

Bankability for medium duration energy storage

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Problem: Dominance of existing technologies

Almost all projects financed since 2016 in GB were lithium based chemistries

- First lithium grid scale projects installed since ~2011
- Lithium batteries have been considered 'bankable' across the industry 2018 onwards
- Today we have limited discussions on lithium-ion technology ability to perform
- Key reasons for this shift:
 - Reference projects, particularly in GB market
 - Improvements in warranties / long term guarantees
 - Improvements in performance, most notably cycle life
 - Cost reduction at the cell level
 - Better understanding of the fire / explosion risk



How can other technologies compete?

3rd Party Validation can support this process

- Provide an independent view on a range of parameters or metrics
- Validate certain claims such as safety or performance degradation
- Opine on the ability to deliver turnkey projects to customers

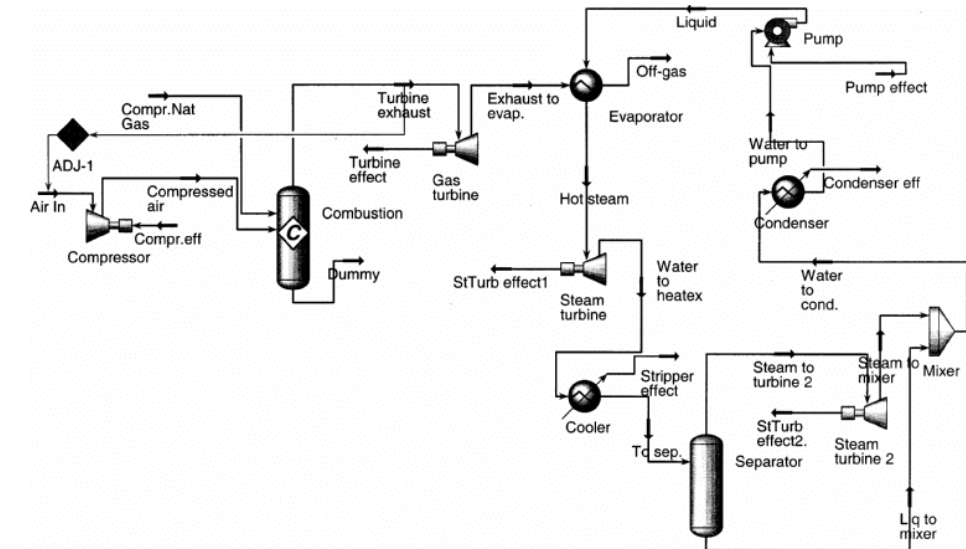


Bankability report structure

Performance validation through modelling validation

- Main area of focus is to assess the model to meet the specification:
 - Energy capacity
 - Power capacity – charge & discharge
 - Roundtrip efficiency
 - Response times
 - Ability to follow a real world load profile

All the above points are compared to the nameplate specification.



