

The role of natural gas in increasing the uptake of renewable energy

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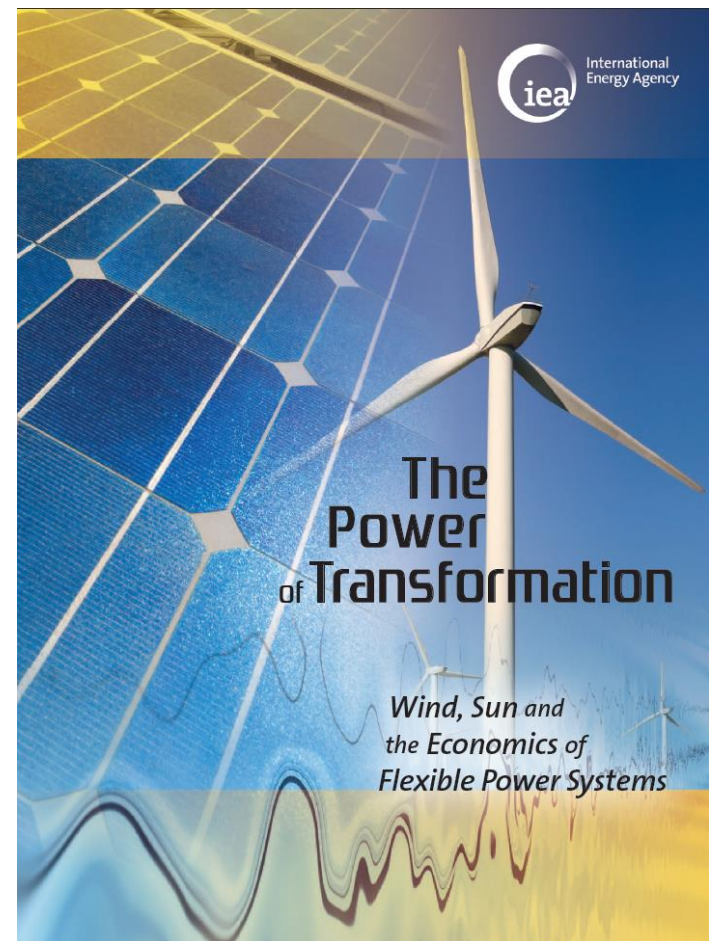
Group of Experts on Gas, 2nd meeting, 20 January 2015, Geneva

The Grid Integration of Variable Renewables Project - GIVAR



■ Third project phase

- 7 case studies covering 15 countries, >50 in-depth interviews
- Technical flexibility assessment with revised IEA FAST tool 2.0
- Detailed economic modelling at hourly resolution
- Publication released 26 February



Gas and variable renewables



■ Strategic match:

- Gas plants are cheap to build. This is a clear advantage for VRE integration. It does not make sense to build a very expensive power plant, that you then only use when wind and sun are not operating at a high output.
- You can start and stop certain gas power plants very often and at short notice. They can also change their output rapidly once they are running. This helps to deal with the sometimes rapid swings that wind and sun bring for the balance of the power system.

■ But: complementarities in Europe are not materialising

Crucial distinction: dynamic vs. stable systems



Dynamic Markets China, India, S. America, Africa

Stable Markets EU/US

- Demand driven
- Capacity/generation welcome - no incumbents displaced
- RE competes with full costs of new generation
- Infrastructure can be built up in parallel

- Policy driven
- Capacity /generation additional – incumbents displaced
- RE competes with marginal costs of existing generation
- Existing infrastructure sub-optimal



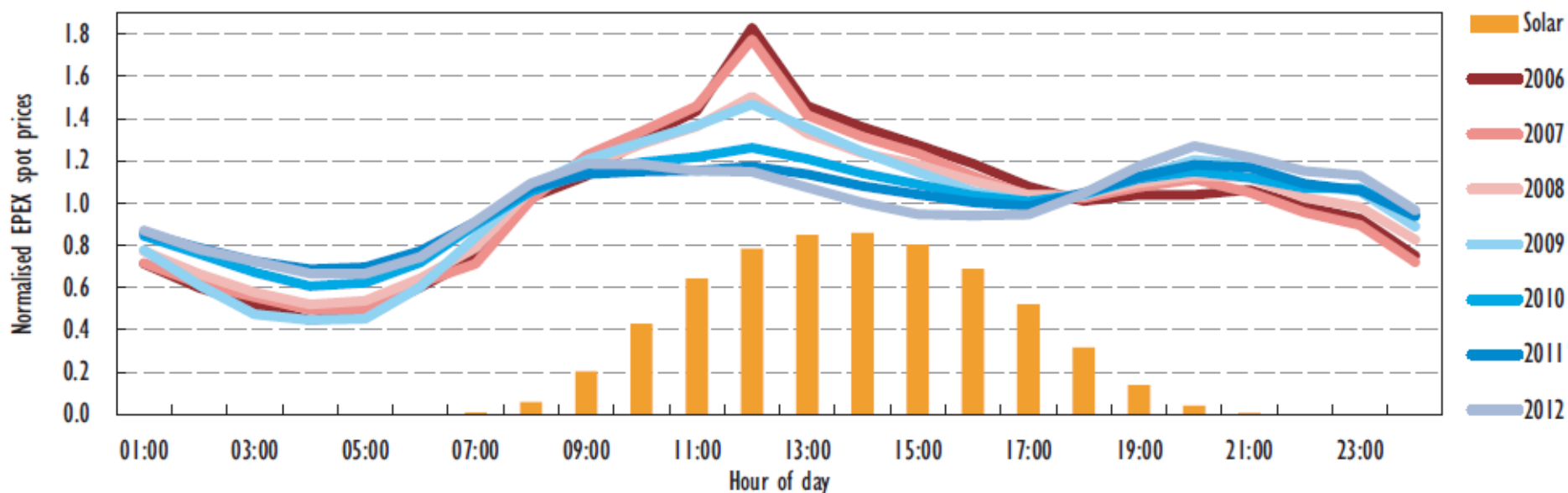
Supportive policy
frameworks often
with long term ppa's



