 MW the 2010 peak power demand

Italian Transmission Network Development
Wind and Photovoltaic installed capacity

Wind (MW)

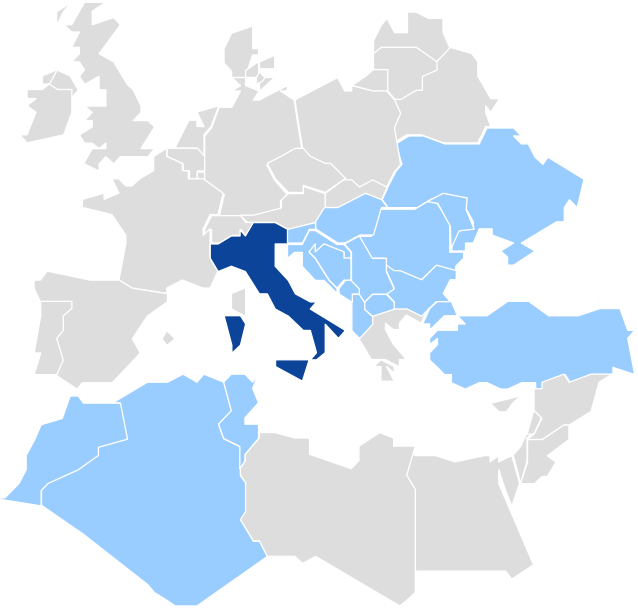


Photovoltaic (MW)



Double challenge in Southern Italy:
renewable boom and grid weaknesses

International development



Eastern Europe (EE)

Market Fundamentals:

- Surplus of energy from cheap and green sources available in the medium long term
- High differential of electricity prices

Opportunities:

- Development of Transmission "Corridors" in EE
- Participation in projects of EE transmission grid expansion (EPC/BOOT) via Consortiums
- Opportunities from privatization processes
- Technical assistanceto TSO / Regulators / Governments on market and transmission issues

Northern Africa

Market Fundamentals:

- Surplus of primary energy (oil & gas)
- Very high solar potential
- Proximity for transport, also thanks to technological developments in submarine links
- High differential of electricity prices

Opportunities:

- Italy as "electric hub" in the Mediterranean basin
- Leverage on TERNA mangerial experience and technical "know how" to develop projects with l TSOs and other stakeholders

CROSS BORDER CAPACITY (NTC):

