



**PÖYRY**

**NEW FORMS OF FLEXIBILITY IN MARKETS**

Elering smart grids conference, Tallinn  
3 June 2014

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# PÖYRY MANAGEMENT CONSULTING – ENERGY



- Europe's leading specialist energy management consultancy.
- Offering expert advice from strategy to implementation on policy, regulation, business operations, financing and valuation and sustainability.
- Providing in-depth market analysis and strategic insight across Europe.
- Over 200 energy market experts in 13 offices across Europe:
  - Düsseldorf
  - Helsinki
  - London
  - Madrid
  - Milan
  - Moscow
  - Oslo
  - Oxford
  - Stockholm
  - Paris
  - Vienna
  - Villach
  - Zurich

# PÖYRY MANAGEMENT CONSULTING INVOLVED IN ALL ASPECTS OF SMART ENERGY

From resource to user – and back – we are supporting change



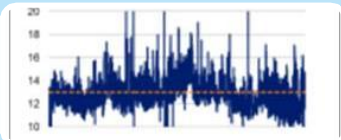
## End-users

- Industries: complex production, sourcing, self-generation optimisation concepts
- Small-scale: Future of retail 2020 in telecom, media, retail and energy, eVehicles



## Information, analytics and technologies

- Demand side management, eServices,
- Energy market information processes: ICT, Datahub, Smart meters, CRM, MDM



## Markets and regulation

- Design and modelling of markets and regulatory systems i.e. for flexibilities and RES
- Helping nations, regions or cities to develop in smart: i.e. London



## Centralised supply and delivery systems

- Grid optimisation: Distributed generation, storages, eHighways
- Increasing Opex efficiency, sustainability and flexibility capabilities in old power plants



## Decentralized supply and delivery systems

- Solar, heat pumps,
- New concepts: Storages for electricity and heat: Accumulators, batteries, etc.

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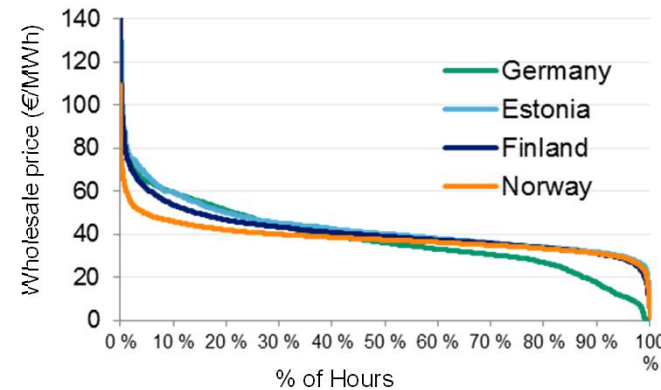
# CONTENT

1. Why do we need flexibility?
2. What are the alternative sources of flexibility?
3. What are some of the challenges to realization of flexibility?

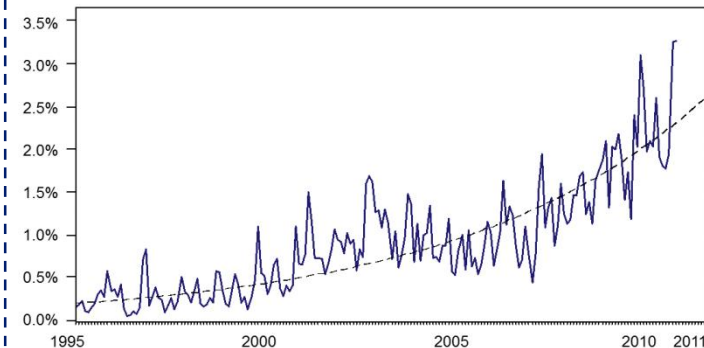
# THE SITUATION TODAY

- Flexibility enables the system to be balanced, physically, at any point in time
- Good flexibility in the Nordics- Baltics
  - Hydro
  - Large industrial units provide some demand response
  - Strong interconnection between markets
- Current interest in developing demand side response
  - Expected increase in balancing requirements, partly due to thermal plant closures, RES and demand increase
  - To support peak demand
  - Contribute to network security

