



Case Study

Innovative Utility-Scale PV Solar + DC-coupled Storage

Examining the End-to-End Power Conversion Solution used
in LATAM's largest PV+storage power plant



Optimize PV Systems







DC-Coupled Storage



Software Controls
& Monitoring



Hardware Platforms

-  AC coupled solar integration
-  Power Converter Station for BESS integration
-  Advanced Multiport Power Station
-  Static Synchronous Compensator







Software Platforms

-  EMS
-  SCADA

eks Energy is a leading power conversion system manufacturer focused on grid-friendly energy storage and renewable integration.



Competitive advantages

-  AC & DC coupling
-  Ample range of Operations
-  Fast response
-  Open control Platform
-  Grid-forming
-  Droop and Virtual Synchronous Machine Control

5.3 GW+

Installed

30+

Countries with Deployments

180+

Projects Deployed

20+
Years

of Experience

4 GW
Per Year

Manufacturing Capacity

About the Project

PV Solar + DC-coupled Energy Storage

Location	Andes; Antofagasta; Chile
Model of the plant	Hybrid: PV + Battery
Rated Power at POI	130 MW
Capacity	650 MWh
Inverter and battery converter	eks Energy Advanced Multiport Power Station
String optimizer	Ampt V1475-32-30
Altitude	2700 masl
Construction	2020 – 2023

Ampt String Optimizers



eks Energy
Advanced Multiport
Power Station



About the Project

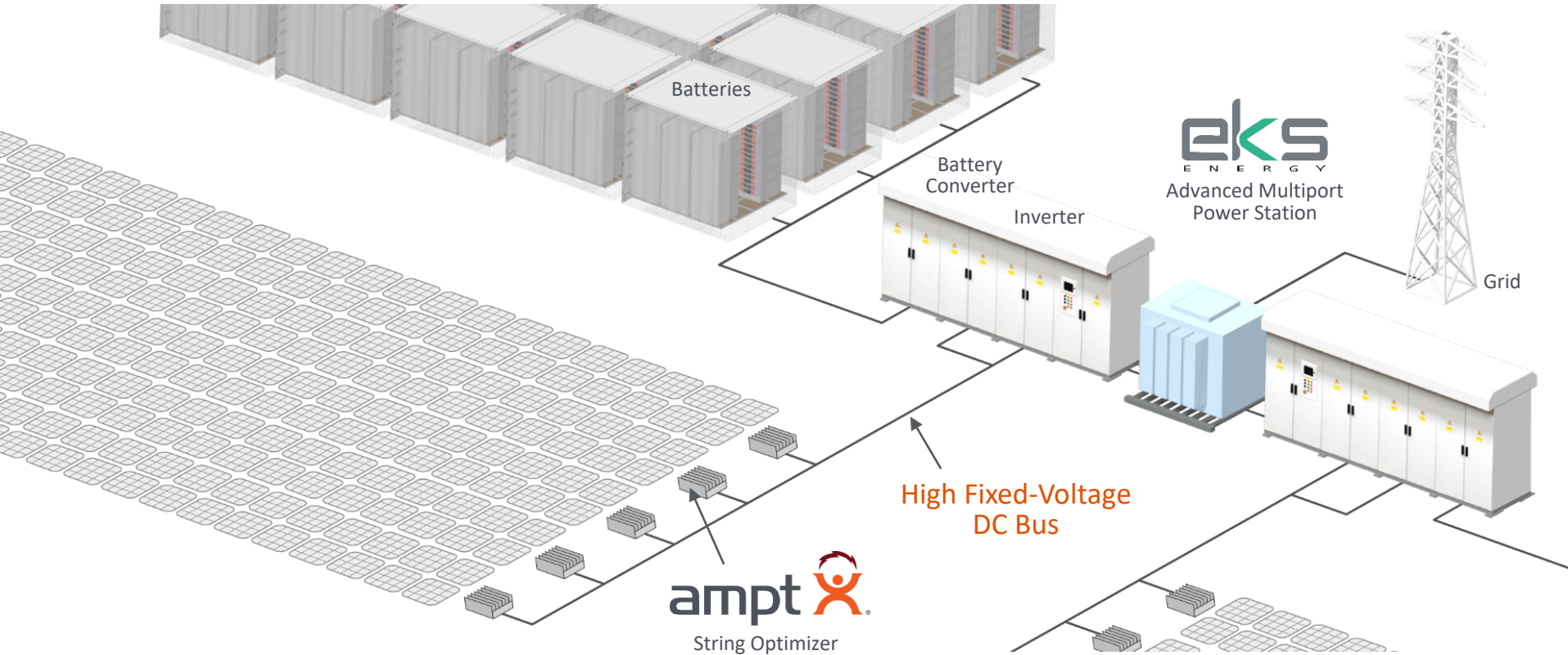
Storage as a Transmission Asset (SATA)