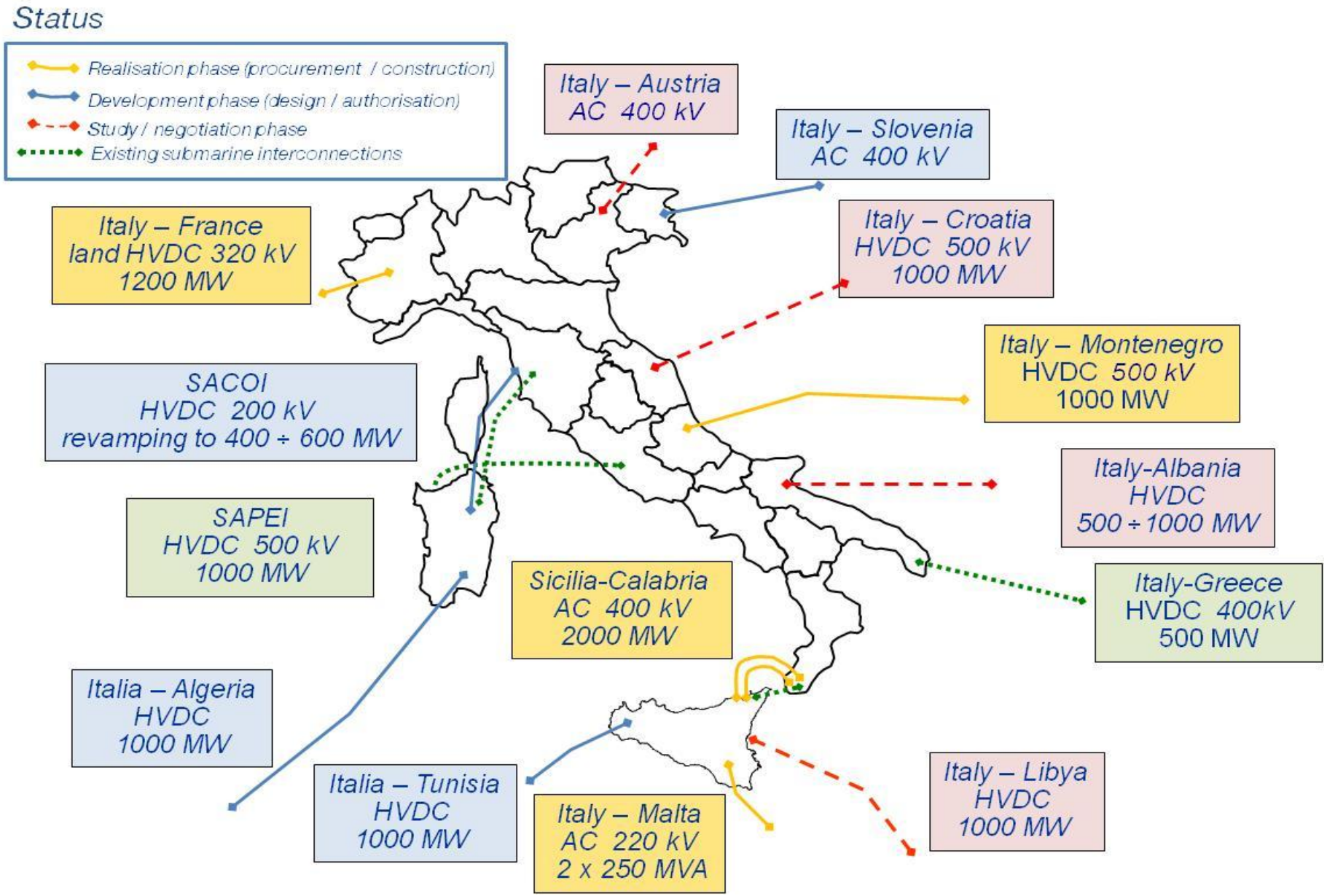
- **7.540 MW NORTH BORDER**
  - **by French (4 tie-lines)**
  - **by Switzerland (9 tie-lines)**
  - **by Austria (1 tie-lines)**
  - **by Slovenia (2 tie-lines)**
- **500 MW GREECE**

DEVELOPMENTS:

