E-HIGHWAY2050 PROJECT RESULTS

ELECTRICITY HIGHWAY BOOKLET

Sebastien LEPY – Chairman SDC

ENTSO-E Assembly Meeting

1/10/15

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E-Highways 2050 at a glance

2012-2015 research project, funded by EC

Focus = grid development 2030 - 2050 towards decarbonation of the European power sector

with design & testing of new methodologies

A large consortium with ENTSO-E, TSOs, industrial associations, academics, consultants and 1 NGO

A booklet and a conference 3-4 Nov. 2015 in Brussels to present the results

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Important outcomes

New methodologies and tools to build long term scenarios, identify investment needs and value them that will inspire the **TYNDP**

Scenarios for 2050 with high RES development and corresponding grid investment needs

RES imply grids (but no “overlay” grid)

Grid reinforcements displayed with triggering RES

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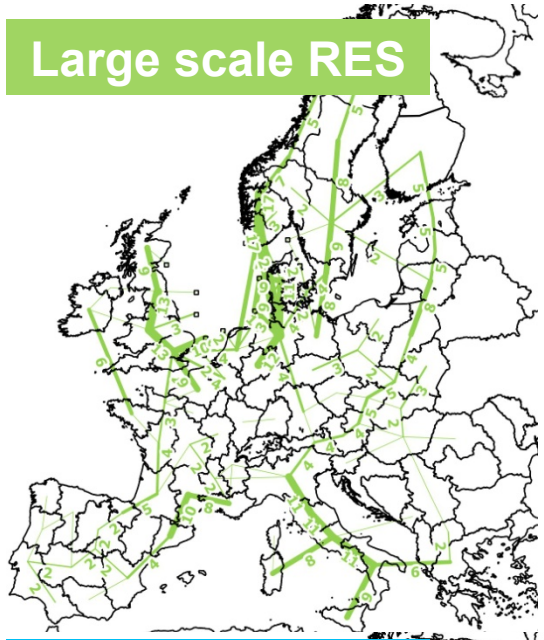
Grid architectures for 2050