- Energy is produced and stored in one location
- Energy is transmitted to another location when the lines are less congested
- Provides additional operational capacity to existing lines
- Avoids expensive upgrades to the transmission system

Project
Location

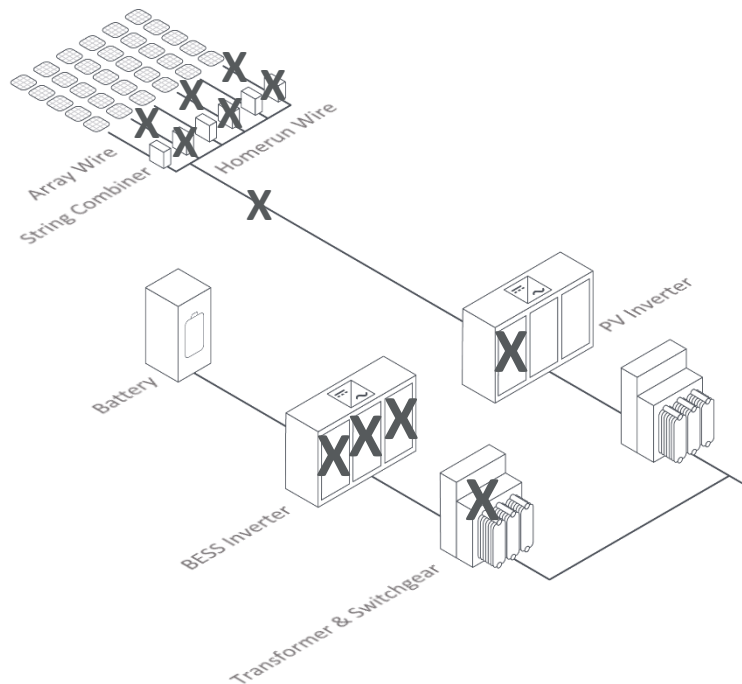
Population
Center

Smart PV + DC-coupled Storage Solution



Our Solution Advantage

AC-Coupled Storage



Fixed DC-Coupled Storage

More energy from string-level MPPT

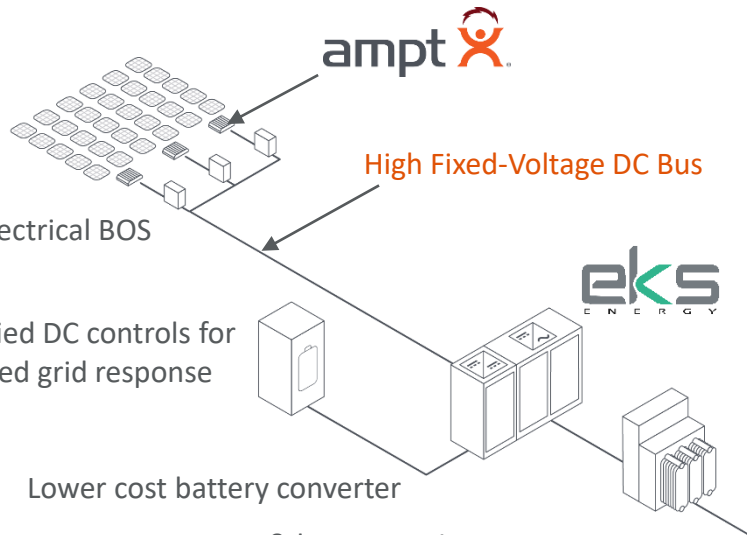
Lower cost electrical BOS

Simplified DC controls for improved grid response

Lower cost battery converter

Fewer & lower cost inverter

Fewer & lower cost transformer



ampt 

eks
ENERGY

Lower Cost & Higher Performance

Higher Voltage, Higher Power Density Inverter



Advanced Multiport
Power Station



		Variable Voltage	High Fixed-Voltage	
DC (PV array)				
Max DC voltage	Vdc	1500	1550	
Voltage range at full power	Vdc	850 - 1500	1350 (Programmable)	
Rated input voltage	Vdc	850	1350	Higher
Rated input current	A	6400	6400	
AC (Grid)				
Nominal AC voltage	Vac	600	850	Higher
Rated output current	A	2080	2080	
Rated AC power	MVA	2.0	2.8	40% ↑