## Sorting hourly prices in 2013

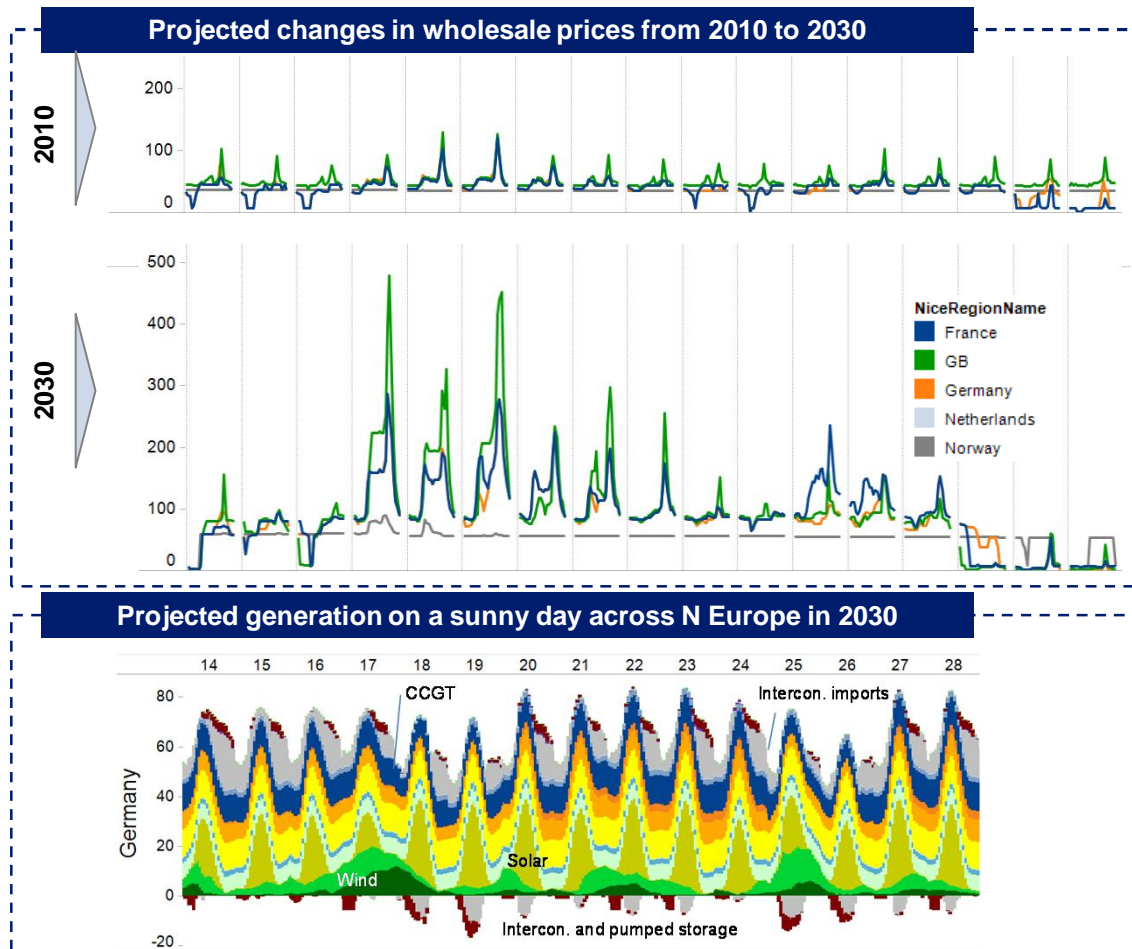


## Deviations from normal freq.



# ACROSS MUCH OF EUROPE, THE NEED FOR FLEXIBILITY WILL GROW WITH INCREASING WIND AND SOLAR GENERATION

With new forms of generation, prices and dispatch patterns will be dictated by wind and solar, retirement of existing flexible capacity will also influence the situation



1. Rate of change in generation and hence volatile residual demand (net intermittent generation)
2. Dislocation between supply and demand leads to network stress
3. Flow patterns match intermittent profiles

Varying types of flexibility are needed

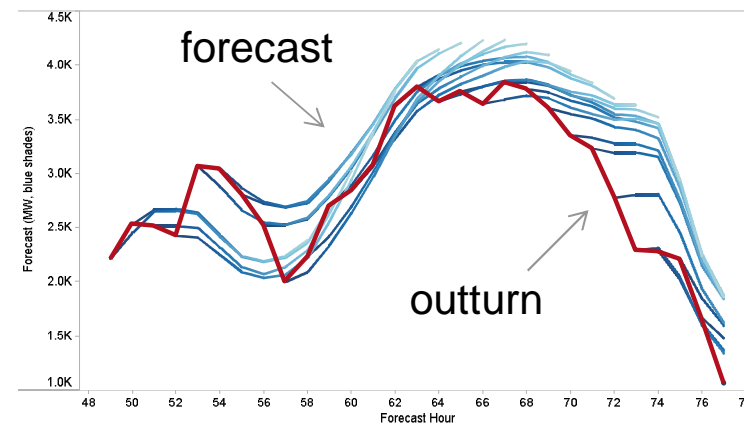
Capabilities and system needs will evolve

System context important

# THE NEED FOR WITHIN-DAY BALANCING IS ALSO EXPECTED TO INCREASE

- Weather (wind and solar) forecasting errors will involve larger variations closer to delivery
  - wind in the Nordics and Baltics
  - interconnectors to intermittent regions
- This will lead to increased value for flexibility of demand and generation, increased focus on within-day
- Nordic-Baltic system has significant flexibility through hydro so although the impact of wind and solar is still felt it will be less than thermal Europe
- Opportunity for producers and consumers to respond to within-day price signals

