Pricing the value of flexibility – findings from the “The Power of Transformation”

Simon Müller
Analyst – System Integration of Renewables

Electricity Security Advisory Panel Workshop on SCARCITY AND FLEXIBILITY PRICING, 2 July 2014, Paris
Third project phase at a glance

- 7 case studies covering 15 countries, >50 in-depth interviews
- Technical flexibility assessment with revised IEA FAST tool
- Detailed economic modelling at hourly resolution
What shapes the integration challenge?

Properties of variable renewable energy (VRE):
- Variable
- Uncertain
- Non-synchronous
- Location constrained
- Modularity
- Low short-run cost

Flexibility of other power system components:
- Grids
- Generation
- Storage
- Demand Side
Three pillars of system transformation

1. Let wind and solar play their part
2. Make better use of what you have
3. Take a system wide-strategic approach to investments!

System friendly VRE
Technology spread
Geographic spread
Design of power plants
Transformation depends on context

**Stable Power Systems**
- Little general investment need short term

**Dynamic Power Systems**
- Large general investment need short term

- Maximise the contribution from existing **flexible** assets
- Decommission or mothball **inflexible** polluting surplus capacity to foster system transformation

- Implement **holistic, long-term** transformation from onset
- Use proper long-term **planning instruments** to capture VRE’s contribution at system level

* Compound annual average growth rate 2012-20, slow <2%, dynamic ≥2%; region average used where country data unavailable

© OECD/IEA 2014
Efficient prices at high shares of VRE

- **Variability**
  - high temporal resolution of price signals, *i.e.* prices are valid only for short time periods
  - allowing large differences in prices, *i.e.* negative and very high prices

- **Uncertainty**
  - short-term price signals, *i.e.* prices formed close to real-time and based on current system status
  - operating reserves and balancing, *i.e.* how to deal with forecast errors

- **Location constraints and modularity**
  - high spatial resolution of price signals, *i.e.* prices differ from place to place

- **Non-synchronous technology**
  - (additional) system service markets, *i.e.* substitutes for classical inertial response in certain systems
Large room for improvement in design of system services markets
Short scheduling intervals (5min best practice)

Adjust schedules up to real time (5min best practice)
Co-operation with neighbours

- Germany has four balancing areas (historic reasons)
- Reserve sharing mechanism across four areas
- Reduced requirements despite rapid increase of VRE
Do we price flexibility at its value?

- We already have markets for flexibility:
  - In particular: balancing markets

- Three main problems:
  - Product definition often not robust at high shares of VRE
  - Services sometimes not remunerated or markets under-developed
  - Trading ill-aligned with trading on wholesale market

→ Value of flexibility is not appropriately priced
→ Wholesale market prices do not reflect value during scarcity (including flexibility)
Are your operating reserve and system service definitions VRE ready?

- Example Ireland DS3 programme

**Frequency Services**

- Synchronous Inertial Response
- Fast Frequency Response
- Fast Post-Fault Active Power Recovery

**Ramping Margin**

**Voltage Services**

- Dynamic Reactive Power
- Steady-state Reactive Power

Source: EirGrid
But does flexibility have a value today?

- **Medium-term:**
  - PV reduces value of pumped storage

- **Long-term:**
  - Mutual *increase* of market value
simon.mueller@iea.org