



CLEANHORIZON

The Energy Storage Experts

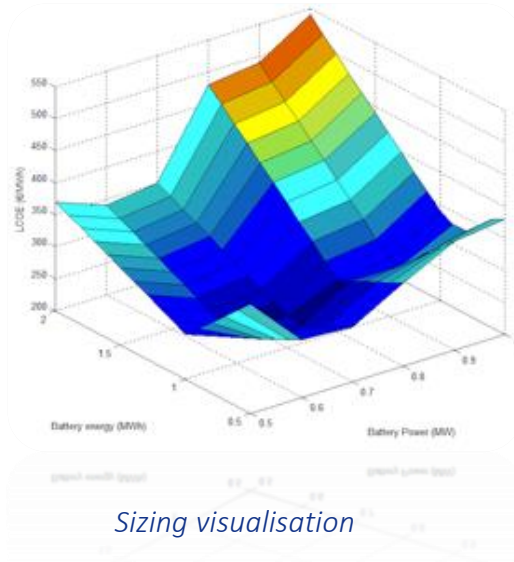
**CRE-STORE:**  
**Helping you size energy storage**



# Clean Horizon delivers owner's and lender's engineering services for energy storage projects

## At the project level

From storage sizing:



To procurement:

- Technical specifications
- Administration of RFP
- Selection of vendors
- Contract negotiation

## At the grid level

Helping utilities and planners assess the impact of energy storage on renewable integration and grid stability.



# Clean Horizon model CRE-STORE provides all the tools that enable optimal sizing of energy projects for various applications.

In comparison to other energy project sizing tools, CRE-STORE is more adaptable and provides all the features necessary to optimally size a project providing different services.

	Technologies			Services				Others		
	Various storage technologies	Wind	Generators	Behind the meter	Off-grid minigridd sizing	Asset (T&D) upgrade deferral	FCR-Follow frequency signal	Dispatch detail	Degradation of PV, inverters,...	Forecasts (PV, wind, load)
HOMER Pro	✓	✓	✓		✓	✗	✗	✗	✓	✗
HOMER grid	✓	✓	✓	✓	✓	✗	✗	✗	✓	✗
ODYSSEY	✓	✓	✓	✓	✓	✗	✗	✗	✓	✓
DER-VET		✓	✓	✓		✓	✗			✗
Blast	✗	✗	✗	✓	✗	✗	✗			✓
CRE-STORE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

**£ CRE-STORE calculates accessible revenues for storage providing various services.**

In comparison to other energy project sizing tools, CRE-STORE manages to calculate accessible revenues for storage providing a wide range of services. It can be adapted to any country and needs.

	Incentives		Market services			Other Services		User	BTM	
	PPA	Arbitrage DA	Spinning /non spinning reserves	FR	Stacked services	Demand response	Back up + ressource adequacy	Voltage support	Customer user constraint	Demand charge reduction / peak shaving
<b>FRACTAL</b>	✓	✓	✓	?	✓	?	✗	✗	✓	✗
<b>DER-VET</b>	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>SAM</b>	✓	✓	✗	✗	✓	✗	✗	✗	✓	✓
<b>BLAST</b>	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓
<b>HOMER GRID</b>	✗	✓	✗	✗	✓	✓	✓	✗	✗	✓
<b>SIMSES</b>	✗	✓	✗	✗	✗	✗	✗	✗	✗	✓
<b>CRE-STORE</b>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓



# CRE-STORE allows to analyze the performances of storage systems.

In comparison to other energy project sizing tools, CRE-STORE provides various storage performance analysis tools. It also analyses the impact of battery use on its degradation and assesses if a given storage system can provide FCR.

