

The evolving Transmission-Distribution Interface - local flexibility markets

IEA TCP WIND Task 25: Design and Operation of Energy Systems with Large Amounts of Variable Generation



Hannele Holttinen, Juha Kiviluoma

Operating Agent Task 25

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iea wind

Towards 100% renewables power systems, with broader transition



- Load transition: changing the fixed load paradigm
- Smart grids: enabling distributed resources, DSO role
- Inverter controls: rapid responses, synchronous machine characteristics from wind and solar

Aggregators and prosumers same same but different



EUROPE'S ENERGY SYSTEM	TODAY	2050 Accelerated Electrification
ELECTRIFICATION	24%	51%
RATES OF ELECTRIFICATION		
Industrial Processes	36%	62%
Transport	1%	48%
Buildings	36%	48%

New electrification loads not same same but very different

Small distributed resources offer flexibility



Through aggregators

- flexible demand in wholesale and balancing markets, if sufficient volume is aggregated
- Easier communication /transparency towards DSOs, TSOs
- DRP Demand Response Provider, responsibility for imbalances as well

Directly

- through local flexibility markets and peer2peer
- Consumer and IoT behaviour? HEMS and BEMS devices already in place, optimising energy use
- Price incentives for system level flexibility? No 'cross balancing', please!

European activities



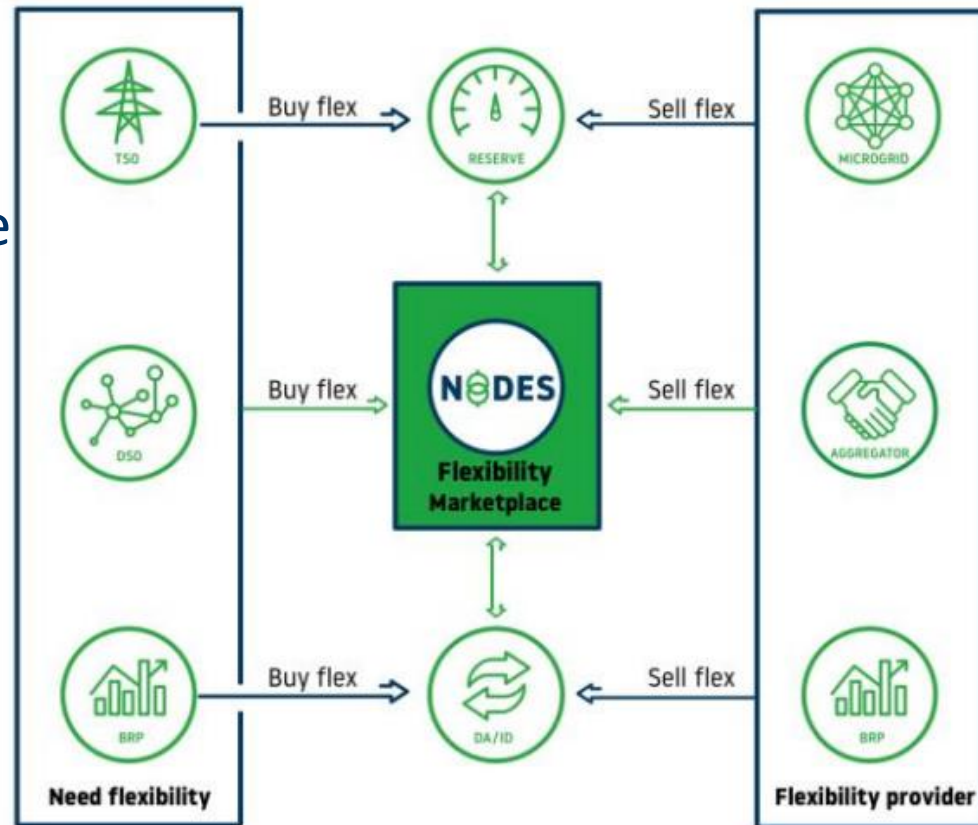
- Distribution level flexibility has multiple use cases: DSOs, TSOs and portfolio balancing of Balance Responsible Parties (BRPs)
- Locational signal, from distribution system, to zonal markets
 - who should be the market operator - separated or integrated with other markets?
 - include a reservation payment?
 - which type of products should be traded in flexibility markets, standardized?
 - DSO and TSO procure flexibility in the same market? whether DSO or TSO should have priority over flexible resources and, real-time TSO-DSO coordination when a flexible resource is activated ?
- First demonstrations: NODES (Nordpool), Enera (Tennet-DE, DSOs and EPEX), Piclo (UK DSOs), GOPACS (NL platform, geo-tags from ID)



