# Exploring European best-of-breed DSO congestion management models


## A shared engineering perspective on Europe's energy flexibility markets

**Interim results**

USEF's DSO Workstream

January 2018

# Europe's Changing Energy Landscape

"By 2030 half of all our electricity will be powered by renewables, and in about 35 years it will be carbon-free. That's a big step up from today's 27.5% renewables. We must prepare our electricity system, making it more flexible and market-oriented. Only then can we meet our Paris climate commitments and Energy Union goals."


***Miguel Arias Cañete,***

*European Commissioner for Climate Action and Energy.*

**New forms of energy flexibility are required**

# Industry bodies agree on the need

"CEER regards customer participation in the electricity market as extremely important, and realizing the potential of demand-side flexibility offers an important route to increasing that participation."

CEER
Council of European Energy Regulators

"ENTSO-E advocates the further development of DSR and highlighted the numerous associated benefits, from the reduction of energy costs for consumers to making the system more flexible and increasing competition to the markets."

entsoe
Reliable Sustainable Connected

"Using system flexibility services for voltage control and congestion management could provide clear benefits for DSOs, grid users and society as a whole."

EDSO
for smart grids

"Demand response (DR) will be one of the building blocks of future wholesale and retail markets, offering electricity customers the opportunity to reap the full benefits of their flexibility potential. The development of innovative demand response services will empower customers."

eurelectric
ELECTRICITY FOR EUROPE

USEF

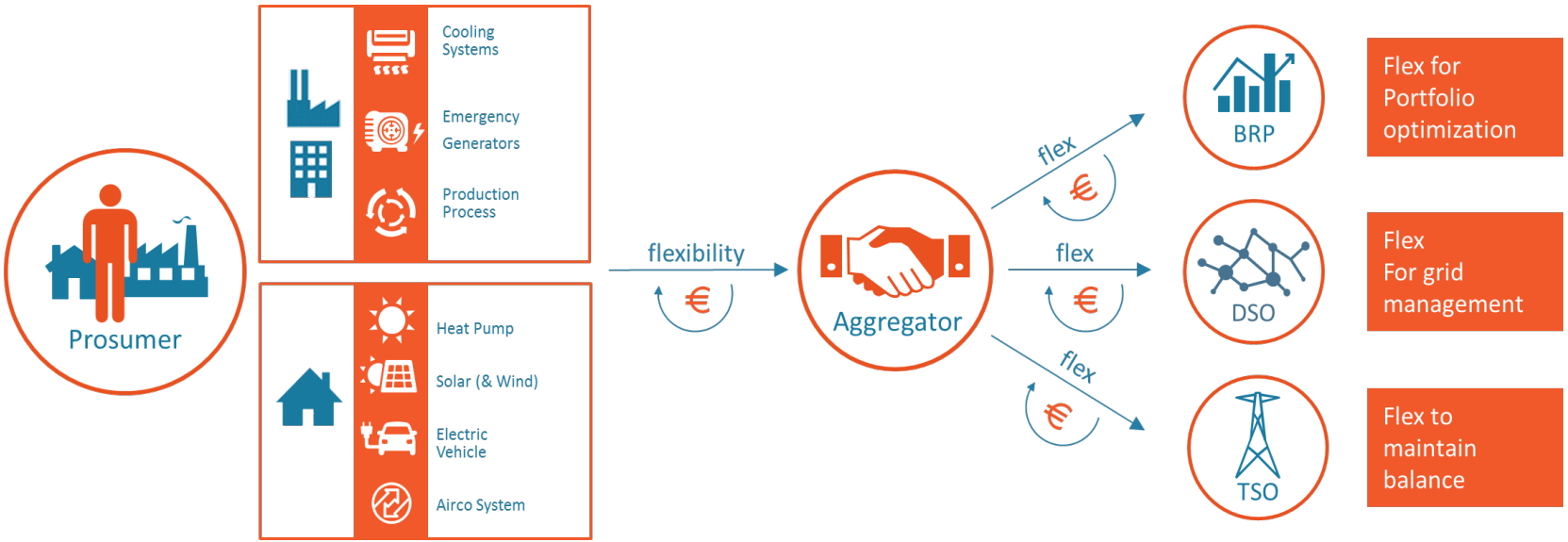
# and so does the European Commission

"DSOs have the possibility to optimise investment in networks through the use of smart grids, including demand side flexibility. Flexible grid access and real-time flexibility can reduce or postpone investment needs. "