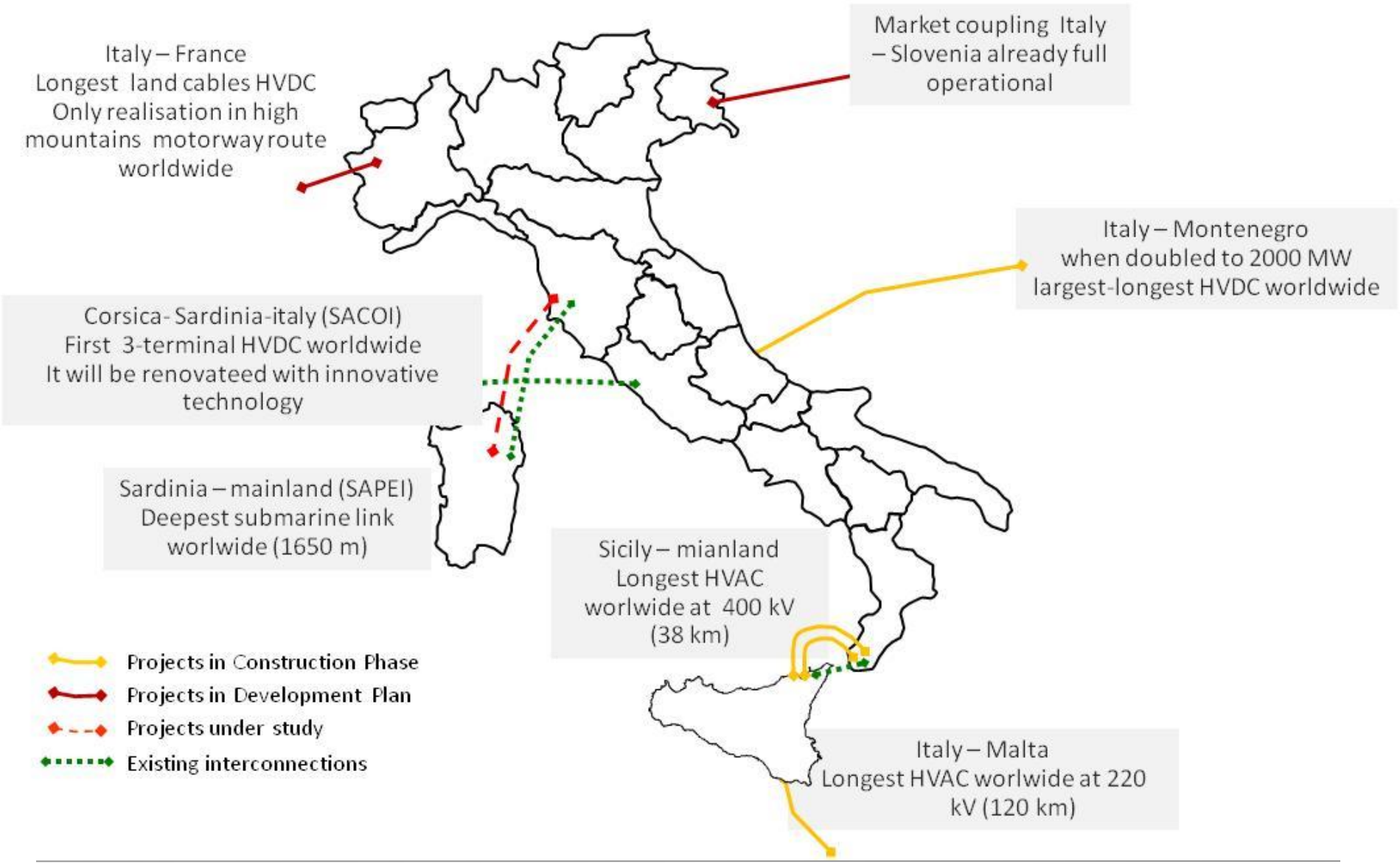
+3.000/5.000 MW ON NORTH

+1.500/4.000 MW ON BALCANS AND NORTH AFRICA

Interconnections

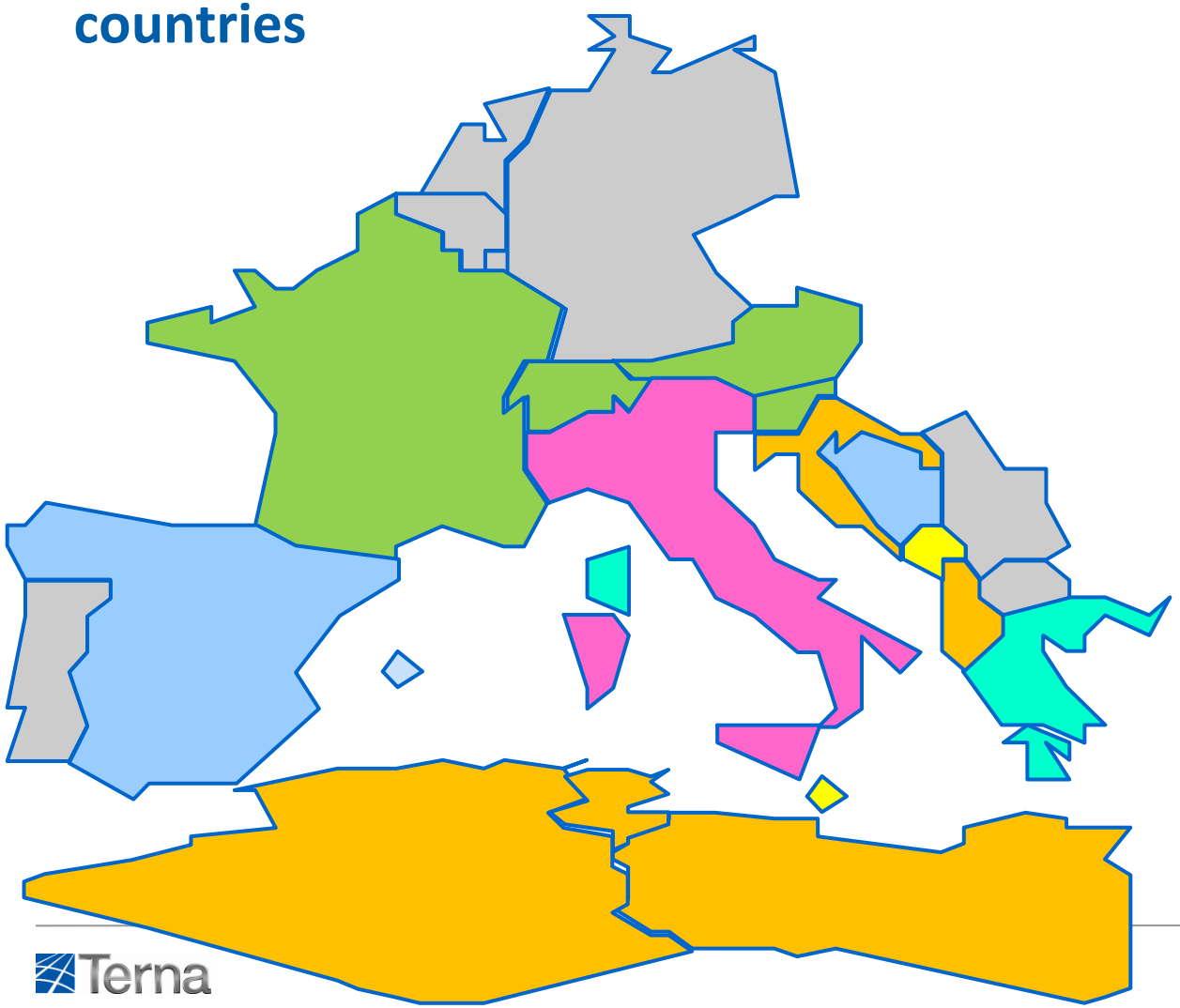


Several projects under realisation are record-breaking