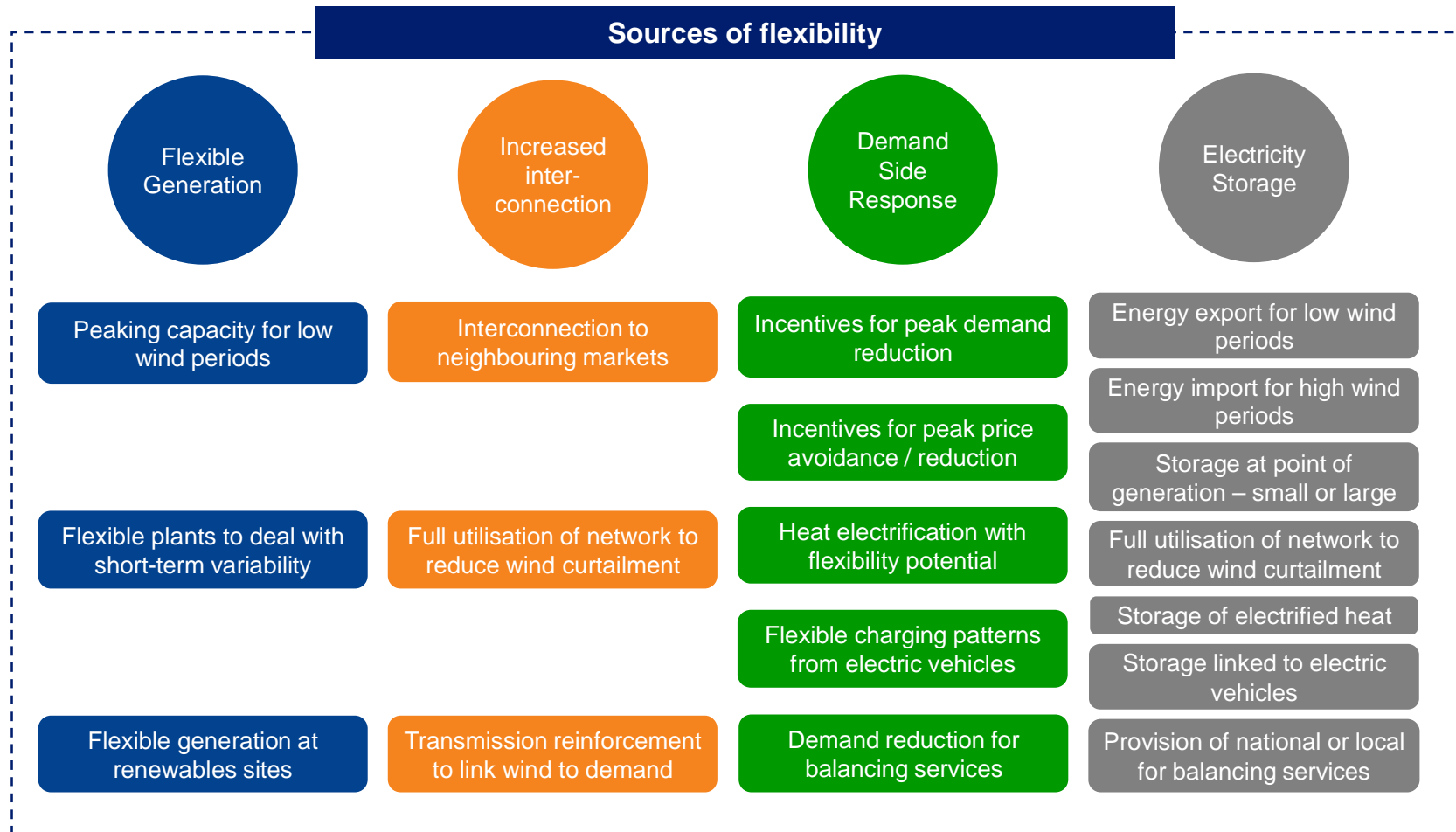
## Wind forecast error



## Interconnection south will increase



# THERE ARE FOUR MAIN SOURCES OF FLEXIBILITY

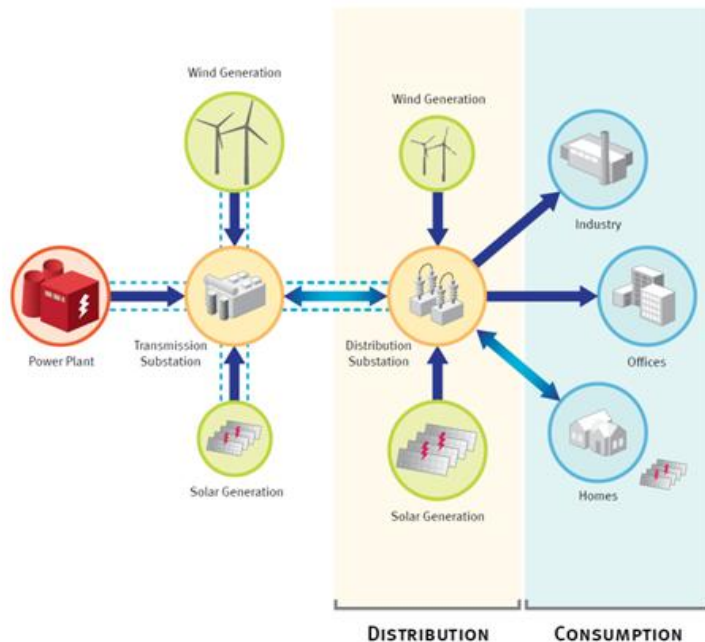




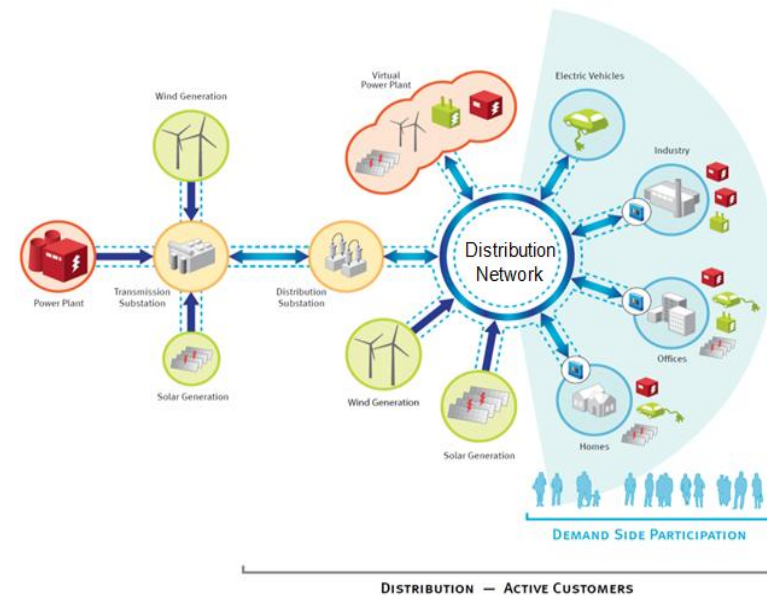
# RESHAPING OF NETWORKS WILL ENABLE ACCESS TO DECENTRALISED FLEXIBILITY

The customer is currently a passive element of the value chain but will become more active in the future with smart meters as enablers of this change