Local flexibility markets: NODES



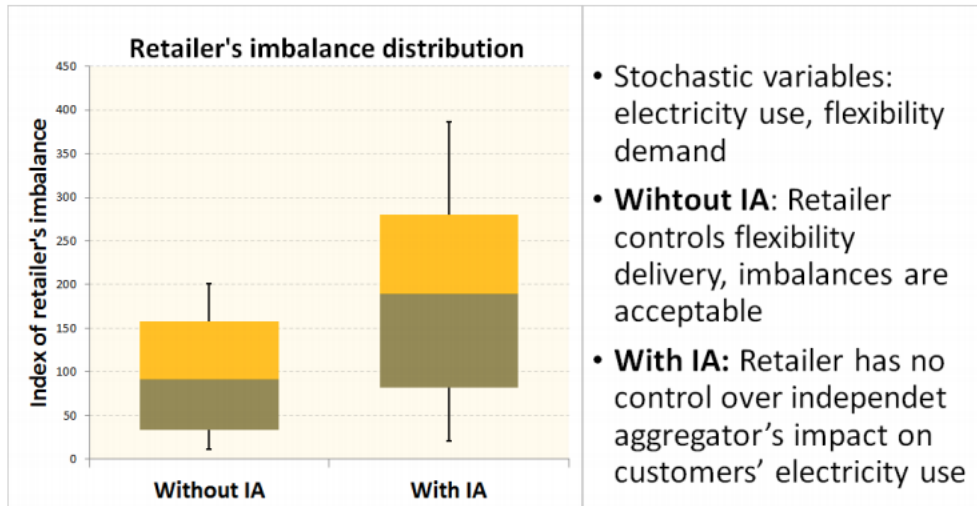
- Market place to facilitate local flexibility bids to DSO
 - platform for local, flexible electricity markets with features allowing for connecting to other markets (NORDPOOL).
 - shortFlex continuous market close to real-time
 - longFlex market for availability (capacity)



Challenges to local markets



- Local peer to peer trading is not found to benefit the power system in general. Flexibility is most valuable on system level.
- Local markets could work as siphons of small scale flexibility for wholesale markets.
- Local distribution network bottlenecks main target for local markets. For inward bottlenecks, new tariff structures the key.
- Basis of fair market implementation is balance management



Concept of each end-user as a balance responsible party: balancing issues are easier to manage and keep as fair for all parties.

IA=independent aggregator



Market challenge: price incentives



- Paying for new services
 - More grid support services: inertia, ramping, voltage,...
 - Transition: introducing services at the stage when system benefits and need (before that no use/payments for providers)
 - Remunerating for capabilities or grid code requirement?
- Scarcity pricing or capacity payment

TODAY

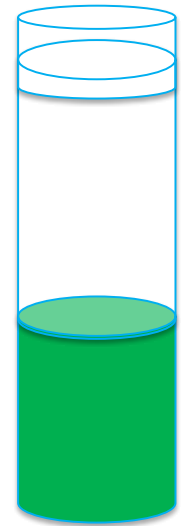


System services

Energy

Capacity

FUTURE?



Data exchange



- DataHUBs, not yet real time
 - building up in Europe
 - TSO/DSO activity to share metering data
- Smart meters, real time:
 - DSOs can shed certain loads, service to aggregators
 - Meters have interface to HEMS/BEMS
- DER communication at three levels:
 - no communication, 1-way and 2-way communication
 - sufficient to have most of DER in 1-way communication and only some (bigger) devices under 2-way communication