Bankability report structure

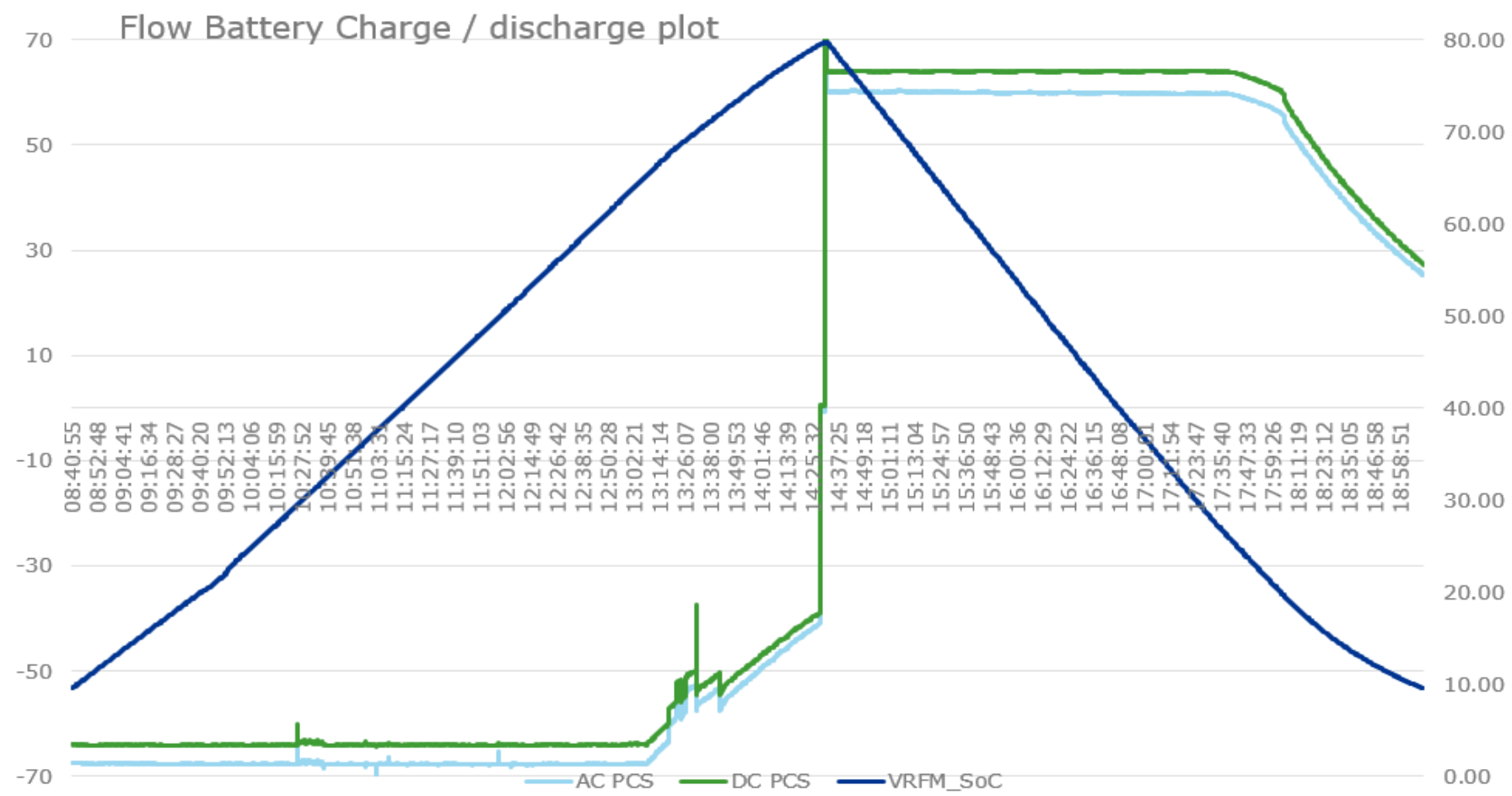
Performance validation at test facility

- Main area of focus is to validate the specification:
 - Energy capacity
 - Power capacity – charge & discharge
 - Roundtrip efficiency
 - Response times
 - Ability to follow a real world load profile