## One way energy flows, passive customers



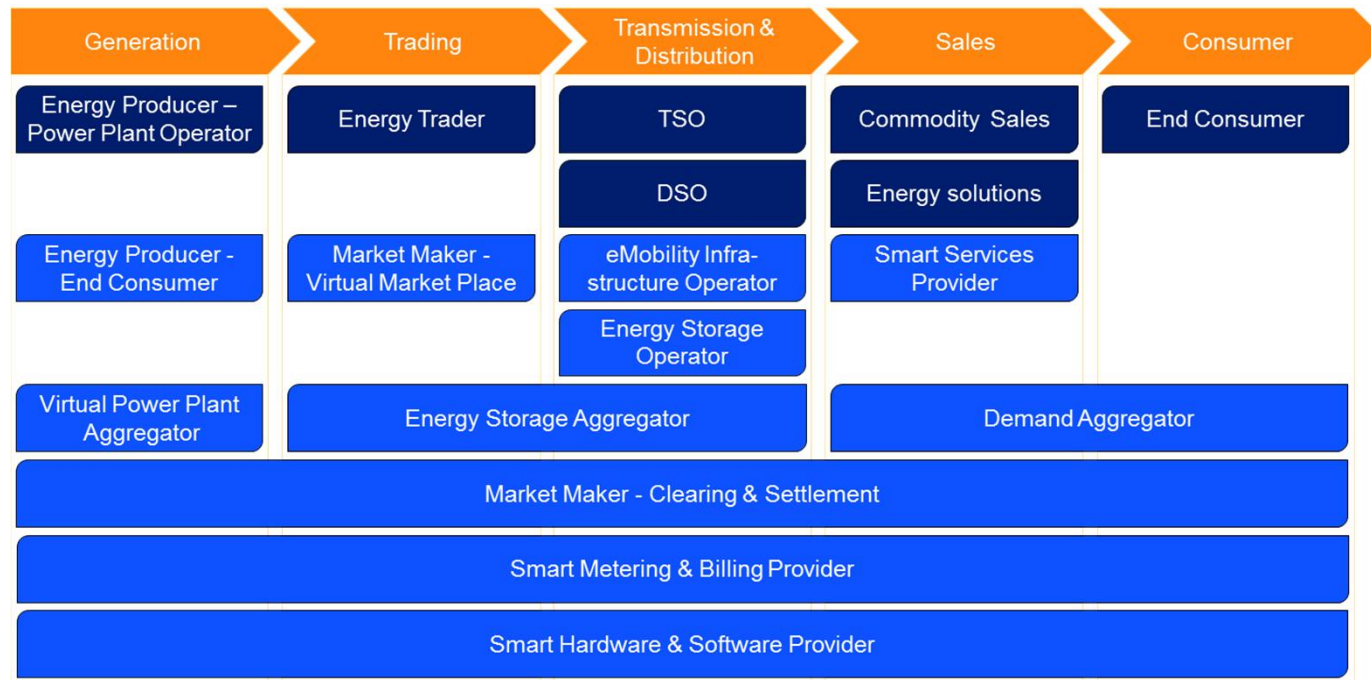
## Multidirectional flows, active customers