Simulations and modelling future power systems

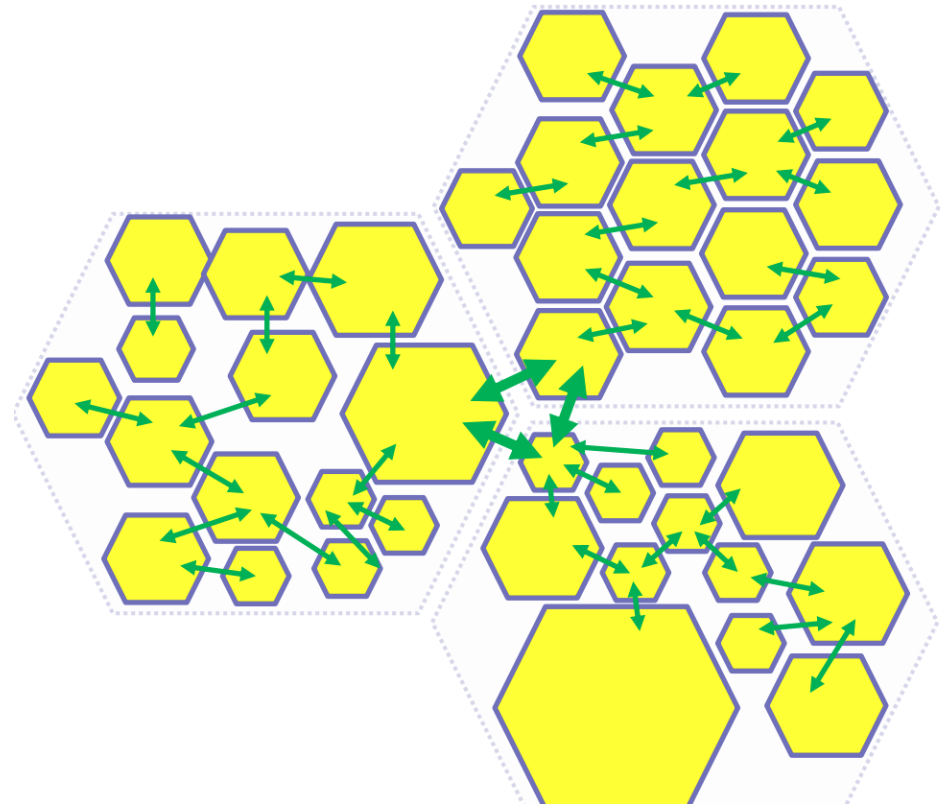


- TSO needs/wants to aggregate all data from DSOs: \sum DSOs per balancing area
 - Where is aggregated data ok also in future?
 - Consumer behaviour behind load flexibility needed for models?
 - Need to make aggregate loads better, or individual models faster
- UK Imperial College example of benefits from whole system approach (Session 2B, 17 Sep)
 - optimising assets, and balancing, of DSOs and TSO
 - And sector coupling (el and gas markets)

Using the local flexibility to system benefits



- Market based DSO/TSO collaboration through local flexibility markets
- Flexibility value as price signals to DER
- Vision: web of cells, with local smartness, utilising large system benefits when no grid bottlenecks



Thank You!!



Hannele Holttinen

Hannele.Holttinen@recognis.fi

+66 61 473 5255

+358 40 5187055

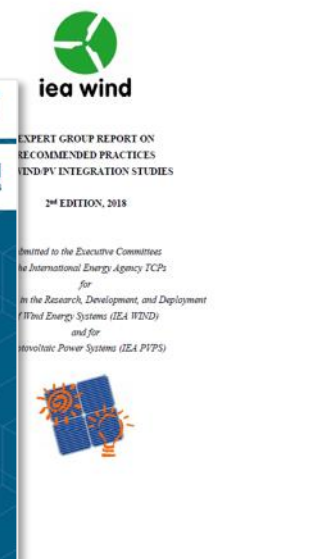
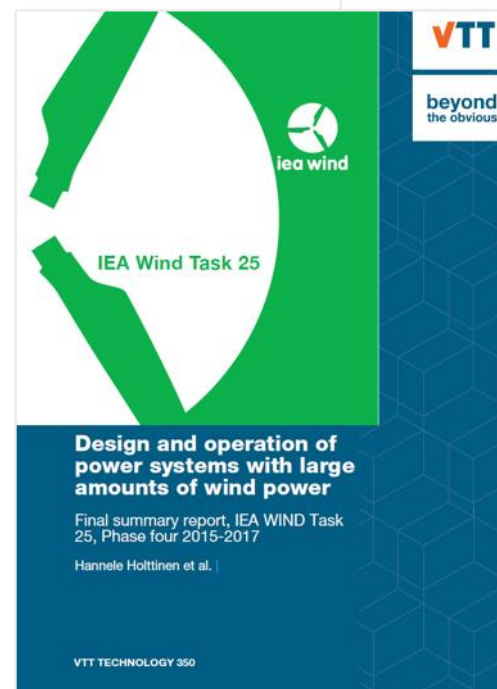


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Canada	Hydro Quebec (Alain Forcione, Nickie Menemenlis); NRCAN (Thomas Levy)
China	SGERI (Wang Yaohua, Liu Jun)
Denmark	DTU (Nicolaos Cutululis); Energinet.dk (Antje Orths); Ea analyse (Peter Børre Eriksen)
Finland (OA)	VTT (Hannele Holttinen, Juha Kiviluoma)
France	EdF R&D (E. Neau); TSO RTE (J-Y Bourmaud); Mines (G. Kariniotakis)
Germany	Fraunhofer IEE (J. Dobschinski); FfE (S. von Roon); TSO Amprion (P. Tran)
Ireland	UCD (D. Flynn); SEAI (J. McCann); Energy Reform (J. Dillon);
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Norway	NTNU (Magnus Korpås); SINTEF (John Olav Tande, Tii Kristian Vrana)
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