Deploy fewer inverters at a lower cost per watt

Lower Cost, Higher Efficiency Battery Converter

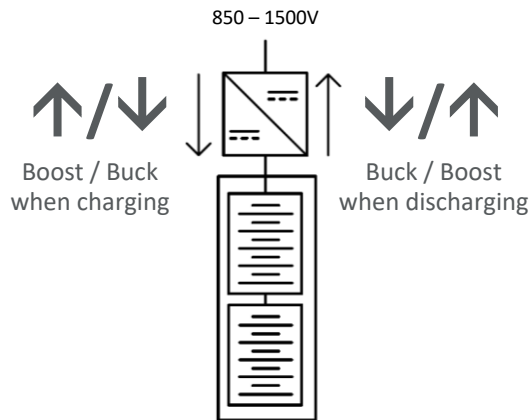


Advanced Multiport
Power Station

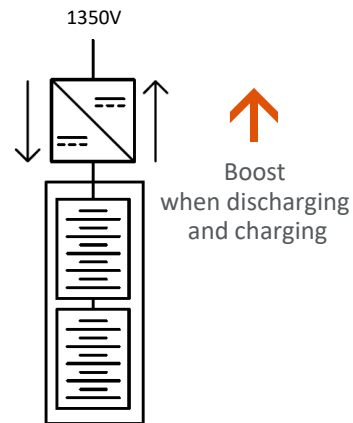


Battery
Converters

Variable Voltage

















High Fixed-Voltage



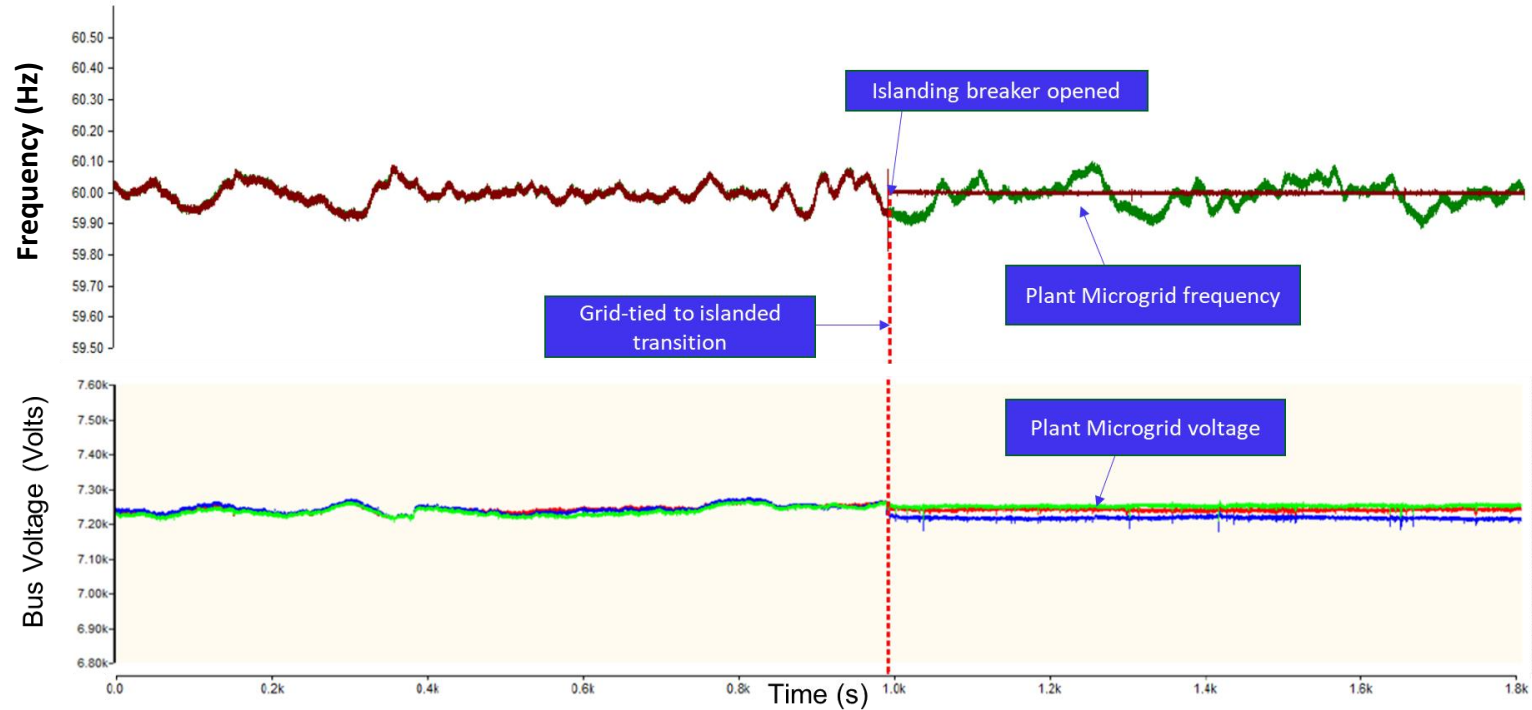
- 50% less circuitry
- Higher power density
- Higher efficiency (+0.5 – 0.8%)

GFM: All Functions/Manageability of Traditional Power Plants

Feature	GFM	GFL
Voltage and Frequency ride through capabilities		
Reactive power support		
Frequency control capabilities		
Virtual inertia		
Islanding operation		
System restart		
Black start		