***European Commission** – Regulatory Recommendations for the Deployment of Flexibility*

European Commission

# Creating value from flexibility



# USEF's DSO Workstream – Congestion Management

Using flexibility for effective congestion management increases grid reliability - the primary concern of all network operators -and can help to avoid or delay grid reinforcement.

USEF and several DSO's across Europe have developed initiatives to address this.

This workstream aims to assess multiple existing solutions, their specific environments and drivers, in order to define and share best-of-breed approaches for the different challenges network operators face.

## Contributors:

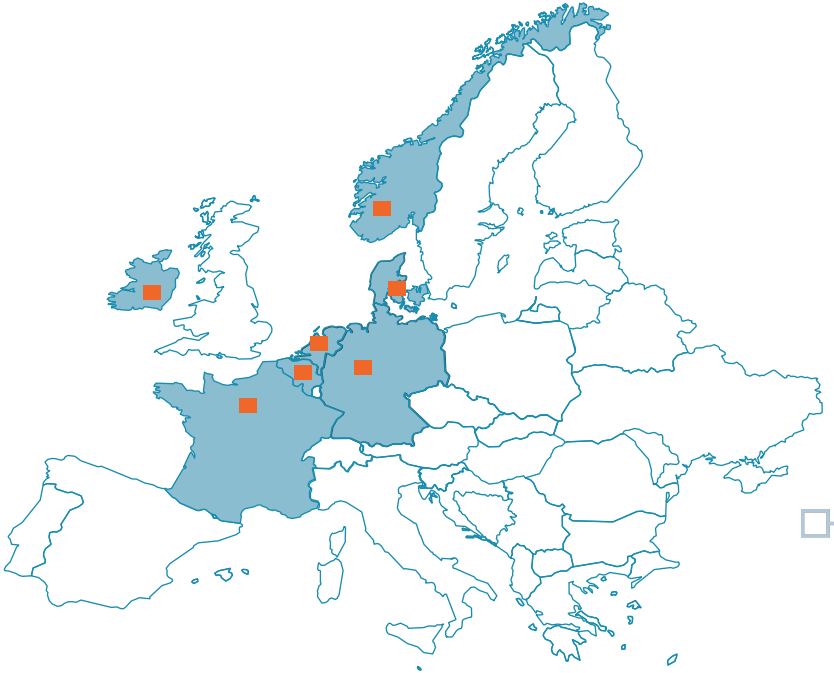
- Aura Caramizaru (EDSO)
- Carolina Vereda (Eurelectric)
- Claude Perret (Enedis)
- Didier Halkin (ORES)
- Herman Bontius (USEF / Alliander)
- Joachim Matthys (Eandis)
- John Hodemaekers (USEF / Stedin)
- Katharina Volk (Netze BW GmbH)
- Milo Broekmans (USEF / Stedin)
- Paul de Wit (Alliander)
- Poul Brath (Radius)
- Sahra Vennemann (Innogy)
- Sven Jundel (Innogy)
- Tony Hearne (ESB)

