SOLAR POWER AFRICA 2022

Financing standalone storage - is project finance an option for standalone storage in Africa?

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WHAT IS A STAND-ALONE STORAGE PROJECT ?

- projects whose customers include power utilities solar PV or wind facilities
- projects that can be active in the merchant market (arbitrage)
- front of the meter (FTM) storage projects (not coupled with RE projects)
- whilst there are various storage technologies available (e.g., pumped hydro, flywheel, flow batteries, etc.) lithium-ion battery storage technology is leading the market and is the subject of this presentation
- rapid technological advances in lithium-ion technology leverages advances gained in its use in the EV market

DRIVERS OF STAND-ALONE STORAGE PROJECTS

- reduction in system costs, especially batteries
- realization by power utilities and renewable energy customers that storage supports renewable energy penetration into the grid
- developers having a better understanding of lender and sponsor requirements to make a project bankable
- better understanding of storage project risks and revenues by equity and debt funders, as more projects come online
- better risk mitigation methods being employed

APPLICATIONS PROVIDED BY STORAGE

- generation capacity augmentation
- ancillary services:
  - spinning reserve
  - frequency regulation - manages grid supply / demand balance
  - frequency response - reacts to system frequency changes in seconds
- transmission congestion reduction
- transmission grid upgrade deferral
- voltage support
- black start

ROLE OF A FINANCIAL MODEL IN UNDERSTANDING THE ECONOMICS OF A STORAGE PROJECT

- provides a structured framework in integrated economic valuation
- provides transparency and visibility to all parties (developers, lenders, sponsors, customers, etc.)
- sensitivity analysis' can be run for different inputs
- lenders and sponsors can have visibility to the developer's assumptions and approach
- ability of developers and sponsors to robustly defend the model assumptions strengthens the viability / bankability of the project
- cost of capital is critical to the profitability of the project - capital structure matters
- cost of capital is also a reflection of riskiness of the project

CHALLENGES OF EVALUATING STORAGE PROJECTS

- various complex revenue and cost assumptions in the Financial Model
- some project applications not easily monetized
- inability to appreciate all monetizable project applications affect cost of capital
- complexity of cost and revenue streams affect cost of capital
- some project applications that are valued by the customer (e.g. asset deferral) are likely to be missed in the Financial Model for revenue streams

PROJECT REVENUES

- a bankable storage project should ensure that the project will generate sufficient and reliable revenues to cover, debt service, operating costs and earn an acceptable IRR for equity providers
- revenue opportunities for storage projects have increased with project applications becoming more formalized
- not all applications have identifiable revenue streams - challenge to storage projects
- PPA type contracts are more stable than operating a facility in a purely merchant market
- PPAs don’t guaranty profitability, just reliable revenue streams
- arbitrage (cannot support a project bankability):
  - charging at low cost (off peak) and selling at high cost (peak demand)
  - applicable in an organized market
  - will compete against generation when selling

PROJECT COSTS

- Capital costs
- Capacity maintenance costs:
  - battery replacement / augmentation as a result of module degradation (caused by operating profile and environmental conditions)
  - augmentation is meant to maintain the storage capability (MWh) or rate of charge (MW/min)
    - can be achieved by oversizing the system or periodic augmentation to cover performance guarantees
    - lenders may require a high DSCR, which may affect the project capital structure (less debt)
    - lenders may require maintenance of reserve account to cover future augmentation costs
    - lenders may resort to sales revenue sweeps
  - different technologies experience degradation at different rates:
    - lithium-ion battery has high degradation rate (calendar aging and cycle life)
    - flow battery and flywheels, for example, have minor or no degradation
    - degradation affects project costs and revenues and can affect the financing of the project

PROJECT COSTS (CONT.)

- Operating costs
  - Charging / operating losses
    - affected by round-trip-efficiency (RTE) - a very important input
  - O&M costs:
    - lithium-ion battery are low maintenance - no moving parts
    - remote monitoring reduces on-site visit requirements
  - Warranty costs:
    - important component of operating costs
    - a major requirement for developers and lenders lenders
    - typically focused on manufacturing defects and performance

Wartsila Battery Energy Storage Solutions

WÄRTSILÄ

180 COUNTRIES

70GW GENERATED

1.5+GW STORAGE SYSTEMS

The world's leading hybrid power systems provider integrating thermal, renewables and storage

WÄRTSILÄ ENERGY BUSINESS

Global energy storage leader and engine-based power plants systems optimiser with 650+ MW deployed or under contract globally