Italy as a Euro-Mediterranean hub

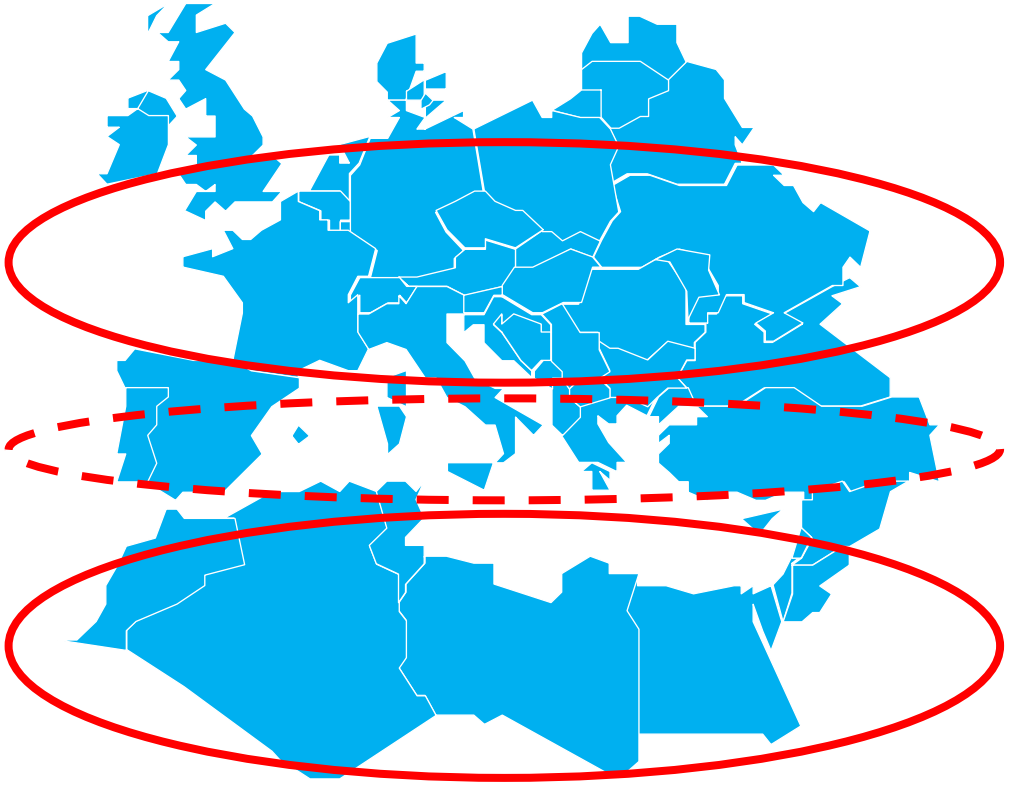
- ✓ until year 2000 → only 4 land borders
- ✓ now → studies and projects for electric borders with up to 15 countries