Diagrams source: EURELECTIC

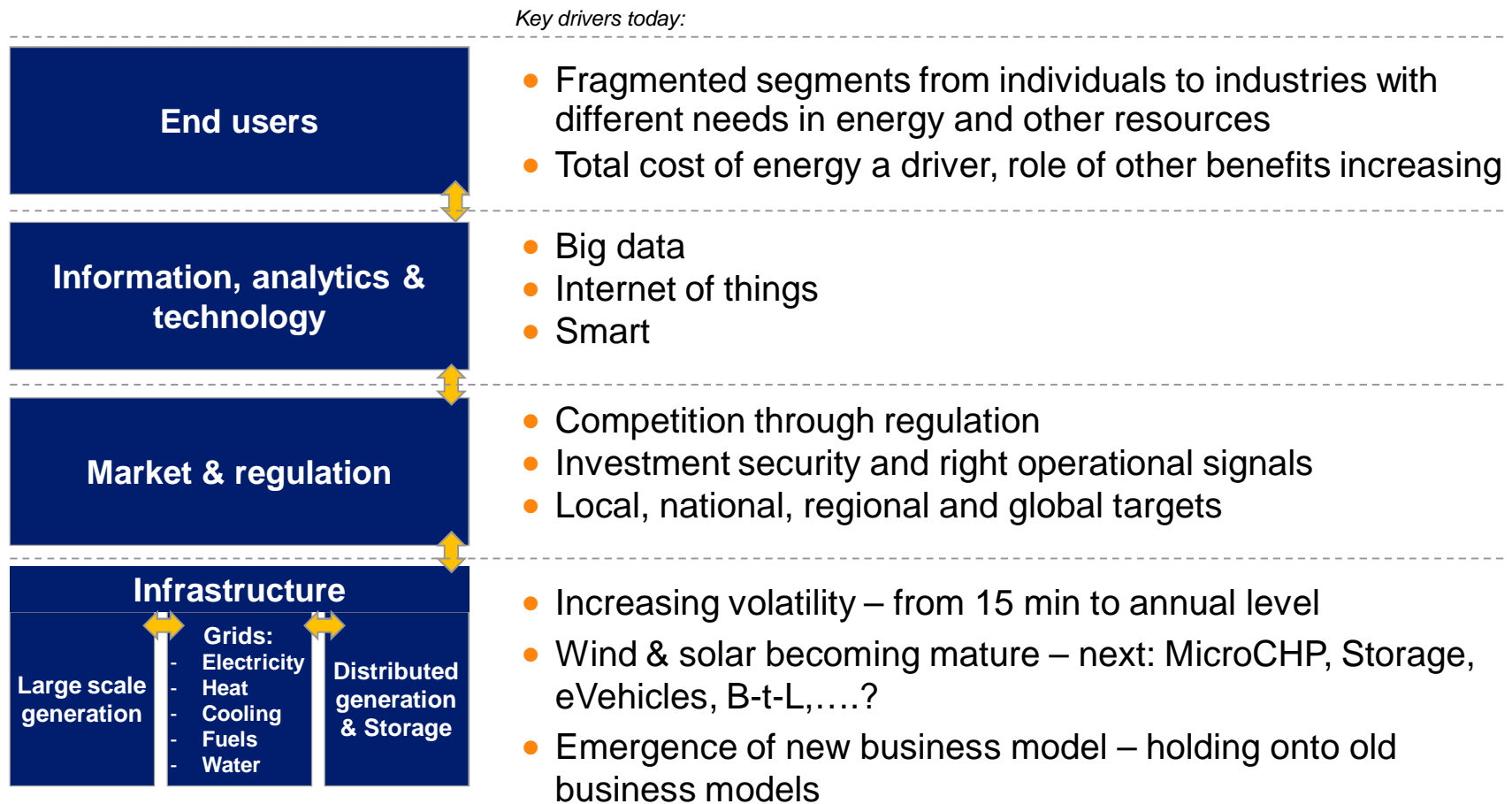
# THERE HAS BEEN A LOT OF WORK ON COMMERCIAL MODELS

The advent of smart technology represents significant opportunities for different parts of the energy system in terms new relationships, new commercial arrangements and new solutions



