Developments in EU Policy for Marine Renewable Energy

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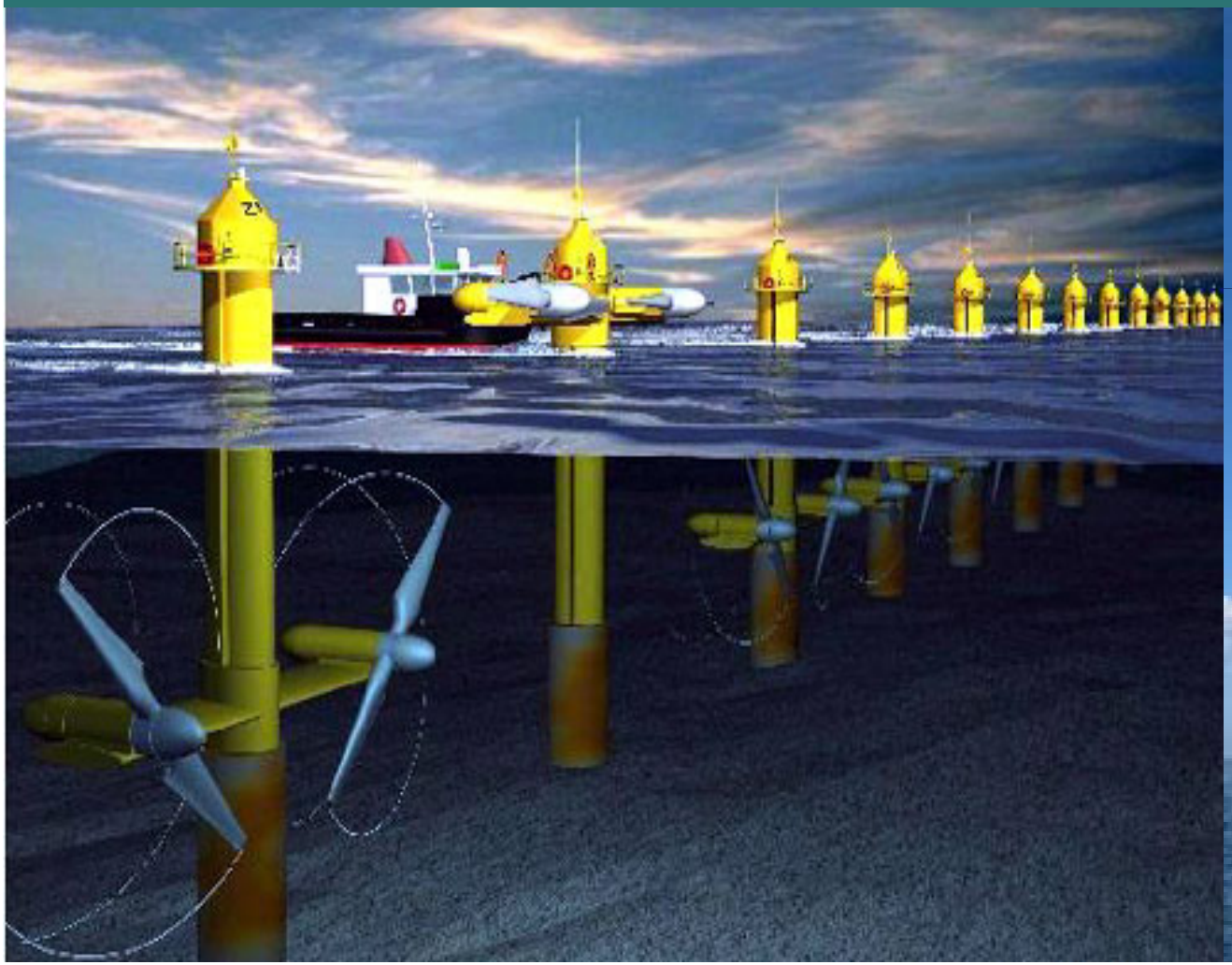


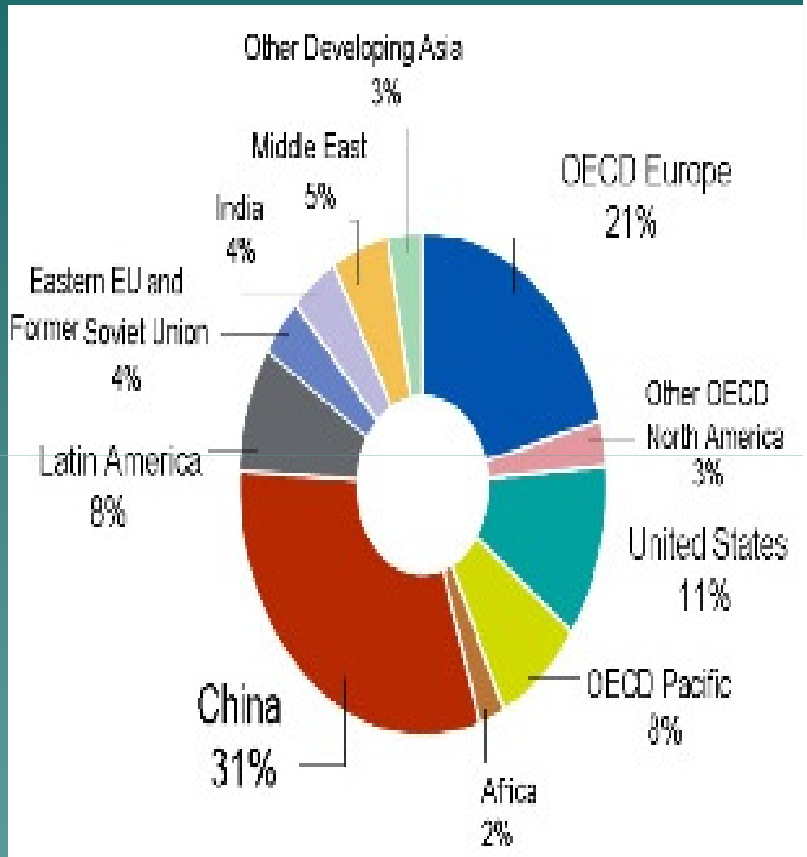
Introduction and Context

The **International Energy Agency (IEA) BLUE Map scenario** assessed the most **cost effective** strategies for reducing power sector emissions **by half in 2050**.

Wind power could contribute 12% of the overall reduction necessary, reaching more than **2000 GW** of installed capacity in 2050.

This would require an average annual installation of **47 GW,** up from 27 GW in 2008. This requires about **US $ 3.2 trillion of investment** over the period **2010-2050**.

Most of this investment will take place in **China**, that will host more than 30% of total amount, followed by **Western Europe** and **United States**. Figure shows the **regional investment in wind energy for 2050**.



IEA Blue Map Scenario: Key actions for wind energy

Set **long-term targets**, supported by predictable **market-based mechanisms** to drive investment, while pursuing cost reductions;

Set mechanisms for **appropriate carbon pricing**;

Develop **integrated, long-term plants** for wind power deployment, taking account of other power system needs and competing land and sea-usage;

Appoint lead agencies to coordinate **advance planning of transmission infrastructure** to harvest resource-rich areas and interconnect power systems;

Set **incentives to build transmission infrastructure**;

Increase **social acceptance** by raising public awareness of the benefits of wind power;

Encourage **exchange of technology** and deployment best practice with developing countries;

Further develop **carbon finance options** to attract wind energy investment in developing regions

Overview of Presentation

European Union Directives and Policies for Offshore Wind and Marine Renewable Energy Issues, with emphasis on Wind.

Examination of Related Initiatives for European Energy Market and Transmission Infrastructure Requirement

Environmental Requirements Important and Addressed in Separate GOC 2010 Presentation. Not focused on here.

EU Climate and Energy Policy

Directorates-General (DG) for Climate Action and Energy created in February 2010.

Links between the DGs of Climate Action, Energy and Environment have not yet been specified.

The European focus on climate action and energy security is **likely to strengthen policies and initiatives for offshore wind energy, and the establishment of European electricity grids**.

