Demand Connection Code – Call for Stakeholder Input

26th April JESG Workshop

Agenda

- Overview of DCC scope
- Feedback from 18th April ENTSOE workshop
- Overall DCC justification
- DSR for reserves
- DSR for system frequency control
- Reactive Capabilities
- Voltage withstand capabilities
- Frequency withstand capabilities
- Next steps

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DCC Timeline

Phase	*Timeline*	*Progress*
Preparatory phase	Mar 2011	Kick-off, initial scoping
Preparatory phase	Jul 2011	First meeting with DSO Expert Group
Preparatory phase	Jul 2011	Publication of ACER's Framework Guidelines
Preparatory phase	Sep – Dec 2011	DCC drafting, initial stakeholder meetings
Formal phase	Jan 5 2012	EC mandate letter received
Formal phase	Jan 2012	Internal ENTSO-E consultation
Formal phase	Apr - May 2012	Stage 1 consultation – call for stakeholder input
Formal phase	Jun - Sep 2012	Stage 2 consultation – on draft code
Formal phase	Sep - Dec 2012	Review comments, code update
Formal phase	Dec 2012	Finalise code and submit to ACER

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ENTSOE Slide extract – Framework Guideline

Framework Guideline

- Meet requirements in Framework Guideline on Grid Connection July 2011
- Functional requirements/capabilities only in Network Code not their use
- Compliance is only for requirements in the NC and these requirements specifically
- Retrospective application in line with FWGL and RfG will only be implemented at a National level following TSO demonstration in a CBA and agreement with National Regulatory Authority of need and appropriateness
- Quality of connection (i.e. Number of circuits, etc) is not part of this code
- Demand connected that singularly or grouped that causes a cross border issue is covered by code regardless if they are connected to TSO and DSO networks
- DSOs are treated as significant demand users
- Closed Distribution Networks are covered in NC as per 3rd legislative package

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European Stakeholder Engagement

- DSO Expert Group
  - Members (approx. 10) of three European wide DSO associations: Eurelectric DSO, Cedec, Geode, including 2 GB experts
  - Sequence of 7 meetings since 2011 with agreed work programme
  - Minutes now available on ENTSOE site
- IFIEC
  - 2 meetings to date 23 Nov 2011, 29 Feb
- CENELEC
  - In the context of EC mandate M490 on smart gird deployment, met Dec 5
- CECED
  - 1 meeting to date – initial discussion on demand response by domestic appliances
- User Group
  - Now established
  - 19 April, early July, mid Sep meetings scheduled

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Stage 1 consultation – call for stakeholder input

- Published April 5, closes May 9
- General feedback sought on options for inclusion in DCC
- Five key new requirements have been identified
  - Demand side response for reserves
  - Demand side response for system frequency control
  - Reactive power exchange capability
  - Voltage withstand capability
  - Frequency withstand capability
- 3 of these (in black) have been prepared with initial CBAs
  - Initially based on GB and Ireland, ENTSOE has committed to providing additional cases from other regions
- The consultation asks questions of stakeholders and for supporting data to be provided

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Feedback from ENTSOE workshop – 18 April

- 50+ attendees
- …

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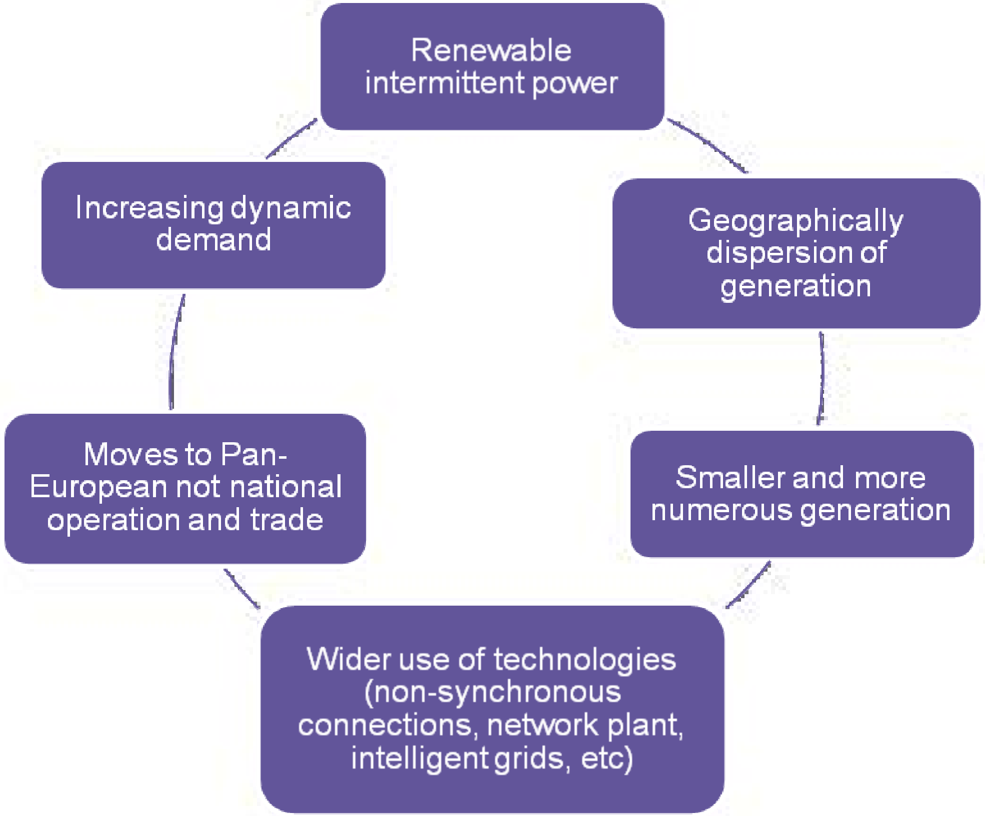
Overall DCC drivers