N.	COUNTRY
1	FRANCE
2	SWITZERLAND
3	AUSTRIA
4	SLOVENIA
5	GREECE
6	CORSICA
7	MALTA
8	MONTENEGRO
9	ALBANIA
10	CROATIA
11	TUNISIA
12	LYBIA
13	ALGERIA
14	SPAIN
15	BOSNIA-HERZEGOVINA

➢Transmission is for Dii a key success factor, as well as:

- ✓ generation cost-competitiveness
- ✓ off-take agreements at pre-defined prices under a decarbonised European electric system



Transmission path entails:

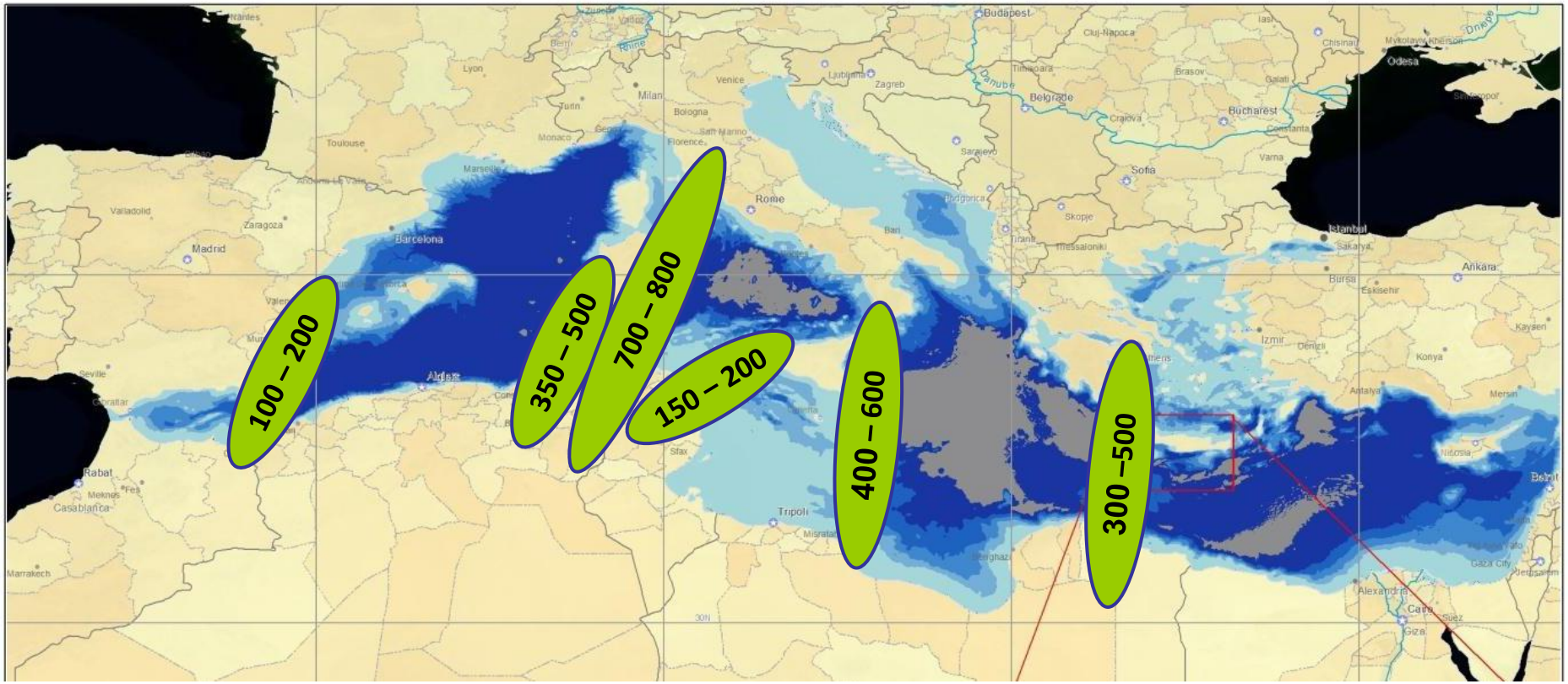
1) connection to European grid + reinforcements
2) crossing of Mediterranean sea through undersea cables
3) connection of power plants to local grid + extension

Main challenges for trasmission

N.	Portion of path	Technical challenges	Operational challenges
3	Connection of new power plants	Weakness or lack of grid near new plants	Deep impact on national grid planning and operation
2	Sea crossing	Sea depth and in some cases length	Reliability of undersea equipment limits size of links
1	Insertion into European grid	Bulk injection requires strong terminal nodes and internal reinforcements	Re-design (in some cases inversion) of traditional flows of national grids