Three key objectives of the EU's new energy policy:
- **reducing greenhouse gas emissions,**
- **ensuring security of supply and**
- **improving EU competitiveness**.

Immediate focus on offshore wind farms, though ongoing work also on marine renewable energy and carbon sequestration under seabed.

Renewables' contribution to EU electricity consumption up to 2020				
Type of energy	2005 Eurostat TWh	2006 Eurostat TWh	2010 Projections TWh	2020 Targets TWh
Wind	70.5	82	176	477 (34.8%)
Hydro	346.9	357.2	360	384 (28%)
Photovoltaic	1.5	2.5	20	180 (13.1%)
Biomass	80	89.9	135	250 (18.3%)
Geothermal	5.4	5.6	10	31 (2.3%)
Solar thermal elect	-	-	2	43 (3.1%)
Ocean	-	-	1	5 (0.4%)
Total RES	504.3	537.2	704	1370
Total Gross Electricity Generation EU-27	3320.4	3361.5		
(Trends to 2030-baseline)			3568	4078
(Combined RES and EE)				3391
Share of RES	15.20%	16.00%	19.70%	33.6-40.4%

European Renewable Energy Council: European Renewable Technology Roadmap 2008

EU Climate and Energy Policy for Offshore Wind

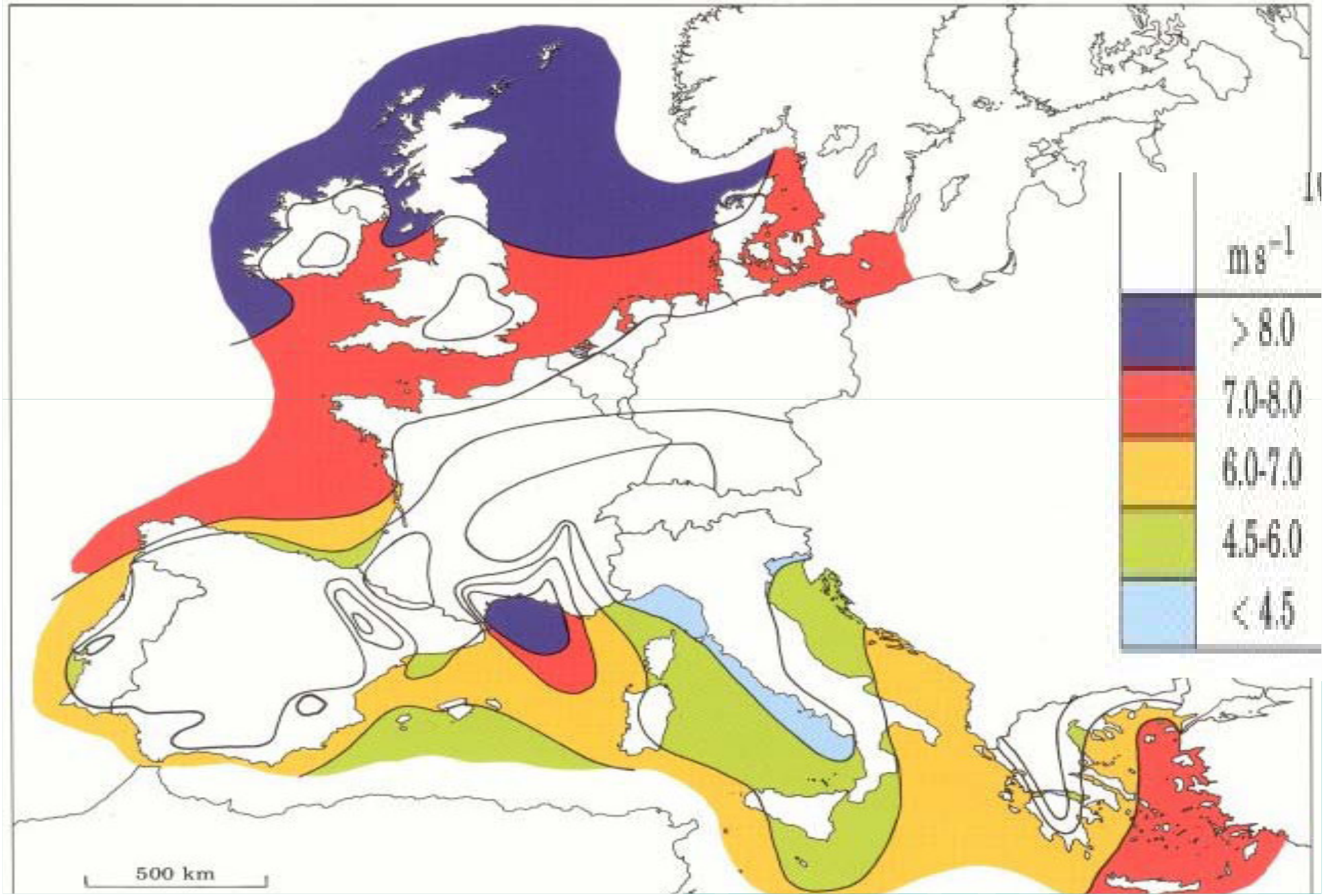
EU Communication on Offshore Wind Energy recognized that wind energy will play an essential role in meeting the EU's target for 20% renewable energy by 2020 and achieving a secure, environmentally friendly and affordable supply of energy for Europe.

The Communication identified the challenges to offshore wind energy, and how actions can help meet these challenges.

Key themes stressed by EU representatives include:

- Need for more cross-border cooperation to share experiences and coordinate better in fields such as electricity grid and maritime spatial planning,
- Regulatory practices regarding interconnections and transmission infrastructure investments, and
- Environmental impact assessments of wind farms.

Offshore Wind Opportunities: Average European Wind Speed



Wind power installed in Europe by end of 2009 (cumulative)

	Installed 2008	End 2008	Installed 2009	End 2009
EU Capacity (MW)				
Austria	14	995	0	995
Belgium	135	415	149	563
Bulgaria	63	120	57	177
Cyprus	0	0	0	0
Czech Republic	34	150	44	192
Denmark	60	3,163	334	3,465
Estonia	19	78	64	142
Finland	33	143	4	146
France	950	3,404	1,088	4,492
Germany	1665	23,903	1,917	25,777
Greece	114	985	102	1,087
Hungary	62	127	74	201
Ireland	232	1,027	233	1,260
Italy	1010	3,736	1,114	4,850
Latvia	0	27	2	28
Lithuania	3	54	37	91
Luxembourg	0	35	0	35
Malta	0	0	0	0
Netherlands	500	2,225	39	2,229
Poland	268	544	181	725
Portugal	712	2,862	673	3,535
Romania	3	11	3	14
Slovakia	0	3	0	3
Slovenia	0	0	0	0
Spain	1558	16,689	2,459	19,149
Sweden	262	1,048	512	1,560
United Kingdom	569	2,974	1,077	4,051
Total EU-27	**8,268**	**64,719**	**10,163**	**74,767**
Total EU-15	**7,815**	**63,604**	**9,702**	**73,194**
Total EU-12	**453**	**1,115**	**461**	**1,574**
Of which offshore and near shore	374	1,479	582	2,061

European Union: 74,767 MW
Candidate Countries: 829 MW
EFTA: 449 MW
Total Europe: 76,152 MW

	Installed 2009	End 2008	Installed 2009	End 2009
Candidate Countries (MW)				
Croatia	1	18	10	28
FYROM*	0	0	0	0
Turkey	311	458	343	801
Total	**312**	**476**	**353**	**829**
EFTA (MW)				
Iceland	0	0	0	0
Liechtenstein	0	0	0	0
Norway	103	429	2	431
Switzerland	2	14	4	18
Total	**105**	**443**	**6**	**449**
Other (MW)				
Faroe Islands	0	4	0	4
Ukraine	1	90	4	94
Russia	0	9	0	9
Total	**1**	**103**	**4**	**107**
Total Europe	**8,686**	**65,741**	**10,526**	**76,152**

*FYROM = Former Yugoslav Republic of Macedonia
Note: Due to previous-year adjustments, 114.77 MW of project de-commissioning, re-powering and rounding of figures, the total 2009 end-of-year cumulative capacity is not exactly equivalent to the sum of the 2008 end of year total plus the 2009 additions.