Challenges Ahead - Drivers

Change is at the core of Transmission network planning and operation



However scale and speed of change in recent years is unprecedented

Challenges Ahead – Necessary Response

Fundamental change to network planning and operation by TSOs to integrate RES and move from national to synchronous or European network view.

Network codes through EC 3rd legislative package will be instrumental in this

Key challenges identified within the context of this code:

- Replacing services previously held on large scale generation
- Dealing with the volatility of renewable energy sources
- Performance of distribution networks
- Ensuring Smartgrids deployment provides benefit to these needs

Challenges Ahead - Options to deal with High RES

Demand response appears to be most effective option

Option	Pros	Cons
synchronous conventional generators are required to provide the most significant system services	▪ No significant change from today	▪ Cost constraining off RES ▪ CO_2 emissions - RES constrained off ▪ 100 % CO_2 free production only with nuclear and CCS ▪ Risk of lack of system services
RES generators to provide their share of the system services	▪ No additional CO_2 emissions for voltage support services	▪ RES has to be constrained (and therefore wasted) ▪ Embedded generation needs full control
extensive building of storage systems	▪ Only limited CO_2 emissions (from less than 100% cycle efficiency) ▪ Supports RES integration	▪ New storage systems have to be built Europe wide ▪ Feasibility not in all areas ▪ High environmental impact
demand facilities provide their share of system services	▪ No additional CO_2 emissions ▪ Supports RES integration ▪ Services have the potential to be provided at low/no cost or minimum consumer impact ▪ Highly reliable - risk spread ▪ Consumers are able to participate in market to reduce CO_2 and will pay less	▪ Public perception of possible inconvenience ▪ Public acceptance ▪ DSOs need to contribute more towards managing a system with high RES (e.g. voltage)

Location in network requires that adequate network performance ensured both from both transmission and distribution networks to realise the full potential of RES

Level of Detail

Cross border impacts can arise from:

1. Localised events cascading into widespread events
2. Aggregated impacts of large numbers of smaller sized system users

Therefore ENTSO-E's view is:

- Detail is adjusted to the purpose of each requirement - Determined by the extent of the system-wide impact of each requirement.
- The NC DCC focuses on significant users which are either Demand Facility or Distribution Networks (DSO or Closed Distribution Network Operator) connected to the transmission system.
- Facilitate all players to participate in the market place, all users significant grid users in the context of DSR.

Question:

What is your view on ENTSO-E's interpretation of the level of detail required in the NC DCC?

New requirements

- The stage 1 consultation includes detail of 5 new requirements:
  1. Demand side response for reserves
  2. Demand side response for system frequency control
  3. Reactive power exchange capability
  4. Voltage withstand capability
  5. Frequency withstand capability
- The consultation seeks to determine if they are needed, and if so, if they should be voluntary or mandatory
- For 1-3 initial CBAs were presented, focusing on GB and Ireland
  - Today will focus on the proposals and GB content

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DSR for reserves

DSR delivering Reserve Services - Context

Reserve capability is required by TSOs to deal with uncertainty ahead of real-time.

- uncertainty due to demand and unscheduled position for generation
- Increasing forecasting errors due to high penetration of RES

⇒ a bigger volume of reserve will be needed to ensure system security.

Reserves are typically required to be available from a time when an incident occurs until the time that generation can start up and produce replacement power

TSOs define reserve ancillary services in this context and in real-time operation instruct at the lowest cost.

