Q&A

Webinar: Optimizing Cost and Compliance: Navigating BESS Procurement in a Shifting Market

1 **Is COSMOS bankable?**

Results of our price forecasts and simulations, run with the COSMOS tool, have been harnessed to make positive decisions on financing BESS projects. We would be glad to share more information and present our references.

2 **How much does the AC BOP contribute to the overall cost of the BESS pack?**

Several factors, primarily relating to project size and scope, influence the pricing. The overall size of the project is crucial, as is the scope of work, which can account for up to 35% of total costs. This increase typically occurs when the project's scope includes comprehensive services such as engineering, equipment supply, and installation.

3 **Is "COSMOS" an acronym or trademark?**

COSMOS is an acronym for Clean Horizon Optimal Simulation of Market Operations for Storage.

4 **Germany, for example, is devising a framework for 72+ hours of storage. Are you modeling such long durations?**

COSMOS can indeed be used to simulate long duration storage.

5 **Do the calculations for project IRRs that you present include corporate income tax?**

The IRR calculated by COSMOS is a pre-tax IRR.

6 **Can you analyse different business scenarios with COSMOS? For example, in Germany if you are part of an Innovation contract, you may not charge the batteries with energy from the grid, only from renewable sources. Can you simulate that scenario, taking into account the benefits from market premiums (subsidies)?**

COSMOS is designed to calculate revenues across various scenarios over a specified period. The tool is applied to different configurations of projects and grid

connections, and can also simulate PPAs.

The COSMOS tool was set to meet specific requirements of the Innovation Tender. The simulation results facilitate the computation of revenues and the identification of the most optimal strategies to maximise the profitability of a given project.

7 **What is the average size (or min/max range) of the projects which you managed with your tools (in terms of the MW/MWh of a project, no. of projects, regions covered, etc.)?**

Are you currently involved in or supporting permitting processes, legal approvals, etc.?

Regarding the projects that we have managed with our tool, COSMOS, they range from 1MW to 600MW. The same applies to building business models. When discussing the procurement of the projects we are leading, it amounts to approximately 300MW with a duration of 2-4 hours in both Central Europe and the Middle East.

8 **Where we can find the COSMOS application?**

For a demo and more information about the tool, please contact us at sales@cleahorizon.com. Currently, COSMOS is available as an executable file that allows you to run simulations. We are excited to announce that it will soon be offered on our online platform as a SaaS solution.

9 **How does CH recommend assessing the augmentation cost if the price trajectory in 5 or even 10 years is not clear?**

Therefore, there is no one-size-fits-all answer to this question as several parameters will eventually affect the decision whether augmentations are actually needed.

On the one hand, revenue structure will be the first decisive factor as merchant projects will have to adapt to projected revenues. Their business models will have to assess the actual benefit versus cost of said procedures as some markets may get saturated with time as more batteries penetrate them and pull prices down.

In the case long-term contracts that occur under governmental tenders or PPAs, requirements for minimum usable energy capacity levels can be more frequent as contractual obligations.

On the other hand, the way how said augmentations happen can vary based on the profile of the integrator and fees linked to these augmentations. Bigger suppliers may be inclined to do initial oversizings to prevent future costs linked to on-site interventions (transportation, on-site works, service interruptions, etc.) and potential compatibility issues between different product generations. Smaller integrators may have less DC enclosure capacity at hand for larger projects and could suggest periodic augmentations to palliate that problem while allowing for notable cost reductions on the battery cost. All in all, there is no straight answer and such topic is to be investigated on a per-project basis.

10 **Would Clean Horizon also provide services to a Route to Market to build an internal tool for simulating business cases,including simulating various balancing markets, ancillary services, etc.?**

Clean Horizon supports RtM in developing and enhancing their tools by sharing knowledge on tool settings and methodologies for optimal dispatch of BESS assets. In the full version of the COSMOS tool that is available, we disclose our methodology and provide a detailed explanation of the elements considered for achieving optimal dispatch.

11 What are the absolute minimum warranties that Clean Horizon would recommend to purchase from an ESS integrator (performance, availability, etc.)?

The safest approach is to request warranties and performance guarantees that span the entire lifetime of your project (especially for debt-financed projects).

The initial legal product warranty for inverters and transformers spans between 3 and 5 years depending on suppliers, and typically three to five years for the batteries. Your solution provider may offer an extension of the warranty for the entire lifetime for a cost. The price for this extension is influenced by the level of risk the supplier is willing to cover and their negotiations with their own suppliers.

Regarding performance guarantees, these help ensure that the system operates as expected while fair penalties are paid in case the project is underperforming. Ideally, performance guarantees should cover usable capacity (in MWh) and the AC-AC roundtrip efficiency (in %) at the point of connection as well as project availability (in %).

12 How does COSMOS forecast trading revenue stacks? How many cycles are there in relation to the intraday price curve?

COSMOS is a tool that simulates how the battery will be dispatched to different markets based on the results of our price forecasts. The running of the simulation accounts for: 1) technical inputs (installed capacity (MW), storage duration (h), grid connection, degradation profile, maximum number of cycles, etc.); 2) market participation rules (trading interval granularity, prequalification rules, etc.); 3) market prices. Clean Horizon provides reference inputs via the tool, however, the user can modify these inputs to account for the specificities of a given project (for example, a higher ceiling for number of cycles, an alternative CAPEX/OPEX, an alternative degradation profile, etc.). COSMOS then simulates the operations of the storage system by deciding to participate in the different markets for each trading interval. We are happy to share a more detailed breakdown about the inputs and the trading strategy of COSMOS, if you are interested.

13 Revenues from the FCR in France are capped compared to previous years since the market is becoming saturated. Can we expect the same tendency in the aFFR market and does your cosmos tool take into consideration FCR and aFRR price decline over time?

Clean Horizon forecasts that FCR prices will remain low due to market saturation. Regarding aFRR, there are two markets: capacity reservation and energy activation. In general, battery penetration is one of the key factors considered when building price forecasts, as it tends to shift more expensive assets leading to a decrease in price. Our forecasting tools take this impact into account for both aFRR reservation and activation markets.

Using our COSMOS tool, we create a revenue stack based on price forecast results for all markets available for storage. In France, the revenue streams that should be considered to achieve a high level of profitability include: FCR, aFRR energy and capacity, the balancing mechanism (mFRR), the capacity market, and arbitrage in the day-ahead and intraday markets.

ABBREVIATIONS:

BESS	Battery Energy Storage Systems
MASCE	Mechanism for the Acquisition of Storage Capacity
FCR	Frequency Containment Reserve
aFRR	Automatic Frequency Restoration Reserve
SOC	State of Charge
DA	Day-ahead
BM	Balancing mecanism
PPAs	Power Purchase Agreements
COSMOS	Clean Horizon Optimal Simulation of Market Operations for Storage