European Offshore Wind and Marine Renewable Energy

- Without an integrated approach, offshore wind energy deployment can be caught between conflicting uses, interest groups and rules from different jurisdictions.
- This can create project uncertainty, increases the risk of delays or failure of wind projects, impairs growth.
- These barriers are further aggravated by the absence of an integrated and coordinated approach to maritime spatial planning between the different member states and regions.
- Another key aspect of implementation of offshore wind and marine renewable energy will be further development of open and transparent markets for electricity generation, transmission and sale.

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Offshore Wind Energy: National Implementation

All EU policies and directives for offshore wind must be implemented nationally.

European countries have different planning regimes and instruments.

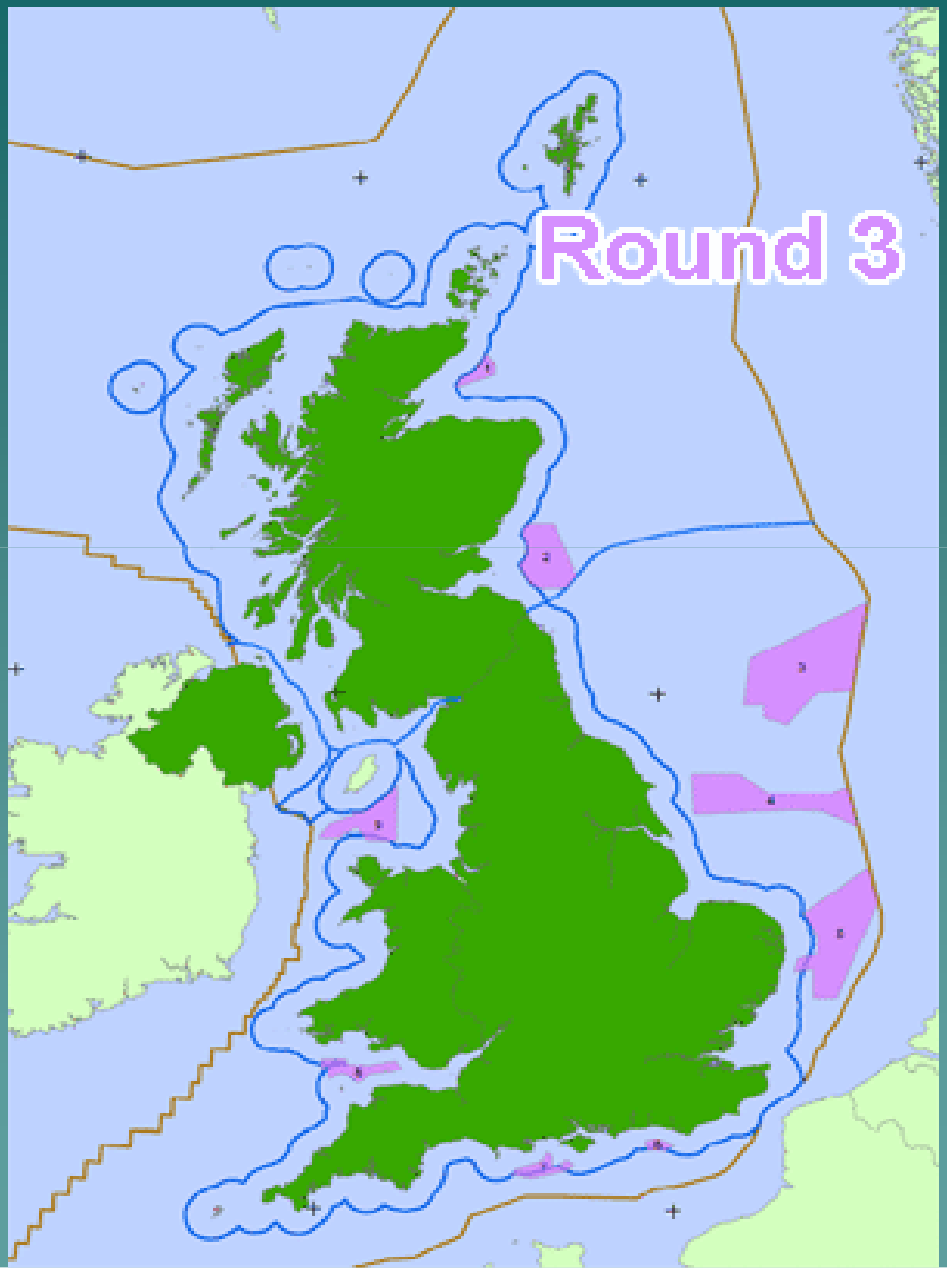
-Germany, there are regional plans for the territorial seas and national Exclusive Economic Zones plans,

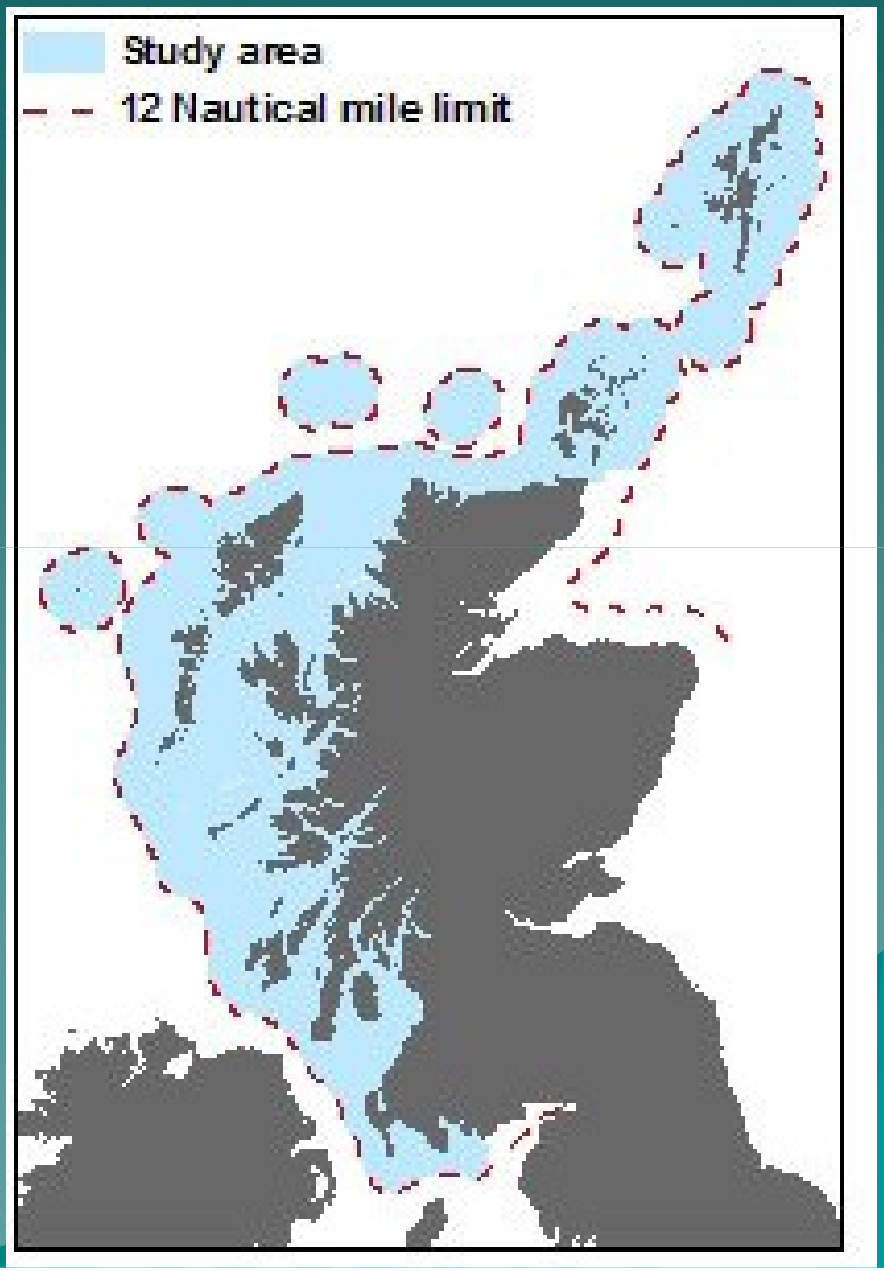
- France, sea "Enhancement Schemes" have been used in some areas as the main instrument.