- During windy and sunny times, with high RES production, synchronous generation could be displaced, which removes the most economic service for providing reserves

⇒ Risk of a lack of services provided by synchronous generation during high RES production periods

DSR delivering Reserve Services – Example

Example: GB forecasting for 2025 with a central scenario for RES development

- The number of hours during which RES generation will be greater than total demand will increase
- In these cases, the need of reserve can reach **12 GW**, which cannot be provided by synchronous generation only.

Example:

30 GW of RES production

25 GW of demand, 8 GW of net export

3 GW left to be provided by synchronous generation (nuclear, run at 25% output)

This nuclear generation shall provide around 6 GW of reserve.

=> 6 GW left, to be provided by others means

If provided by RES generation, during 5% of the hours of the year => **cost =650 M€ !**

(reserve costs for 2010/2011: ~ 120 M€)

DSR delivering Reserve Services – Possible Options

What are the options?

1. Do nothing, just leave it to the existing market players.
2. Open up markets to share reserve services beyond the existing control areas.
3. Open up for reserve service provision even between synchronous areas.
4. Define DSR reserve services

The options 2 &3 will probably be developed, using especially HVDC links capabilities but they are out the DCC scope.

<u>The goal of the DCC is to define the technical requirements</u> permitting to provide DSR reserve services. The way these services will be used and/or paid is out of the scope.

The DSR reserve services considered are those providing <u>support to crossborder constraints.</u>

All other DSR needs (DSOs' network constraint management, energy suppliers management of time of energy consumption) are out of the scope of the NC DCC.

DSR delivering Reserve Services – possible providers

How could such reserve services be provided?

All demand which is capable of being deferred for extended periods can be used.

- **Industry and business premises**

Some stakeholders already provide reserve services. These services are expected to continue and to expand in volume

- **House hold level**

« wet » white goods and charging of electrical vehicles not yet engaged in this kind of services.

Their flexibility will only bring minor or even no inconvenience for most consumers.

Why such an option?

« wet » white goods represent a huge amount of MW capable of being deferred without noticeable prejudice.

Electrical Vehicle charge is also a new opportunity to get reserve.

DSR delivering Reserve Services – wet white goods & EV

How can this kind of services be achieved?

These services will be possible via some kind of aggregation

The TSOs needs shall be defined in the NC DCC

The qualities in end user equipement can be specified at European level and implemented through European standards

Additional facilities required, but not in this code.

3 alternatives are considered:

- Alternative 1: Define optional service capability, leave delivery to market
- Alternative 2: Define standard service capability, leave delivery to market
- Alternative 3: Define standard service capability, with mandatory delivery

DSR delivering Reserve Services – Alternatives

Alternative 1: optional service capability, leave delivery to market

- Choice left to the consumer to purchase an equipment with or without the capability
- Opportunity left to disable the service to have certainty of operation of the equipment when needed
  - Risk of low take up at time of purchase
  - Need to encourage the end customer to leave the service available

Alternative 2: standard service capability, leave delivery to market

- All equipments purchased have the capability,
- Opportunity left to disable the service
  - Big volume of reserve available
  - Cost/unit will be lower than alternative 1.
  - Need to encourage the end customer to leave the service available

Alternative 3: standard service capability, with mandatory delivery

- All equipments purchased have the capability
- No possibility to disable the service
  - Big volume of reserve available, predictability
  - Cost/unit will be lower than alternative 1.
  - Difficult to accept from the customer

DSR delivering Reserve Services – Questions

What is your view of the analysis presented on the challenge ahead associated with reduced availability of reserve services from synchronous generators at time of high RES production?

Is there any class of users that should be excluded from providing these reserve services?

What would be the technical and economical limits to the development of DSR for industrial customers, commercial premises and Closed Distribution Network operators?

With regard to the provision of mitigating the short fall of reserves, are there any comparable alternative options?

What would be the typical cost to equip one appliance under each of the 3 alternatives?

What form and level of incentive do you believe is required to encourage consumers not to switch the reserve off under alternative 1 and 2?

Considering the cost and consequences of the alternatives, do you support use of DSR for this purpose?

Which of the 3 DSR alternatives would be your preferred option to achieve the greatest societal benefit and for what reason?

If the services proposed here are provided, what further uses of these technical capabilities would be most beneficial and why?

DSR for system frequency control

DSR Delivering SFC

The increasing need for frequency response services associated with high RES conditions.

