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
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
Grid architectures for 2050

- Large scale RES
- 100% RES
- Big & market
- Small & local
- Fossil & nuclear
A top down scenario construction

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

Redistribution of the generation between macro areas

Adequacy OK? Energy mix OK? Imbalances OK?

Hourly stochastic simulations at macro area level

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

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<th>Large RES</th>
<th>100% RES</th>
<th>Big &amp; market</th>
<th>Large fossil fuel</th>
<th>Small &amp; local</th>
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<tbody>
<tr>
<td>Range of Imbalances</td>
<td>+/- 80%</td>
<td>+/- 80%</td>
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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
Mark the date
Conference
“Unveiling the Electricity Highways Project Results: Europe’s Future Secure and Sustainable Electricity Infrastructure” on 3-4 November in Brussels

Sebastien LEPY
Chairman SDC
ENTSO-E
sebastien.lepy@rte-France.com
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.
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
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**
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