NINES – DG and Storage
Smart Grid Forum's WS6 Workshop

13 October 2014

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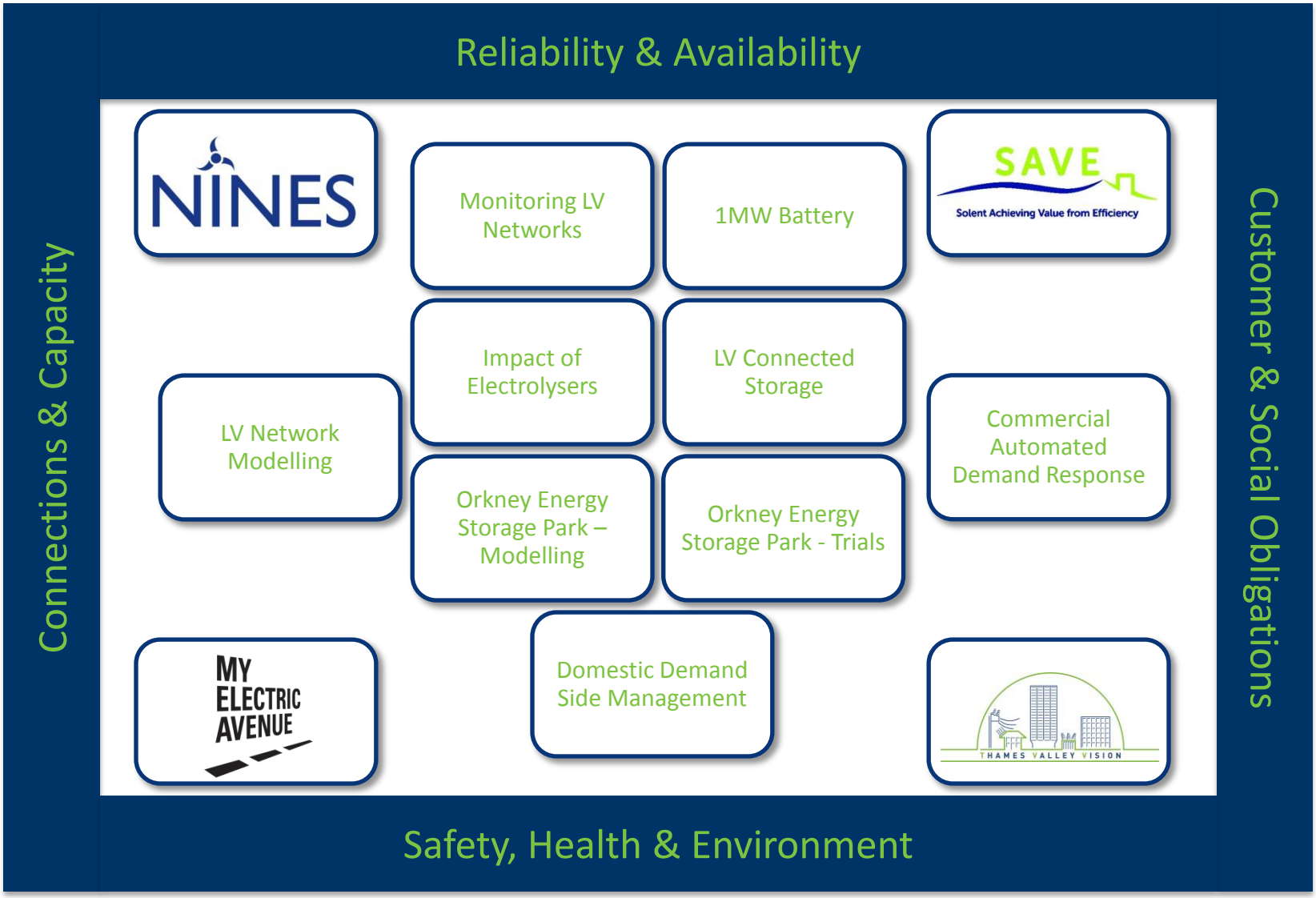
Scottish and Southern Energy
Power Distribution



