



Le réseau de l'intelligence électrique

Supergrid : un réseau pan-européen innovant pour la transition énergétique

Le réseau de RTE, haute et très haute tension

DU 400 000 AU 63 000 VOLTS

100 000 KM DE LIGNES

8500 employés

46 INTERCONNEXIONS AVEC 6 PAYS FRONTALIERS

4.5 Mds de chiffre d'affaire

**Les infrastructures durent au moins 50 ans
10 ans pour construire une nouvelle ligne**



LE SYSTÈME EUROPEEN

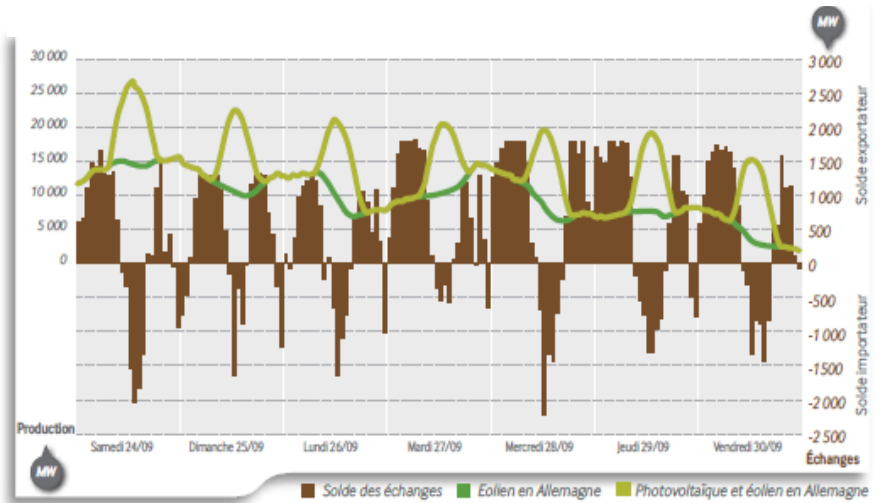
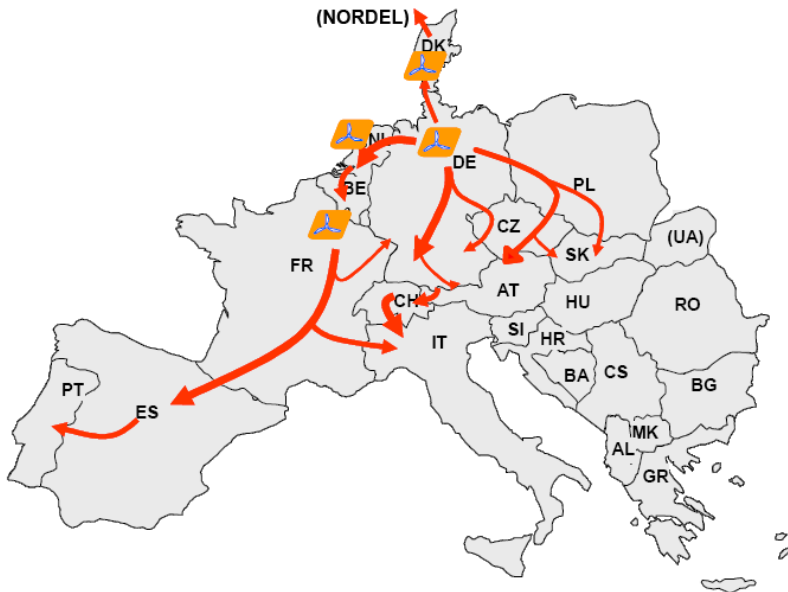
Intégration des EnR, dont des parcs massifs
(raccordement, marché)

Des mix énergétiques différents et
complémentaires

Un marché en construction
(consommateur européen)



Interdépendance des pays



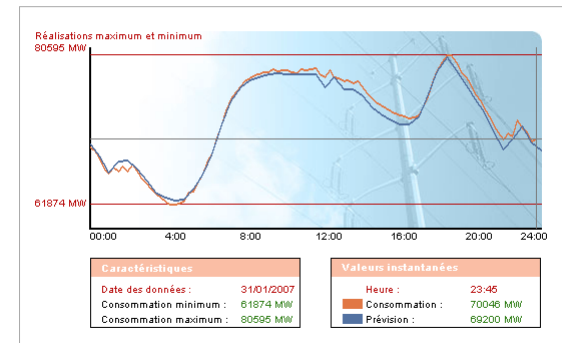
Les finalités des SmartGrids en France et en Europe

Insertion massive des EnR au meilleur coût



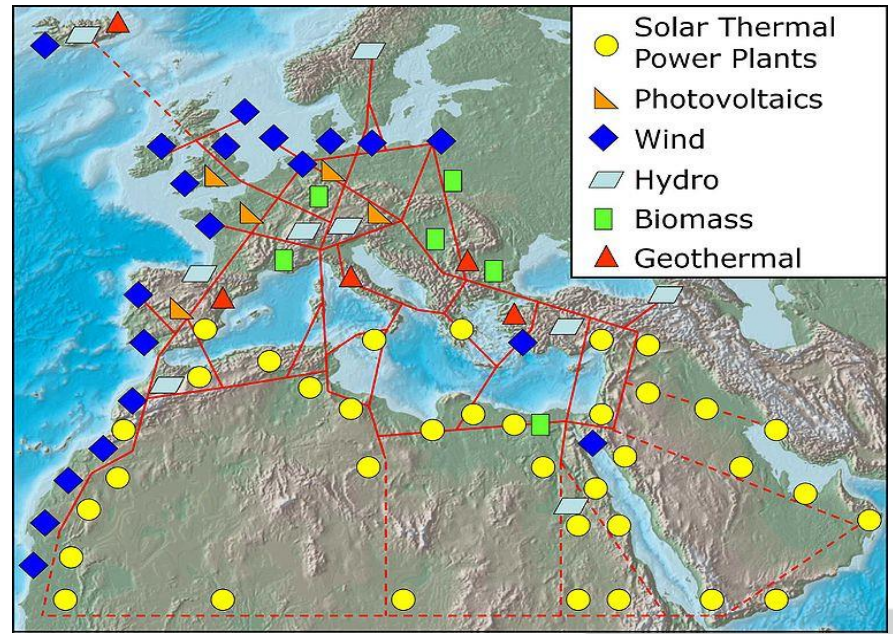
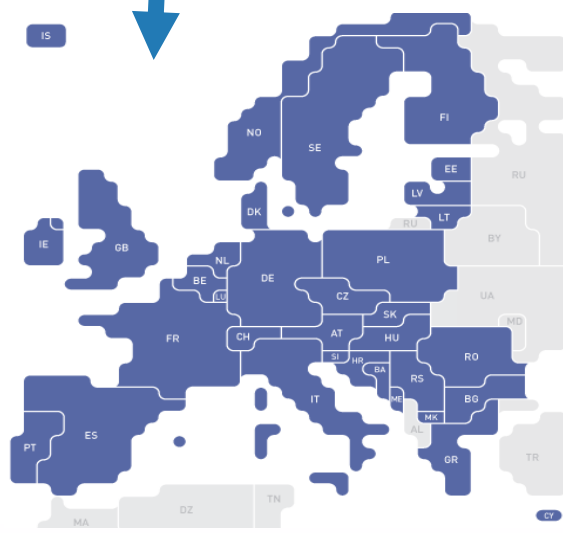
Maitrise/modulation de la consommation en énergie et à la pointe

Courbe de charge de la journée du : 31/01/2007



Qui accompagnent la transition énergétique...