Large scale RES

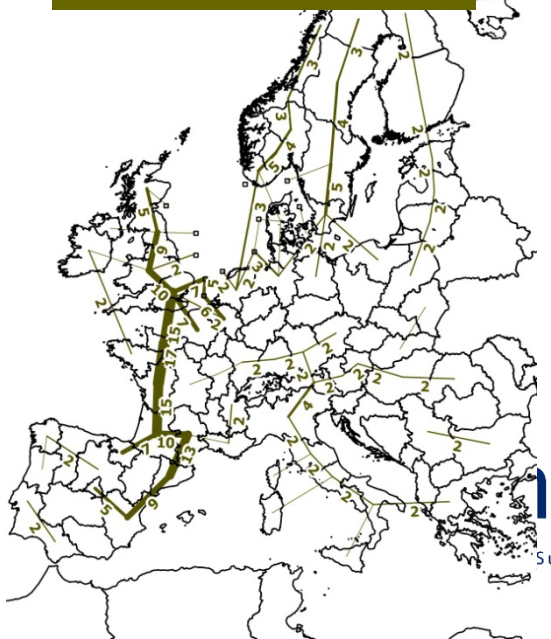


Small & local

Big & market

100% RES

Fossil & nuclear



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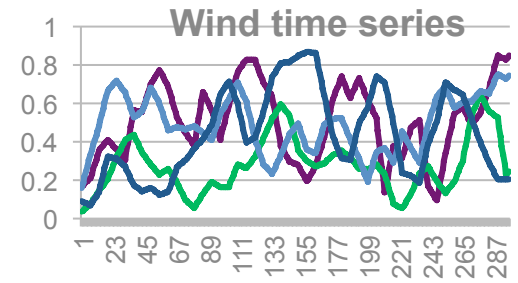
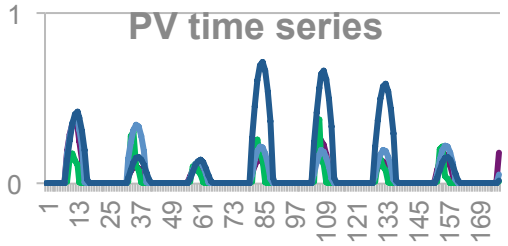
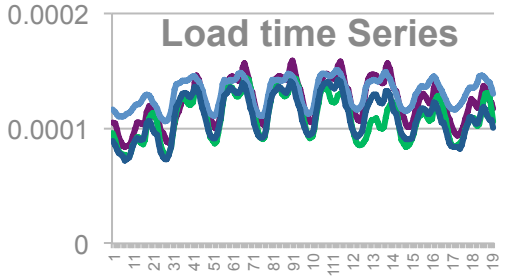
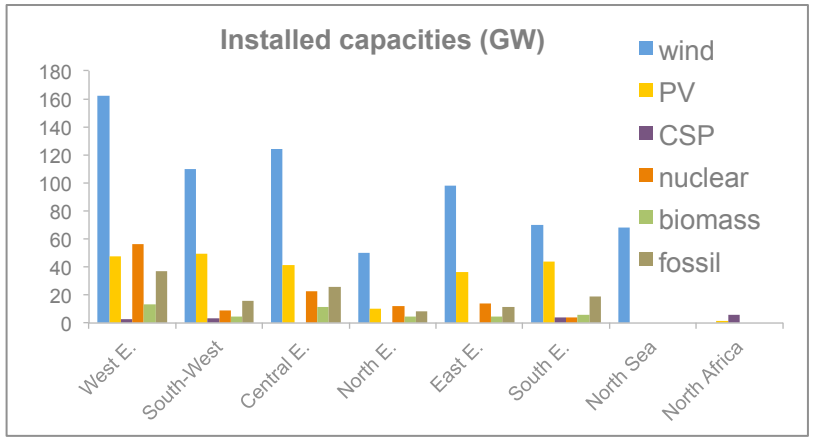
A top down scenario construction

Inputs: set of time series (11 wind and PV, 3 load)









Hourly stochastic simulations at macro area level

Adequacy OK?
Energy mix OK?
Imbalances OK?

NO

Redistribution of the generation between macro areas

Final installed capacities/ final Imbalances
Incl. assessment of storage and Demand Side Management needs

	Large RES	100% RES	Big& market	Large fossil fuel	Small & local
Range of Imbalances	+/- 80%	+/- 80%	+/- 30%	+/- 30%	+/- 10%

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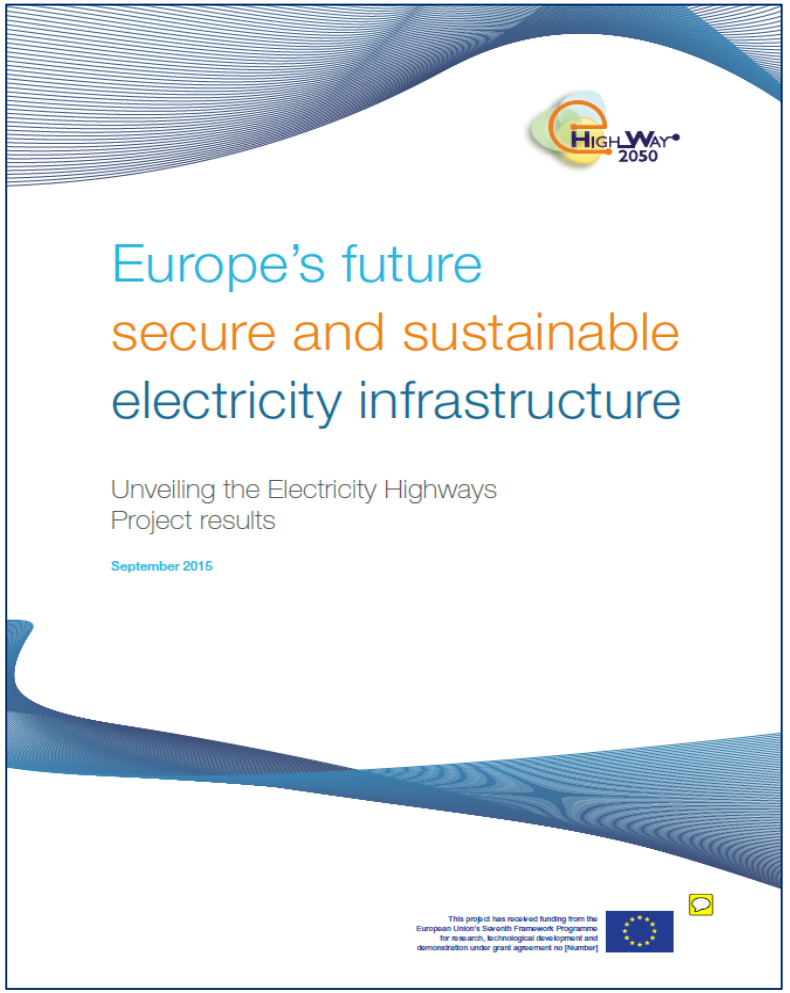
The E-Highways 2050 Booklet