- Frequency control is required by TSOs to deal with perturbations in demand as well as modest changes in generation in real-time.
- It is also required to deal with major system frequency events, the most significant of which is either a big infeed loss or a system split into two or more islands.
- Frequency control measures deal with demand and generation balance in seconds and minutes.
- The need in a given synchronous area has been defined by the largest loss which the system is designed to cope with. This varies from Ireland 500MW to GB 1800MW to Continental Europe 3000MW.

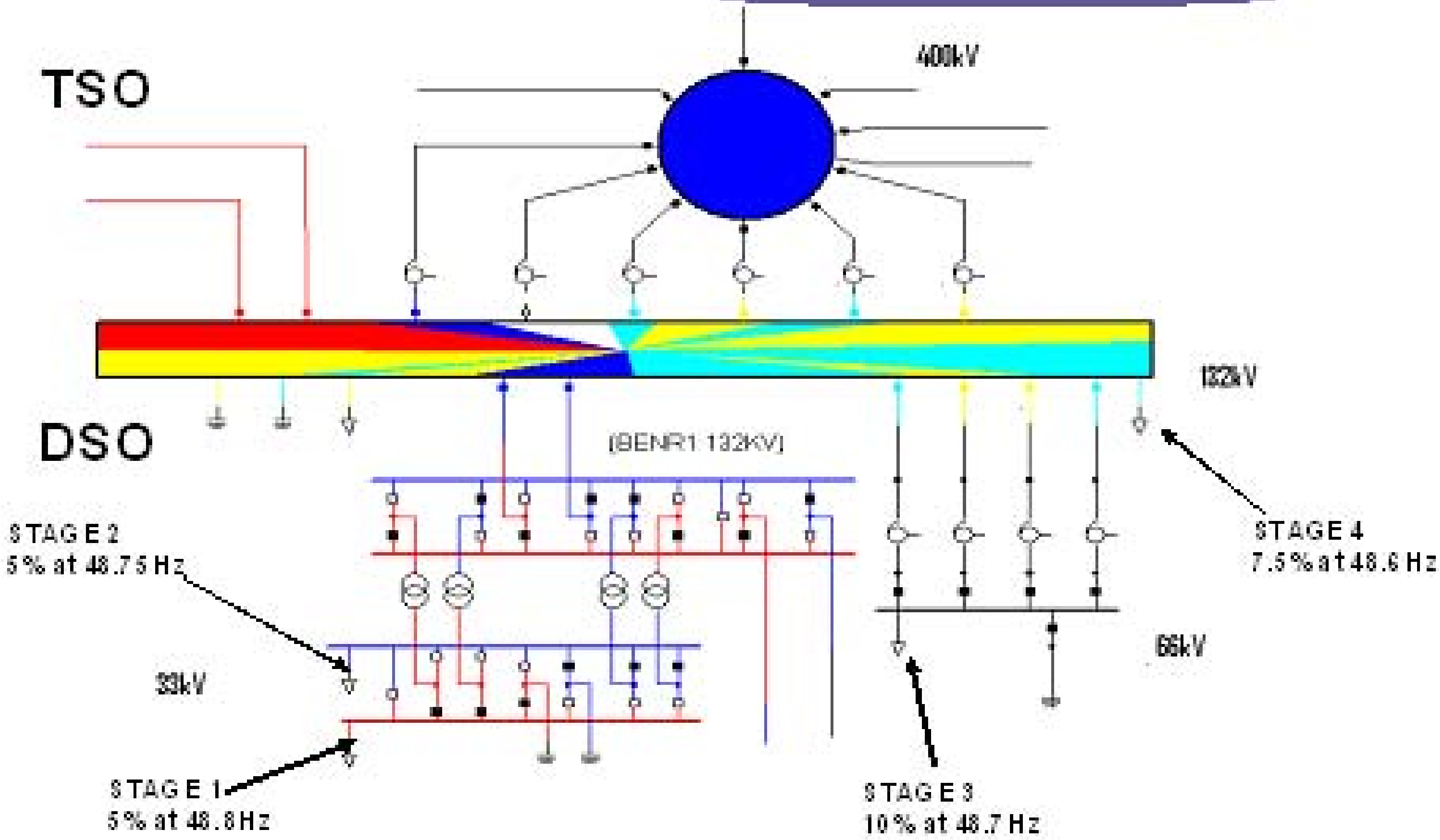
DSR Delivering SFC

In the context of severe frequency events, introduction of large scale RES introduces two major new challenges.