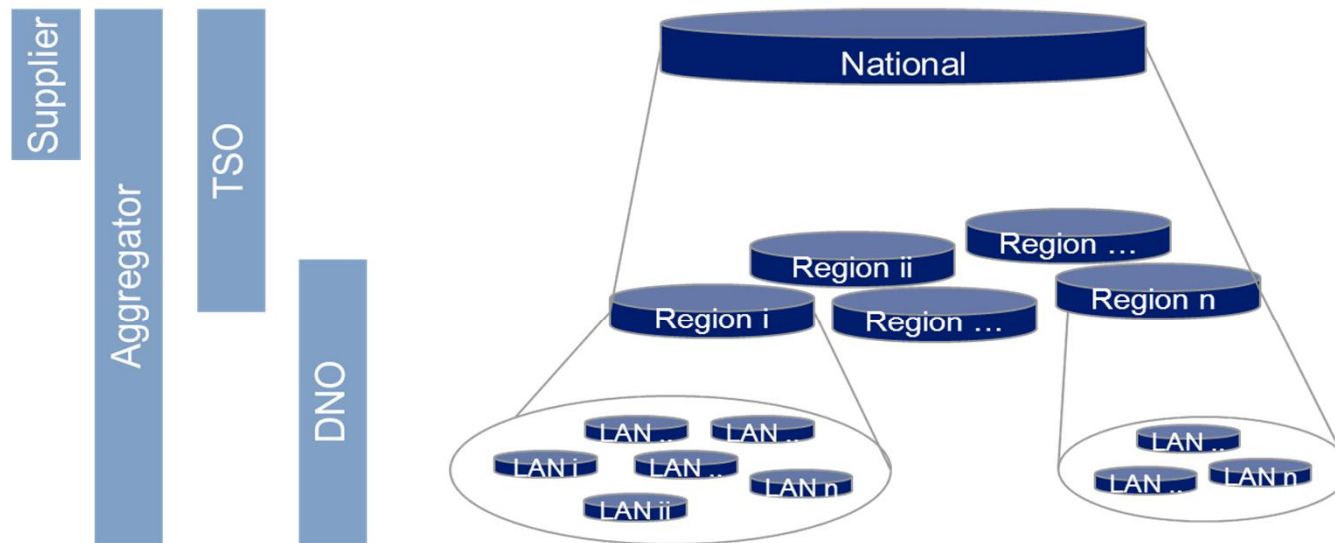
# SMART PROVIDES PLATFORM FOR SYSTEMIC CHANGE

Usage and supply in energy is affected and enabled in various platforms



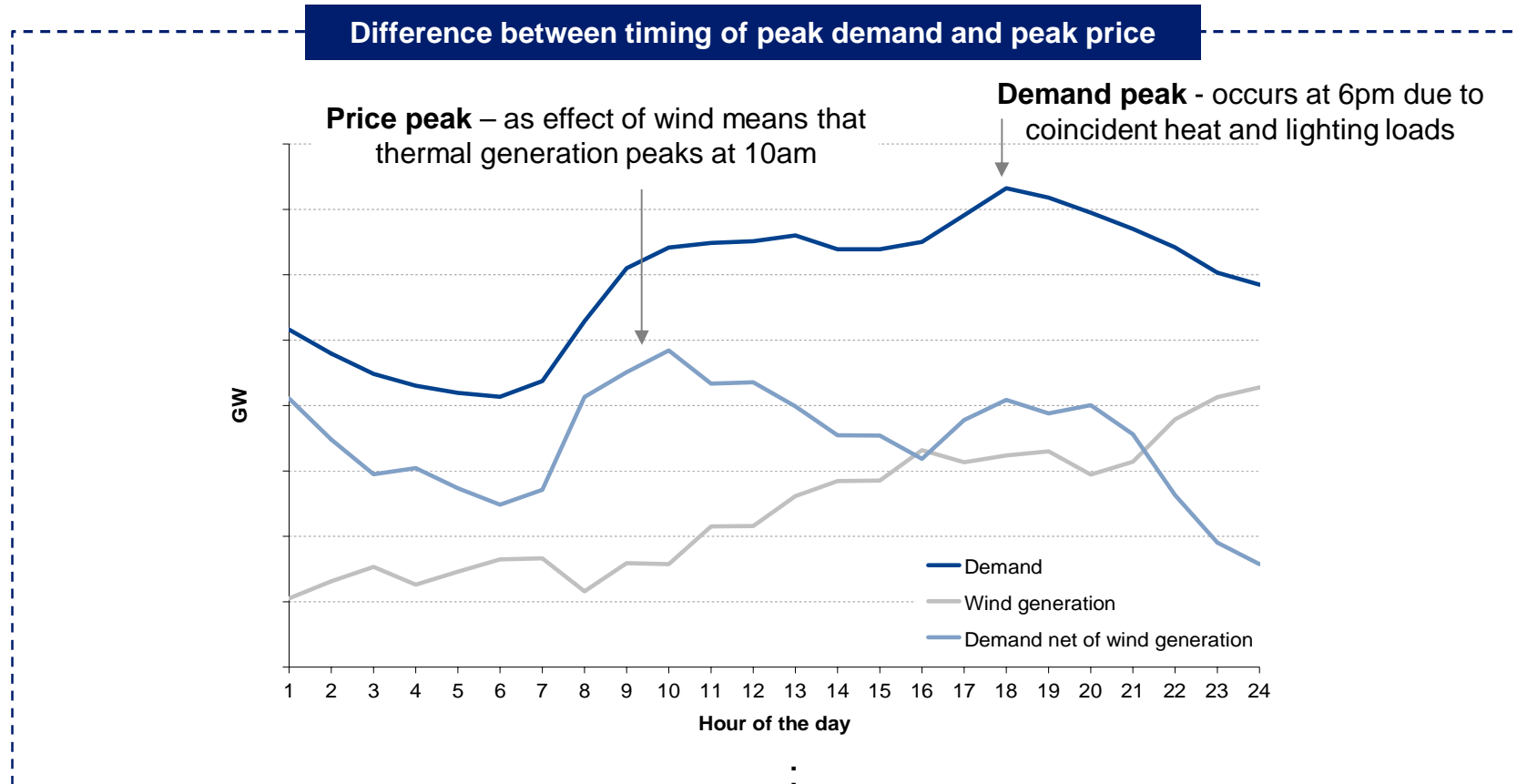
# NEW SOURCES OF FLEXIBILITY BRING TOGETHER DIFFERENT STAKEHOLDERS

Stakeholders may have different views on how to utilise flexibility; recognition of this situation and co-ordination between stakeholders will be key