Distances

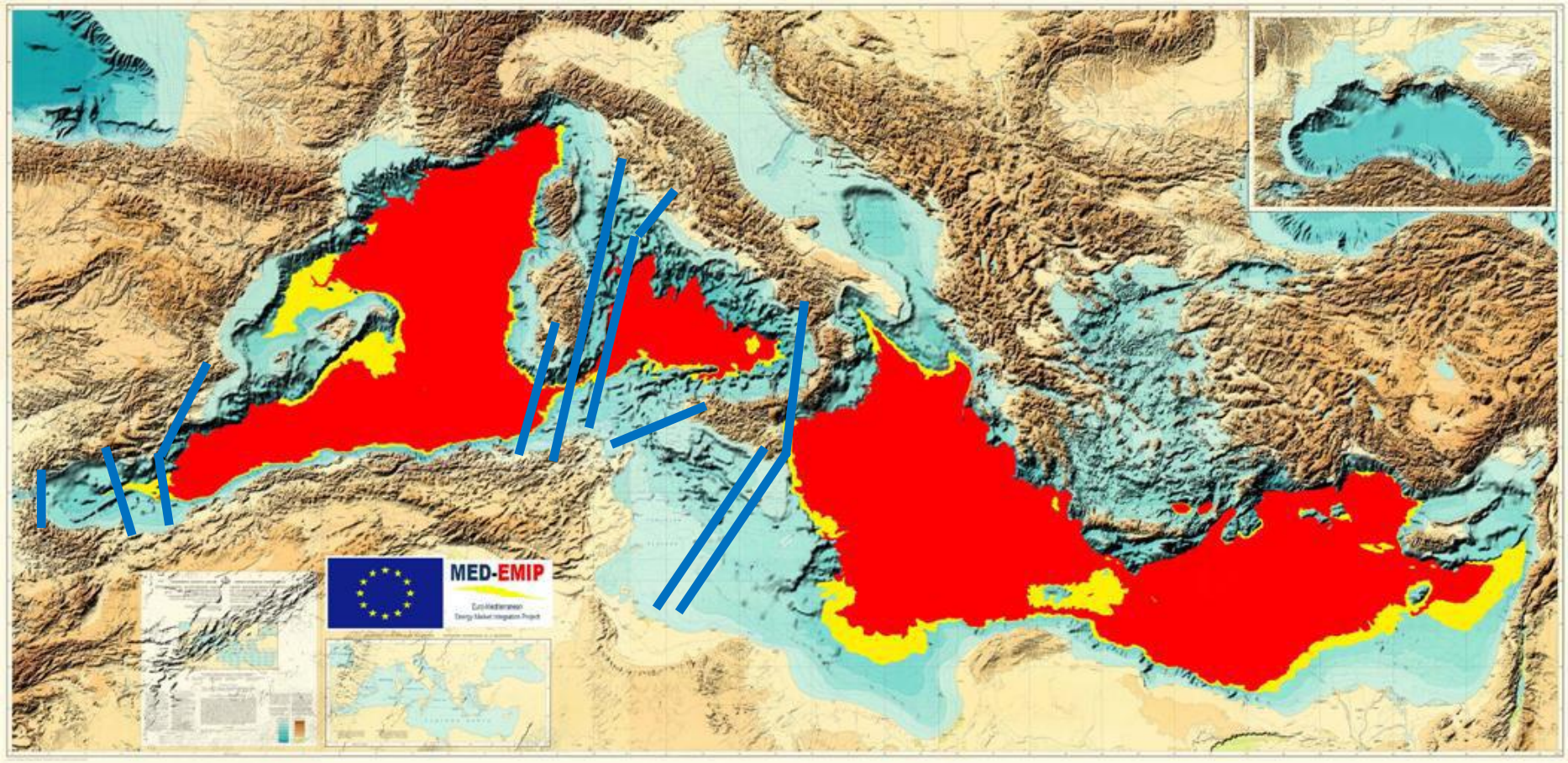
✓ **Except from Gibraltar area, distances to be covered are in the range between 100 and 800 km**



