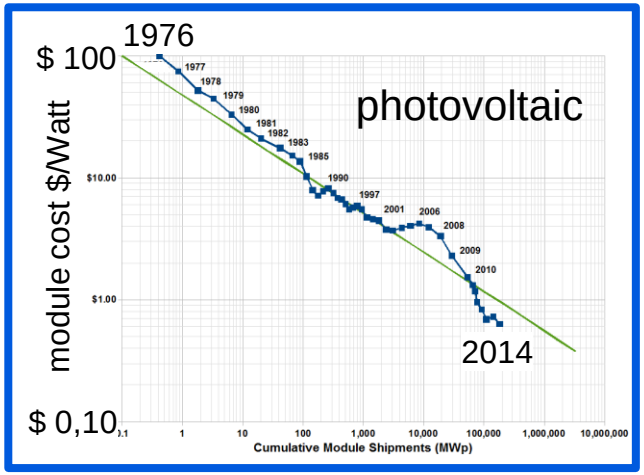
IRENA Innovation Week, Bonn, May 11-13, 2016 – Jochen Kreusel

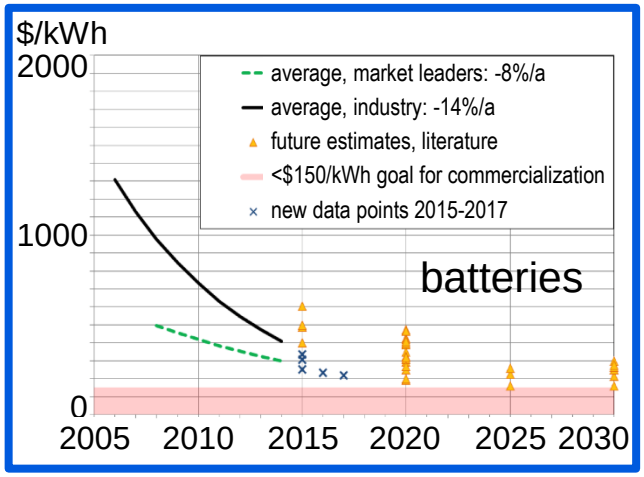
Deep dive Modelling and Planning e-Highway 2050 as an example

The challenge
Rapidly evolving technologies

Source: https://en.wikipedia.org/wiki/Swanson%27s_law

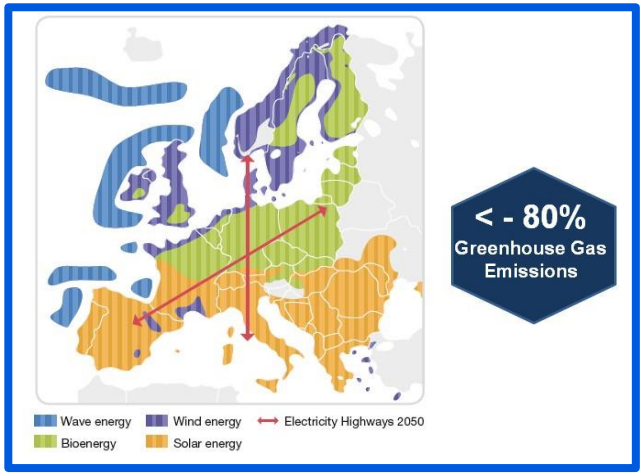


Source: Björn Nykvist et al., http://www.pv-magazine.de/nachrichten/details/beitrag/batteriepreise-purzeln-weiter_100020916/