De l'intelligence à toutes les mailles géographiques

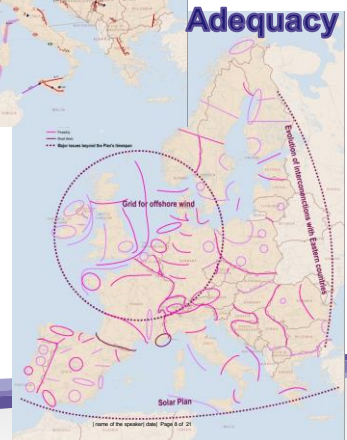
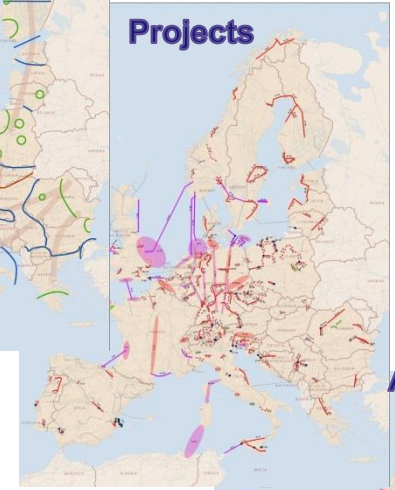


Supergrid ?

La notion de Super grid cristallise les idées nouvelles de développement de réseaux de transport d'électricité à l'échelle continentale. Elle accompagne les besoins de sécurisation de l'approvisionnement, d'acheminement à grande échelle de l'énergie électrique de sources renouvelables et d'échanges commerciaux transfrontaliers.

Why a Ten-Year Network Development Plan?

Regulation (EC) 714/2009 – “In order to ensure greater transparency regarding the entire electricity transmission network in the [Union], the ENTSO for Electricity should draw up, publish and regularly update a non-binding [Union]-wide ten-year network development plan”



Transparency

TSO cooperation platform

Stakeholder involvement

Inform EU policy and investment decisions

Sole basis for selection of PCIs

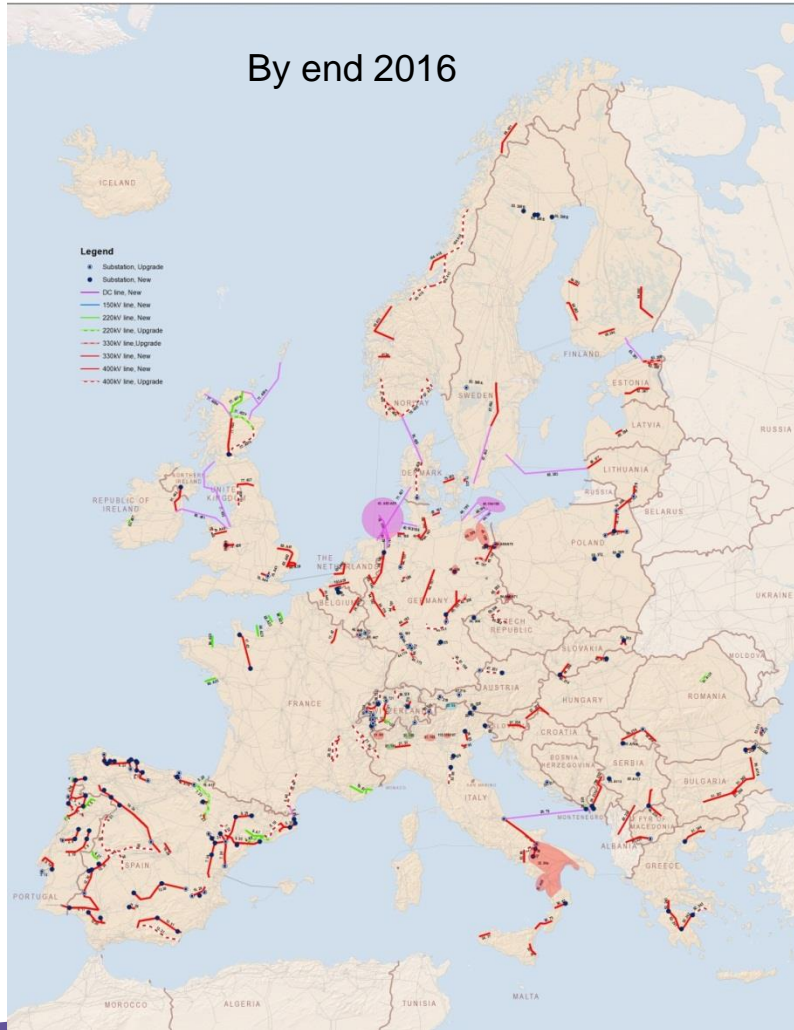


New with the new regulation (EC) 347/2013

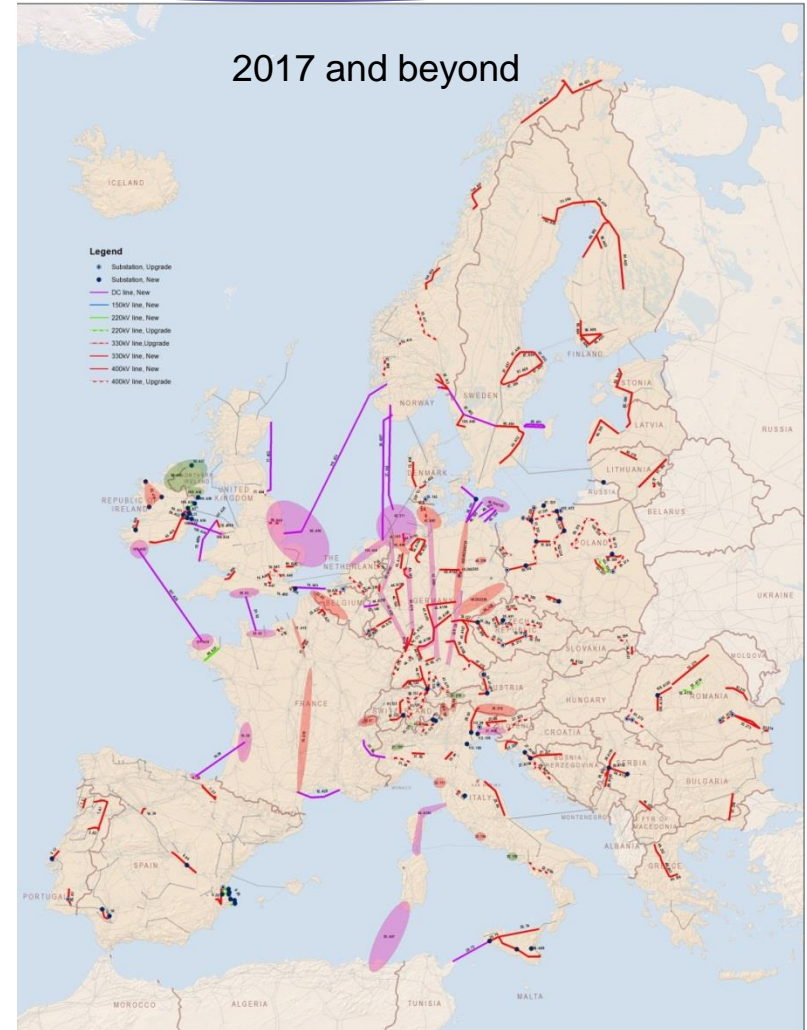
TYNDP 2012 - 2020 Europe – 80% of all investment triggered by RES development: plant connections & interconnections