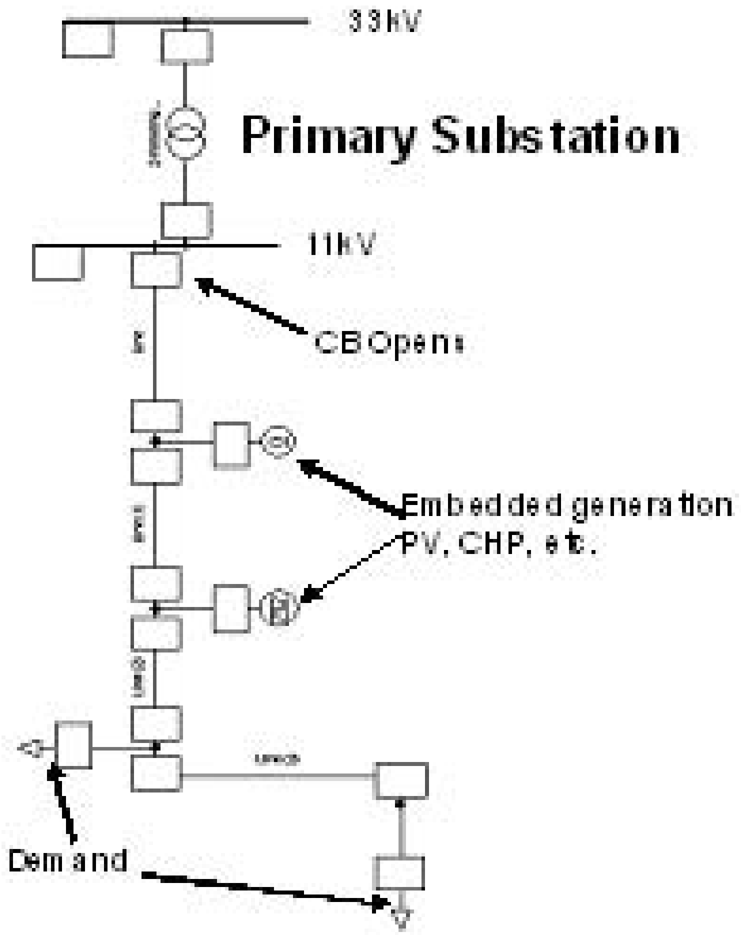
1. RES delivered via power electronic converters severely reduces system inertia (ability to slow down frequency change).

2. The second challenge arises from the need for a means to cope with extreme events via defence plan measures, most notably Low Frequency Demand Disconnection (LFDD). **As per Diagram A on next slide**

DSR Delivering SFC – Diagram A (LFDD)



DSR Delivering SFC



Deploying STAGE 1

The required 5% of demand reduction in MVA is not achieved.

Due to the mix of embedded generation and demand, connected to the selected circuit, this may yield 3% rather than 5% of demand reduction.

Therefore, increases the overall generation deficit.

DSR Delivering SFC

During windy and/or sunny times with high RES production synchronous plant is no longer "in merit" and is replaced by asynchronous RES generation (e.g. wind & solar PV).

Overall the consequence of the RES development is:

1. A large reduction in the availability of economic frequency response
2. Reduced system inertia and hence need for faster response
3. Less capability of dealing in a traditional way with extreme events

DSR Delivering SFC – Frequency Response

Normal Frequency Management Related to Extreme RES Penetration – GB case study

- The following case study shows the opportunities given by the use of temperature controlled devices in frequency management, for normal frequency response.
- Temperature controlled demand which has a target temperature with a small difference between the temperature it turns on and the temperature it turns off, is ideally suited to deliver such a service without inconvenience to the end user.

What are the ALTERNATIVES?

- Alternative 1: Voluntary service capability – mandatory usage
- Alternative 2: Voluntary service capability – voluntary use
- Alternative 3: Capability as standard, with mandatory delivery
- Alternative 4: Do nothing

DSR Delivering SFC – Frequency Response

	£/MWh	MW	10% in a Year (hrs)	Total £M
Cost to Deloading Wind (most expensive 10%, ignoring rest)	100	3300	876	**289**
	120	3300	876	347
	150	3300	876	434
	200	3300	876	578
Holding Cost on Wind for Response	£/MW/h	MW	10% in a Year (hrs)	Total £M
	0	3300	876	0
	5	3300	876	15
	10	3300	876	29
	15	3300	876	43
	20	3300	876	58
	25	3300	876	72
	30	3300	876	87
Taking minimum cost for deloading and ignoring holding cost for response , which is £290M + £0M				£290M

DSR Delivering SFC – Frequency Response

Temeperature Control Potential for DSR	Total MW Potential for DSR	Total Net MW with load factor	Install/Replacement MW per year
Domestic Refridge/Freezer	2000	400	40
Commercial Air Conditioning	2800	840	84
Domestic Heat Pumps	1400	700	70
Industrial Refridge/Freezer	2600	260	26
	8800	**2200**	**220**

The potential Demand Side Response is governed by the duty cycle/load factor and the volume of new installed capacity each year, which is estimated as:

20% Domestic refrigeration yields 40MW / year

30% Commercial air conditioning yields 84MW / year

50% Heat Pumps yields 70MW / year

10% Industrial refrigeration yields 26MW / year

DSR Delivering SFC – Frequency Response

The cost in £M / year per 100MW of frequency response for the 4 alternatives is calculated. Also illustrating, at the end of a ten year period (replacement/installed) the accumulated MW available and cost will defer for each alternative, each compared with the holding cost for wind for 10% of that year when wind exceeds demand.