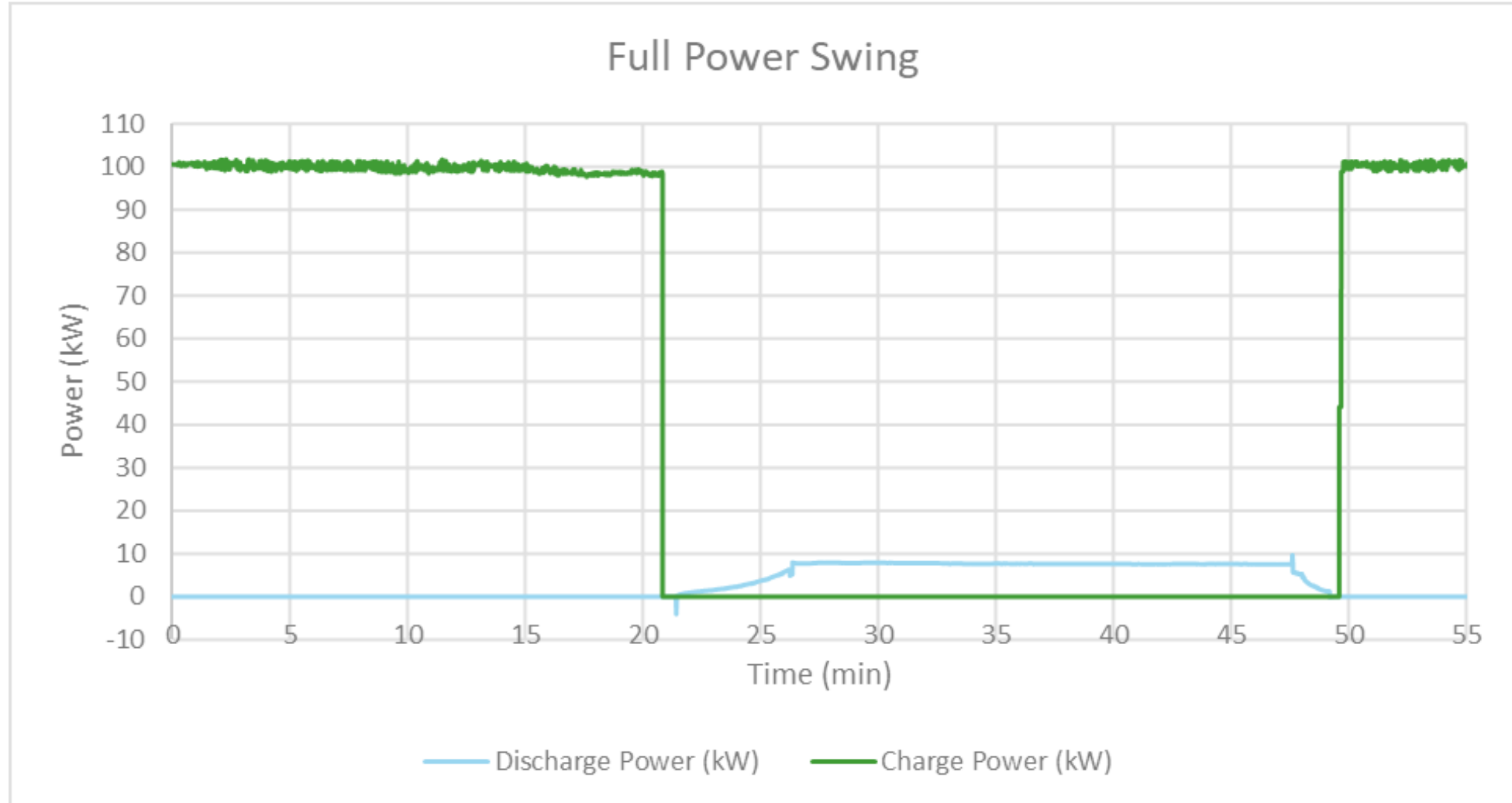
All the above points are compared to the nameplate specification.