- UK, Germany and Denmark, have integrated the deployment of offshore wind energy into a global approach that encompasses industrial, research and policy aspects.

- Based on this integration, UK, Germany and Denmark are being seen as promising markets for offshore wind farms.

UK Offshore Wind Farm (Round 3) & Wave and Tidal Leases (Planning for Round 1)





UK- Dogger Bank Offshore Wind Lease, Round 3 lease in January 2010, possibly Largest Wind Farm in the World

UK's Wave and Tidal Leasing Round 1 in Pentland Firth and Orkney Waters

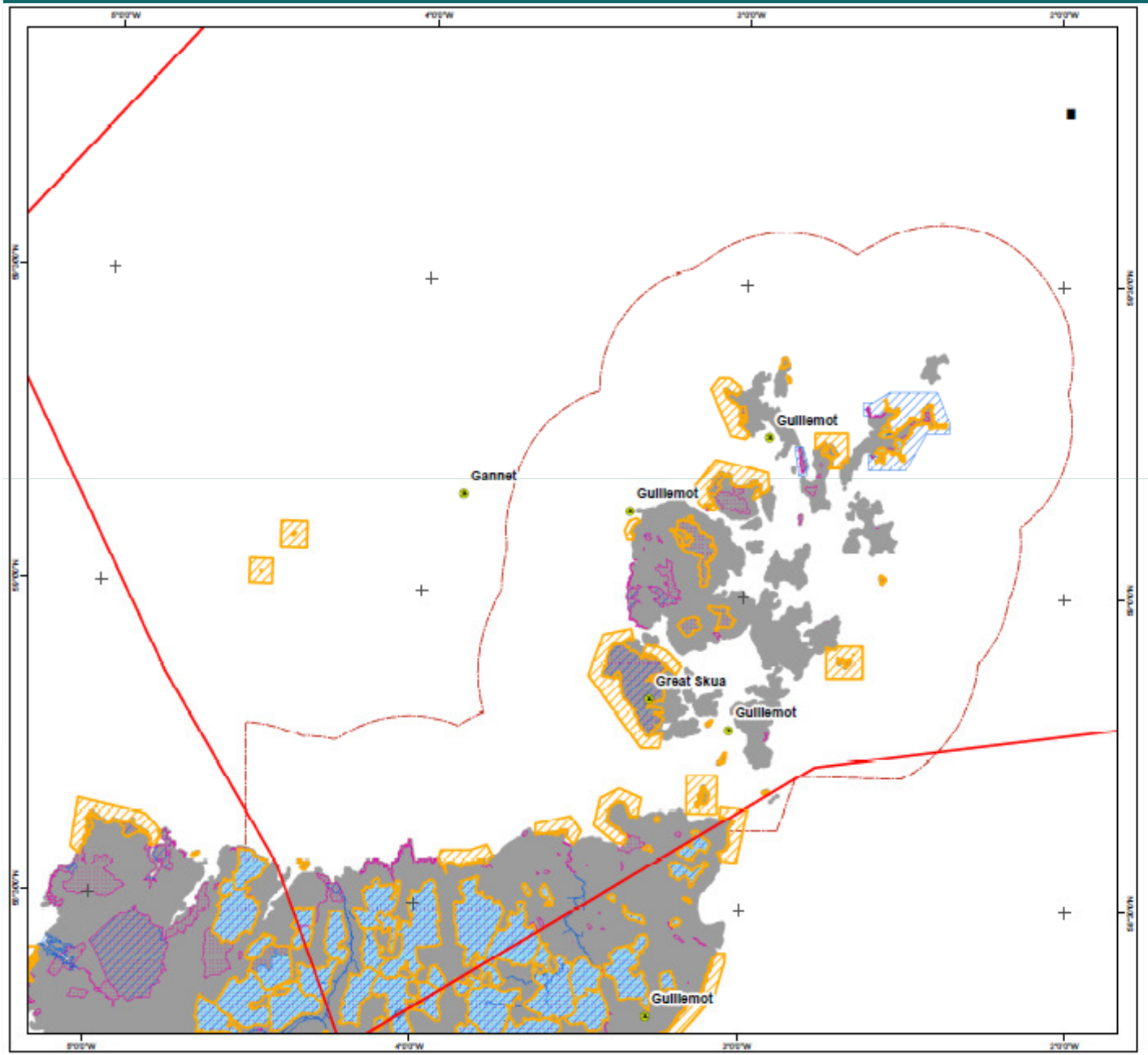
In March 2010, the Crown Estate announced the names of the successful bidders for the world's first commercial wave and tidal leasing round, for ten sites in Pentland Firth and Orkney waters.

The 1.2 GW of installed capacity proposed by the wave and tidal energy developers for 2020, 600 MW each from wave and tidal. There are ten agreements.

The developers have signed agreements for lease with The Crown Estate to take forward the development of their wave and tidal energy installations.

This will allow developers to enter the UK statutory consenting process for their sites with security of access to the seabed.

Pentland Firth & Orkney Waters Marine Spatial Planning Framework
Underpinning the UK Round 1 Issuance of Wave and Tidal Leases



PENTLAND FIRTH AND ORKNEY WATERS MSP FRAMEWORK AND LOCATIONAL GUIDANCE

Protected Sites

Legend

- UK Land
- MSP Study Area
- Important Breeding Colonies
- Bird Conservation Value >50
- Proposed Special Protection Areas (pSPA)
- Special Protection Areas (SPA)
- Sites of Special Scientific Interest (SSSI)
- Special Areas for Conservation (SAC)
- Wetland Conservation (Ramsar)
- Potential Reefs

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European Super Smart Electricity Grid

- The concept of Supergrid was first launched a decade ago and it is defined as "An electricity transmission system, mainly based on direct current, designed to facilitate large-scale sustainable power generation in remote areas for transmission to centres of consumption, one of whose fundamental attributes will be the enhancement of the market in electricity".
- Unlike point to point connections, Supergrid will involve the creation of "Supernodes" to collect, integrate and route the renewable energy to the best available markets, and can be is a trading tool to enhance the security of supply for all of Europe.
- There can be many forms of Supergrid, with an Offshore Supergrid is based on the seas around northwestern Europe. There can also be as a Solar Supergrid in the Mediterranean. These grids will ultimately be linked to supply electricity across the EU.
- See Friends of Supergrid, and www.offshore.grid.eu.

European Super Smart Electricity Grid

Smart grids are useful for large scale and small scale renewable energy, and for balancing the variable loads that will occur with renewable energy.

