

Revenue Stacking: Maximising the Value of Energy Storage Services

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**CIGRÉ Grid of the Future
Philadelphia October/November 2016**

Commercial opportunities for electricity storage are becoming clearer



- Greater requirement for load flexibility within distribution networks
- Decreasing unit costs for energy storage technologies
- Improved understanding of the services that energy storage could potentially provide to a range of customers
- Innovation projects to explore use of electricity storage as utility owned and 3rd party embedded assets
- *This is resulting in greater clarity on required technical specifications (e.g. control systems) and certainty of commercial models*

Key principles for electricity storage business models



- Optimising a revenue stack requires consideration of interdependent commercial and technical issues
- How and when services could be combined within a single business model:
 - Existing revenue streams versus revenue streams that may be available in the near future (subject to regulatory and commercial environment);
 - High energy (long timescale) versus high power (short timescale) services;
 - Global services vs. locational services;
 - The state of charge at which the energy storage facility should usually be held: does each service require the facility to import, export, or a variety of both;
 - Partitioning - will the service require a partitioning of energy storage capacity.

Range of existing and new services with varying requirements

Table 1: Energy Storage Service Requirements and Characteristics

Service	Current	Future	High Power	Location specific	Constrained Network	Partitioning
EFR	✓		✓			✓
FFR	✓		✓			
STOR	✓		✓ ¹			
Energy Arbitrage	✓					
Avoided Network Tariffs	✓			✓	✓	
Constraint Management		✓	✓ ¹	✓	✓	To be decided
Voltage Support		✓		✓	✓	To be decided
Power Flow Optimisation		✓		✓	✓	To be decided
Phase Balancing		✓		✓	✓	To be decided

- ¹Depends on the system or specific network (in the case of constraint management) requirements when the service is requested e.g. peak loading period may only last for a few minutes or for over two hours.
- Specific operational and locational requirements and/or requirements for partitioning of specific capacity in the asset will limit those services that can be stacked

Services with responses over similar timescales tend to cluster into more efficient service stack



	EFR	FFR	STOR	Energy Arbitrage	Network Tariffs	Constraint Manage	Voltage Support ²	Power Flow Opt	Phase Balancing
EFR ³									
FFR									
STOR									
Energy Arbitrage									
Network Tariffs									
Constraint Manage									
Voltage Support									
Power Flow Opt									
Phase Balancing									

Figure 1: Guide to Revenue Stream Stacking – Avoiding Conflicts

- Potential conflicts:
 - High power and high energy services
 - Services that are seen as so vital to the system operator that capacity must be partitioned, to guarantee its availability when required.
 - Services only suitable for a constrained network or unconstrained network.
 - Services that require energy storage to discharge vs those that require it to charge or do both.

Commercial and regulatory challenges remain



- Appropriate regulation can facilitate clear and fair commercial models and give potential investors confidence in the profitability of their assets.
- Challenges include:
 - Contract tenure for existing storage services
 - Certainty of revenue streams
 - Network planning standards
 - Network charging regimes
 - Licensing framework
 - Evolution of DNO to DSO

Conclusions

- Significant commercial opportunity that can be achieved through service stacking however it is critical to appreciate and evaluate a number of technical considerations relating to service requirements and network characteristics.
- A well-informed choice based on technical feasibility and optimisation analysis must be made at the design stage to determine the choice of storage technology and the corresponding business plan.
- In order to access these services efficiently and to appropriately monetise the value of electricity storage to grid flexibility, there are number of regulator and commercial challenges to be addressed.

- Thank you!
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