The Booklet sums up the results and the ‘story’ of the project

The basis for the 3-4 November conference

Currently under consultation within both the Project and ENTSO-E (Monitoring Body, SDC, SOC and MC)

An updated version of the Booklet has been sent **to the Assembly** on 30 September for review and **for approval by the mid of October**



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Mark the date

Conference

“Unveiling the Electricity Highways Project Results: Europe’s Future Secure and Sustainable Electricity Infrastructure”

on 3-4 November in Brussels

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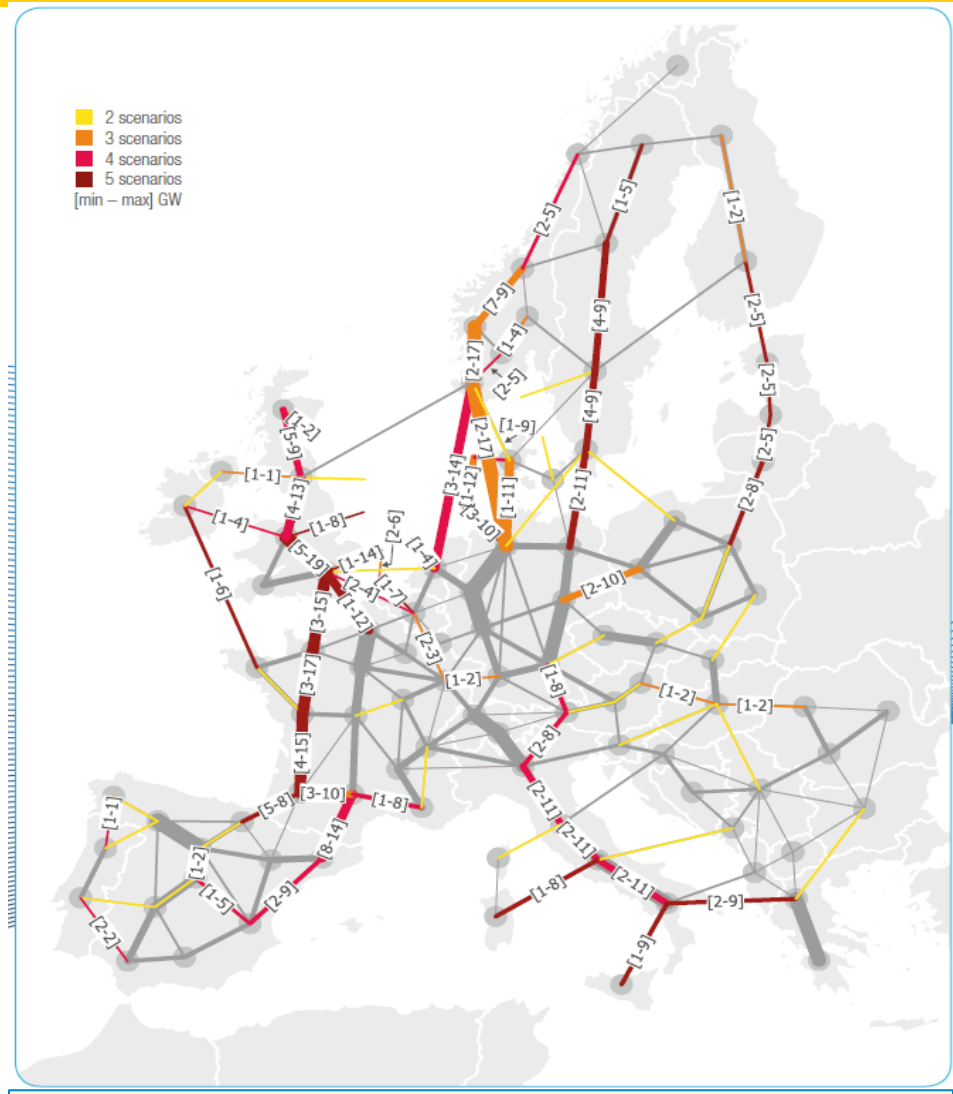
Common Grid reinforcements

- Overview of the proposed new transmission reinforcements to support each of the five scenarios.
- **Predominance of "North to South" corridors** → all scenarios have several reinforcements collecting electricity from the North of the pan-European electricity system (North Sea, Scandinavia, UK and Ireland) and transport it to the continental synchronous area (northern DE, PL, NL, BE and FR) including via submarine corridors.
- **Major corridors** also enable the collection of energy from southern countries like ES and IT, but also support their needs with the generation coming from the North.