Alternatives		Dom F/F		Com Air Con		Dom H/P		Indus F/F		Total	Total	Summary
		MW	Cost £M	MW	Cost £M	MW	Cost £M	MW	Cost £M	MW	Cost £M	£M/100MW
1	Voluntary / Mandatory 20% take-up	80	3	168	3.6	140	2.4	52	1.8	440	10.8	2.5
2	Voluntary / Voluntary 10% take-up	40	32.5	84	7.8	70	5.2	26	3.9	220	49.4	22.5
3	Mandatory + Mandatory	400	10	840	2.4	700	1.6	260	1.2	2200	15.2	0.7
4	Do nothing constraint wind (nuclear for reserve)	0	0	0	0	0	0	0	0	2200	290	13.2

QUESTION to STAKEHOLDERS???

ENTSO-E believes these services below can be introduced for new appliances (and temperature controllers) without any detectable difference to the primary purpose of the service of the appliance. Can you share any specific knowledge or experience and associated data you may have on the following topic?

Regarding the DSR application related to temperature controlled demand to deliver a smarter, robust and a more user friendly LFDD-capability to avoid frequency collapse and hence contain the impact of rare events with large system frequency

Regarding the use of the temperature controlled demand beyond LFDD-capability for frequency response

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Reactive Capabilities

Reactive Capabilities – Introduction

Fundamental

➢Voltage in electricity grids can only be influenced by the use of devices that are able of either absorbing or feeding reactive power.

➢Reactive power cannot be transmitted over long distances.

➢Local reactive power capabilities are crucial for voltage stability which is a key issue for system security.

Today

➢DSO networks and consumers are mostly passive concerning reactive power.

➢Reactive power comes from large transmission connected generators.

➢TSO adapts the reactive power produced (or absorbed) by the large generators to the reactive need of the consumers.

Future

➢In future only few (or even no) big generators will be in service to the transmission grid.

➢Generation will either be far away from load centers or will be dispersed in distribution networks.

➢In both cases, there will be significantly less reactive reserves directly available for the TSO.

➢As a consequence, other reactive power sources must be installed.

Reactive Capabilities – Options

Options for reactive power sources in future:

- Compensation devices installed by the TSO.
- Compensation devices installed by the DSO.
- Compensation devices installed by the demand facility owner.
- Use of the reactive capabilities of dispersed generation.

ENTSOE opinion:

- All options will be needed in future.
- Therefore: Requirements for the interfaces
- TSO – DSO and
- transmission connected demand facilities – TSO
  must be defined in the code.

GB CBA on reactive compensation

- For GB 3 locations were chosen
  - Based on location – highly integrated point in network with high levels of available merit order generation (urban) and inverse (rural)
- The study considered 2 options:
  - Reactive support provided by the user at their connection point of 132kV
  - Reactive support provided by the TSO at 275kV
- Overall Conclusion
  - Reactive power is most cost effectively provided beyond the transmission connection point of demand users
  - Reactive power requirements should restrict the steady-state range of reactive power that may be imported and exported to a minimum, recognising that the ranges should permit the use of capabilities of embedded generation and DSR

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GB CBA - results

The reactive block requirements at the different voltage levels and for different demand injections are shown in table 1 below:

Substation	Up to 500MW@0.85		>500MW@0.85	
	HVreactive re-quirements(MVAr)	LV reactive requirements (MVAr)	HV reactive requirements (MVAr)	LV reactive requirements (MVAr)
Barking 132kV	None	None	2x150@275kV	3x60@132kV
Bishops Wood 132KV	None	None	2x150@275kV	2x60@132kV
Norton 132kV	None	None	1x150@275kV	1x60@132kV

TABLE 1

Table 2 summarises the cost assumptions of the standard blocks of reactive compensation. It should be noted that only the cost of a standard AIS bay and standard MSC (no reactor requirement was found in the study).