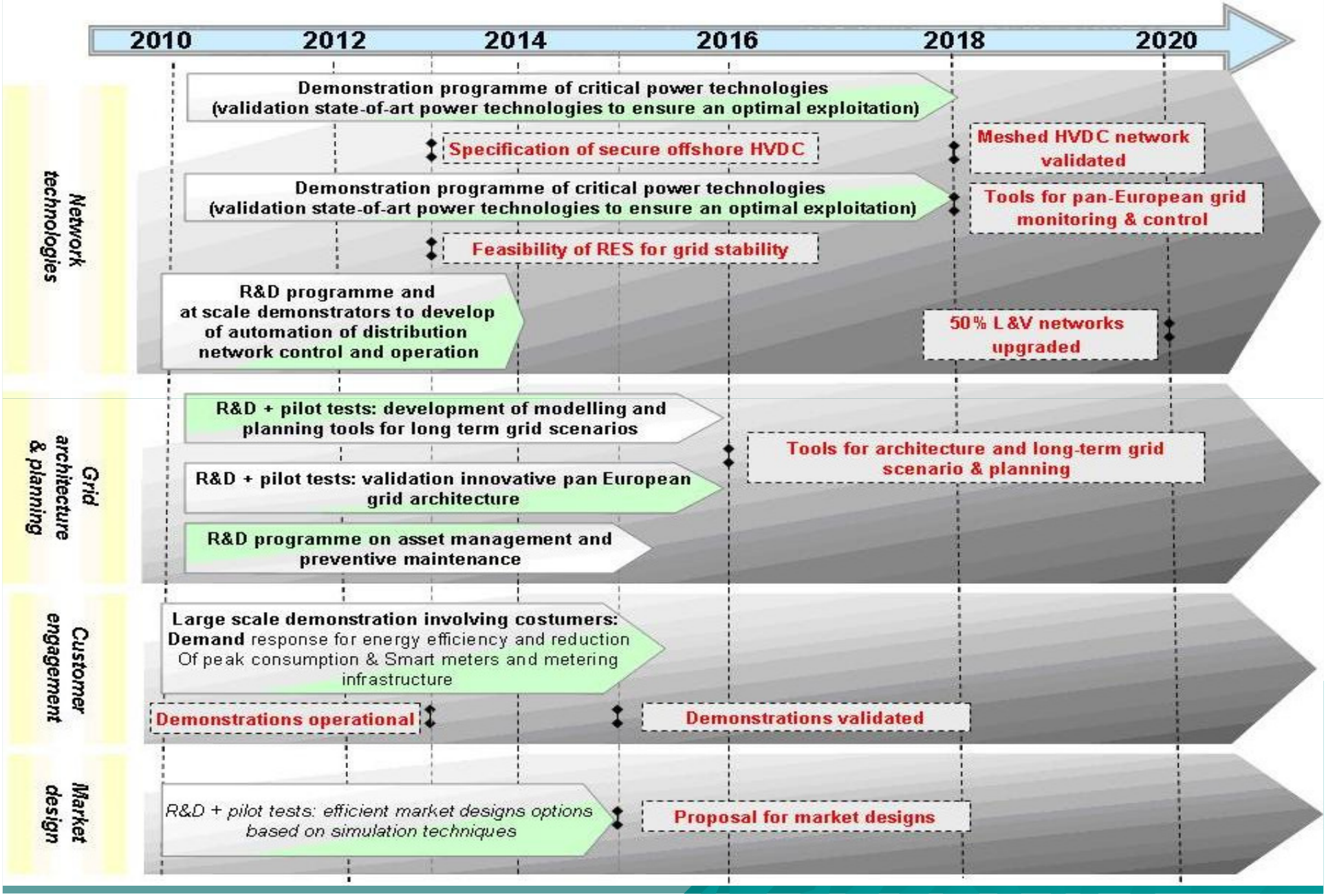
A smart grid is intended to generate and distribute electricity more effectively, economically, securely, and sustainably.

It integrates tools and technologies, products and services for generation, transmission & distribution facilities and customer appliances and equipment.

Smart grids accomplish this with advanced sensing, communication, and control technologies, enabling bilateral exchanges with customers, providing greater information/choice, power export capability, demand participation,energy efficiency.

EU SMARTGRID technology platform & Offshore Grid tech-economic study, Intelligent Europe Energy programme.

EU Grid Road Map



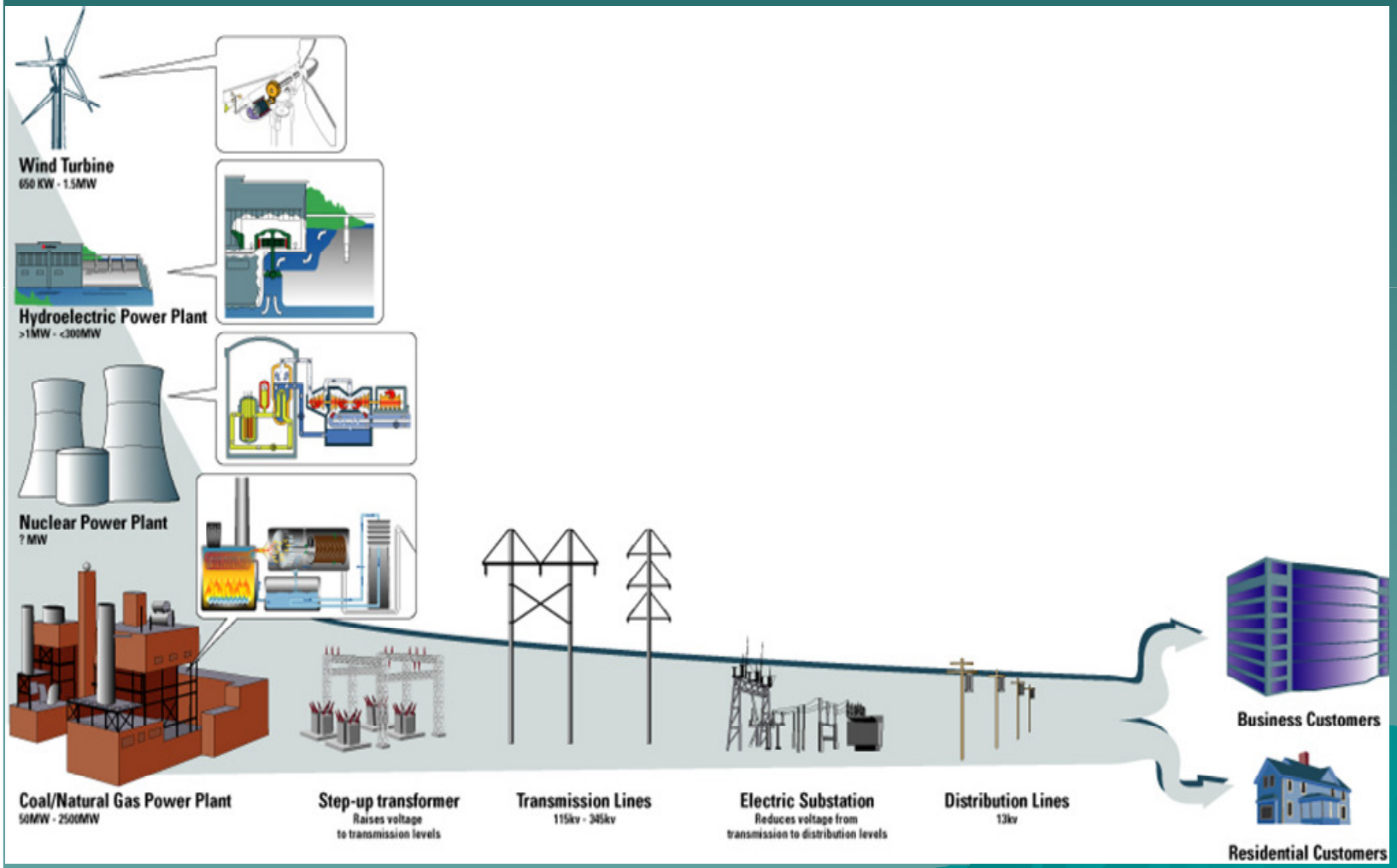
European Smart Grids

Without effective deployment of the SmartGrids concepts, European security of electricity supply in general, and the operational security of the European electricity grids in particular, may not be maintained. This is crucial not just for the large scale development of renewables, but also because of the steady demand growth and more onerous environmental requirements which conventional grids and methodologies will increasingly find difficult to meet.
(European Commission Smart Grids Technology Platform, "SmartGrids, Strategic Deployment Document for Europe's Electricity Networks of the Future (Draft)", September 2008)