Bankability report structure



Bankability report structure



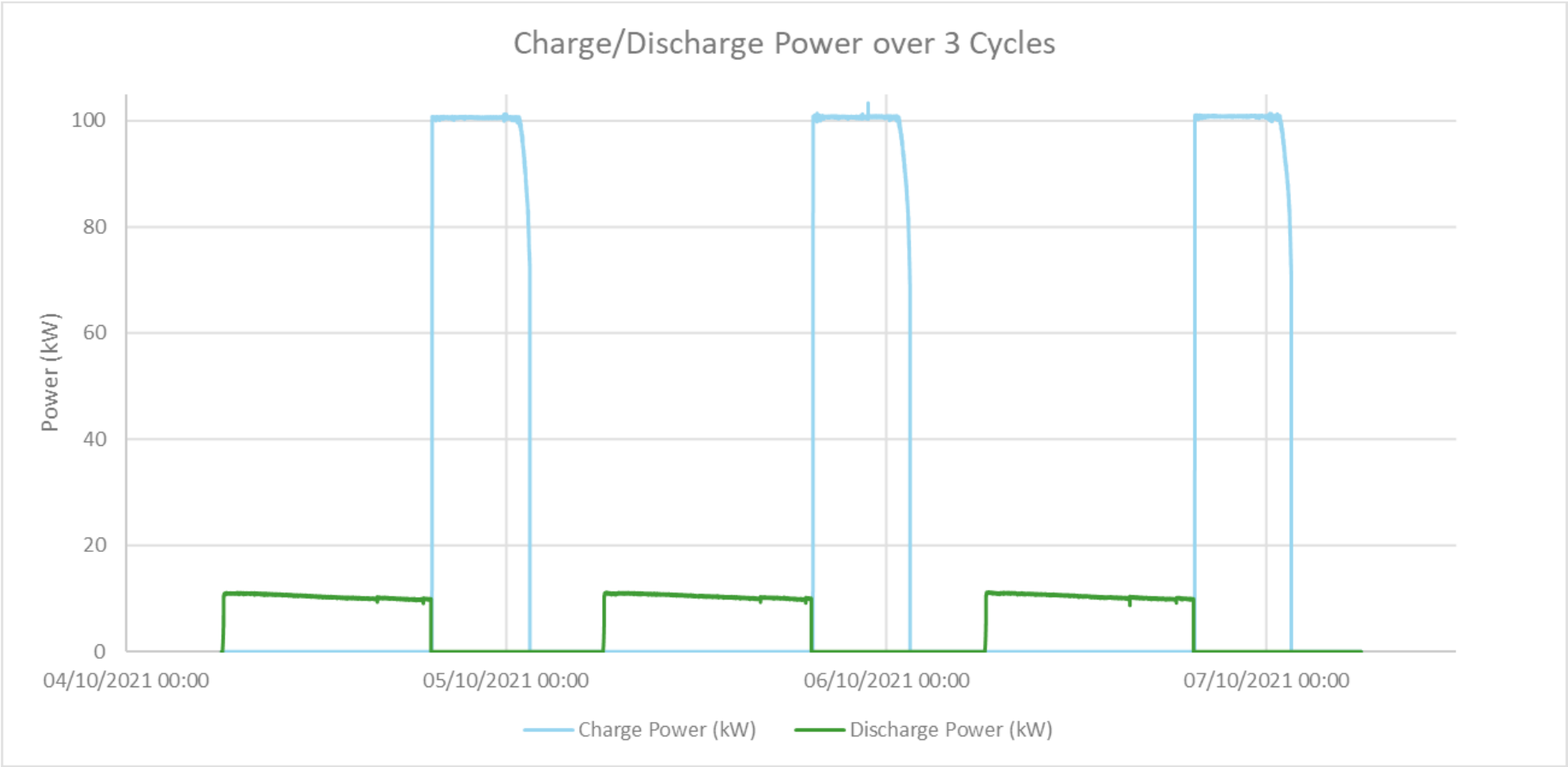
Bankability report structure

Performance validation at customer installation

- Main area of focus is to validate the specification:
 - Compare results with test house data
 - Availability over an extended period of time
 - Detail the reasons for any outages
 - Detail the maintenance work completed; planned & unplanned
 - Obtain long term efficiency data
 - Demonstrate the system providing a customer benefit



Bankability report structure



Bankability report structure

Additional areas of focus

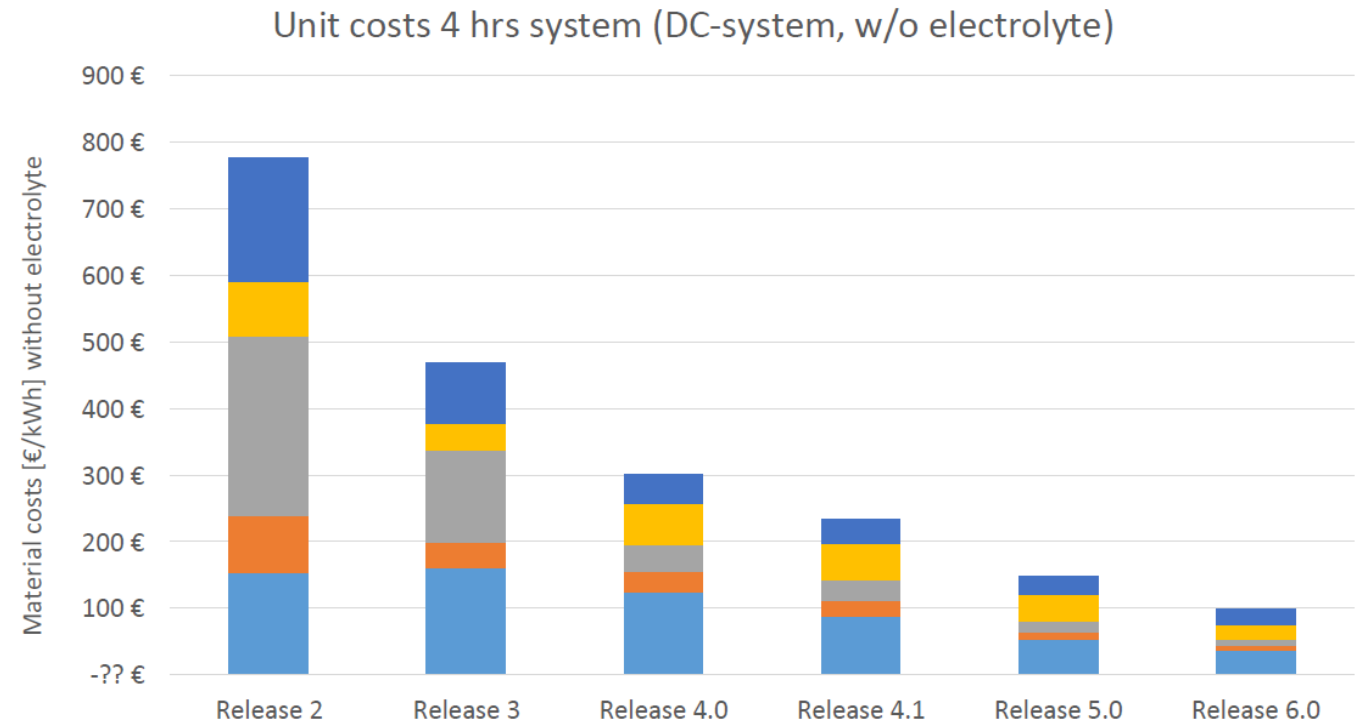
- Manufacturing capability:
 - Normally split into two main parts:
 - Validate the current annual capacity
 - Opine on the reasonable level they could achieve through scale up plans
- Assessment of the staff competence / management structure
 - Looking to highlight any specific risks
 - High reliance on any one individual
 - Experience of scaling up manufacturing volumes