Type	Reactive compensation block (MVAr)	Voltage level (kV)	Approximate Total scheme cost (£/m)
MSCs	45 #	132	1.4
	150	275	2.9

TABLE 2

360 MVAr has been costed based on available information on 45MVAr units (8 rather than 6 @ 60MVAr.

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GB CBA – results continued

The total cost of reactive compensation on the transmission network compared to that on the Distribution Network is shown in table 3 below.

Voltage level	Reactive requirement	Total Cost (£/m)
LV	8x45MVAr #	11.2
HV	5x150MVAr	14.5
Difference		3.3

TABLE 3

Reactive Capabilities – General Questions

- Do you agree that increasing displacement of large synchronous generation is a significant new challenge?
- Do you agree that a review of existing requirements is needed, to take into account the new challenges mentioned above?
- Do you agree with the conclusion from the initial CBAs (Italy, Ireland and GB) that the societal benefits are greater for reactive management to occur closer to the reactive demand? In either case please provide the rational with supporting evidence where available on the aspects of the conclusion of the CBA that you agree or do not agree with.

Reactive Capabilities – Questions specifically relevant for DSO connections

- Do you agree that the development of cables and embedded generation introduce further challenges regarding reactive power control, including risk of high voltage during minimum demand?
- Is it reasonable to ask DSOs to avoid adding to the problem of high voltage on the transmission system during minimum demand by avoiding injecting reactive power at these times?

Reactive Capabilities – Which options do you prefer?

- Do nothing. Leave the TSO to sort out reactive balancing. The CBA of the transmission located reactive capability option in the CBA is relevant here.
- General limit on power factor at transmission to distribution interface, e.g. better than 0.90 or 0.95, with the value set in each country by each TSO subject to public consultation and NRA decision or an equivalent process as provided by the applicable legal framework, such as the definition of a limit in MVAr.
- As in the previous point except the power factor limit set on a local (or zone basis) by the TSO following CBA & consultation / NRA decision.
- Total separation between distribution and transmission reactive flows (i.e. 0 MVAr at the interface).
- The DSO at network exit points treated in the same way as generation is treated in network entry points with the DSO expected to regulate voltage continuously. Should this be limited to slow time scales of minutes (e.g. achieved by means including transformer tapping) or extended to fast acting reactive power support for disturbed conditions?
- Establishment of full reactive markets (e.g. in zones) encompassing DSO contributions as exist in some countries with respect to generation today?

Voltage Withstand Capabilities

Voltage Withstand Capabilities – Introduction

Fundamental

- Voltage stability is a **key issue** for system performance and **security**.
- Most of the **large-scale disturbances** in the electricity transmission system in the recent years were caused by **voltage instability (low voltage)**, particularly in Continental Europe.
- **High voltage** situations are now increasing due to the development of underground cables and due to the lack of generation support in specific areas.
- In these cases, any additional losses of demand due to narrow voltage withstand capabilities makes the situation worse.

Today

- Generator units used to contribute most to voltage stability.

Future

- In future all kinds of network users need to contribute to support voltage stability, taking into account their technical capabilities and their connection voltage level.
- Also Distribution Networks, both DSOs and Closed Distribution Networks, provide a pathway for embedded generation and DSR to contribute to voltage stability and are essential to ensure that their capabilities can be utilised.

Voltage Withstand Capabilities – Introduction

Future

- Intermittency of RES, and a less controllable, wider and more dispersed generation portfolio increases the needs for stability and certainty in response from other elements in the network.
- Withstand capabilities in case of high voltage situations would be particularly valuable support for all demand users.
- NC DCC relates to **cross border issues** and therefore the NC only looks to place requirements on **transmission connected demand users**.
- ENTSO-E recognises the right of the demand user to alter their demand for their own reasons seeking only to increase the stability of demand by avoiding equipment limitations.

Voltage Withstand Capabilities – Options

Several options are possible to deal with this issue in the NC DCC:

I. Do nothing. Demand Units/ Demand Facilities/ Distribution Networks are not expected to be equipped with a defined voltage with stand capability.

II. Demand Facilities or Closed Distribution Networks are not expected to be equipped with a defined voltage with stand capability, unless offering DSR services.

III. Include voltage withstand capabilities in the NC DCC for Demand Units connected directly to a transmission-connected Demand Facility or Distribution Network.

IV. Include voltage withstand capabilities only at the transmission connection point.

Voltage Withstand Capabilities – Questions

To evaluate the need to implement voltage withstand capabilities in NC DCC we would like to ask the following questions:

Questions:

1. Do you agree with the analysis concerning the need of voltage withstand capabilities?
2. What are the technical limitations to voltage withstand capabilities in your Demand Units in option iii?
3. What are the technical limitations to voltage withstand capabilities in your Demand Facility or Distribution Network in option iv?
4. What would be the costs induced by such requirements in option ii, iii and iv?
5. Which alternative would you prefer? In case of option ii, iii or iv, shall the requirements be defined for all Demand Units/ Demand Facilities/ Distribution Networks or with specific voltage connection levels only?