# Congestion management in Europe

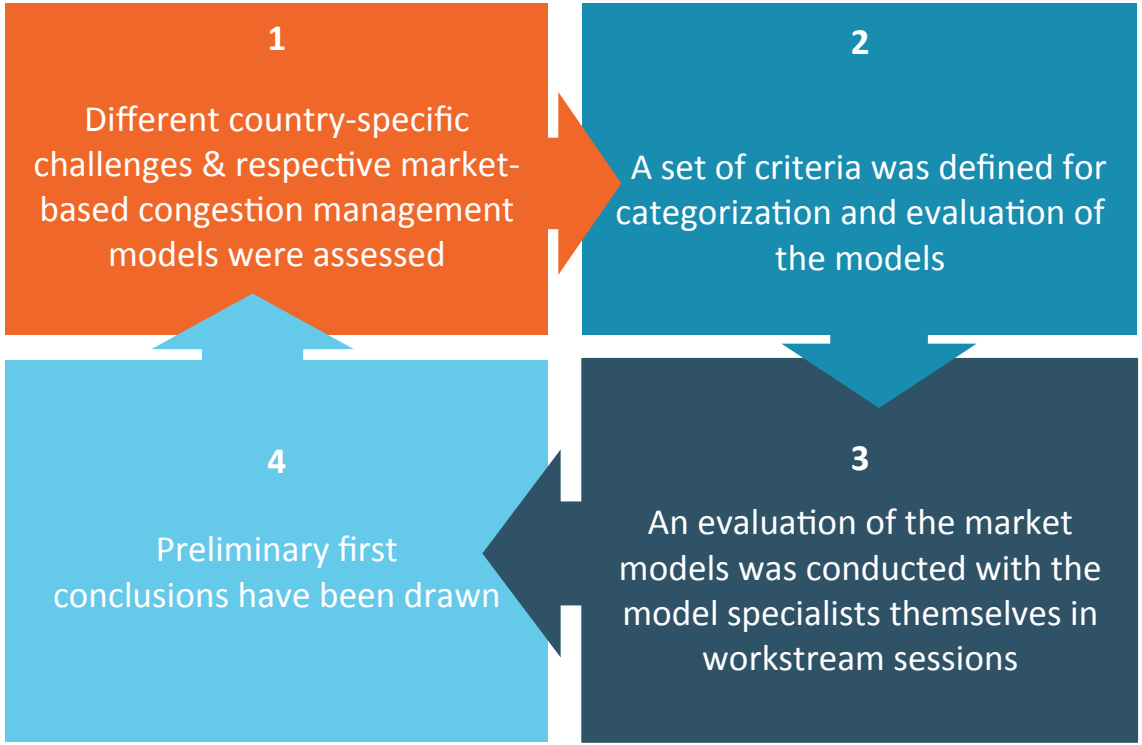
Different countries use different approaches

Initiatives assessed by the workstream are from:
Belgium, Denmark, France, Germany, Ireland, The Netherlands, Norway and the USEF model

Included in this interim report:
Belgium, Germany and USEF



# Our methodology




- The assessment is qualitative, not quantitative
- This interim report provides a first insight into workstream's activities during 2017
- Final results will be published in March 2018

# The assessment criteria

- Scope & targeted problem (e.g. only congestion management ? market acceleration ? etc.)
- Expected effectiveness of congestion management (e.g. implicit, type of contracts etc.)
- Business model (Regulated or market based)
- Initial cost (regulatory adaptation, technical implementation)
- Operational cost (including obtaining and activating flexibility)
- Prosumer type's addressed (industrial, residential etc.)
- Complexity (implementing the model)
- Multiple parties can be involved simultaneously
- Gaming sensitivity, sustainability
- Type of flexibility resources (RES/feed-in, demand response etc.)

# Sample models: A brief introduction

T-flex

grid-control

USEF

- We provide a first glance at three of the models assessed so far and provide:
  - General descriptions
  - Short introductions to the primary issue each model addresses
  - Models of the interaction between involved parties
  - Typical characteristics of each model
- Note that comprehensive descriptions, comparisons & conclusions will be in our final report