Policy uncertainty

Main market impacts in stable systems

Shift in German spot market price structure



- Reduced market *prices* (merit order effect)
- Reduced operating *hours* (utilisation effect)
- Displacement effect mainly due to
 - low short-run cost of VRE and
 - reinforced by support policies
 - influenced by variability, in particular PV
- Economic impact on gas generation result of several factors

A European “Perfect Storm”



■ Five factors are lining up to form a perfect storm:

1. Electricity demand sluggish or demand falling
2. High natural gas prices in recent years, oil price indexed contracts and tight global LNG markets
3. Low coal prices, after recent investments ample mining/transport capacity
4. CO₂ prices rendered negligible due to ETS design
5. Too rapid past deployment of PV and associated cost burden

➔ European energy challenges, in particular for gas, are not due only to RE deployment.

Modelling 45% of wind and solar PV



■ Investment Model for Renewable Energy Systems (IMRES)

Test system:

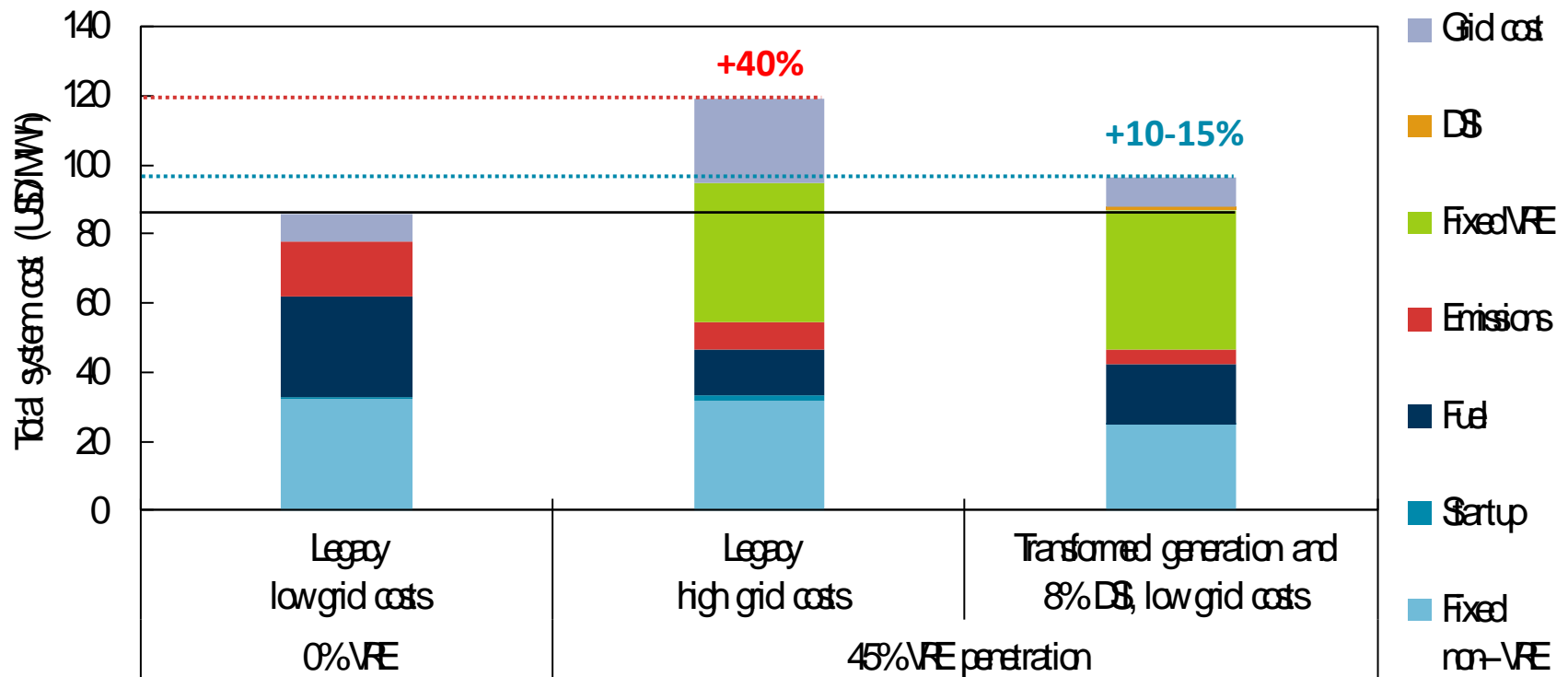
- Similar size to Germany but isolated system
- Dispatchable power plant mix optimised by model

■ Different levels of VRE penetration – up to 45% in annual generation – were investigated.

■ Different scenarios:

- Extreme and purely hypothetical case: a share of 45% VRE in annual generation was added to the system overnight and only the operation of the remaining system was allowed to change (Legacy case)
- Different scenario of the test system considers a more transformative approach. The installed power plant mix is re-optimised in the presence of 45% VRE and additional flexibility options are deployed (Transformed case).

System costs and transformation



- Large shares of VRE can be integrated cost-effectively
- But adding VRE rapidly without adapting the system is bound to increase costs
- Legacy case exaggerated version of current European situation

Power plant utilisation and prices in stable systems – modelling results

■ Transformation of the system

- Re-establishes gas market share at the cost of coal
- Re-establishes capacity factor of gas plants