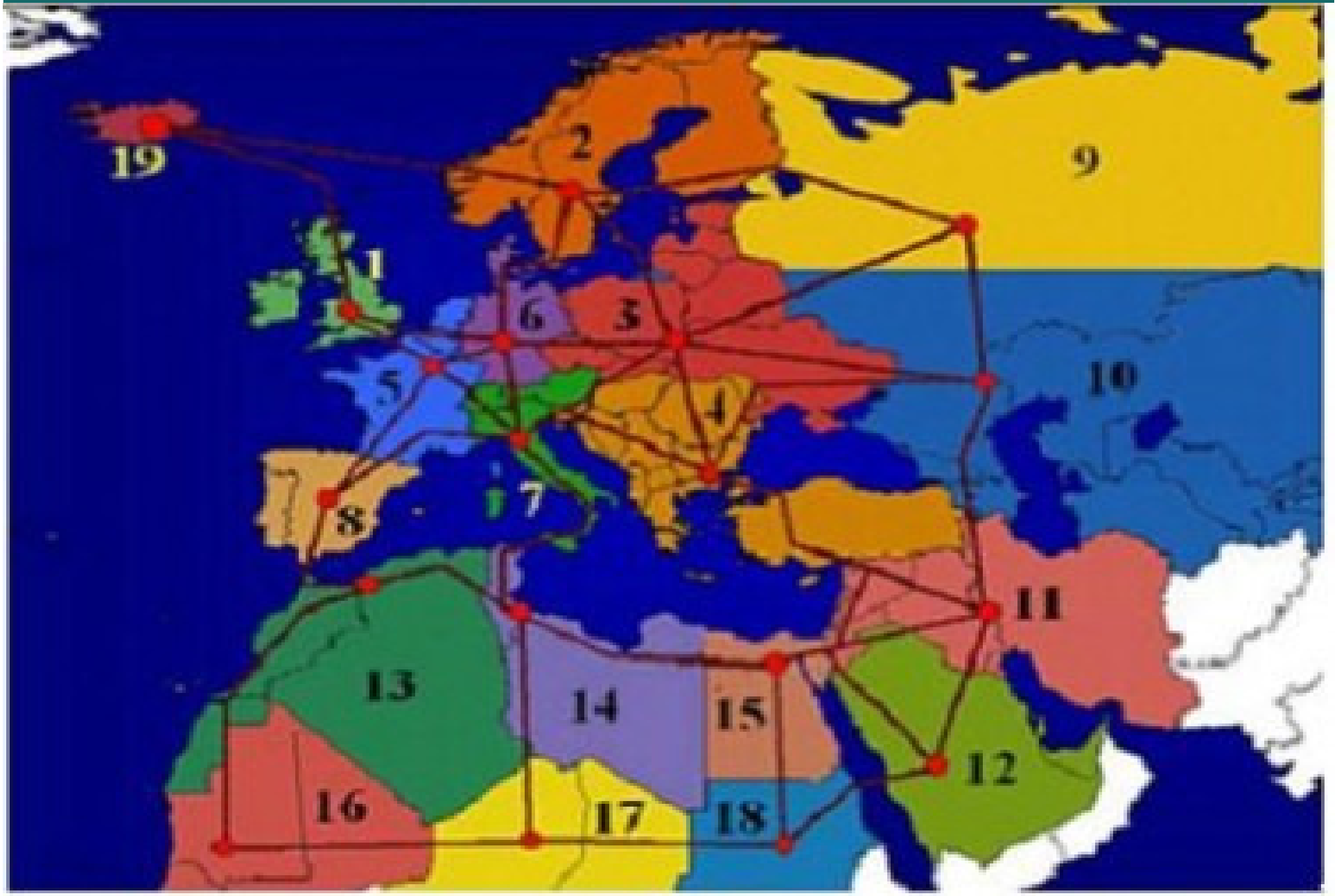
85% of the Carbon Reduction Benefits of a Smart Grid come from System Optimization and Integration of Renewables and only 15% will come from End-User Energy Management (i.e. the benefit of smart meters).

(***UK based Climate Group, http://www.theclimategroup.org/)***

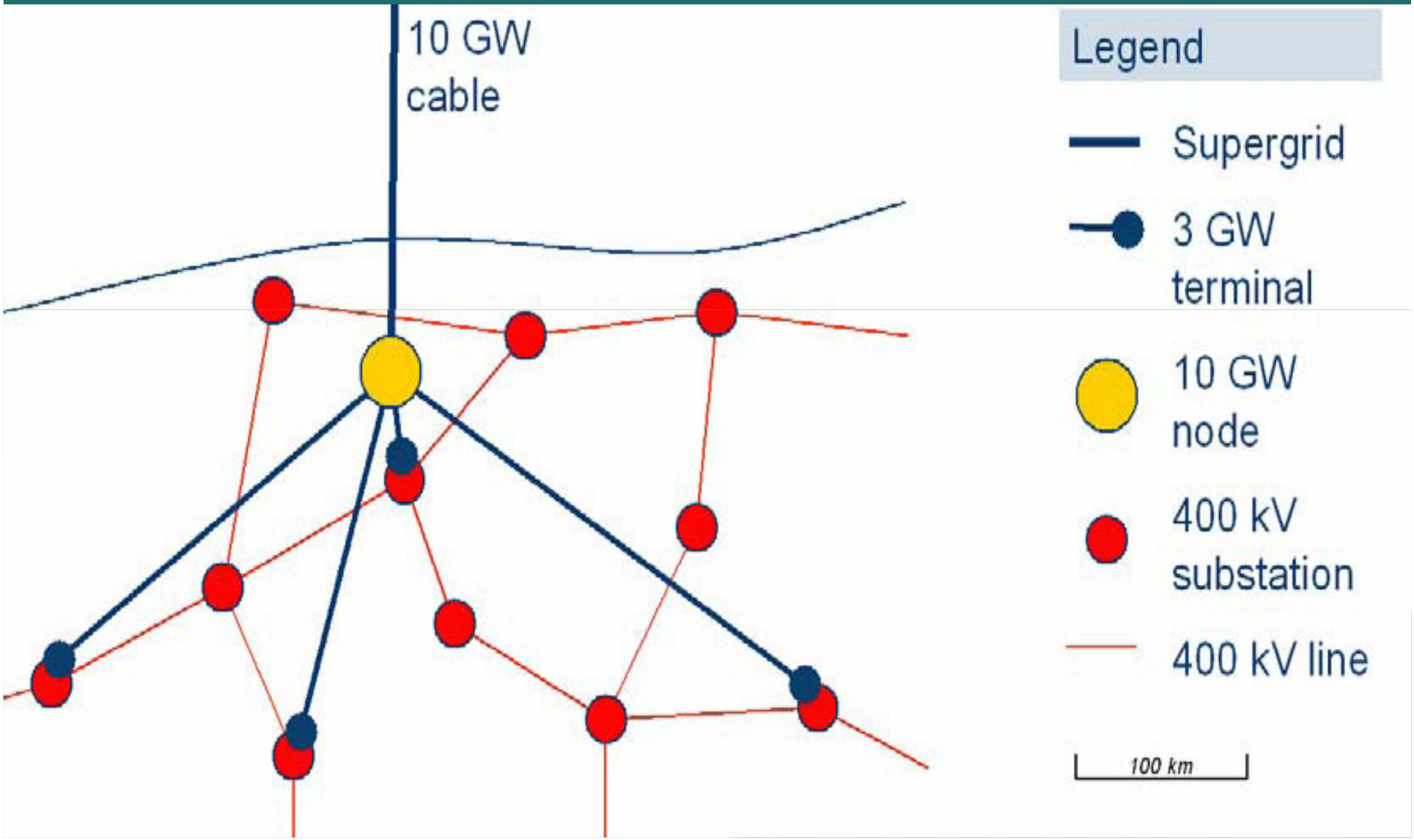
"... a power system that can incorporate millions of sensors all connected through an advanced communication and data acquisition system. This system will provide real-time analysis by a distributed computing system that will enable predictive rather than reactive responses to blink-of-the-eye disruptions." (EPRI, emphasis added)