Sea crossing

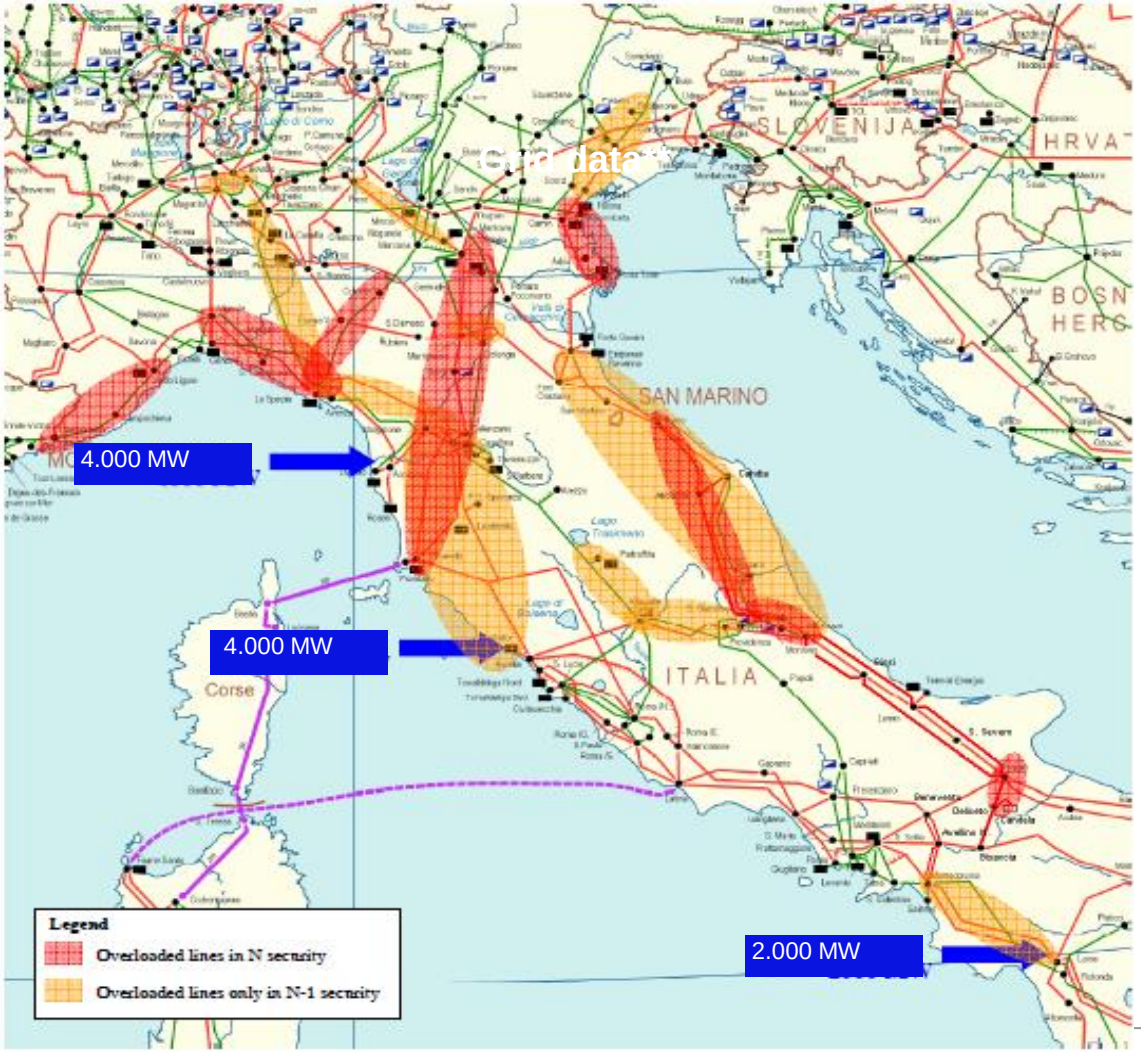
- ✓ Mediterranean deep waters and sea bed characteristics are challenging
- ✓ Feasible paths hypothesis, limited by deep waters and receiving terminals' constraints

Red parts > 2000m beyond present technical limit
In Dii WG we are considering 3000 m reached by 2030



Italian corridor

✓Import of 10 GW of desert power would require ca 1.000 km of grid reinforcements



- **Import of 10 GW of desert power feasible, if submarine links are extended to appropriate nodes in central and northern Italy and reinforcements are included timely in grid development plan for 2030**
- **Reduction of import in central Italy to 2 GW would save need for inner-Italian HVDC link**