Benchmark on local flexibilities for DSO

A deep analysis of the procurement approach of 173 DSO across Europe

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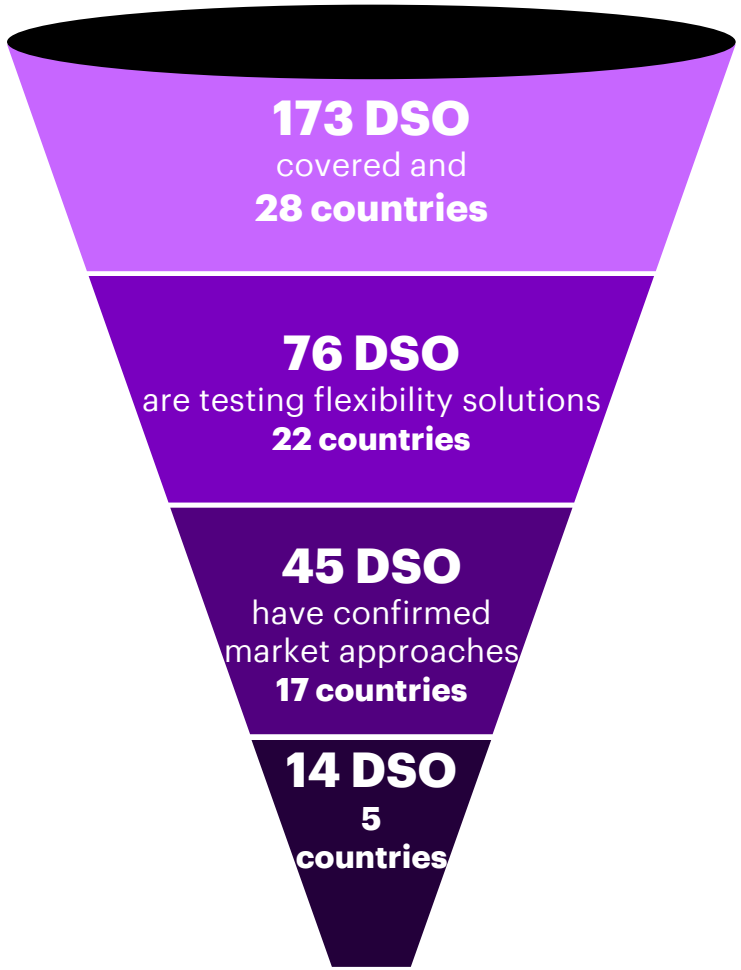
We have assessed 173 DSOs on their flexibility maturity

Criteria used for the analysis

European DSOs have been assessed using the following criteria :

- ✓ Presence of **flexibility** projects / approaches
- ✓ Presence of a **market approach** regarding flexibility (including tenders)
- ✓ **Maturity** level of the market solutions deployed (if applicable)
- ✓ **Voltage level** concerned by the market solutions deployed (if applicable)
- ✓ **Main driver** for flexibility deployment as stated from public sources (injection / demand congestion, ...)
- ✓ **Mobilisation strategy** for flexibilities (market creation, economic value...)
- ✓ **Legal framework** : transposition of the Article 32 of the Clean Energy Package directive 2019/944