LCNF Project Portfolio

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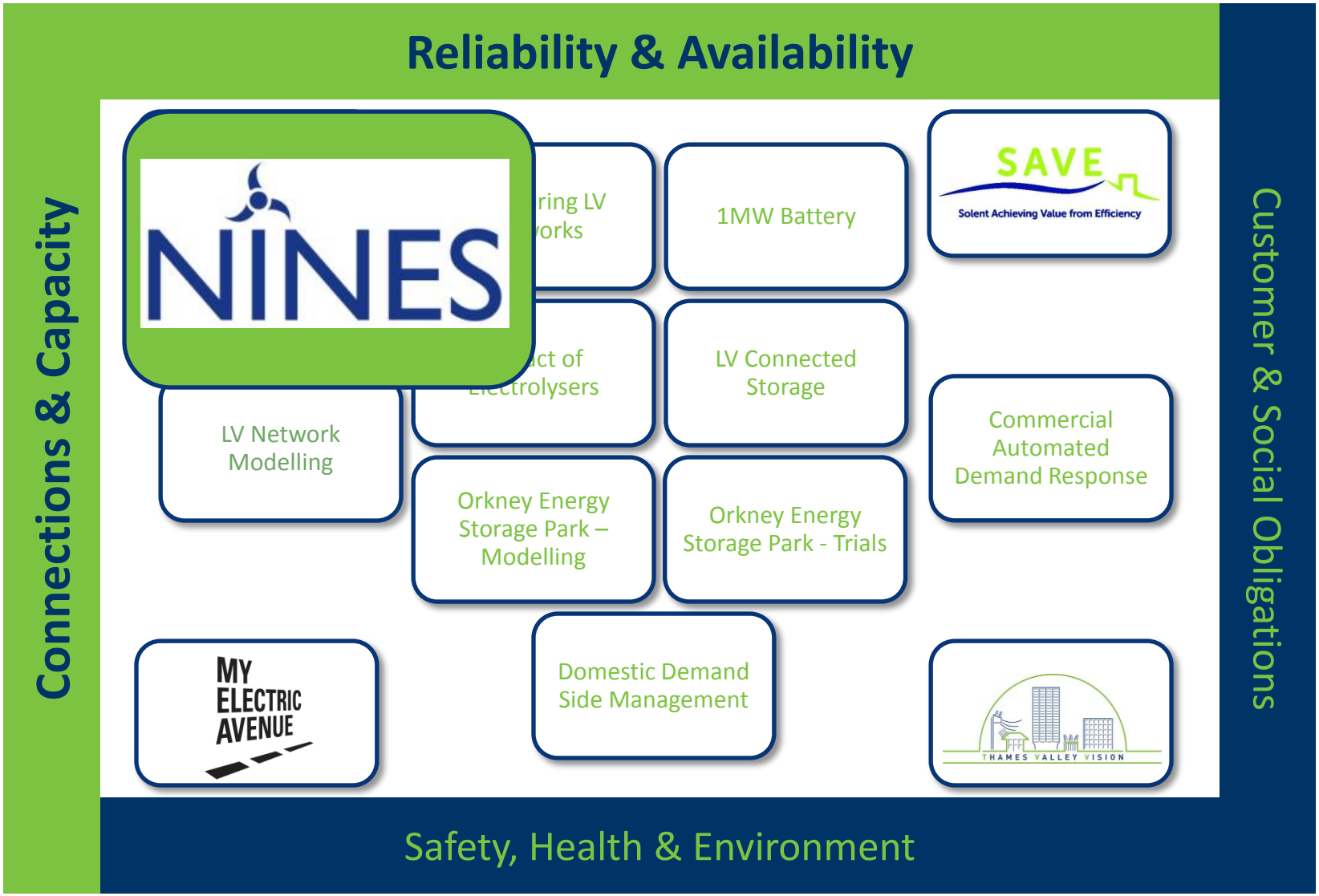

LCNF Project Portfolio

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Agenda

- Shetland overview
- NINES project
- Objectives for DG and Storage trials
- Subgroups' questions