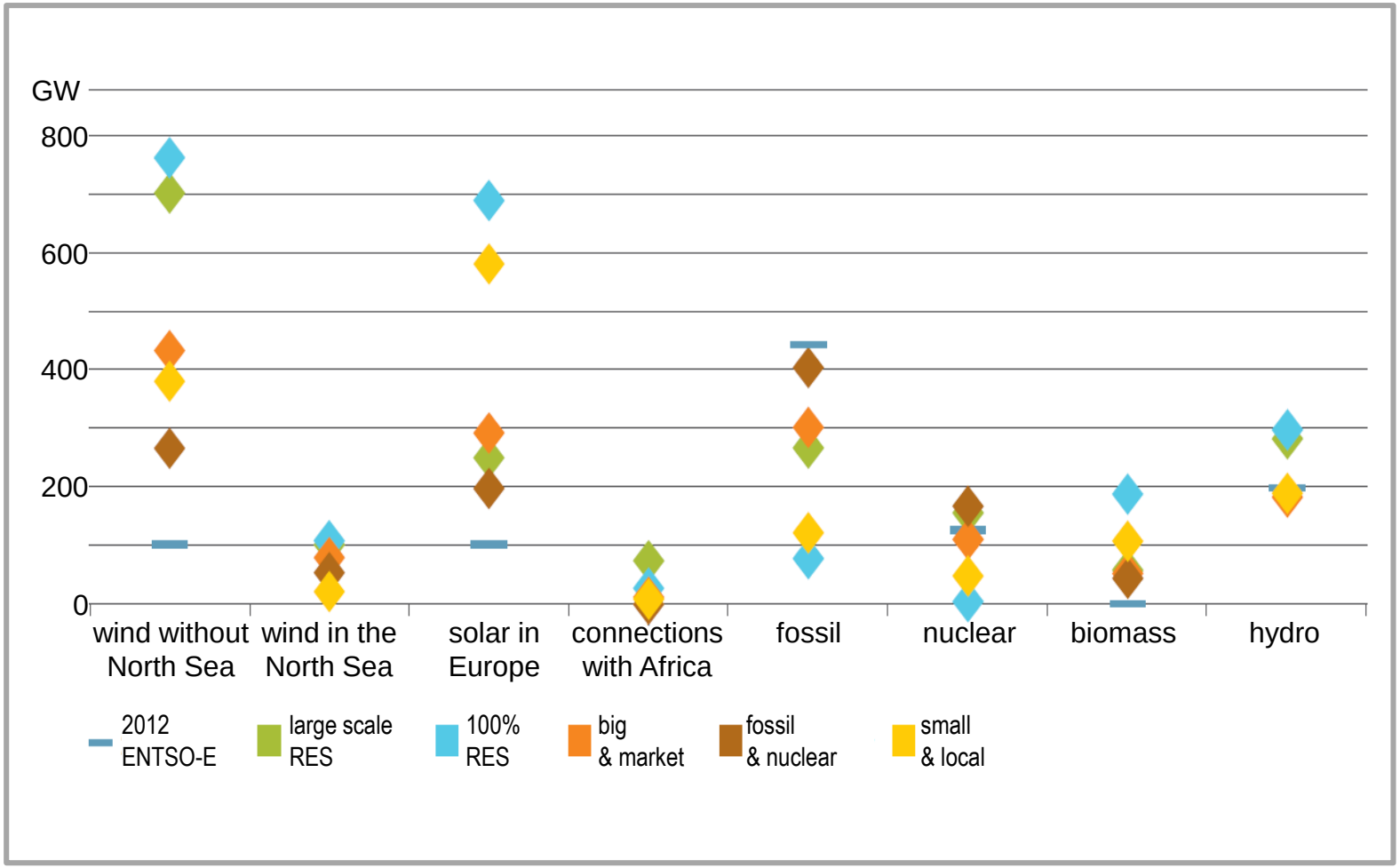
- Two technologies making a fundamental difference
  - Rapid cost decrease
    ⇒ grid parity
  - Nearly unlimited scalability
    ⇒ large and very small installations
  - Consumer investment behavior
- On the other side
  - Transmission grids are an integral part of future power systems
  - Renewables are driving regional expansion
  - Very long planning horizon
  - Increasing uncertainty

e-Highway2050 (2012-2015)
What transmission grids will Europe need until 2050?

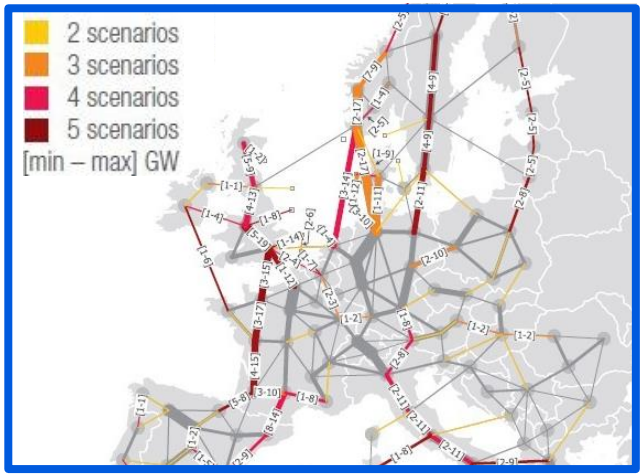


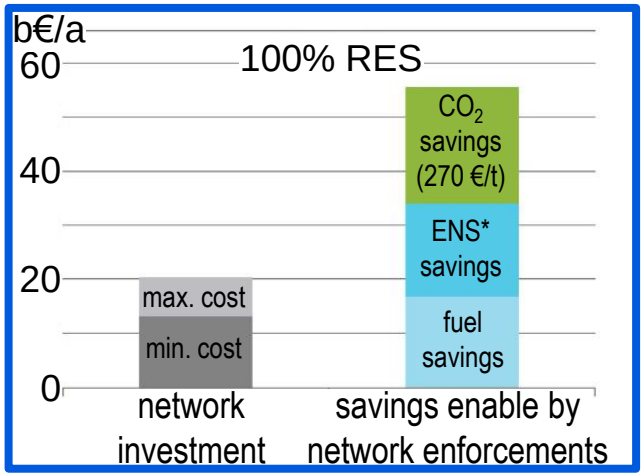
- Background
  - Energy roadmap 2050 of the European Union
  - Starting grid 2030 from ENTSO-E Ten Year Network development Plan
  - Uncertain development on the generation side
- Objectives
  - Methodology to support planning of the European transmission network
  - Modular development plan for possible electricity highways and options for a complete pan-European grid architecture
- More: http://www-e-highway2050.eu

Dealing with uncertainty
Definition of five extreme, though realistic scenarios



e-Highway2050
Exemplary results





- An invariant set of new lines and reinforcements has been identified.
- Needed investments in Pan-European transmission grids between 100 and 400 bn € (depending on technology selection).
- Grid enforcements are the most economic way to reach the climate targets 2050.

*ENS: energy not supplied, avoided investments in additional generation capacity in order to face ENS

e-Highway2050
Summary

- Political targets are achievable by a coordinated pan-European approach
- Grid enforcements are economically attractive
  - Enforcement of the existing grid is sufficient
    ⇒ evolution, not revolution
  - Grid extension allows utilization of attractive generation sites and supports levelling of feed-in
- Increasing requirements for transmission with growing share of renewable energies
- Even in the most distributed and local scenario additional transmission capacity is needed
- New lines planned today are needed also in 2050
  ⇒ clear no-regret measures
- Necessary investments between 100 and 400 bn €

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