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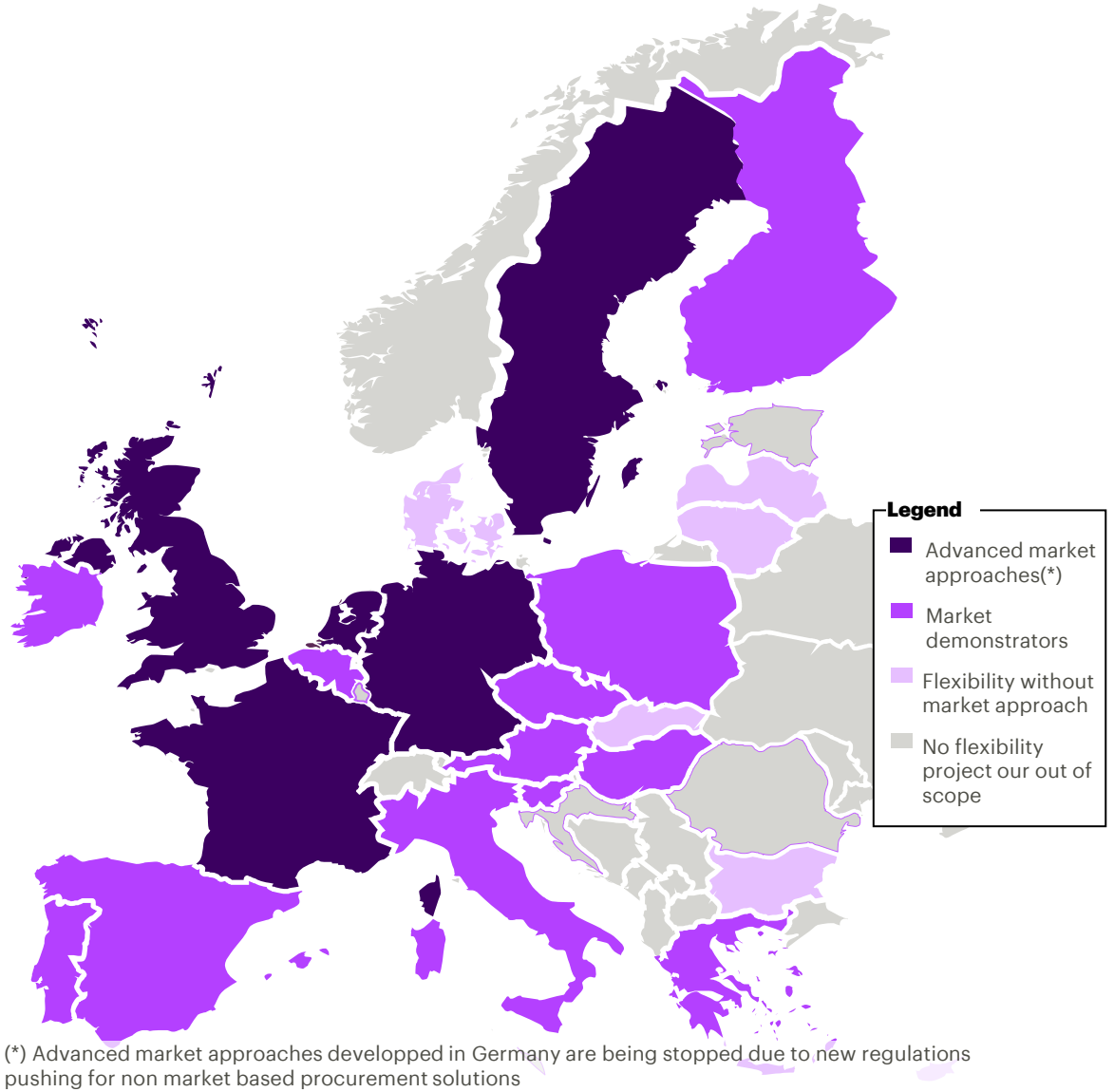
However only a few DSOs are engaged in semi-industrialized market approaches in Europe

26% (45 DSO) of the 173 DSO over 100k clients identified in Europe are engaged in flexibility market initiatives, across **17 countries**

The maturity of the market approaches varies greatly between the identified DSO, with two distinct clusters :

- **31 DSO** have market demonstrators with a low maturity in 2020 (platform pending deployment, small-scale experimentations), mostly via European projects
- **14 DSO** have up and running market platforms or advanced market approaches with functional flexibility sollicitations



(*) Advanced market approaches developped in Germany are being stopped due to new regulations pushing for non market based procurement solutions

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The DSOs that take a similar approach can be clustered into two groups

The two clusters with different drivers

The first cluster is composed of French and British DSOs, with similar approaches regarding the drivers for flexibility use. Flexibility is mainly proactively sought after to solve specific DSO needs in these cases.

The second cluster regroups DSOs whose first priority is to solve congestions arising on the DSO network due to lack of transmission capacity on the upstream transmission grid.