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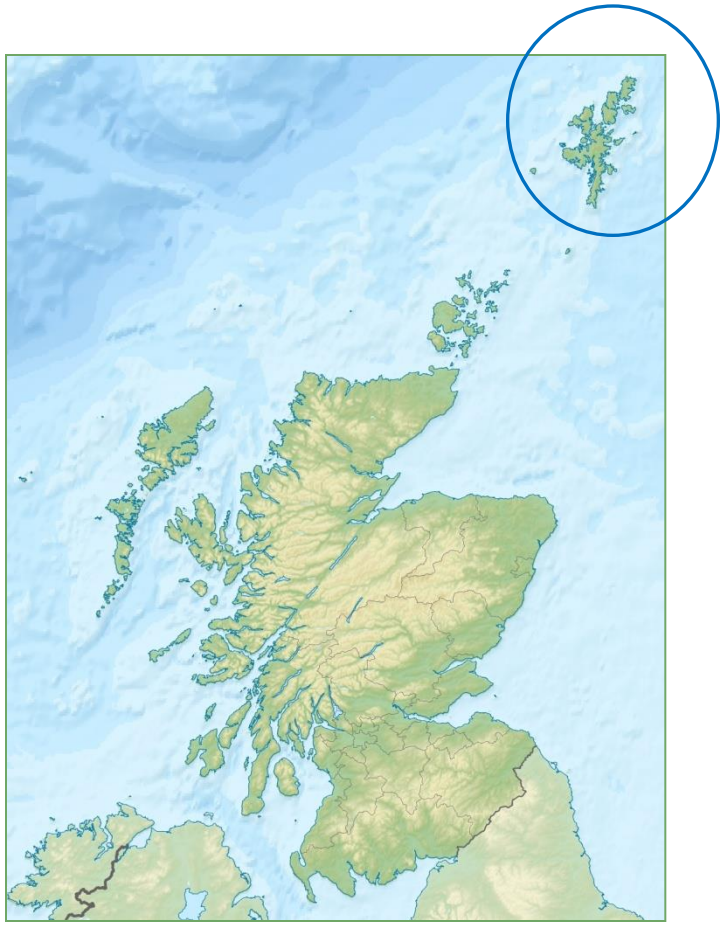
Shetland: An energy island

- Shetland is not connected to the UK electricity network
- Shetland HVDC connector (Caithness-Moray - Shetland) would interconnect Shetland with Mainland UK
- For now, Shetland remains an energy island



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SHETLAND energy problem

Despite massive renewable resources, just 7% of energy is from renewables

➢Maximum night time summer demand of only 11MW does not allow more renewable generation to enter the system (system is “full”)

Most generation on Shetland is from fossil fuels

➢Opportunity for change – Lerwick Power Station needs to be replaced

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SHETLANDS Smart Grid. Two phases

- **Northern Isles New Energy Solutions project (NINES)**
  - £35m expenditure. £15.3m from SHEPD allowed revenue
- **Phase II: repowering of Shetland. Integrated plan**