Bankability report structure

Cost reduction assessment (closely linked to the manufacturing scale up)

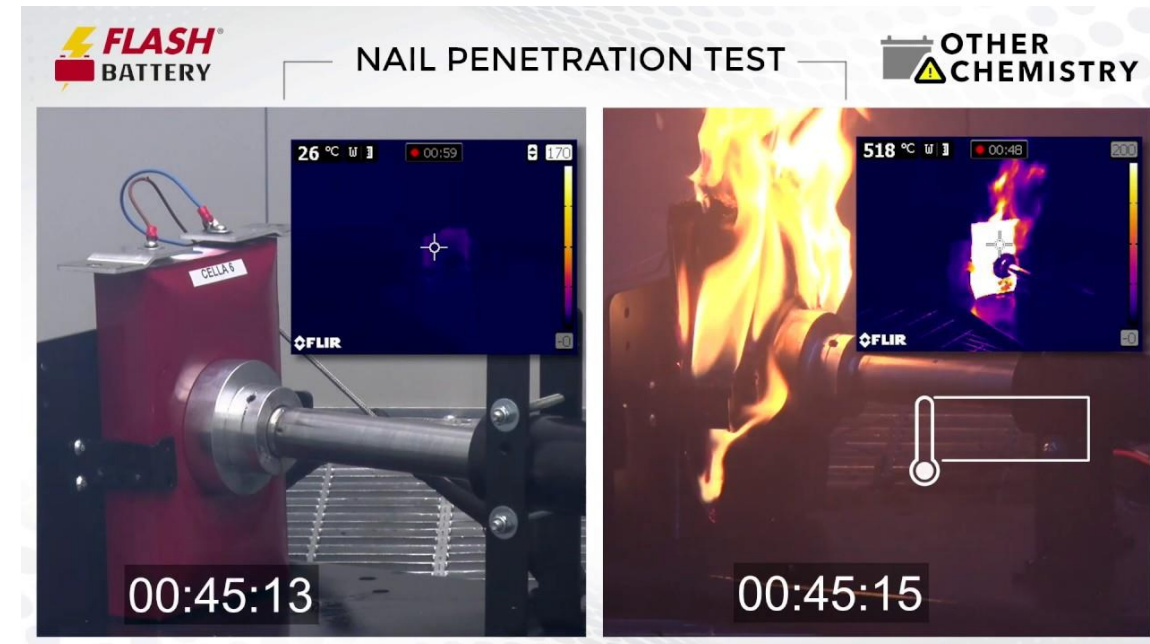
- Main cost reduction normally based on scale up / learning rates
- May include automation assumptions
- Potentially design improvements or material reductions