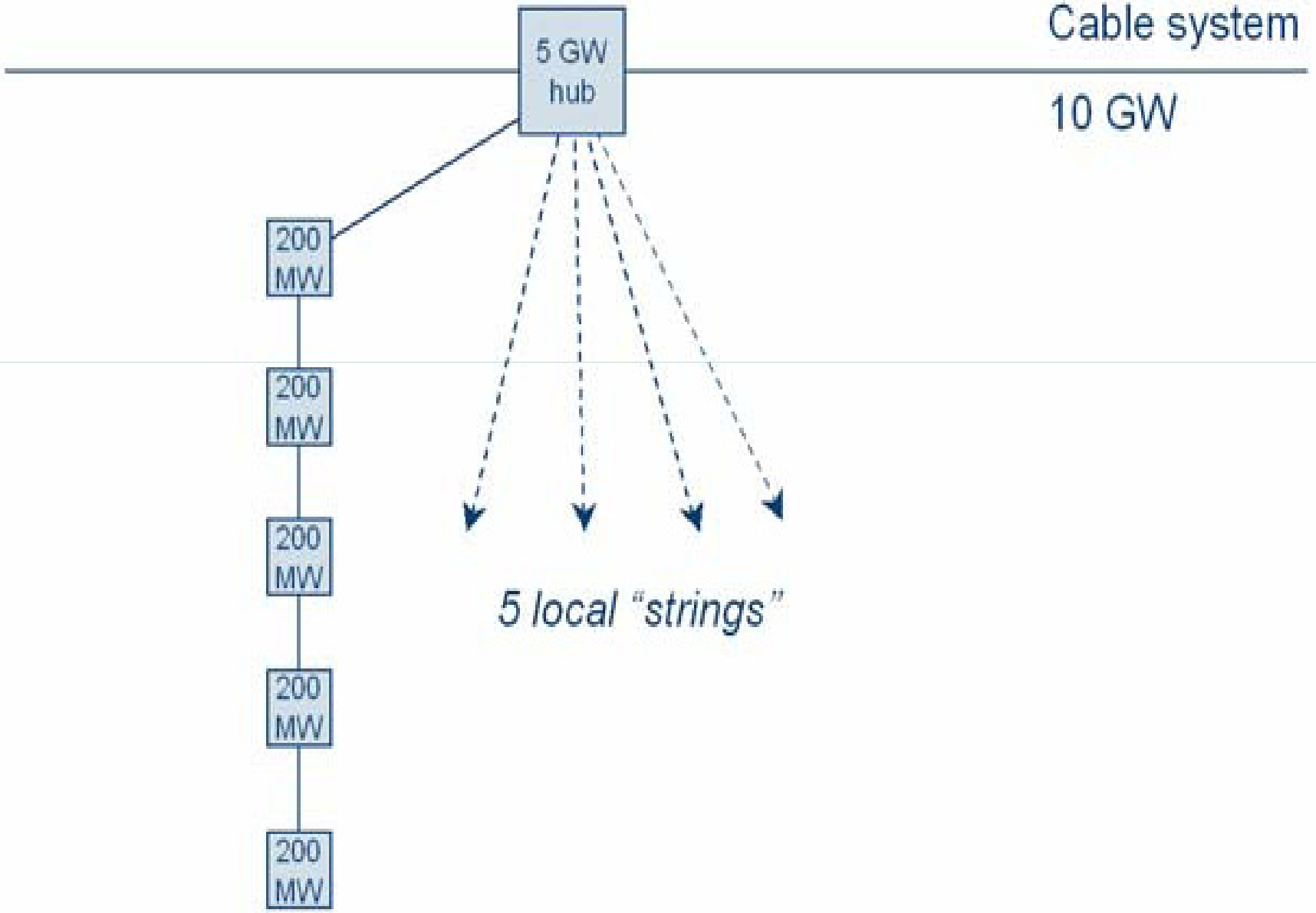
European Energy Superstructure (CZISCH 2005)



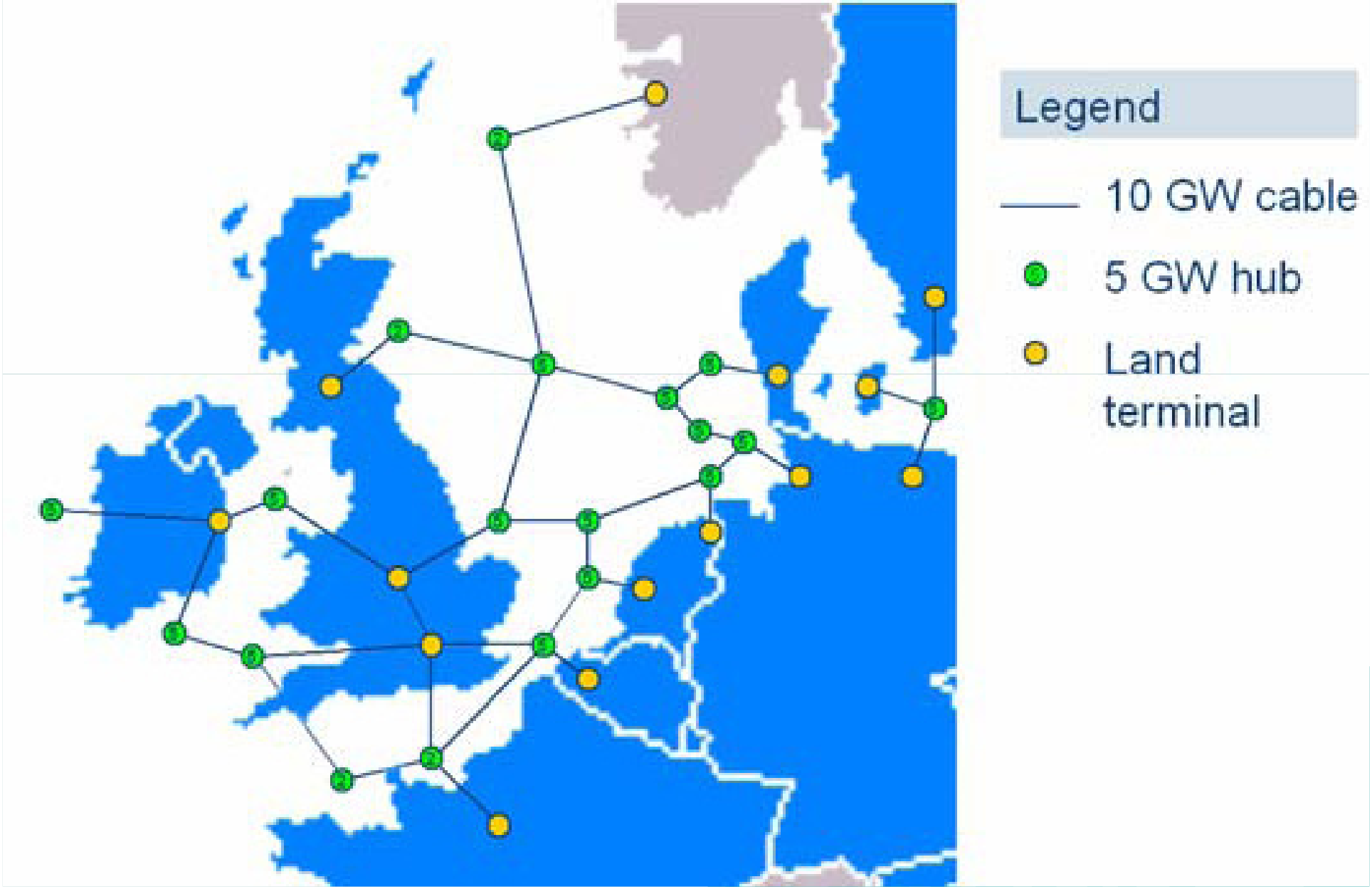
Offshore Wind Requirements: Distribution Area Around a 10 GW Mainland Hub