	Country	DSO Name	Operator leading the approach	Local flexibility context	Main driver for flexibility
Cluster 1		Enedis	DSO	• Proactive approach on flexibility • Rise of renewable in MV	**DSO needs** (planification & operation)
	*	Scottish & Southern Electricity Network	DSO	• Electrification of heating and the rise of electric mobility push the distribution network to its limit • Distribution grid investment validated by NRA	
		SP Energy Networks	DSO		
		UKPN	DSO		
		WPD	DSO		
Cluster 2		Stromnetz Berlin GmbH	TSO – DSO collaboration	• Congestion at TSO level due to high penetration of renewable • Redispatch costs of 1,4 bn€	**HV congestion**
		Schleswig-Holstein Netz AG	Consortium (DSO led)		
		EWE NETZ GmbH	TSO-DSO collaboration		
		Stedin	Multi SO consortium	• HV Congestion in rural areas due to solar (lack of transmission capacity, mostly in substations)	
		Enexis Groep	Multi SO consortium		
		Alliander N.V.	Multi SO consortium		
		Vattenfall Eldistribution AB	Multi SO consortium	• Rise in demand driven by the electrification of transport and heat in urban areas while decrease in local production • Lack of transmission capacity in the high voltage grid	
		Ellevio AB (publ)	Multi SO consortium		
		E.ON Energidistribution AB	Multi SO consortium		

* In the UK, some DSOs which are not listed in this table take a similar approach and could be considered as advanced DSOs

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Local flexibilities to provide solutions both for planning and operation activities

Flexibilities for grid planning

Flexibilities used for grid planning are the result of an approach in which they are evaluated as part of the planning process. As such, the evaluation is done way ahead of the need for flexibility (Y-5 to Y-1).

Investment deferral is when flexibilities are compared to investment alternatives, and are seen as a technically feasible and economically cheaper solution than network reinforcements, allowing to push the investment to a later date

Permanent embedded solutions follow the same approach, however in this case the flexibility is seen as a solution to connect more capacity that what the equipment would allow, optimizing the ratio non injected energy vs. investment.

Flexibilities for grid operations

Flexibility for grid operations is used for a temporary need to relieve constraints on the network. Timeline varies from days to several years.

Demand driven congestion creates the need for temporary demand reduction or generation increase. They occur when demand grows faster than forecasted, or when the optimal investment date has been set for a later date. Lack of supply frequently comes from upstream transmission capacity shortage

Injection driven congestion occurs when the grid capacity (distribution or transmission grid) cannot allow for additional feed-in. It is caused by renewables growth, and solved by demand increase or generation curtailment.

Flexibilities can also be used for **outage management** (planned outage for maintenance or emergency supply), creating an opportunity for a faster and cheaper re-supply of the grid.

Use cases by DSO

Grid planning		Grid operation		
Investment deferral	**Permanent embedded solution**	**Demand congestion**	**Injection congestion**	**Outage management**
Enedis UKPN, SSEN, WPD, SPEN	Enedis	Enedis Vattenfall, Ellevio, E-On UKPN, SSEN, WPD, SPEN	Stedin, Enexis, Alliander Vattenfall Stromnetz Berlin, EWE, S.H Netz	Enedis UKPN, SSEN, WPD, SPEN

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Network visibility drives the contracting options considered

- **Visibility over congestion and maintenance pushes for long term approaches** on flexibility procurement. DSOs with a strong integration of flexibilities in the planning process thus use capacity reservation, for determined timeframes where flexibility is needed. As such, backup power for unplanned outage is contracted without capacity reservation
- **Short-term markets are generally without capacity reservation, as the flex needs are less predictable**, and back-up solutions often already exist to cover the risk.

	With capacity reservation fee	Without capacity reservation fee
Long-term market (contracts for period of 6 months up to 3 years)	*Capacity reservation ensures that the flexibility provides the same reliability guarantees as the other alternatives* Enedis UKPN, WPD, SPEN, SSEN Alliander Vattenfall	*No reservation is needed when no alternative solutions provide a better service (example of Outage Management)* Enedis WPD, SPEN, SSEN
Short-term market (day ahead and intraday)	*NA*	*Approach to find economical alternatives to existing solutions, for grid operation use cases* Stedin, Alliander, Enexis Ellevio, Vattenfall, E.ON Stromnetz Berlin, EWE Netz, Schleswig-Holstein