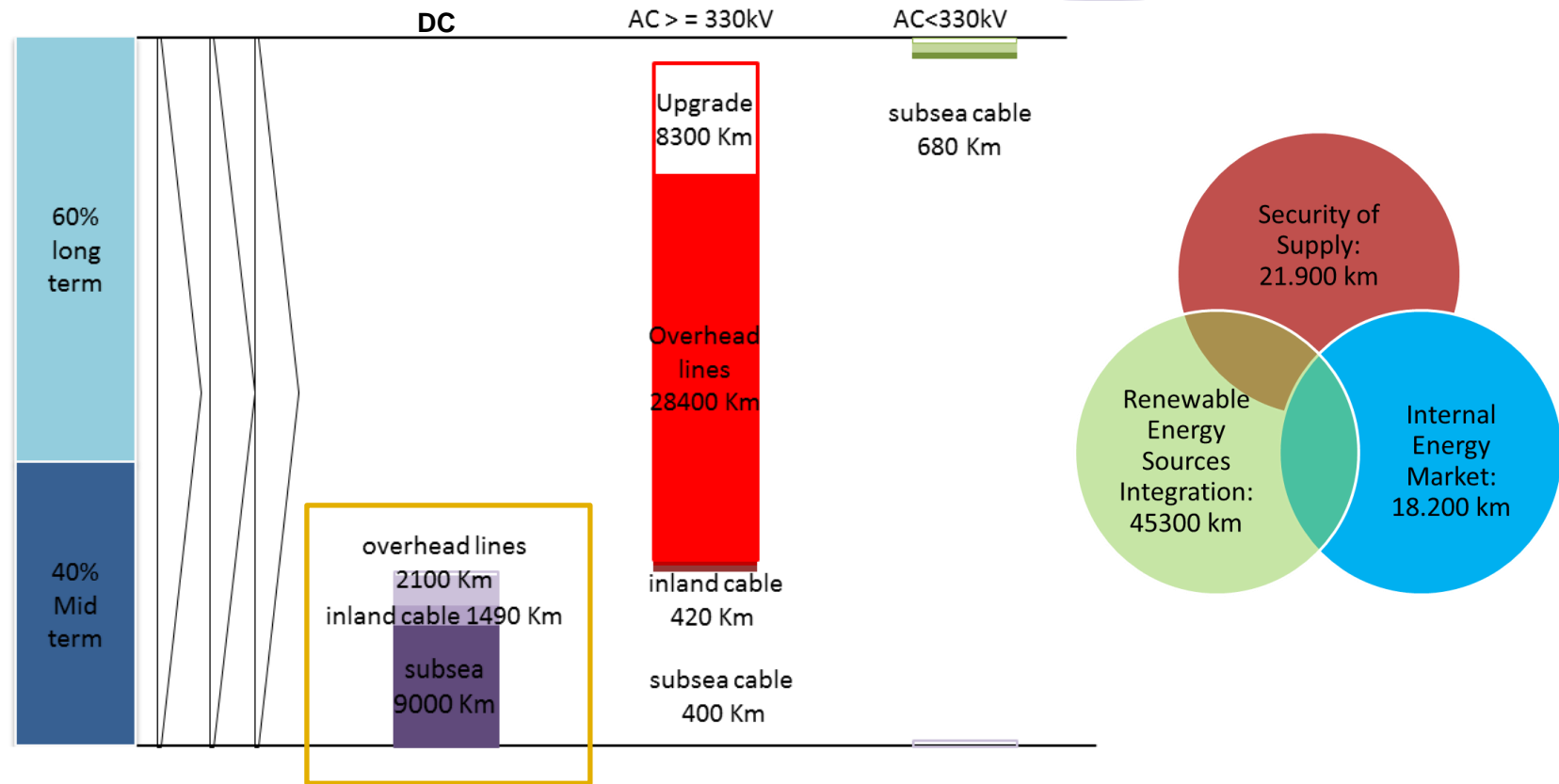
By end 2016



2017 and beyond



TYNDP 2012 - 2020 Europe – additional 52300 km lines



TYNDP 2012 already based on cutting edge technology: largest DC VSC equipment, longest AC lines, parallel AC/DC operation, ...

TYNDP 2014 – 2030 Vision 1 boundaries and their usage

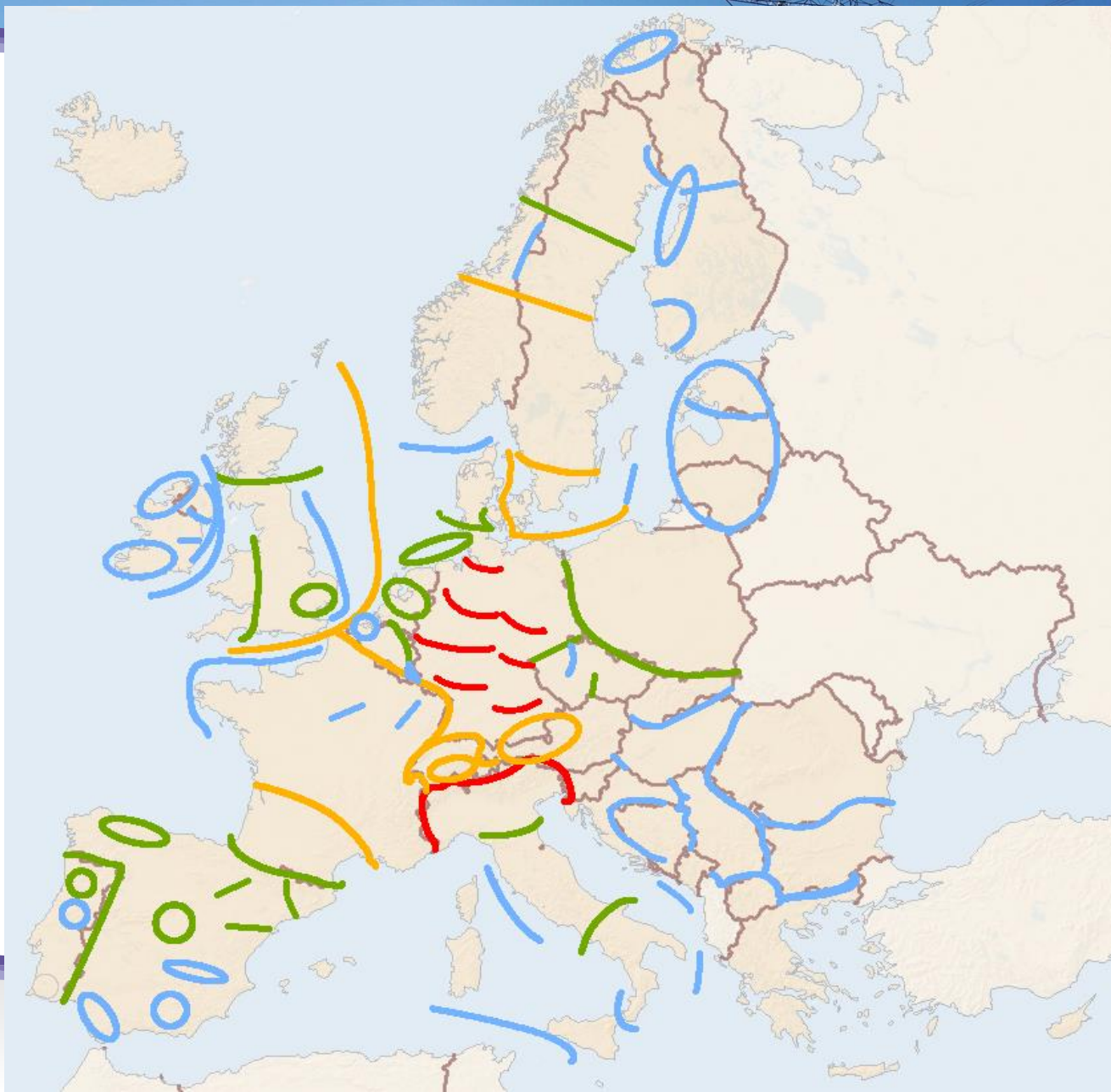
Boundaries related to:

- Generation connection
- Market integration
- SoS

=> More details in the final TYNDP 2014

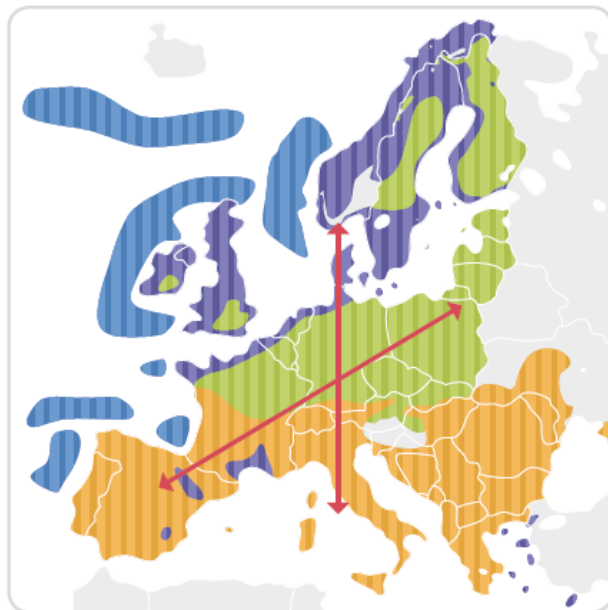
Legend:

- <2000 MW
- 2000 - 4500 MW
- 4500 - 10000 MW
- >10000 MW

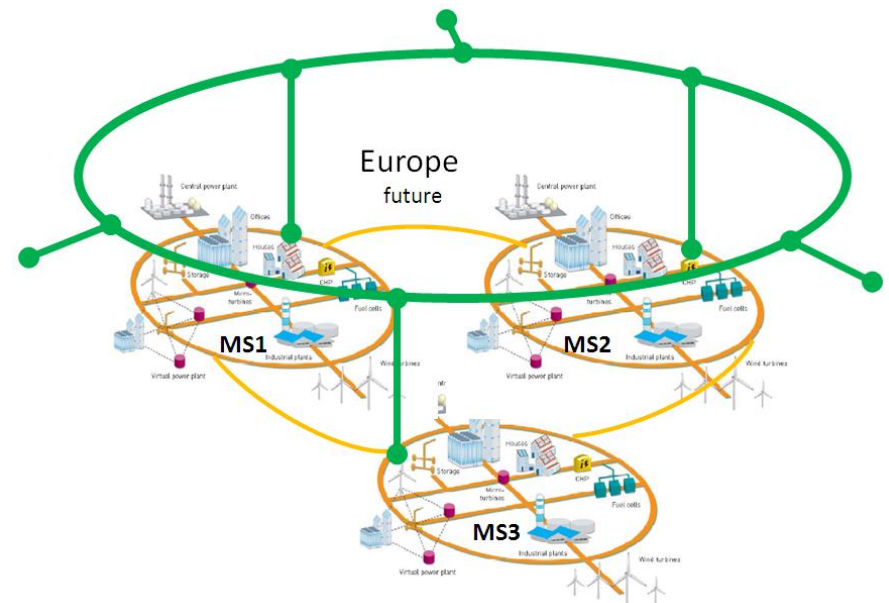


1. European project e-Highway2050

“Planning for **European Electricity Highways** to ensure the reliable delivery of renewable electricity and **Pan-European** market integration”



■ Wave energy ■ Wind energy → Electricity Highways 2050
■ Bioenergy ■ Solar energy



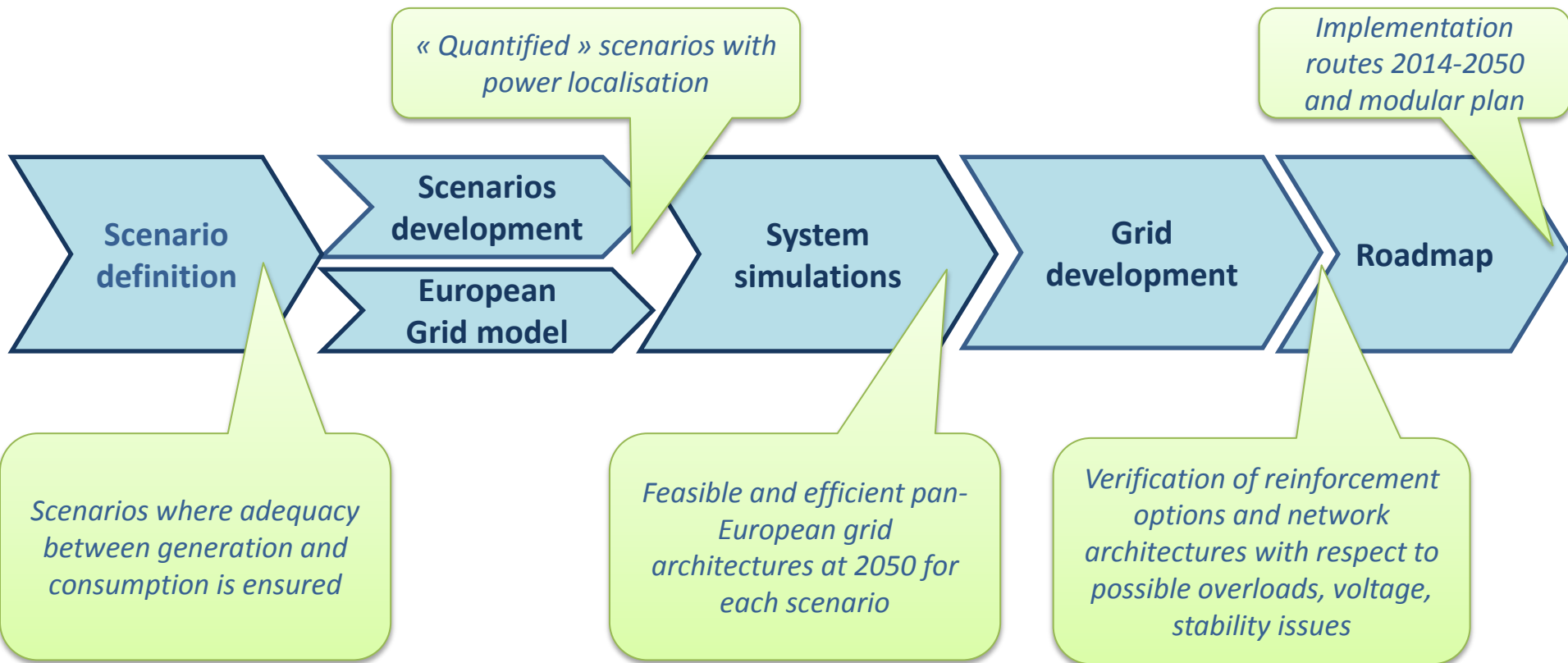
40 month project, from **September 2012 to December 2015**

3. A consortium of 28 direct partners

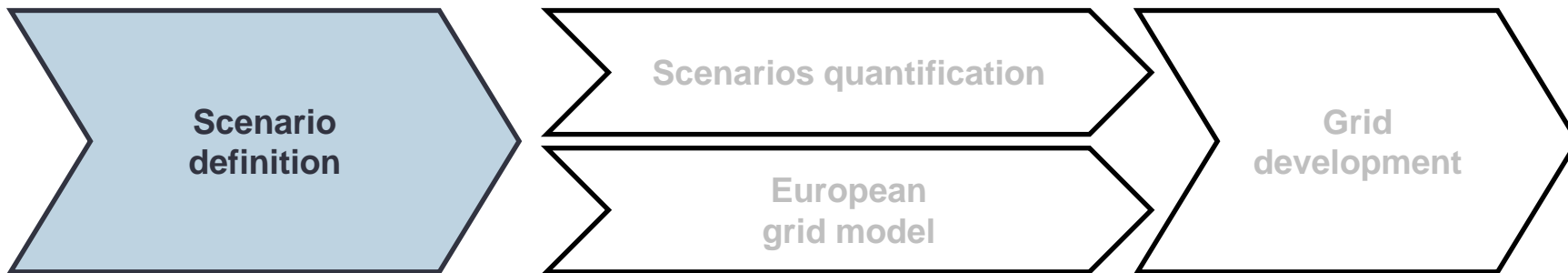
The consortium consists of 28 direct partners, categorized into four main groups:

- TSO (Transmission System Operators):** entsoe, elia, 50hertz, Svenska Kraftnät, amprion, ceps, RED ELÉCTRICA DE ESPAÑA, ENERGINET/DK, swissgrid, PSE Operator, APG, HTSO, REN, Terna, Rte, eiec.
- Industry:** EWEA (The European Wind Energy Association), eurelectric (Electricity for Europe), T&D europe, europacable.
- Research Institute:** Brunel University London, SINTEF, ECN, TU Berlin, RSE (Ricerca Scientifica Sistemica Energetica), UNIVERSIDAD ICAI ICAIDE COMILLAS MADRID, KATHOLIEKE UNIVERSITEIT LEUVEN, JEN, ensiel (ENERGIA E SISTEMI ELETTRICI), INSTITUTO SUPERIOR TÉCNICO.
- Experts:** E3G, Collingwood Environmental Planning, dena (German Energy Agency), TECHNOfI, PÖYRY.

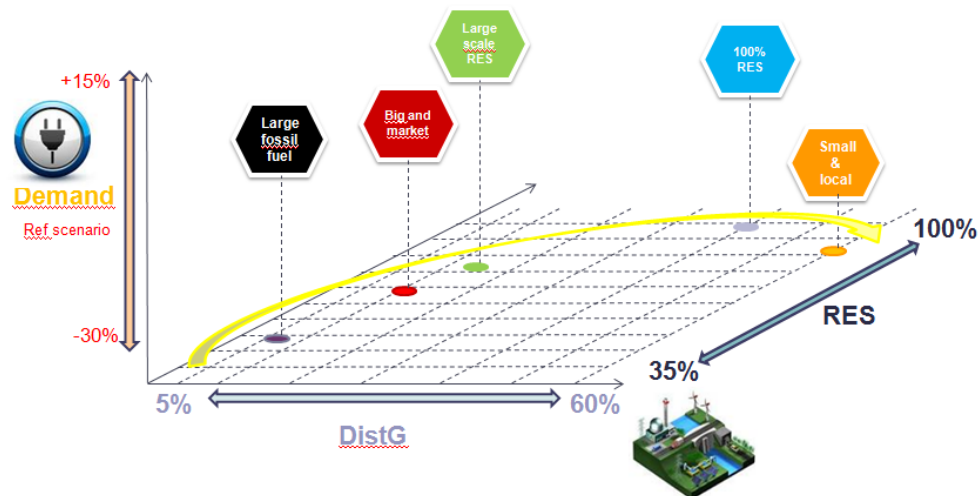
4. The main process of e-Highway2050



Reminder of the e-Highway2050 process



Five scenarios



Reminder of the e-Highway2050 process

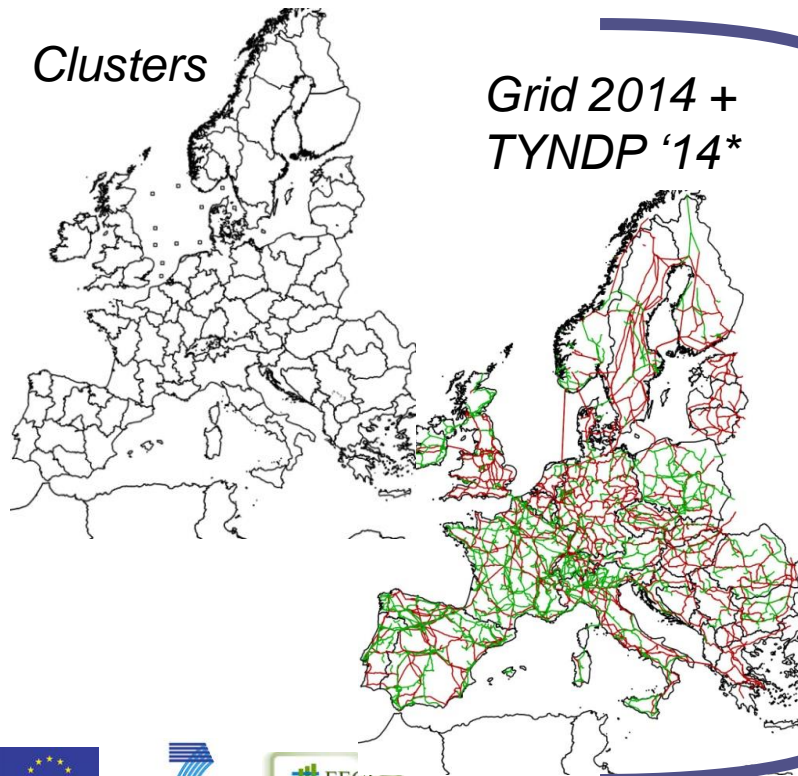
Scenario definition

Scenarios quantification

Grid development

European grid model

Clusters



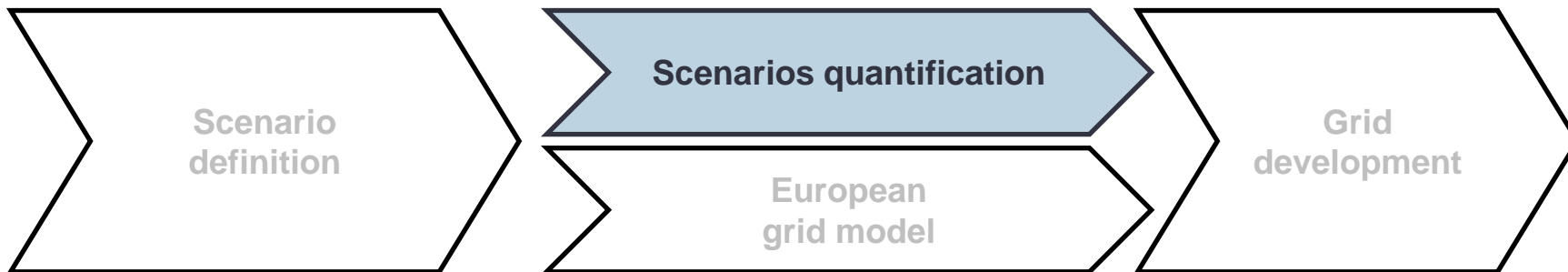
Grid 2014 + TYNDP '14*

Equivalent grid model



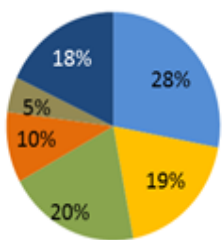
* All reinforcements included in CIM Data-Set (April ,13)

Reminder of the e-Highway2050 process



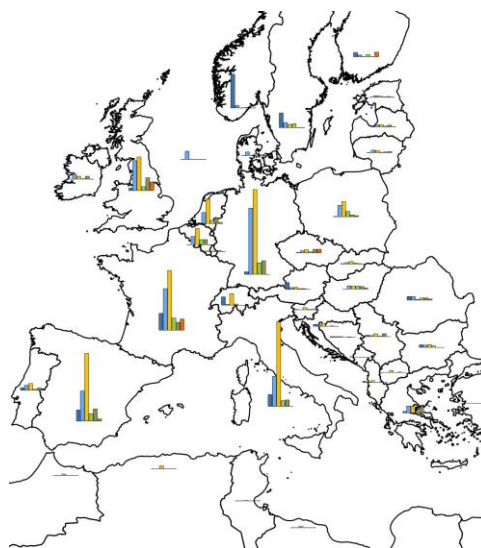
Installed capacities and demand at :

