



# International experience in local electricity markets for the procurement of flexibility services

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*IAEE Online Conference  
08 June 2021*

# About this Study

*Joint work with Michael Pollitt and colleagues from Project MERLIN*



*With thanks to distribution utilities/ESOs (Ausgrid, Avacon, Enedis, Liander, NGENSO, Stedin, Tennet, Tepco, UK Power Networks, Western Power Distribution), ENA UK, FfE, NYSDPS, Silicon Grid, energy experts.*

**MERLIN** = Modelling the Economic Reactions Linking Individual Networks:  
Is a BEIS funded innovation project, under the Power Forward Challenge:  
Canada-UK Joint Challenge on Smart Energy Systems.



Project reports published at SSEN website. <https://project-merlin.co.uk>

This presentation draws on the first and second report:

- The first of which compares 13 use cases of DNO/DSO to procure flexibility
- The second makes recommendations of what can be learnt from the cases
- The third identifies key regulatory aspects for the development of local flexibility markets in 7 jurisdictions
- The fourth (forthcoming) measures the value of procuring flexibility (CBA) under key scenarios

# Scope

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- Selection of Use Cases (13 in total) from 7 jurisdictions
- Discussion of latest projects/initiatives (from 2017 onwards), with a combination of demonstrators (including proof of concept) and business as usual (BAU)
- With diversity in the type of services to be procured and flexibility providers
- With different approaches to market design

# Scope

## List of Use Cases

Country	project/initiative name	project leader(s)	type	start date	status
Australia	Battery Virtual Power Plant (VPP)	Ausgrid (DSO)	demonstrator	Jun-18	ongoing (Phase 1 completed)
France	Nice Smart Valley	Enedis (DSO)	demonstrator	Jan-17	end Dec. 2019
Germany	Avacon	Avacon (DSO)	demonstrator	Jan-17	end Dec. 2019
	The Altdorfer Flexmarkt (ALF)	FfE e.V.	demonstrator (proof of concept)	2017	ongoing (end in 2020)
GB	Power Potential	NGESO (TSO)	trial	2017	ongoing (end in March 2021)
	Flexible Power	WPD (DNO)	BAU	Mar-19	ongoing
	Flexibility Services	UKPN (DNO)	BAU	Mar-19	ongoing
	Piclo Flex	Piclo	BAU	Mar-19	ongoing
	Cornwall Local Energy Market	Centrica	trial	May-19	ongoing (Phases 1 and 2 completed)
Japan	V2G Demonstrator Project Using EVs as Virtual Power Plant Resource	Tepco (integrated utility: DSO/TSO)	demonstrator (proof of concept)	Jun-18	ongoing (end in 2020)
Netherlands	Dynamo	Liander (DSO)	BAU	Q4 2017	ongoing
	GOPACS	TenneT (TSO) and 6 DSOs	BAU	Jan-19	ongoing (potential extension to first DSOs: Liander, Stedin)
Norway	Nodes	Nodes	BAU	2018	ongoing (different European countries)

# Method

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## Questions raised per each Use Case:

- *What are the recent developments in **smart architectures and solutions** for the procurement of flexibility services?*
- *What are the **different proposals for market design** for the procurement of flexibility services?*
- *Why are **new business models** required to capture the value of flexibility?*
- *How do network operators value flexibility?*
- *What are the **most and least common trends** in the acquisition of flexibility services and what is still missing?*
- *Can **regulatory changes** help to unlock the value of flexibility for a more efficient grid management and service provision?*

# Comparison of Use Cases

Country	Use Case	product/service to be traded/tested	flexibility providers	aggregators	price rule	use of maximum prices, ranges (market-based only)	remuneration scheme
Germany	<b>Avacon</b>	distribution grid constraint (congestion)	residential flexible loads (heat pumps, storage heaters) and generation assets (solar PV)	no	regulated prices (non market-based)	not applicable	(1) availability/others: Flex loads (a discount of around 57% of grid charge), (2) utilisation: DER compensated in line with loss of production
	<b>The Altdorfer Flexmarkt (ALF)</b>	constraint management (with short and long term products)	PV systems, heat pumps, electric vehicles, and storage systems, such as night storage heaters, home batteries	optional (short term), no (long term)	short term: pay-as-bid, long term: regulated prices (customers)	not defined yet	(1) short term: utilisation according to contracted power and offered price, (2) long term: lump-sum payment (i.e. yearly)
GB	<b>Power Potential (NGESO)</b>	reactive and active power	PV systems, wind turbines, CHP, biogas plants, etc	optional	pay-as-bid (wave 2)	no	utilisation (active and reactive power) and availability (reactive power)
	<b>Flexible Power (WPD)</b>	flexibility services (several)	PV systems, wind turbines, CHP, biogas plants, storage systems, flexible loads	optional	pay-as-bid (with regulated prices)	yes	availability (secure, dynamic), utilisation (secure, dynamic, restore); with maximum prices (£300/MWh secure, dynamic; £600/MWh restore)
	<b>Flexibility Services (UKPN)</b>	flexibility services (several)	PV systems, wind turbines, CHP, biogas plants, storage systems, flexible loads	optional	HV: pay-as-bid, LV: regulated price	yes (range per site)	availability (secure), utilisation (secure, dynamic), service fee (sustain: £47.58/kW/year). Range (with lower and upper values) regarding total price for HV (secure)
	<b>Piclo Flex</b>	flexibility services (several)	PV systems, wind turbines, CHP, biogas plants, storage systems, flexible loads	optional	pay-as-bid	yes (based on each DNO's requirements)	utilisation and/or availability depending on the service
	<b>Cornwall Local Energy Market</b>	flexibility services (several)	diesel generators, gas turbine, flow battery, domestic battery clusters, ice manufacturer	optional, phase 1 (Kiwipower)	phase 1: pay-as-bid (with regulated prices), phase 2: pay-as-clear	yes (Phase 1)	phase 1: utilisation, phase 2: utilisation, availability (reservation). Regulated price up to £300/MWh (combined) in phase 1

