AGGREGATION AND STACKING OF GRID SERVICES

The Ørsted vision is a world that runs entirely on green energy. Ørsted develops, constructs, and operates offshore and onshore wind farms, solar farms, energy storage facilities, renewable hydrogen and green fuels facilities, and bioenergy plants. Moreover, Ørsted provides energy products to its customers. Ørsted is the only energy company in the world with a science-based net-zero emissions target as validated by the Science Based Targets initiative (SBTi), and Ørsted aims to deliver a net-positive biodiversity impact from all new renewable energy projects it commissions from 2030 at the latest. Ørsted ranks as the world's most sustainable energy company in Corporate Knights' 2022 index of the Global 100 most sustainable corporations in the world and is recognised on the CDP Climate Change A List as a global leader on climate action. Headquartered in Denmark, Ørsted employs 7,292 people.

Challenge Background

Ørsted is seeking novel solutions for the aggregation and stacking of revenue streams from grid services. Relevant approaches may include hardware and software solutions for the control and coordination of Hybrid Power Plants (HPPs) through to commercial and contractual solutions for aggregation across multiple power plants – and anything in between.

Hybrid Power Plants (HPPs) are power plants comprised of several generation and storage systems (e.g. offshore wind, onshore wind, solar, battery storage, power-to-x, etc.). A key component of an HPP is the controller, which must be capable of interoperating the various generation and storage systems to optimise efficiency, safety and performance.

As shown in the figure below, there are five main services and twelve functions that HPPs may engage in.

		Services				
		Active Power Services	**Reactive Power Services**	**Commercial Services**	**Grid Support** (Stability, Resilience etc.)	**Islanding Service/Support**
Functions	1	Manual Dispatch	Manual Dispatch	Manual Dispatch		
	2		Reactive Loss Reduction			
	3		Voltage Support			
	4	Frequency Services		Frequency Services	Frequency Services	
	5	Inertia		Inertia	Inertia	
	6				Soft Charging	Soft Charging
	7	Gradient Reduction	Gradient Reduction		Gradient Reduction	
	8	Power Oscillation Damp	Power Oscillation Damp		Power Oscillation Damp	
	9			Black Start	Black Start	Black Start
	10	Capacity Firming		Capacity Firming		
	11	Load Shifting		Load Shifting		
	12	Power to X		Power to X		

*Highlighted functions are expected to have the highest potential value

Novel approaches to stacking and/or aggregating these services and functions, across hybrid or multiple power plants, are expected to improve operational efficiency and optimise revenue generation. In turn, improved business cases and reduced levelized cost of energy are anticipated.

By implementing solutions for the optimal stacking and aggregation of grid services, power plant operators will be able to more efficiently and effectively manage multi-energy systems, with ever greater impact as the world's first energy islands come online from 2030.

Solution Requirements	
Functional Requirements	The solution should: • Stack and/or aggregate multiple grid services/functions to improve revenue generation from hybrid or multiple power plants • Help to mitigate the merchant risk faced by power plants deployed in non-subsidised markets • Support optimisation in the range from real-time to day-ahead markets
Technical Characteristics	• N/A
Operating Conditions	The solution should be: • Adaptable to different geographical markets, or as markets evolve • Flexible to various configurations of HPPs (i.e. with different combinations of generation and storage systems)
Cost Requirements	• Solutions should contribute to overall reductions in levelized cost of energy

Market Opportunity

The need to rapidly integrate ever-increasing amounts of renewable energy into energy systems, along with falling levelized cost of storage, indicates an increasingly attractive market for developers of HPPs. This, in turn, suggests an increasingly lucrative market for suppliers of technologies and services (such as aggregation and stacking of grid services) to HPP developers. Towards the end of the decade, and with the world's first energy islands coming online from 2030, it is anticipated that an ever-greater proportion of new, renewable-energy-based power plants globally will be in hybrid form.

Eligibility and Further Information	
Eligibility	Entrants to this competition must be: • Established businesses, start-ups, SMEs (Small-Medium Enterprises), individual entrepreneurs, or academic spinouts. • UK based or have the intention to set up a UK base.
Assessment	Applications will be assessed on: • Applicability to the challenge

	• Innovativeness of the solution • Coherence of proposed business model and company vision • Feasibility and economic viability, including ability of the team to progress the solution • Development potential • Maturity of the solution • Ability to launch product and ease of implementation
IP & Commercial Route	• Existing background IP associated with a potential solution will remain with Launch Academy Applicant(s)/Participant(s). Where any new IP generation is envisaged during the Launch Academy programme, it will be subject to the mutual IP agreement of the Launch Academy Participant(s) and Launch Academy Sponsors if it is jointly developed. If new IP is developed solely by the Participant then it will remain with the Participant. • Where necessary, a non-disclosure agreement (NDA) may be signed to uphold confidentiality in the engagement between the Launch Academy Participant(s) and Launch Academy Sponsors. • ORE Catapult do not take any share of IP ownership or enter commercial ventures through the Launch Academy programme.