	Battery degradation and system losses			Battery use		
	Various storage technologies considered	Battery degradation models	Detailed system loss analysis	Battery use optimization for minimum degradation	FCR simulation-following frequency with battery	Residential PV + storage: flattening the charging curve of the battery during high PV hours
SAM	✓	✓ Cycle + calendric aging model	✓	✗	✗	✗
Per Mod AC		✗	✓	✓	✗	✗
BLAST		✓ electrical and thermal model		✓	✗	✗
SimSES	✗	✓ Cycle + calendric aging model + experimental studies	✗	✓	✓	✓
CRE-STORE	✓	✓ Cycle + calendric aging model	✓ On demand	✓	✓	✓



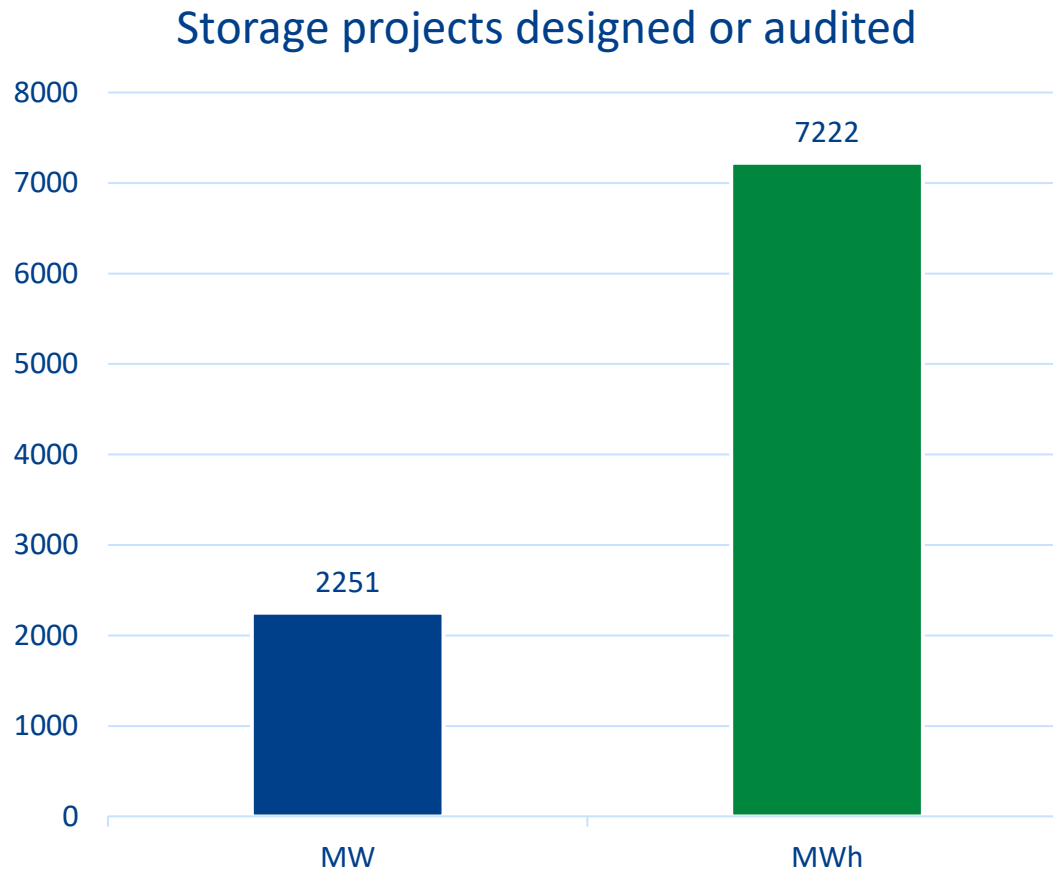
# CRE-STORE allows to precisely analyze and optimize the project's business model.

CRE-STORE provides all the tools required to analyze structured project financing. It provides details on the impact of taxes and incentives on financial metrics such as NPV and IRR. It also enables the calculation of the minimum PPA required for a viable project to reach a given IRR.

	Features		Applications		Costs considered		
	Various ownership models	Monthly cash flows	Several financial metrics analyzed (NVP, IRR, LCOE, ...)	PPA Price and capacity payment calculation	Cost of financing (debt, reserves)	Taxes	Incentives
FRACTAL	✓	✓	✓	✓	✓	✓	✓
DER-VET			✓	✗		✓	✓
ODYSSEY	✓	✗	✓	✗	✓	✓	✓
SAM	✗	✗	✓	✗	✓	✓	✓
HOMER grid	✗	✗	✓	✗	✓	✓	✓
CRE-STORE	✓	✓	✓	✓	✓	✓	✓



# As of December 2021, Clean Horizon had designed or audited almost 7 000 MWh of storage projects





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