Europe level

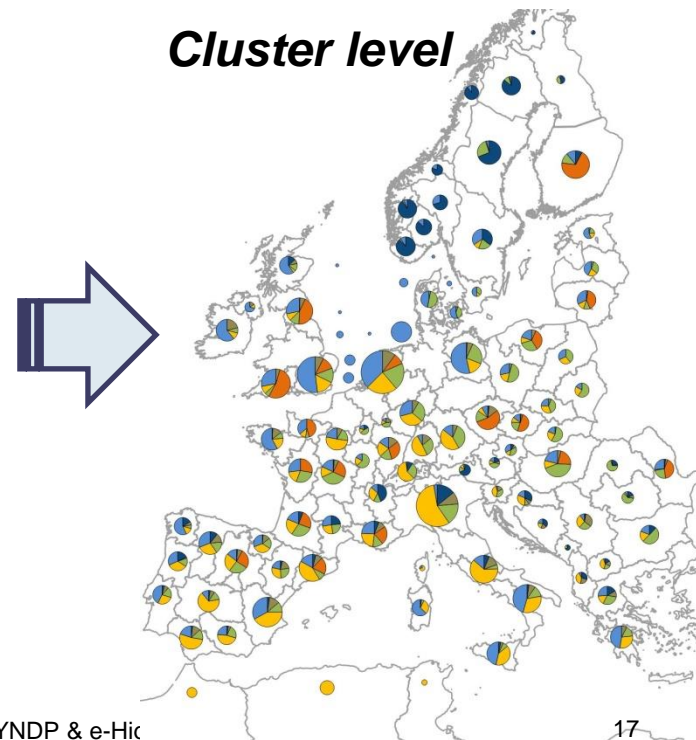


- Wind
- Solar
- Biomass
- Nuclear
- Fossil
- Hydro

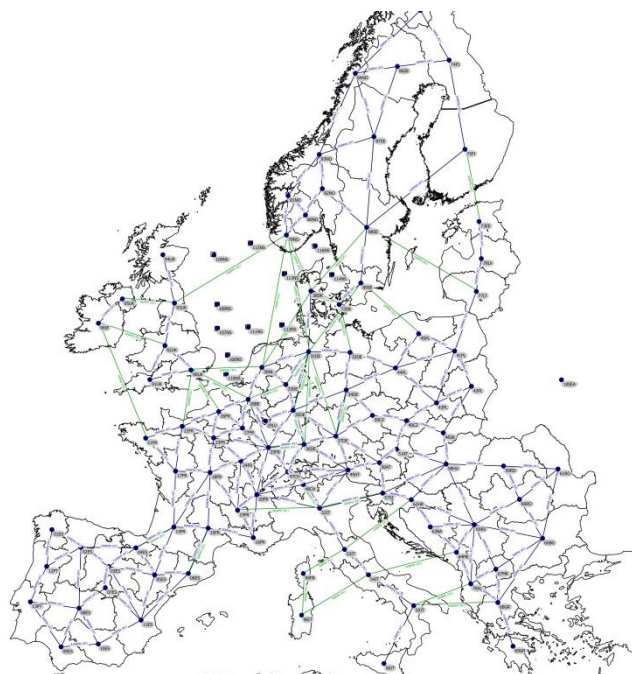
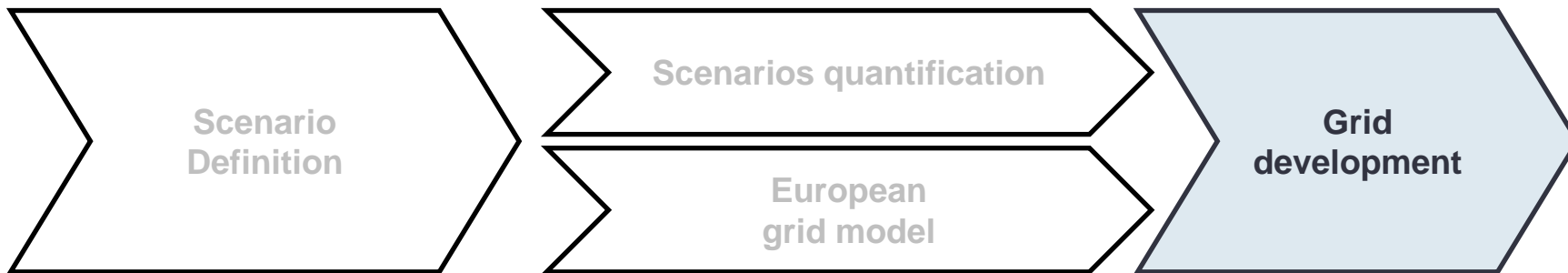
Country level