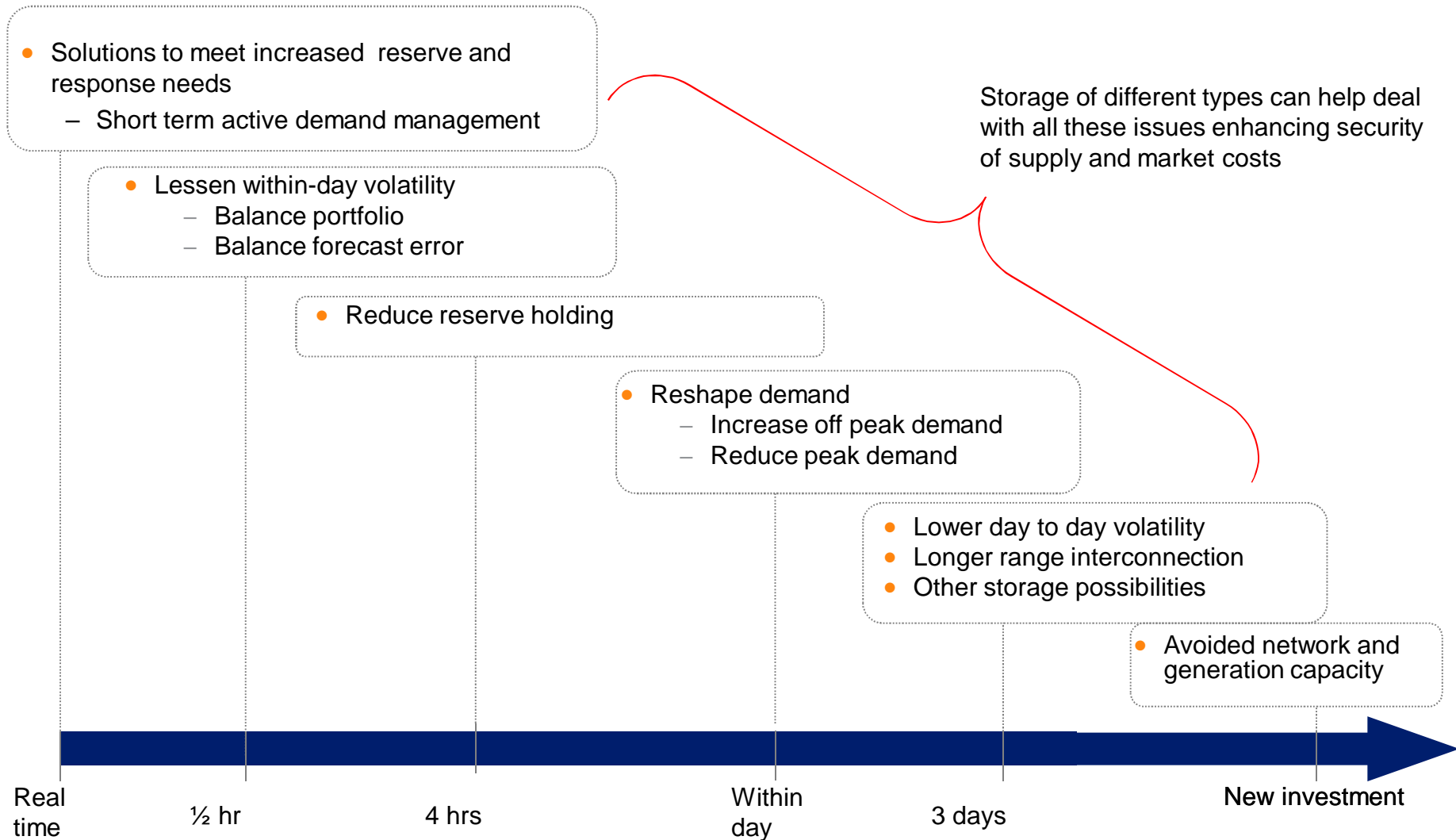
**Values will be dictated by stakeholders focus (e.g. National v Local)**

# DEMAND SIDE RESPONSE CAN BE USED TO REDUCE PEAK DEMAND OR PEAK PRICE



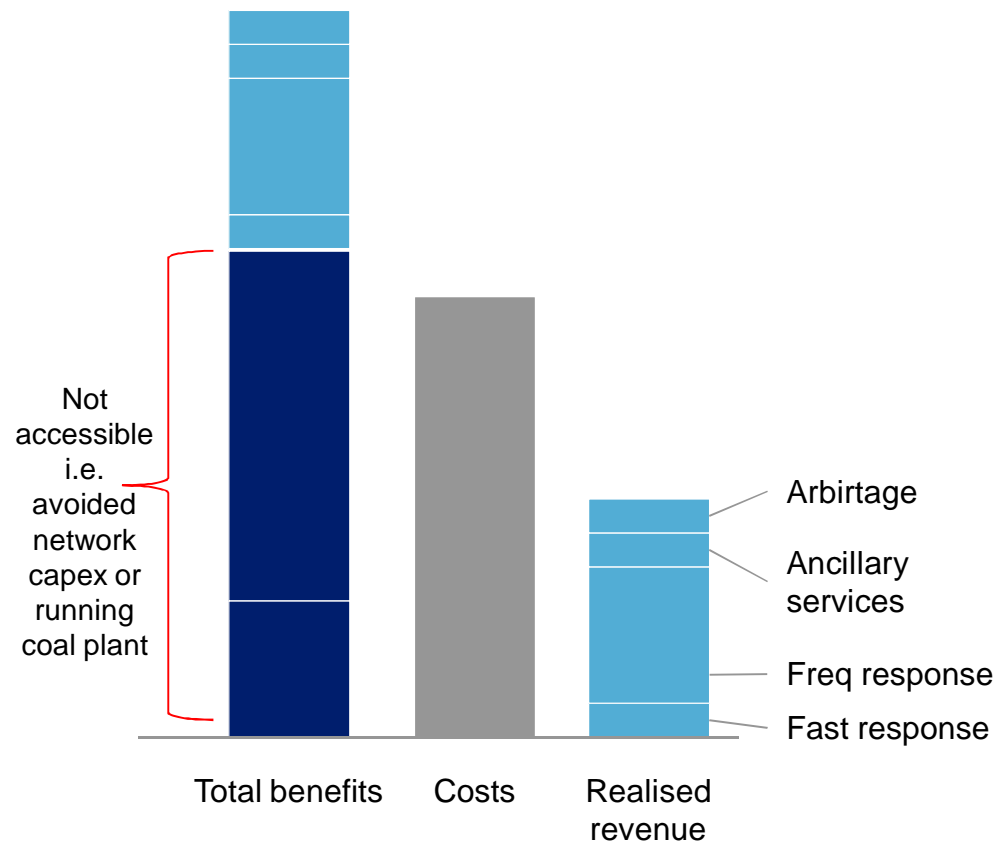
Which peak do you target with DSR?  
Suppliers could have a different answer to DNOs or TSOs