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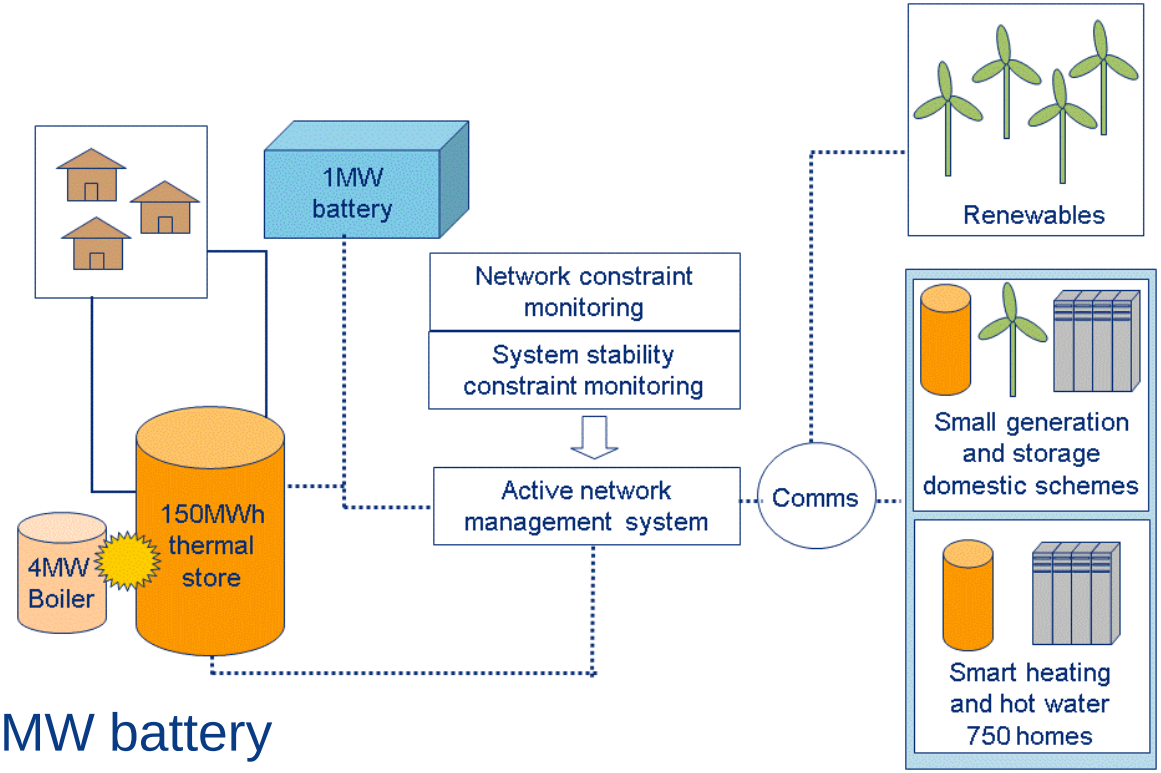
NINES. Main Objectives

- **To provide Shetland with a reliable and sustainable energy solution'**
- **Reduce peak**
- **Increase capacity**



- 1 MW battery
- DSM with frequency response
- Renewable generation
- ANM

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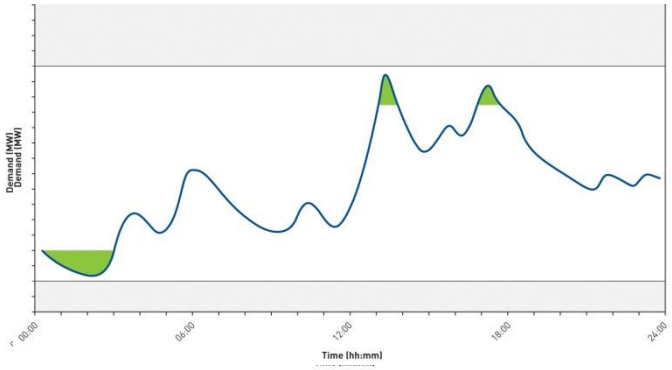
SHETLANDS – DG and Storage trials



ANM allows more generation to be accepted

Loss of 4 MW would cause frequency drop and possible blackout

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DG and Storage questions (1)

1. Compared to the number of expected connectees at the outset of the project, how many connectees have signed up to the project? What reasons have been identified for any variance?

- System chosen to dispatch: **LIFO**
- Capacity to be taken depends on the generators' commercial decision, according to the expected curtailment level
- Initial estimate: between 8 and 14 MW
  - Benchmarking against "unrestrained" UK wind generator

Technology	Capacity	Expected	Actual
Tidal	45 kW	Dec 2013	Apr 2014
Windfarm	500 KW	Feb 2014	Oct 2014
Tidal	500 kW	Oct 2014	Dec 2014
Windfarm	4.5 MW	May 2015	May 2015
Winidfarm	6.15 MW	May 2015	May 2015

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DG and Storage questions (2.1)

2. Comparing to the forecast costs and benefits at the outset of the project to the actual experience and insights so far:

– **Has the project been able to install and trial the solution at the expected cost?**

- Actual connection costs are the windfarms'. In terms of ANM and infrastructure, are on target for outturning as expected. It is too early to tell for operating costs as windfarms are only at the stage of connecting