Cluster level



Reminder of the e-Highway2050 process

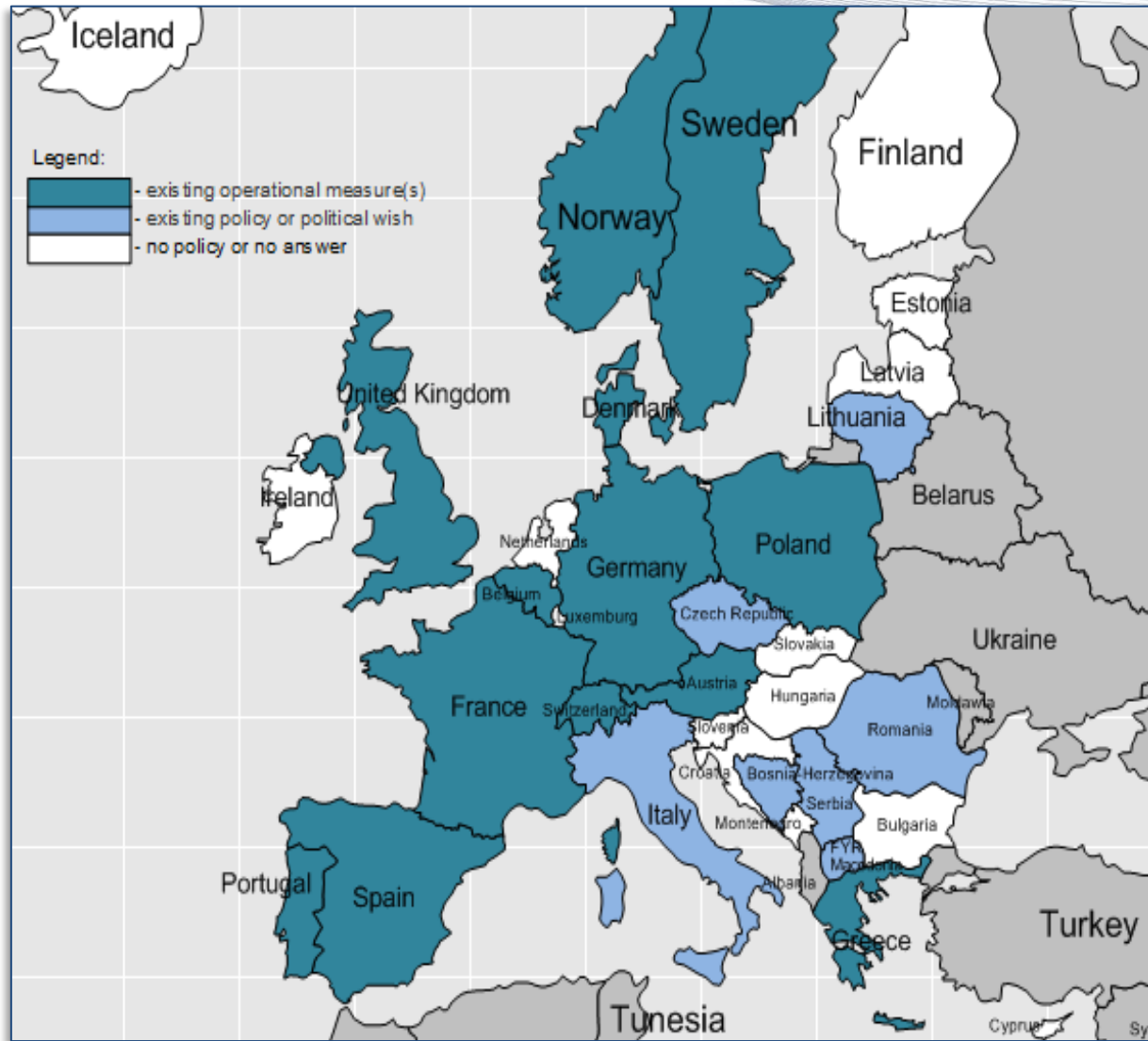


Grid 2014 + TYNDP '14



2050

National policies on energy efficiency



- Blank -no policy or no answer
- ++ -existing operational measure(s)
- + -existing policy or politically desired

Methodology for scenario setup

Uncertainties (examples)

Technical uncertainties

- Technology cost and performance
- Generation, Transmission, Demand
-

Economic/financial uncertainties

- Economic growth
- Population
-

Political/social/environmental uncertainties

- Public perceptions and acceptance
- International climate policies
- International vs. national policy focus
- ...

Research, Development & Deployment uncertainties

- CCS maturity
- Multi-terminal HVDC operability
-

Options (examples)

Technical options

- RES deployment: wind, solar, biomass,
- Non-RES techn: Nuclear, CCS,
- Network techn: HVDC, FACTS, ...
- End use efficiency

Economic/financial options

- Energy and capacity markets
- Subsidies/support schemes
- Taxes

Political/social/environmental options

- Regulations
- Industry standards
- Information campaigns

Research, Development & Deployment options

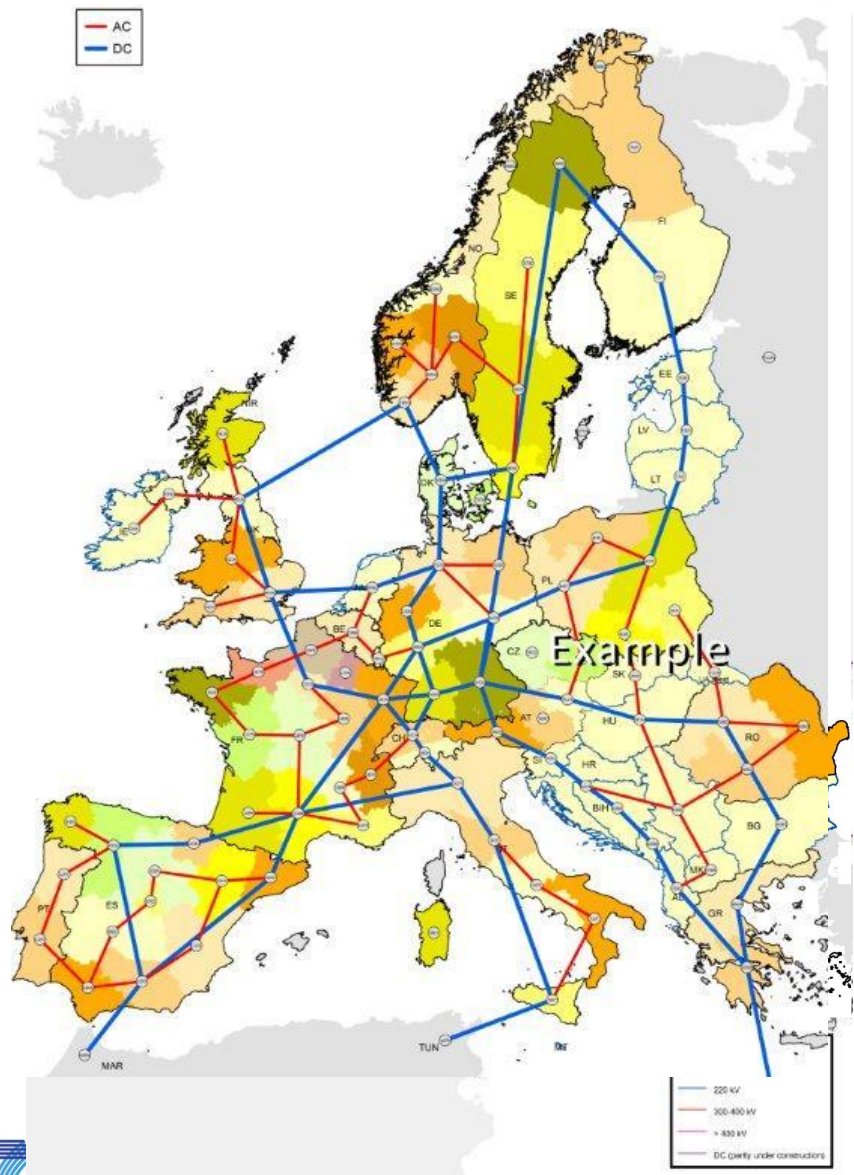
- Research funding
- Laboratory facilities
- Demonstration sites