# STORAGE CAN ACT ACROSS A RANGE OF TIMESCALES TO HELP BOTH THE MARKET AND NETWORKS



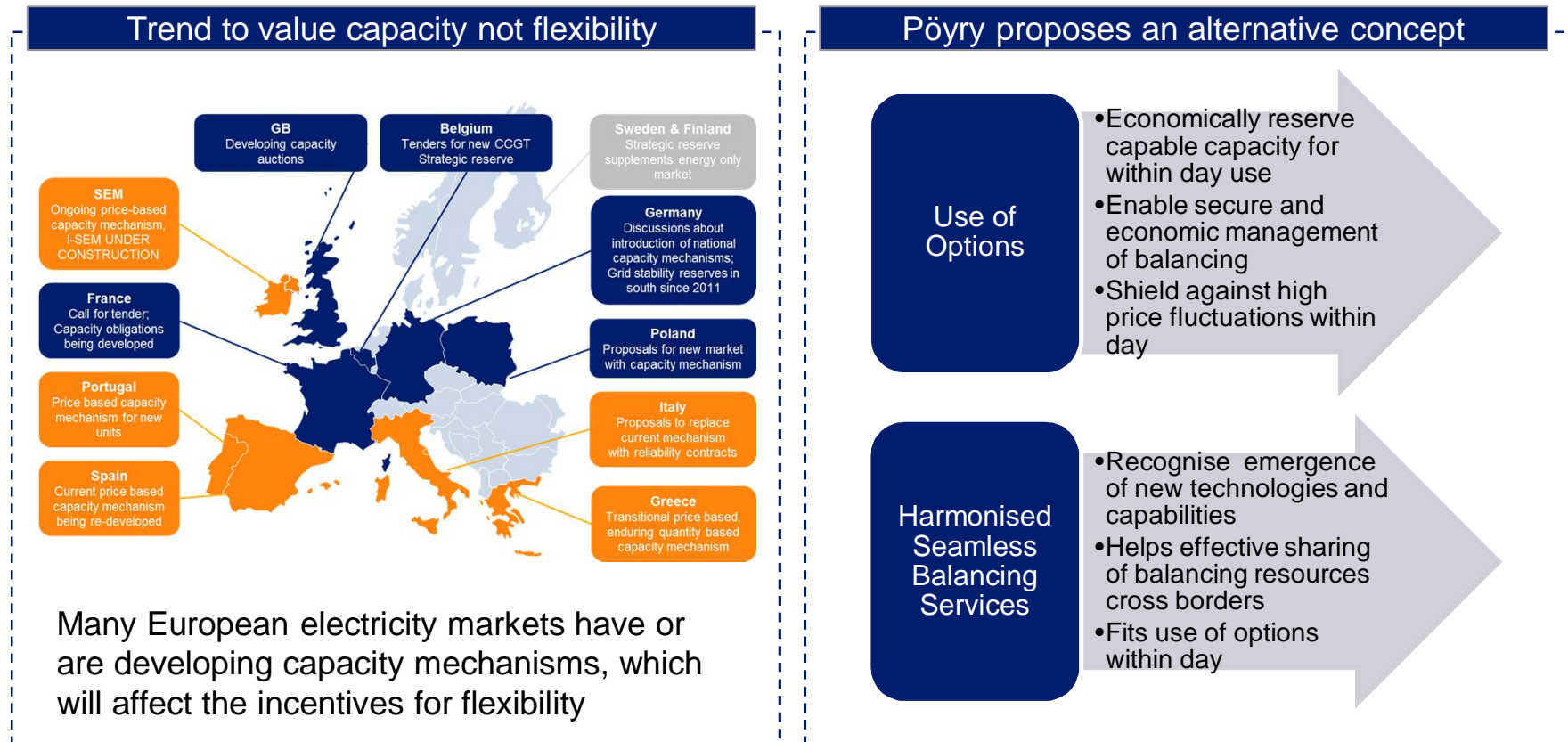
# SOURCES OF FLEXIBILITY COULD HAVE WIDER SYSTEM BENEFITS THAT SHOULD BE RECOGNISED

## Benefits, costs, revenues of storage



- Example shows a storage project that has revenues attributable to wider system benefits
- In the case that full system benefits were recognised, total revenues would be greater than costs
- However, some of the revenues are not accessible under current arrangements
  - Network capex avoidance (needs to be incentivised)
  - Displaced generation
- Access to revenues would enhance project viability

# FLEXIBILITY FROM DSR AND STORAGE NEED TO BE ON AN EQUAL FOOTING WITH GENERATION





# SUMMARY – CHALLENGES TO UNLOCK INNOVATIVE DECENTRALISED FLEXIBILITY

Demonstration projects and supporting regulation are critical

Challenge	Detail	Potential solution
Technical	<ul style="list-style-type: none"><li>• Immature technology</li><li>• High cost</li><li>• Functionality questions</li></ul>	<ul style="list-style-type: none"><li>• Innovation funding</li><li>• Demonstration projects with specific targets and outcomes</li></ul>
Policy support	<ul style="list-style-type: none"><li>• Policy decisions influence revenue streams</li><li>• Consumer engagement with technology</li></ul>	<ul style="list-style-type: none"><li>• Political support for demonstrations</li><li>• Policy support leading to flexibility incentives</li></ul>
Stakeholder interaction	<ul style="list-style-type: none"><li>• Understand stakeholder interaction e.g. utility/TSO /DNO /supplier /consumer</li></ul>	<ul style="list-style-type: none"><li>• Demonstration projects with specific targets and outcomes; Input to regulation</li></ul>
Regulatory	<ul style="list-style-type: none"><li>• Stakeholder co-ordination</li><li>• Regulation must facilitate DSR and storage on equal basis with gen.</li></ul>	<ul style="list-style-type: none"><li>• Modified regulation informed through demonstration projects and studies</li></ul>

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**THANK YOU!**



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