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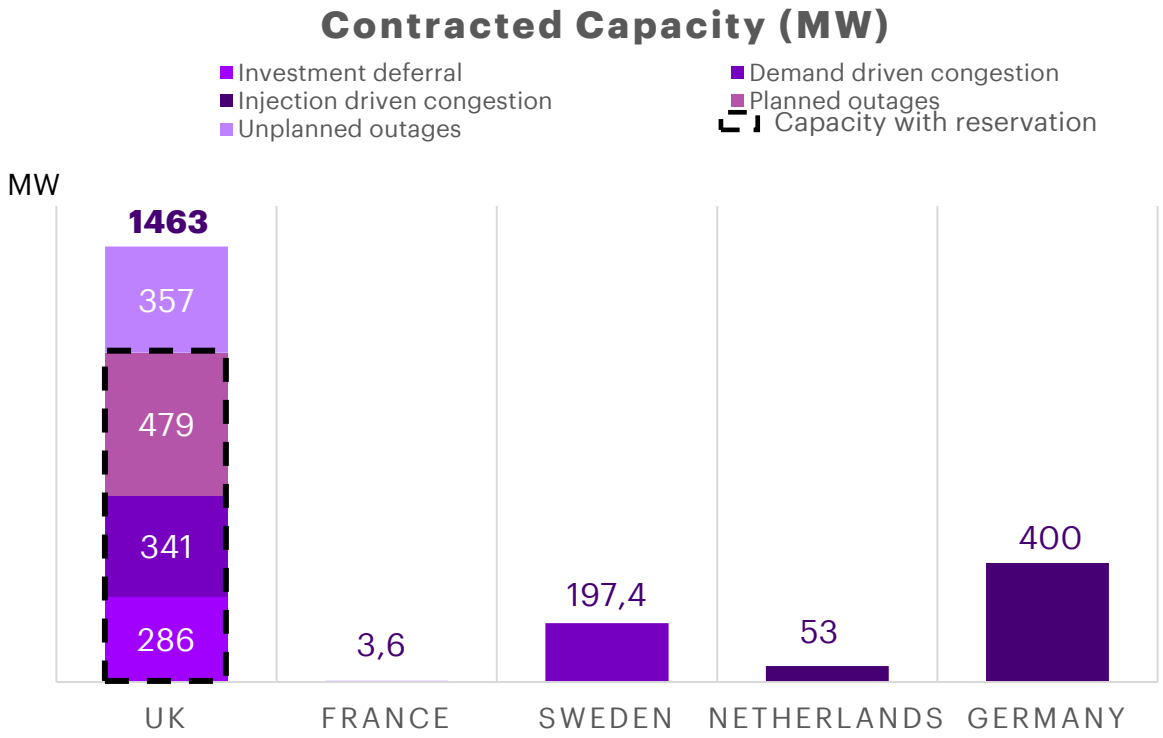
Local flexibility platforms allow market access to all FSPs, however capacity activated is difficult to evaluate

Capacity contracted is high, but activated capacity is not disclosed



Activated capacity is not disclosed for the different countries, but some DSOs provide order of magnitude in the number of hours of solicitation per year.

Amount of contracted capacity varies between countries due to several reasons:

- Actual needs and experiences of DSOs with local flexibility
- Long-term approach to provide visibility on available flexibility
- High reservation fee set up by some UK DSO to secure contractualisation of flexibility (£500/MW/h for UKPN)
- Nature of congestion: injection vs demand
- Possibility of value stacking between different voltage levels

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Conclusions

1. **No 'one size fits all' model:** needs for flexibility strongly depend on each energy context and ambitions both in terms of energy objectives and market organisation

2. **Local flexibility markets are at their beginnings**, in particular regulations are evolving, with most countries in the process of transposing the EU Directive 2019/944

3. **French and UK DSO analysed** seem to be most advanced, covering most of the use cases and having a planned approach towards flexibilities

4. **Market depth and level of competition** are key issues while considering market design

5. Overall optimisation would require a **consistent access to the different ways of mobilising flexibilities** (non-firm connection agreements, network tariffs, rule-based approach and market-based solution)

6. **Coordination between local flexibility markets and other mechanisms** (balancing, capacity, wholesale market, etc.) is key to enable the value stacking of flexibilities

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Thank You