Offshore Wind Requirements: 5 GW Hub, Multiple Strings with Multiple Wind Farms

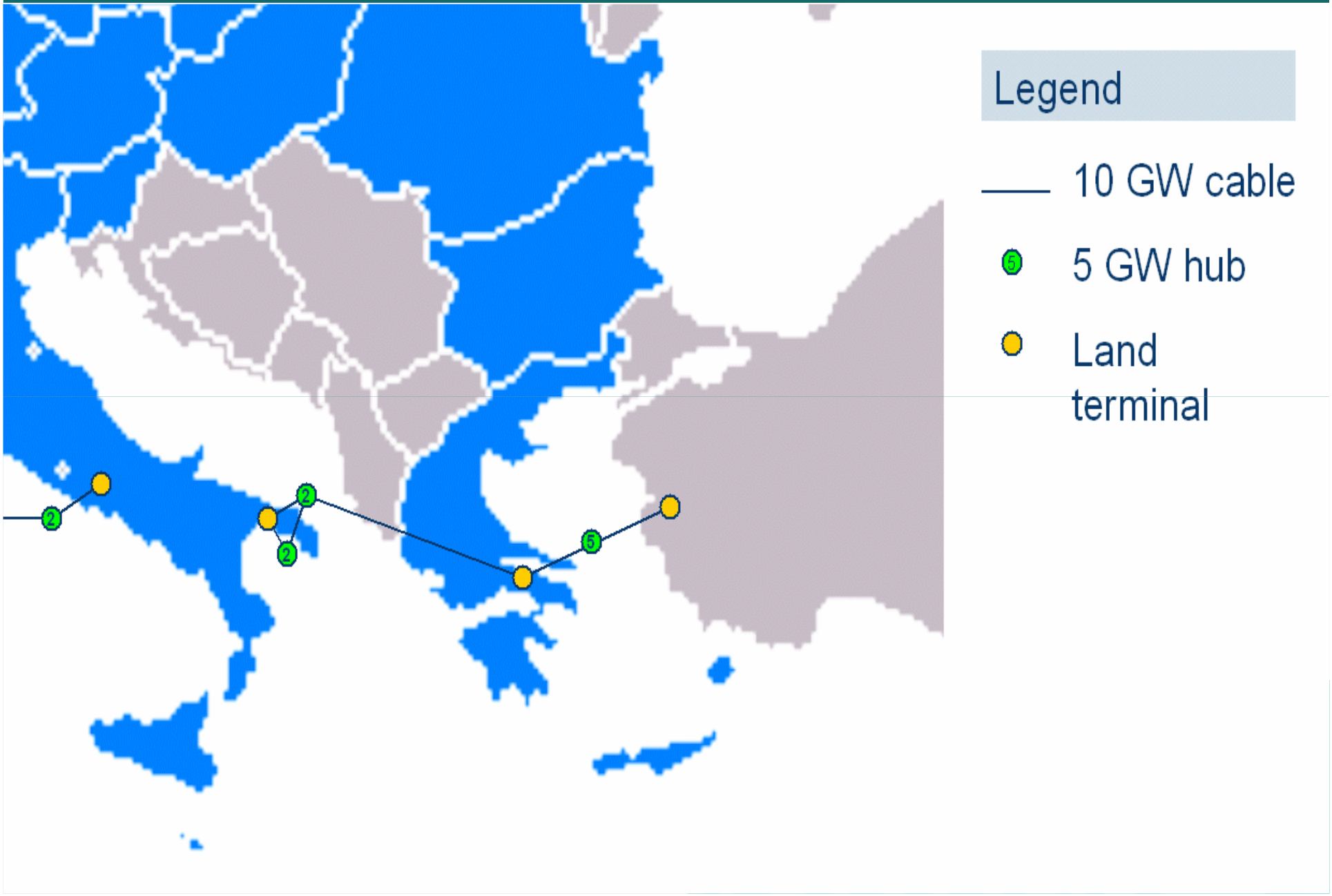


Proposed North Sea Grid

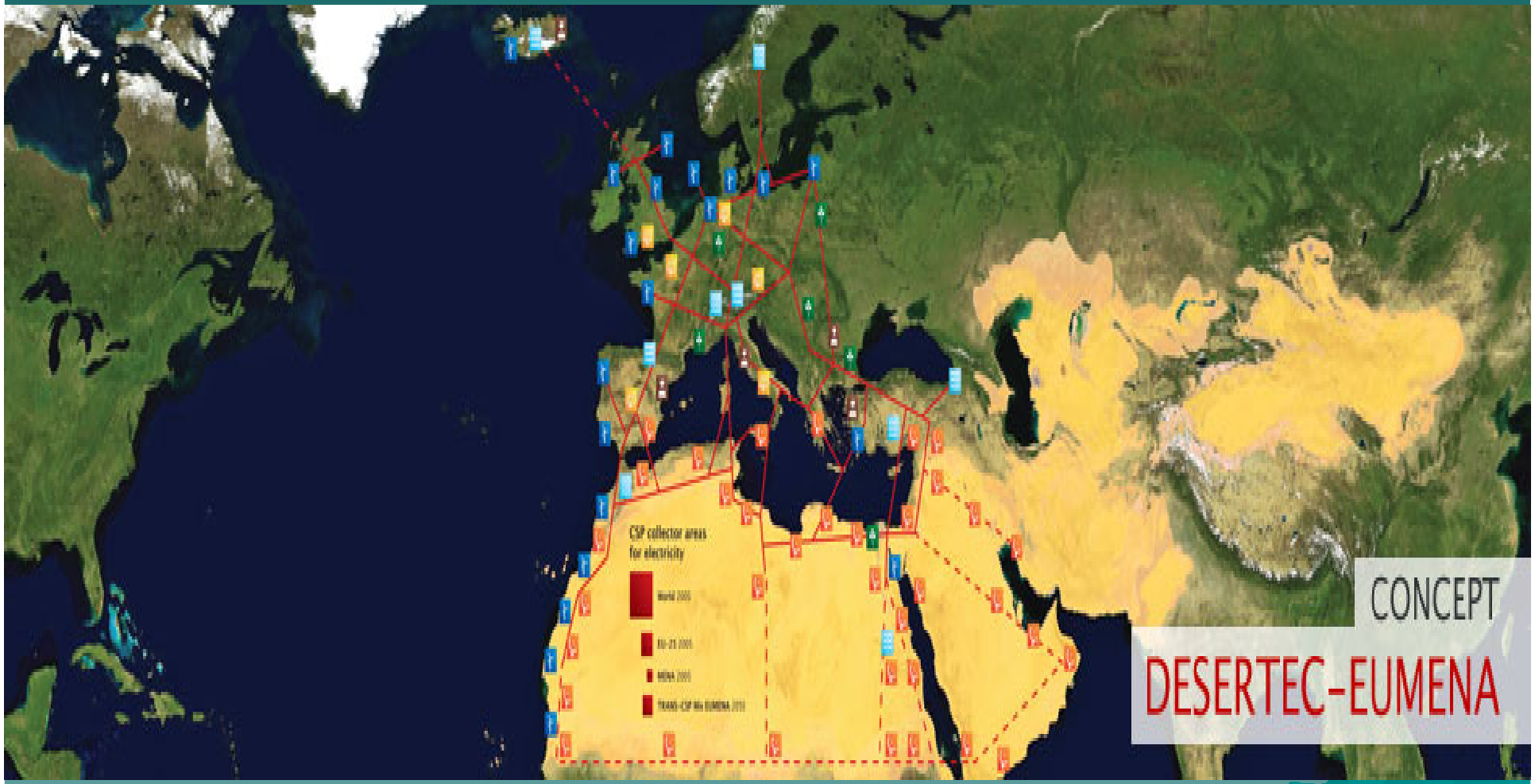


Proposed Ocean Grids for South-West Europe Including Link with Africa (Tunisia or Algeria)

Proposed Ocean Grid for Eastern Mediterranean Sea



Desertec Proposal, including Super Smart Grid and Solar Energy Production in Africa



Thank you, et je vous remercie

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