# MODEL 1: T-flex (Belgium)

- Aims to increase potential for renewables connection at DSO level when the requested TSO/DSO network capacity is not available. Applicable where new connections are requested or existing connections are expanded for renewables
- Basic mechanism is that DSO is only obliged to expand capacity when the network investment cost as calculated by regulator is reasonable. The DSO is allowed to curtail directly when production exceeds capacity. Compensation of the loss of revenues or not depends on curtailed capacity.
- Value drivers for the model:
  - Allows connection of more renewables than theoretically possible at socially acceptable costs
  - Producer knows the risks of curtailment at the beginning of the renewable project
  - Flexibility is offered by the producer by acceptance of the curtailment and compensation of the lost of revenues
  - Pricing rules are set by the regulator. Price of the curtailed energy is defined by the regulator

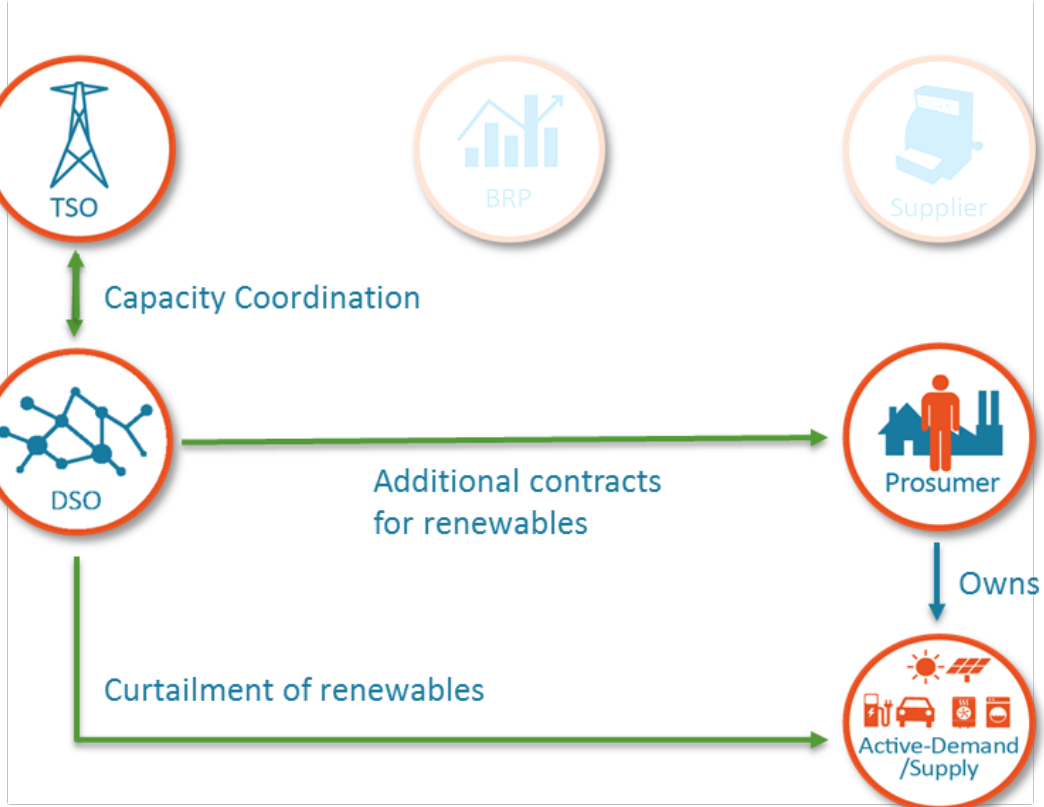

# T-flex

## DSO capacity coordination model

- Renewables integration with existing load
- Curtailment of renewables is allowed when necessary
- Marginal costs based decision for expansion
- Regulated evaluation of the reasonability of investments
- In legislation as of this year

New

Existing




# MODEL 2: grid-control (Germany)

- Aim of the research project is to achieve an overall concept for sustainable distribution grids. A non-discriminatory quota-based approach for congestion management based on the German Traffic Light Concept is implemented with role-specific system solutions. The DSO provides constraints for sales by means of quota to the market participants with flexibility.
- Market participants are free to manage flexibility within the constraints set by the DSO. They may optimize their schedules by using e.g. a secondary “quota” market and negotiate how to meet DSO‘s conditions based on their customer contracts.
- Value drivers for the model:
  - Increases the quality of load & feed-in forecasting for stable grid operation
  - Allows management of local generated grid congestion
  - Avoids uneconomical grid expansion
  - Enables market-oriented load-management