# Comparison of Use Cases

Country	Use Case	product/service to be traded/tested	flexibility providers	aggregators	price rule	use of maximum prices, ranges (market-based only)	remuneration scheme
Australia	Battery Virtual Power Plant (VPP)	constraint management and voltage constraints (phase 2)	residential battery systems	required (Reposit Power)	regulated prices (customers)	not applicable	only dispatch (10kW battery with 10-15 dispatch events can get paid between \$90-\$135 per year)
France	Nice Smart Valley	distribution grid constraint (congestion)	hybrid systems ( residential hybrid boilers, CHP commercial building, hybrid rooftop), flexible customers (residential, industrial)	required (EDF, Engie)	pay-as-bid (aggregator), regulated prices (customers)	not directly but subject to the value of flexibility set by Enedis	(1) availability/others: for aggregators depending on the Use Case; for customers: fixed/variable amounts to participate in the trial; (2) utilisation: for aggregators free
Japan	V2G Demonstrator Project Using EVs as Virtual Power Plant Resource	Replacement Reserve - for FIT ( "RR-FIT") due to network congestion, voltage constraints	EV batteries (V2G-VPP)	required (Hitachi Solutions, Shizuoka Gas)	pay-as-bid	no	RR-FIT: (1) paid for both delta-kW (availability) (2) and kWh (utilisation).
Norway	Nodes	congestion, grid management, balancing services	PV systems, wind turbines, CHP, biogas plants, storage systems, etc	optional	pay-as-bid	no	utilisation (dispatch), availability
The Netherlands	Dynamo	constraint management (congestion)	Lidl (with cold store and battery at the distribution centre), Van del Valk (heat pump)	required (Scholt Energy)	regulated price (aggregator) pay-as-bid (trading parties), TSO/DSO pay a spread (difference between buy and sell order)	not applicable	availability and utilisation. High ratio availability/utilisation (0.9)
	GOPACS	constraint management (congestion) , TSO-DSO coordination	PV systems, wind turbines, CHP, biogas plants, storage systems, etc	optional		no	dispatch (utilisation)

# Main findings

## Smart architectures and solutions

*Different bespoke and third-party platforms in use*

*Integrated within DSOs, independent platforms or aggregators*

*Use of DERMS, SGH, SMGW, platform for ancillary services (PAS)*

*Innovation in clearing solutions too*

## Market design for flexibility services

*Different procurement methods and pricing rules*

*A combination of pay-as-bid, pay-as-clear, with some indication of regulated prices*

*Different combinations of remuneration schemes*

*Different set of flexibility services with some level of standardization*

*Penalties for non-delivery in the form “loss of revenue”*

## New business models

*Different channels to procure flexibility*

*Aggregators are playing an important role*

*Their participation can be compulsory or optional*

*Independent platforms integrated within existing markets, examples of coordination platforms*



# Main findings

## *The value of flexibility*

*Different ways to value flexibility*

*From regulated prices to free ones (full market-based)*

*Use of fixed/maximum rates, ranges (based on CBA)*

*Can be remunerated with a single or a combination of payments*

*Proposal of common methodology in GB*

## *Most and less common trends*

*Most:*

*to solve congestion, diverse range of technologies, multiproduct, aggregated flexibilities*

*Less:*

*pay-as-clear, procurement of ancillary services (reactive power), Gopacs with “intraday congestion spread”, Piclo Flex (full DSOs participation)*

## *The role of regulation*

*Can help in different ways*

*Supportive regulatory environment is crucial*

*Encourage DSOs to experiment, to opt for flexibility if it is more cost efficient, to enable digitalisation and better data management, to set clear roles, etc.*

# Conclusions

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- Smart architectures and solutions should be easy to understand and access, with extensive stakeholder engagement.
- Clear rules regarding market design need to be adopted, ideally aligned with the current ones (i.e. set of parameters), in order to ensure consistency, standardisation and stakeholder buy-in.
- Need for a standard cost-benefit methodology with incorporation of social values, to be published and with indication of WTP, regulators may play a key role on it.
- In the identification of new business models, distribution utilities must identify the sources of value and market test them, with different approaches of partnership and supported by innovation funding.
- Little innovation in auction design, a reverse clock auction with customer revenue benefit target may be an option.
- Regulation can help to unlock the value of flexibility (e.g. innovation funding, price control regulatory regime, etc.)

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# Q&A

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Thank you!