Bankability report structure

Compliance, Safety and Environmental

- The standards that the Customer's technology complies with;
- The safety procedures;
- Compliance with safety and environmental regulations;
- The Customer's environmental processes and practices;
- Recycling capability;
- Existing safety certification, including UL9540

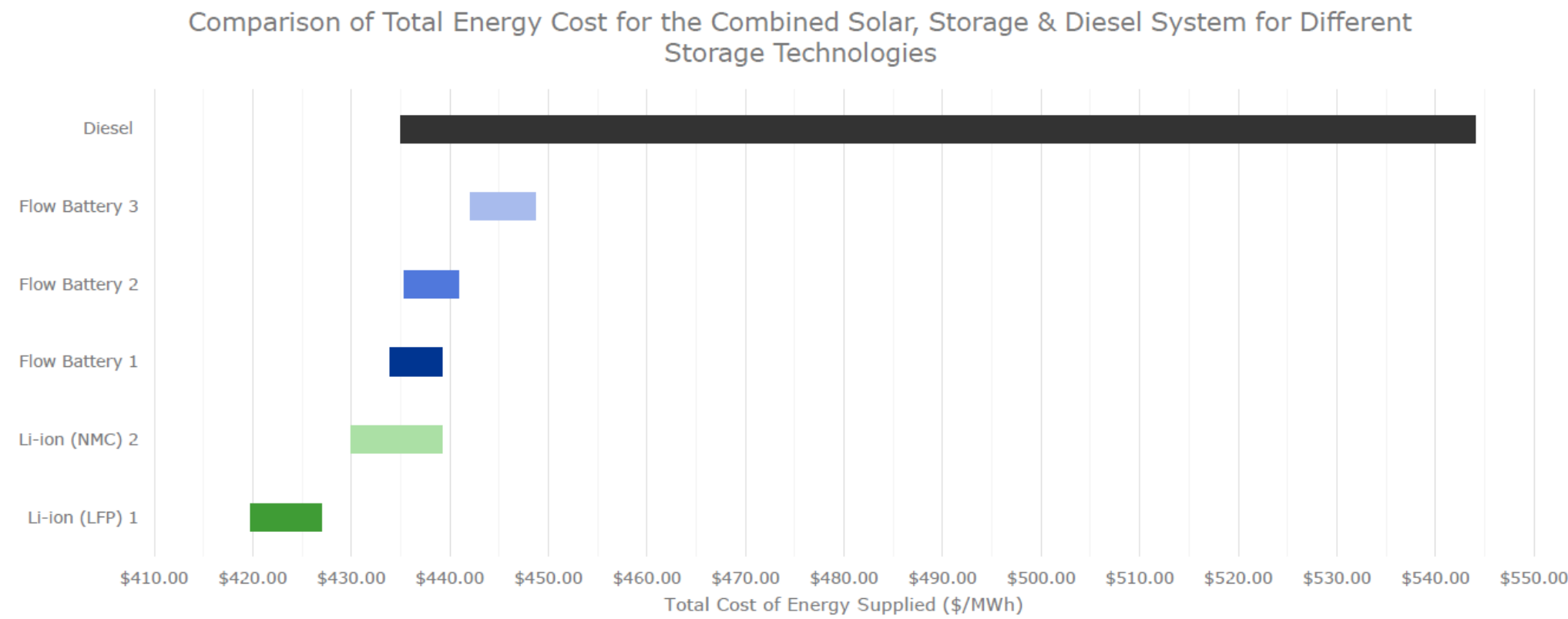


Bankability report structure

Comparison with other technologies

- Aim to bring out the some important areas where the technology performs better than competitors
 - Environmental / safety / capacity degradation / cycling ability
- May perform a Levelised Cost of Storage (LCOS) comparison
 - Typically competing with lithium based chemistries
 - It is possible to demonstrate the cross over point for different scenarios
 - In general lithium is most cost effective up to 4-6 hours of duration

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Conclusion

- It is difficult for these new suppliers to compete with lithium
- Key to bring out all the unique advantages
- Play to the strengths of the technology
- Getting reference projects in applicable markets very important
- Utilising funding to support development where possible
- Validation at all stages of deployment can support this work

Thanks for your attention

Questions?

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