Frequency Withstand Capabilities

Frequency Withstand Capabilities – Introduction

The operating frequency of the system is around 50 Hz. However, an imbalance between generation and demand causes the frequency to deviate from this target value with an extension depending on the severity of the imbalance.

➢A predictable reaction of generation and demand contributes to a easier return of the system to its frequency target value ensuring stable operation

✓In the future generation is expected to be based on more volatile energy sources, mainly non-synchronously connected and with reduced inertia. **This will increase the frequency sensitivity of the power system to power imbalance**

✓The less predictable the reaction of generation and demand is during a frequency deviation **further it will bring a challenge to the frequency control challenge**

As a consequence ENTSO-E evaluates if requirements to withstand frequency deviations should be required in the NC DCC

Frequency Withstand Capabilities – Context of the past

Historically large synchronous generation facilities have formed the backbone of providing the most significant system services to the power system

Concerning frequency withstand capability requirements a different approach was usually <u>taken, in grid codes, for **Generation** and **Demand**</u>

Generation: Required the capability to withstand a determined frequency range

➢Maintaining generation service during frequency deviations is indispensable to contribute to preserve system stability

Demand: No specific requirements for frequency withstand capabilities

➢Demand facilities not providing any service have the natural prerogative, unless contractually agreed, to connect or disconnect at any time depending on specific user needs and decisions

Frequency Withstand Capabilities – Present Context (1)

At present besides large synchronous generation facilities also Renewable Energy Source (RES) generation facilities may provide a significant share of system services to the power system

Also **demand facilities providing Demand Side Response (DSR) services are expected to increasingly provide technical capabilities to the power system**

➢Services will have to be provided even during frequency disturbances

Concerning frequency withstand capability requirements a more similar approach for generation and demand may be necessary in future NC DCC

Frequency Withstand Capabilities – Present Context (2)

Generation: Still required the capability to withstand a determined frequency range

➢Maintain generation service and contribute to preserve system stability during frequency deviations is essential. Present proposal for "NC Requirements for Grid Connection Applicable to All Generators" already reflects this necessity

Demand: two different situations

▪**Users not providing any service**

- ➢ Natural prerogative to connect or disconnect at any time depending on user needs and decisions
- ➢ Predictable demand, concerning capability to withstand frequency deviations, is beneficial to the security of the system

- **Users providing DSR services**

➢Reasonable to accept that the contracted services shall be provided under some certainty. Frequency withstand capabilities are needed

Frequency Withstand Capabilities – Alternatives in the DCC

- Network Operators cannot ensure the system security regardless of the technical capabilities of all users
- Distribution networks (both DSOs and CDNs) provide a pathway for embedded generation and DSR to contribute to frequency response

➢ Frequency withstand capabilities within prescribed ranges are therefore essential for distribution networks

Two options are possible to deal with frequency withstand capabilities in the NC DCC:

- i. Frequency withstand capabilities are mandatory for Distribution Networks and all Significant Demand Facilities
- ii. Frequency withstand capabilities are mandatory for Distribution Networks and for the Demand Facilities or Closed Distribution Networks, which offer DSR services

Frequency Withstand Capabilities – Questions

- Do you agree that certainty is required in the performance of elements in the electrical power system to ensure stable frequency operation and to minimise the cost of procuring frequency response?
- Which of the previous options (i or ii) would you prefer and for which reason?
- Which frequency-sensitive installations do you have in your Distribution Networks or Demand Facility?
- Please provide cost information to:
  - establish frequency withstand capability over the **full range from 47.5 Hz to 51.5 Hz** and over a **limited range from 49 Hz to 51 Hz** for Distribution Networks and Demand Facilities and explain which typical apparatus are needed
  - reinforce frequency-sensitive installations with frequency withstand capability over the **full range from 47.5 Hz to 51.5 Hz** and over a **limited range from 49 Hz to 51 Hz**

Next steps

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Next steps

- Stage 1 consultation closes May 9
- Analysis of stage 1 results May – June
  - Used to give direction to the code and provide justification
- Stage 2 due June – September 2012
  - A web-based consultation on the draft version of the code
- Ongoing European stakeholder engagement
- Monthly updates provided to JESG
- During ENTSOE stage 2 consultation a further focused GB workshop has been scheduled – July 16th

Questions

Any questions?

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