Widths → *according to average reinforcement capacity*
Colour → *the scenario where the reinforcement is needed*

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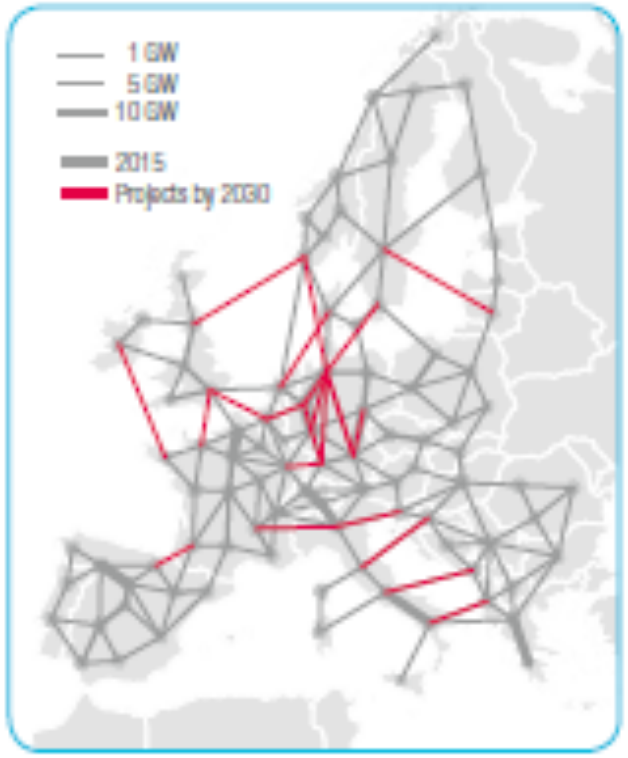
The starting grid



Not the real grid (> 8000 electrical nodes),

but a model with 100 clusters (electrical nodes).

The network foreseen until 2030, and included in the TYNDP14

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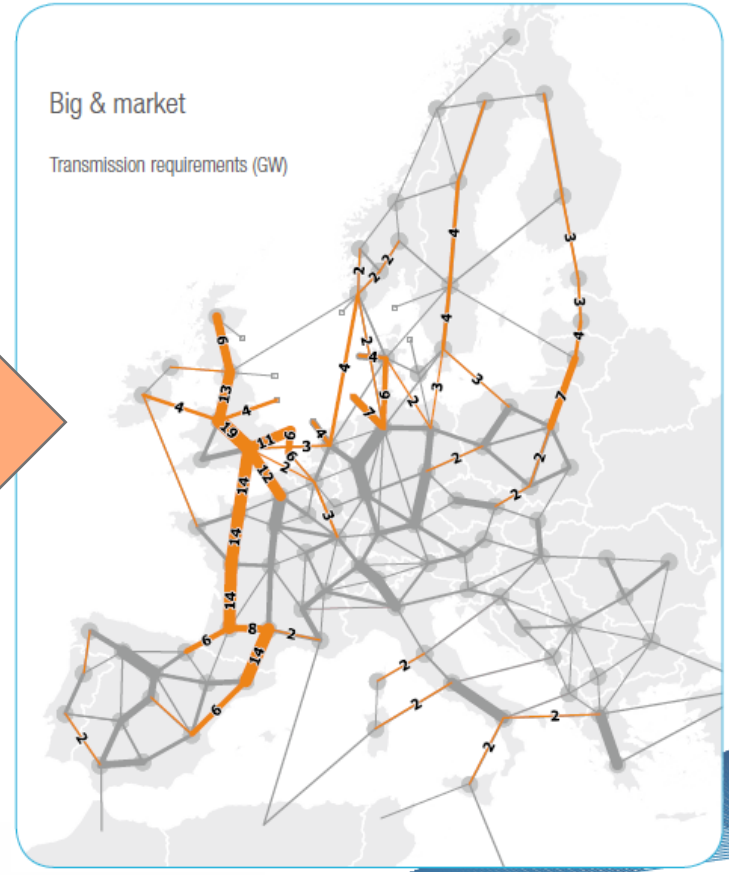
Not an Overlay Grid, but Grid reinforcements