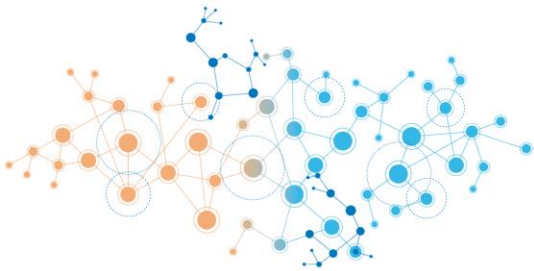
Futures

Strategies

Scenarios

2. e-Highway2050 possible results



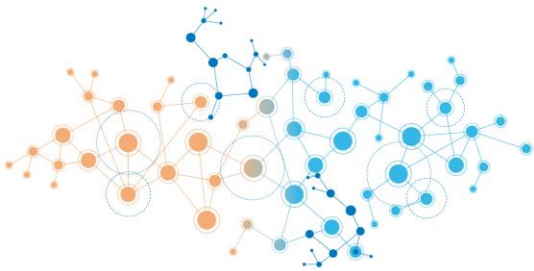


Concept - Idea

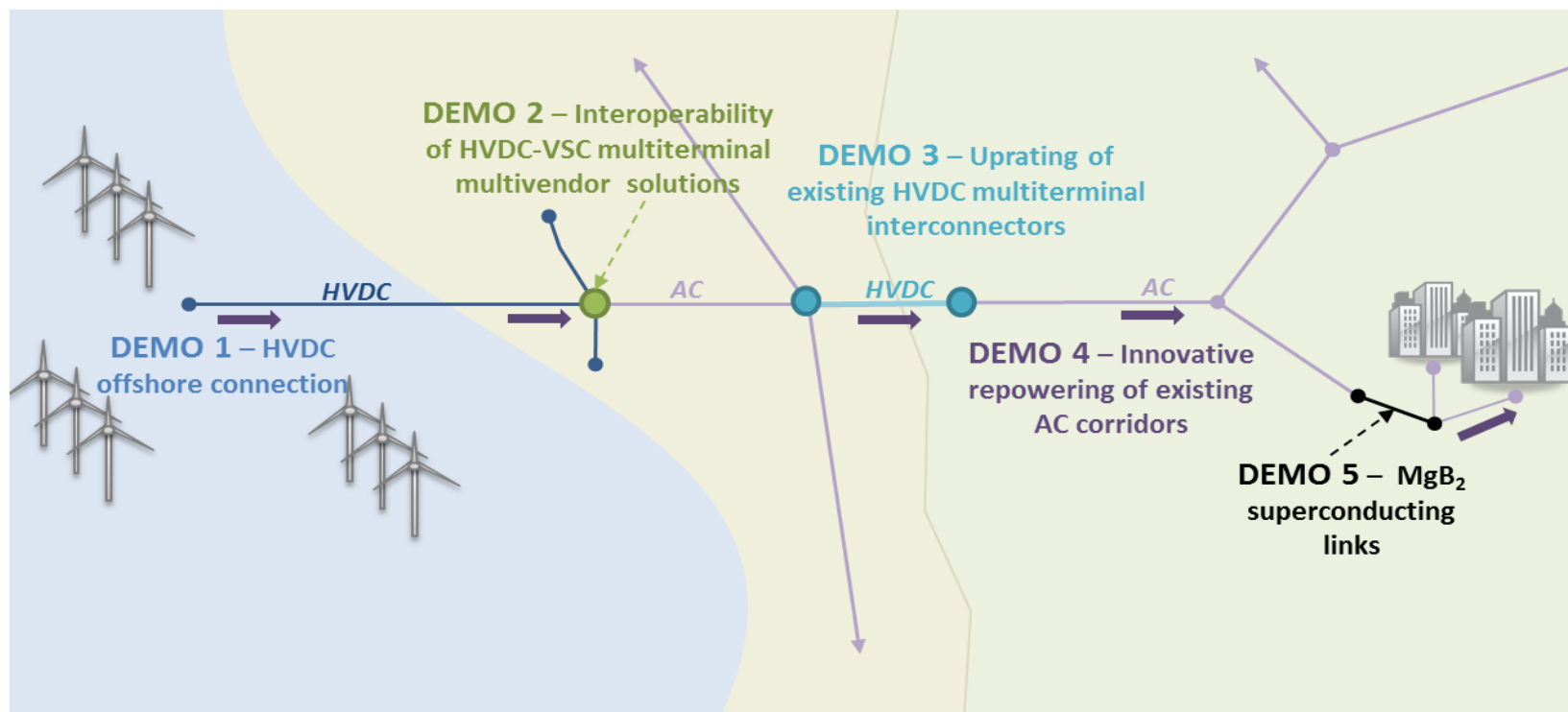
- **BEyond State-of-the-art Technologies for re-Powering AC corridors and multi-Terminal HVDC Systems**
- RD&D project supported by the European Commission under FP7
- Period: Oct. 2014 - Sept. 2018 (4 years)

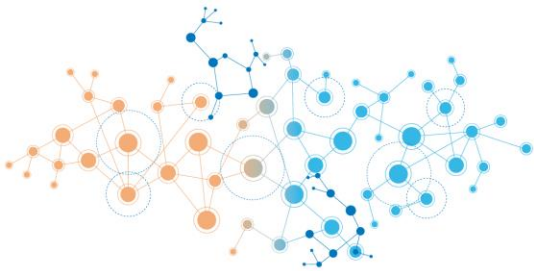
The BEST PATHS project aims at:

“**demonstrating** by 2018 and through real life, large scale demonstrations, the capabilities of several critical **network technologies** required to **increase the pan-European transmission network capacity and** electric system **flexibility**, thus making Europe able of **responding** to the **increasing** share of **renewables** in its energy mix by 2020 and beyond, while **maintaining** the present level of **reliability** performance

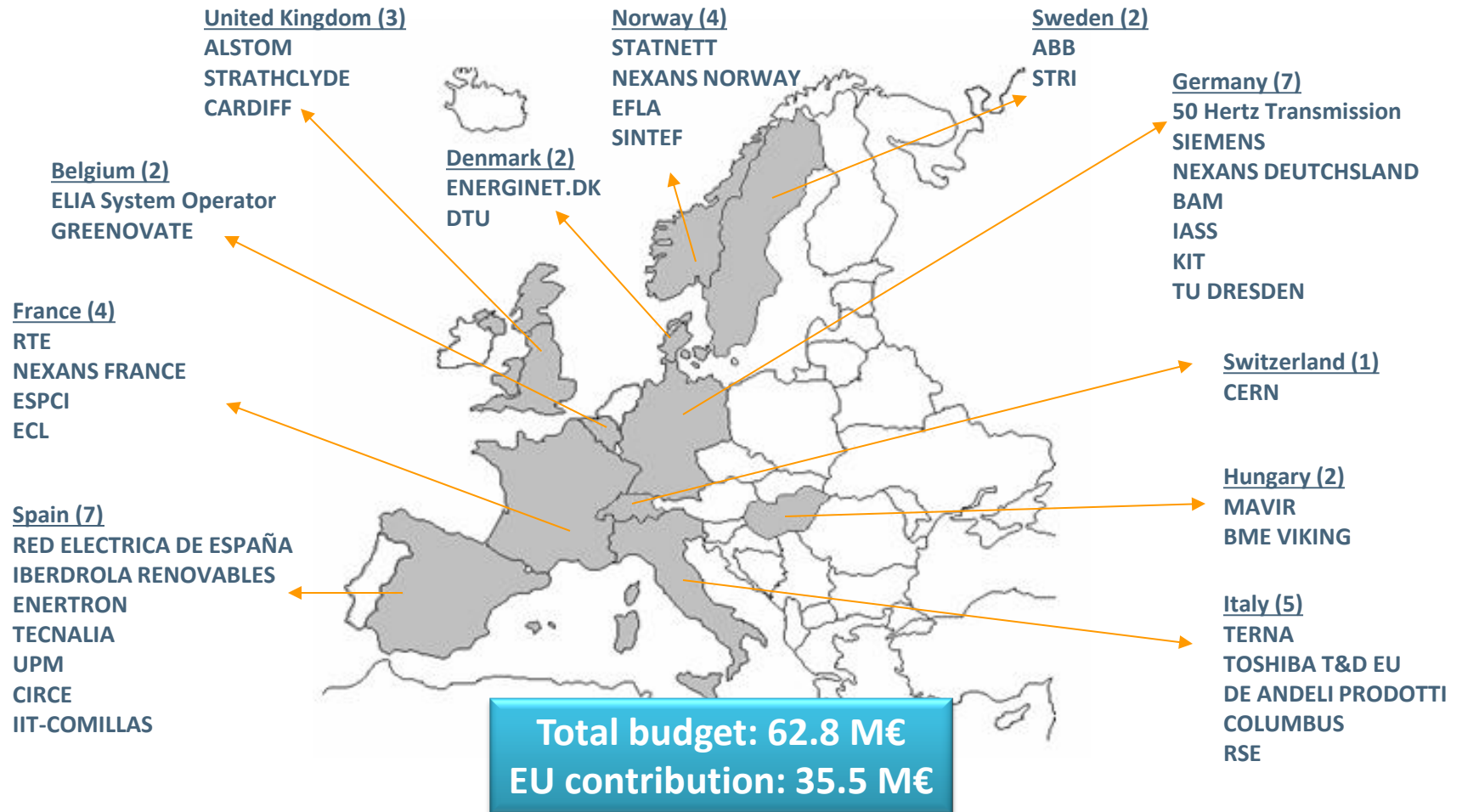


Objectives





Consortium and Budget





Le réseau de l'intelligence électrique

Merci de votre attention !

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