– **Has the project been able to release the expected amount of capacity?**

- Initial number of interested bids (capacity) is according to our expectation for commercial decisions from the DG
- Once renewables are operational, the battery can reduce curtailment allowing more generation into the system
- In relation to the DSM trial, the use of frequency - responsive devices (domestic storage heaters) will allow more renewables to connect (>4MW)

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DG and Storage questions (2.2)

2. Comparing to the forecast costs and benefits at the outset of the project to the actual experience and insights so far:

– **Will the solution be applicable to the number of sites expected?**

- Shetland is a unique situation. “Stability” constraints.
- ANM is much more complex: storage, domestic, generation . Stability constraint, not thermal. Probably the “immediate” application in GB is not obvious.
- Some arrangements are starting to develop which will be relevant for GB market:
  - Bilateral agreements with local load (swimming pool, batteries), in order to manage their curtailment level.

DG and Storage questions (3)

3. **Is there any scope for collaboration among connectees to help with network planning and reduce costs for connection?**

- Probably not relevant in Shetland, as the constraints are not thermal headroom, but stability. Therefore, the connections have been possible without large network reinforcement costs.
- Also, connectees are geographically / electrically distant (many small islands).
- For one instance (tidal generators), they are close together and have been able to benefit from common communications and infrastructure.
- As mentioned before, there is scope for collaboration between generators and demand (load) customers to help the generators better manage and optimise their curtailment level.

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DG and Storage questions (4)

4. **Is the project now commercially viable for rollout across your (and other DNOs') network? What would it take to roll out?**

- Active Network Management is a commercially viable solution.
- In Shetland, it is probably more complex than mainland GB, as ANM has to include balancing and stability ("creating space").

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DG and Storage questions (5)

5. Are the generators in the project still able to offer services to other parties (i.e. the SO) ?

- In Shetland, SSEPD acts as “system operator”. There is no transmission grid, all distribution.
- No ancillary service market.
- Maybe under the integrated plan, there will be scope for these services.
- Ability to offer services to other parties will depend on constraints (ANM would have to have priority)

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DG and Storage questions (6)

6. **How certain is the commercial proposition for the connecting customer and have generators found it easier to secure investment under the proposed commercial arrangements?**

- This is an area where the DNO has no visibility, as it is for the generator and their financing arrangements
- We think this adds another layer of complexity / but also allows connections which would otherwise not happen at all (system is “full”)
- As a result, generators seek better understanding of the constraint
- Also looking for alternative solutions to decrease curtailment

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DG and Storage questions (7)

7. Has the project identified any unintended learning? i.e unexpected impact on system operation or other third parties, new commercial opportunity etc.?

- Very early in connection process.
- Community is more engaged than, maybe, the mainland. They are working with us to find novel ways of improving constraint levels.
- In terms of storage, we are learning ways to operate (more in this in next slide)

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DG and Storage questions (8)

8. What is driving the value from storage in your specific

- Storage is one of the components of the project. It is difficult to understand the benefit from the battery on its own.
- Battery's purpose is to reduce peak and allows more renewable (as the domestic storage and water tank).
- There is a one-to-one correlation for the battery:
  - 15 MW storage heater may provide only 1 MW load shed at peak

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DG and Storage questions (9)

9. **Has the trial identified any additional potential value/business propositions for storage other than the one envisaged at the start of the project?**

- The battery could be used to avoid starting up an engine
- Also to maintain an optimal operational point for the power station
- Two different batteries installed, opportunity to compare them.
  - Procurement lessons
  - Environmental implications

DG and Storage questions (10)

12. What (if any) are the key barriers (commercial, regulatory, social etc) to successful roll out of the storage project? Have you identified options to overcome

- Social (environmental): NaS battery was "difficult" to accept, community concerns about fire hazards. Also, the size of this battery was large, this could be an issue in rest UK.
- Commercial: Battery technology is new. Constraint put on us by the manufacturer (charge/discharge pattern). Immature market, new vendors.
- Ownership and operation of the battery is SHEPD, but we are not a generator. Scheduled by SHEPD and used to solve network constraints, how would you use this in GB is different.

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Questions?

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