BEST-IN-CLASS CONTROL

Powered by advanced GEMS Solutions Suite technology, designed to optimise battery life and maximise battery monetisation strategies

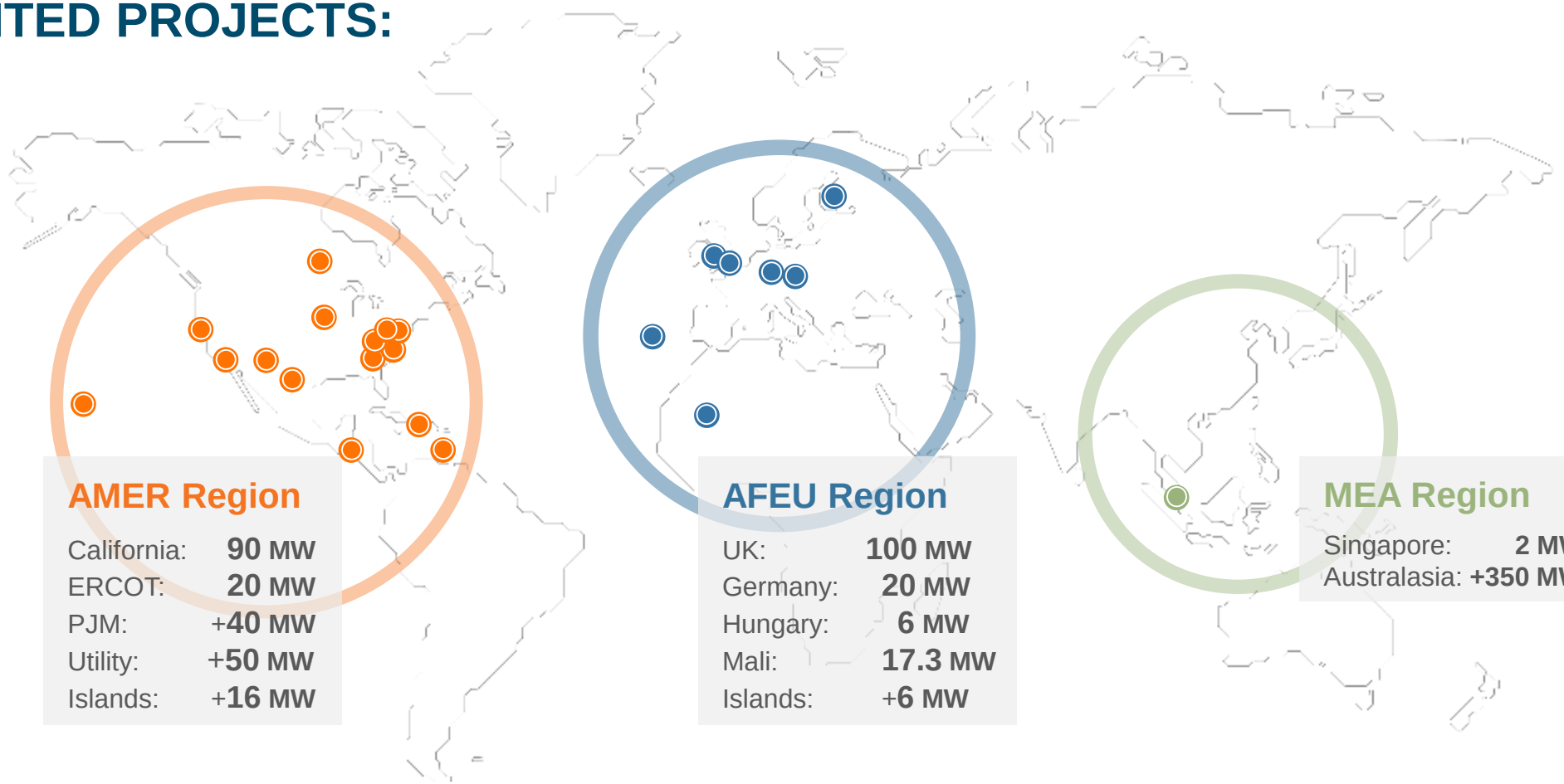
A HYBRID FUTURE REALISED

Unprecedented capabilities to integrate and manage assets into a unified energy future—engines, solar, wind, and energy storage

RECO · e·on Climate & Renewables · AEP American Electric Power · Southern California Edison · SDGE · TEP Tucson Electric Power · AltaGas · Duke Energy · ONCOR · SPgroup · alteo · ContourGlobal · pivot power