- The project results show that due to **HIGH RES development** the **need for grid reinforcements** in all five scenarios, but **NO Overlay HV Grid**
- The network extension rate is in direct relation with the growth rate of non-dispatchable generation, especially wind and PV;
- The new lines and reinforcements to be implemented before 2040 → subset of the ones to be delivered before 2050 in order to meet by then the **low carbon economy orientation**

Proposed Reinforcements



NO overlay grid

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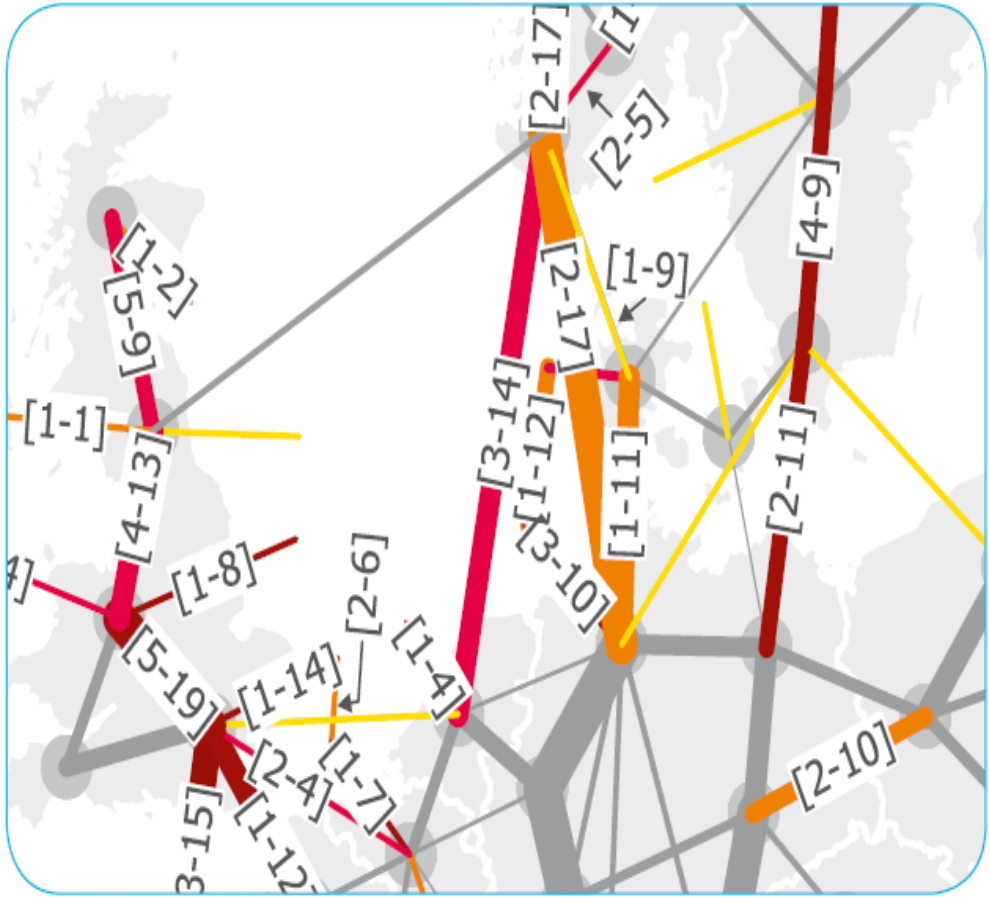
Some examples: The North Sea area

- In the initial grid → capacities of the radial links are only around ½ of installed offshore wind capacities
- Further reinforcements **due to high RES penetration** have been assessed within the study
- **Main conclusion** → by 2050 some offshore clusters with huge volumes of wind power are not close to clusters exhibiting energy deficits
- Example → the offshore cluster near western Denmark is interesting for providing energy to northern Continental Europe rather than to Denmark (no need)
- **Several possible routes** to go from an offshore cluster to a cluster with deficit in energy (e.g. DE):
  - through DK (radial connection to DK and extra capacity DK - DE);
  - and/or through a circular meshing - offshore North Sea clusters



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