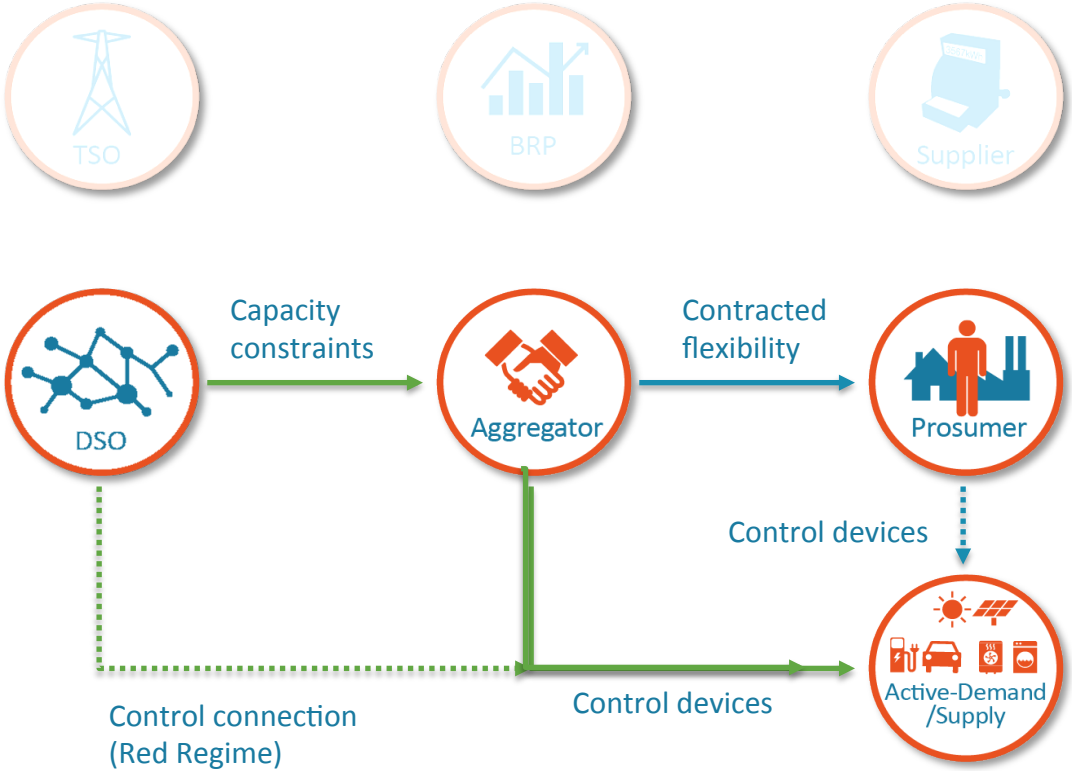

# grid-control

## DSO oriented quota model

- The DSO provides quota for each market participant with flexibility.
- Market participants may trade quota's with each other.
- Adds a yellow phase to the current existing green and red phase to avoid curtailment of customers.
- Red regime by controlling customer devices.

