

What is our key issue(s)?

New + existing connection ensure covers both

Clear + transparent set of requirements

Remove barriers for storage providers

Offshore market liabilities - how does this affect these projects?

NOA Process Interconnectors - how is this linked to code offshore assessments

Electricity Storage

Import + Export

*Fairness
* Quick
* Clear

Do not treat as generation

What's wrong with treating energy storage as demand

Difference in obligation for generators

Level + fair playing field
Extra value offered from storage

Embedded value of storage

Dealt with in context of storage

Small
Medium
Large
Generator rules
clarity

How this would impact on current obligations for generators

Could cause additional cost and requirements

Ancillary Services that could be provided

Consider generation + demand

How do we classify storage?

Consistent of requirements

Treatment of connections

Future proofing for storage technology

Categorising by storage technology

Difference between transmission owners - Scotland/ England

Project risk - Connections contracts

If we don't get this right we could drive storage 'underground'
DEMAND

What is our key issue(s)?

ENERGY

What it is...

How do we treat demand/load (obligations)

What it isn't...

ELECTRICITY

What it is...

Need to open Grid Code and Find 'Storage' section so it is clear what applies

How do you treat hybrid sites?

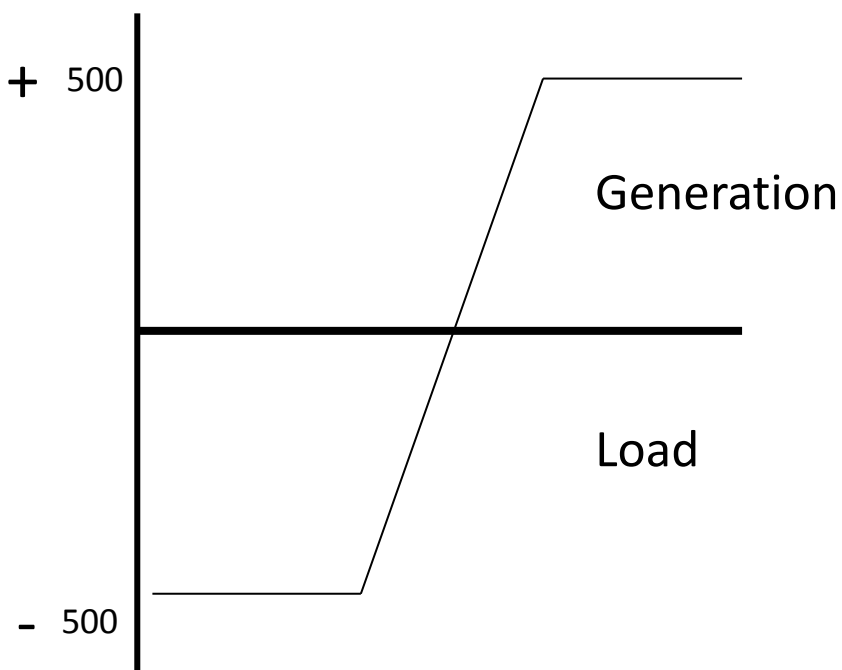
Generation + storage

What applies to storage? (not clear)

What it isn't...

GENERATOR

Clarity for a storage operator



What is our key issue(s)?

What problems could occur if we do nothing about...

- Energy Storage? Effect on Grid
- Electricity Storage? Code Objectives

Need to protect the network from adverse effects
Maintain network capabilities

Lack of coordination could cause instability and other problems, e.g. effective delivery of services

How could certain ES/gen/demand configurations cause problems/possible solutions?

- Technical
 - Market
- } and how does regulatory environment need to be worked to facilitate?

Potential inconsistency between market and system needs

What is our key issue(s)?

1. Visibility/Operational Data
2. Minimum requirements from developer
3. What does the network require
4. Connection and notification
5. Developer
 - a) maximise profit
6. TSO/DSO
 - a) Security of supply at lowest possible cost
 - b) Maximum flexibility
7. How is storage forecast
 - a) Data

What is our key issue(s)?

- Is the definition important?
 - Consider technical requirements instead?
- Set a level of materiality for Storage deployed in Large (100MW+) schemes
 - is it important to distinguish?
 - Class an auxiliary?
 - How do we flag what equipment is installed though?
- How do we consider geography
 - Build/deploy where its needed
- How far do we look into the future to future proof?