Over 1.5 GW+ in operation, deployed or contracted

HIGHLIGHTED PROJECTS:



AMER Region

California:	**90 MW**
ERCOT:	**20 MW**
PJM:	**+40 MW**
Utility:	**+50 MW**
Islands:	**+16 MW**

AFEU Region

UK:	**100 MW**
Germany:	**20 MW**
Hungary:	**6 MW**
Mali:	**17.3 MW**
Islands:	**+6 MW**

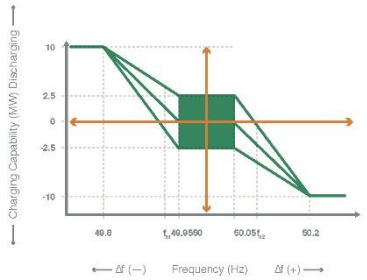
MEA Region

Singapore:	**2 MW**
Australasia:	**+350 MW**

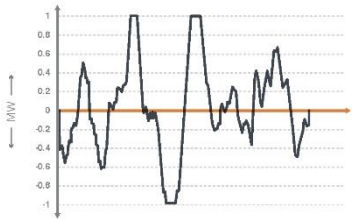
Energy storage
serves multiple purposes

GRID RELIABILITY

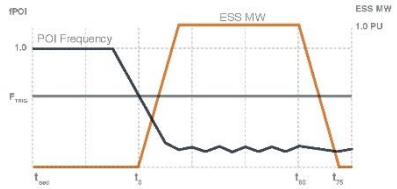
FREQUENCY RESPONSE



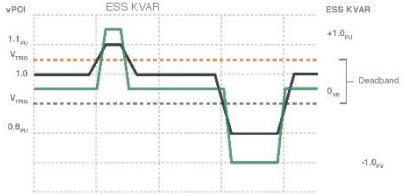
FREQUENCY REGULATION VIA AGC



FAULT RESPONSE

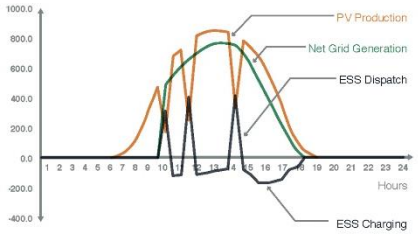


VOLTAGE CONTROL

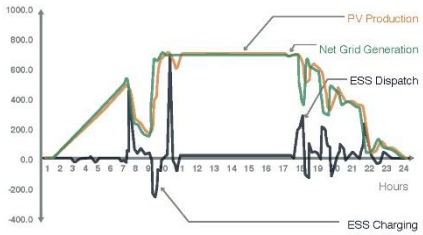


RENEWABLES INTEGRATION

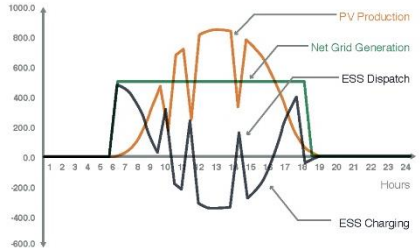
STORAGE + RENEWABLES (A)



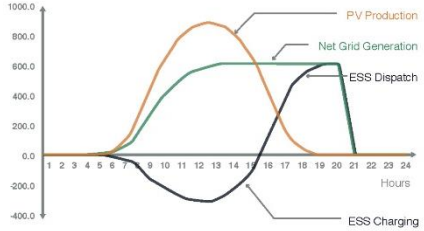
STORAGE + RENEWABLES (B)



STORAGE + RENEWABLES (C)

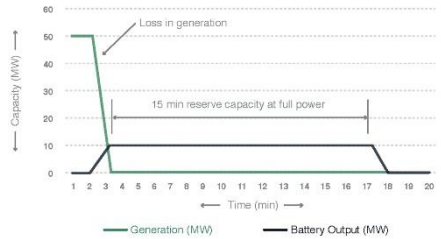


STORAGE + RENEWABLES (D)