New

Existing



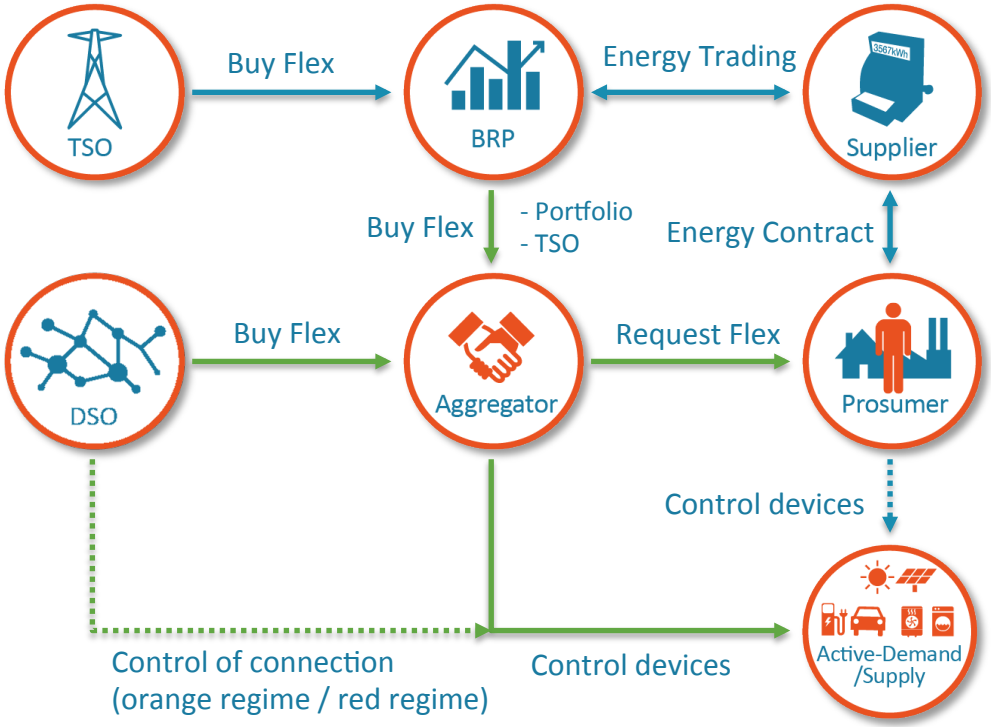

# MODEL 3: USEF

- Aims to enable a smart energy market encompassing all players, including DSO and (residential) prosumers, and deliver a market structure with associated rules and tools for integrating flexibility in most current European market models
- Fits on top of most energy market models in Europe, extending existing processes to offer the integration of both new and existing energy markets. Aims to provide fair market access and benefits to all stakeholders
- The goal is to provide an integral flex market model, including role definitions of all stakeholders in the energy system. Flex requirements and offers of actors/roles are traded on a flex market. BRP role, DSO and aggregator role have direct access to this market
- The market flexibility is available to roles and actors for portfolio optimization, TSO balancing, TSO/ DSO congestion management. Distributed resources up to consumer level on aggregated level

# USEF

- Flexibility is traded on all markets
- All flexibility resources can join
- Can be used by DSO and TSO
- Congestion management by long-term contracts and intraday trading
- Supports a market-based solution in the yellow phase and a direct control solution by DSO in the orange/red phase
- TSO and DSO are responsible for detecting and forecasting congestion
- Aggregator forecast is mandatory, offering of flex is voluntarily

New
Existing



# Four key interim findings

1

## Range of challenges

- Every model has specific strong points. Not all models solve the same problem. Each model is designed to solve one or more specific challenges

2

## Now vs later

- Some models are designed to solve current actual congestion problems while others are designed to solve future challenges

3

## Technical vs market solution

- Some models are specifically oriented to provide a technical solution only while other models are more oriented on providing a market based solution

4

## Key topics

- Key topics for market based solution models are:
  - It is crucial to address the price of the flexibility
  - Capacity reduction can be achieved by providing a certain bandwidth to the market or by buying enough flexibility from market players until the congestion is relieved

# Next steps

- All models will be assessed against the criteria outlined in this interim report
- In-depth descriptions will be made of all models assessed
- Conclusions will be drawn and recommendations made related to the effectiveness of each model in addressing its specific market/congestion situation
- The USEF foundation ‘s design team will evaluate the work stream results and determine their implications for the future development of the framework
- Final results will be presented and available in report format in March 2018




# DSO Workstream

A solid foundation for smart energy futures

Contact:

USEF-foundation
Utrechtseweg 310 – B42
6812 AR ARNHEM
The Netherlands
contact@usef.energy