What is the specification for our technical requirements?

TECHNOLOGY

Storage medium

Export mechanism

Interface mechanism

CONFIGURATION

STORAGE ALONE

STORAGE integrated inside turbine

STORAGE on generation site

CAPACITY THRESHOLD

50MW CAPACITY = 100MW “resource”. How?

What?

TEC...

MW vs MWh vs both vs something else?

RUNNING REGIME

May limit business models as running regime may change with time as value shifts in services (EFR -> Arbitrage ->?). Multiple services?

What is the specification for our technical requirements?

➤ **Technology**

- Mirror gen reqs/specs
- Capacity thresholds
- MW or MWh

➤ **Type of service**

- Power service vs energy service
- Security of supply vs trading

➤ **Location**

➤ **Operating regime**

- Speed of response
- Response characteristics/constraints


➤ **Non-MW Power Services**

- Reactive
- Voltage Control

What is the criteria for our technical requirements?

- **Remove 'red tape'/facilitates storage**
- **Future proofing consistent with speed**
- **Speed of implementation**
- **Impact on other codes**
- **'Appropriate' level of resource deployed**
- **Consistent with overall reduction of bills**

What is the criteria for our technical requirements?

- Doesn't take too long/too many people
 - Balancing to ensure fit for purpose
 - Simple for rapid implementation
 - Future Proof
 - Storage vs other technologies/approaches
 - Mandatory vs Commercial
 - Efficient outcomes
 - Whole system?
 - TN? 
 - Consumer? Same?!
 - Security of supply
 - Safety issues?
 - Experience
- Ensure that rules/req
- are cost effective
 - Don't negatively impact on the operator

What is the criteria for our technical requirements?

GC DEF FOR ENERGY STORAGE

SCALABILITY AND COMMONALITY BETWEEN G CODE + D CODE

NO CATEGORIES FOR DIFF STORAGE TYPES

FLEXIBILITY AND FUTURE PROOFING

ADDING IN CURRENT CONNECTION TOPOLOGY

ENSURE LEVEL PLAYING FIELD DSR + STORAGE

LINK TO OTHER PROVIDER OF FLEX DSR ← AGG

DSM Reqs

GC DEF FOR ELEC STORAGE

NON-STANDARD INSTALLATIONS

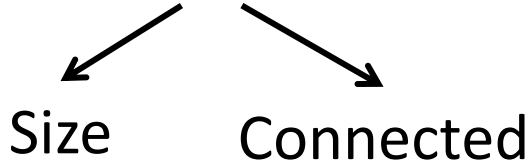
EMBEDDED

FLEXIBILITY

BY MARKET EFR etc.

TABLE TO FLAG REQS

What is the criteria for our technical requirements?

1. Technology neutral
2. Bridge Generation & Demand
3. Interaction with Market (100MW+)
4. Interaction with DNOs
5. Controllability and visibility to the SO
6. Coordination 
7. Scalability
8. Consistency
9. Clarity for developer
10. Security of supply
11. Technology/requirements on power electronics

What is the criteria for our technical requirements?

- Technology neutral
- Running regime
- Clarity

Storage - Technical Req section:

- *Voltage*
 - *Frequency*
 - *FRT*
- } Minimum

Commercial Services – Not GC

What is the specification for our technical requirements?

- What does 'interface' mean from 17th Aug outcomes?
- Import vs Export
 - 'Round trip efficiency'
- Configuration important
 - Standalone Transmission connections less likely than Distribution?
- MW vs MWh vs MVAR
- EU
 - Storage Code?
 - RfG/DCC requirements – need to ensure compliance of any technical standards?
- TO Storage ownership?

What is the criteria for our technical requirements?

- Use existing Gen/Demand requirements with Storage-specific context
- Don't reinvent what exists already
- Cross-over between Transmission and Distribution



CAR PARK



- Understand long duration charge/discharge battery solutions for large-scale demand
- Link to renewable subsidy work with BEIS Ofgem
 - Metering queries (Elexon?)
- Market signals for where storage connects
 - DNO
 - EFCC (EFR)
- How big is important?
 - TSO/DNO