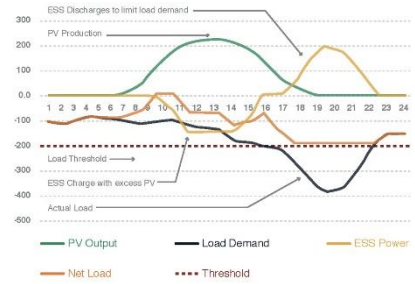


HYBRID OPTIMISATION

BULK CAPACITY



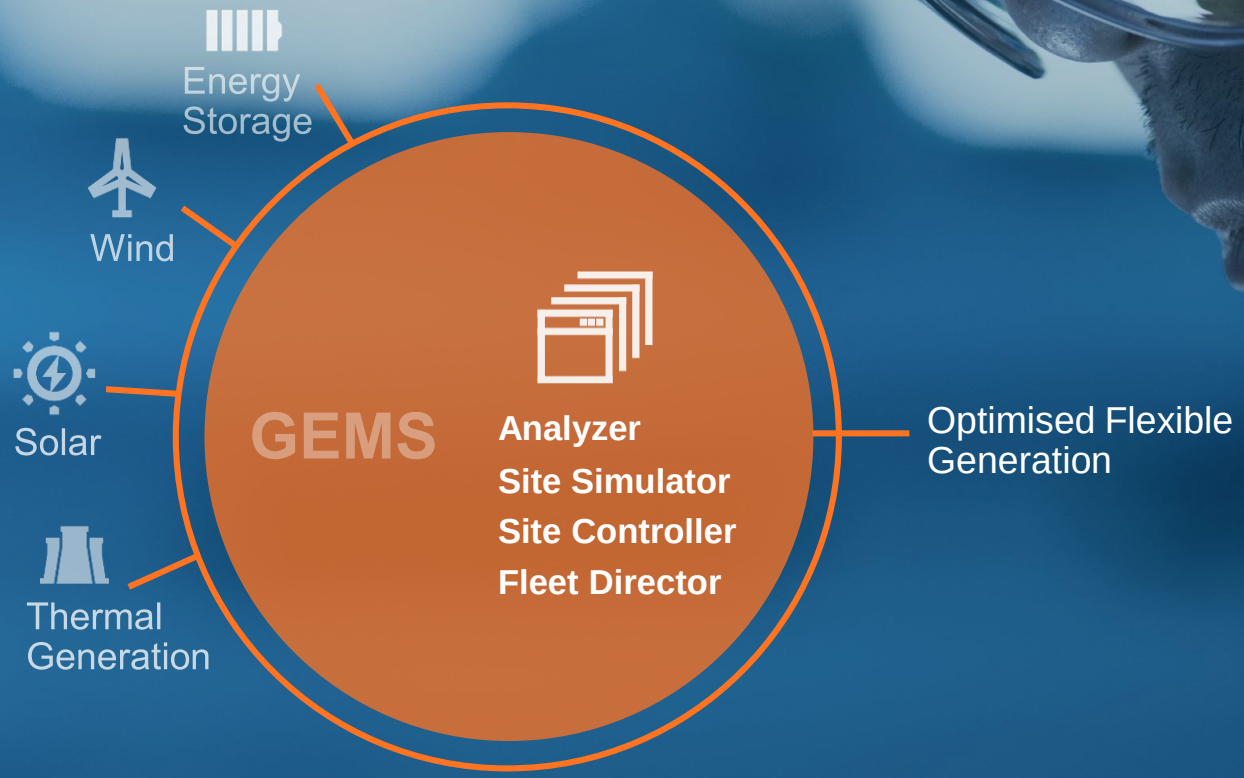
SYSTEM LOAD LEVELING



What we provide: GEMS Digital Energy Platform

What is GEMS?

A suite of proprietary software products developed for building, monitoring and intelligently operating power plants and energy resources



GEMS Solutions Suite

GEMS: The leading energy system management platform

Optimises all generation assets

Secure, flexible, scalable

Deployed in **70+** projects globally

CONCLUSION

- While it is acceptable that developers, sponsors and lenders are appreciative of the risks inherent in financing energy storage projects, the same cannot be said of customers in different countries in Africa.
- Until customers get to appreciate the applications / services provided by energy storage, it will be difficult to reach an agreement on the monetization of these applications / services - complex revenue streams make it difficult for projects to obtain project finance.
- Some markets in Africa, such as South Africa, are now developed to the extent of appreciating the role played by energy storage projects - an enabling environment for funding energy projects through project finance.
- Wärtsilä Corporation, through Wärtsilä Development and Financial Services (WDFS), can work with developers to develop and structure energy storage projects for project finance and, also, help with the sourcing of funding (both equity and debt).
- In conclusion, yes, project finance is an option for standalone storage in Africa.

THANK YOU!

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