Grid-forming mode offers standalone and high and low inertia grid operation

Plant Grid-Tied to Islanded



Smooth transition between grid-tied and islanded mode operation

Founded in 2007

Award Winning Technology

Market Leadership



DC Power Management
Products & Software



~3 GW
shipped

15+
countries with
deployments



Gold Winner for Pioneer in
New Technology - Storage



Top Ten Energy Storage
Solutions Provider

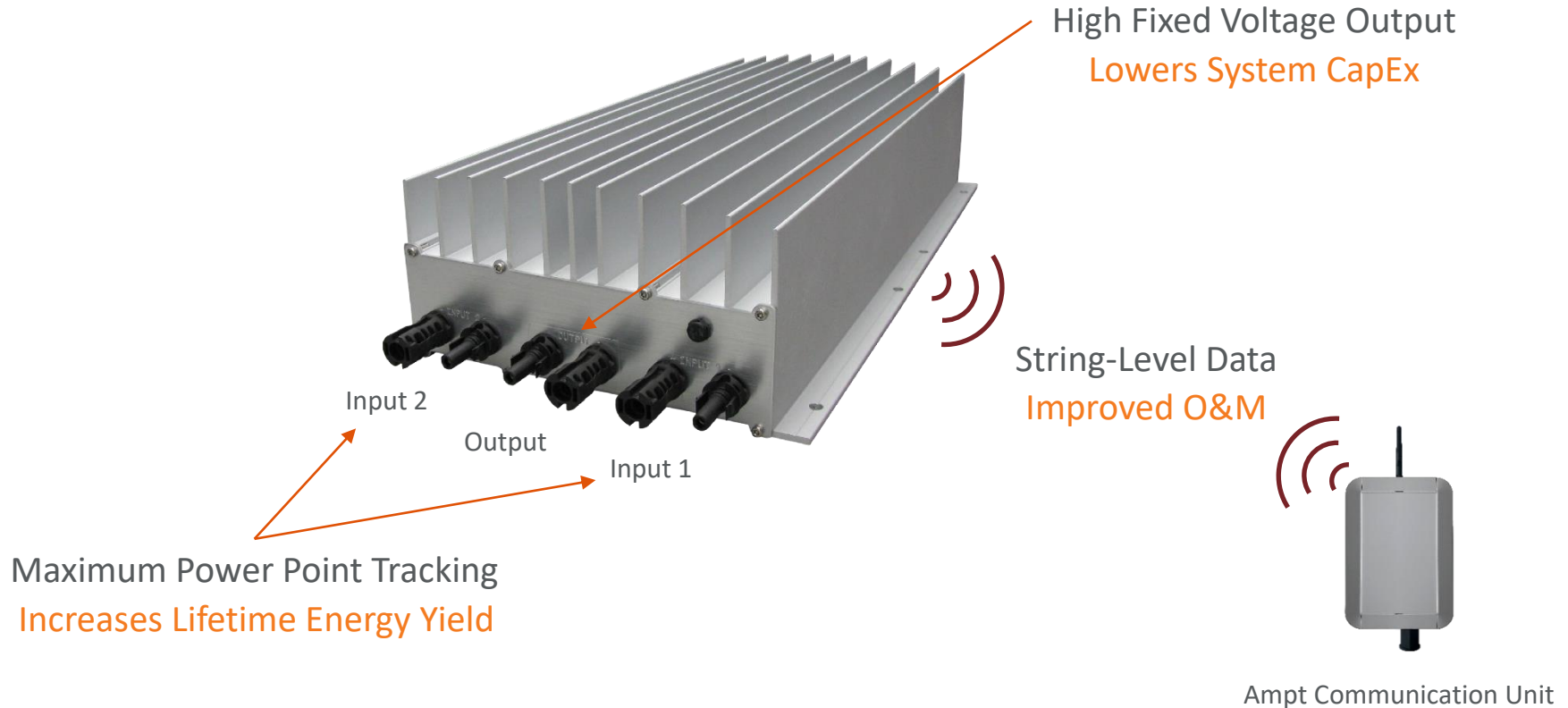


Top Product in
Power Electronics



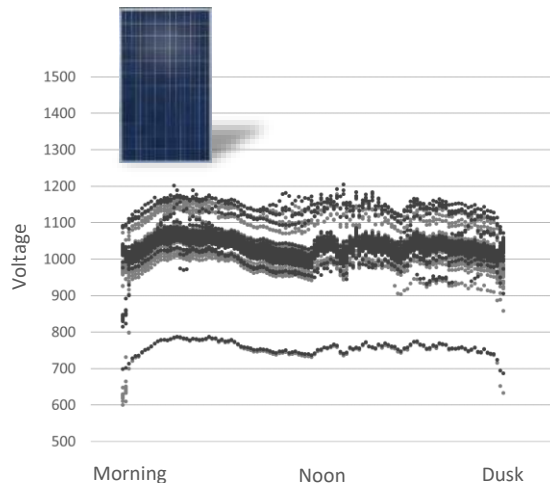
Top Product of the Year

Ampt String Optimizer



String Optimizer Enables High Fixed-Voltage

Variable input from PV module strings

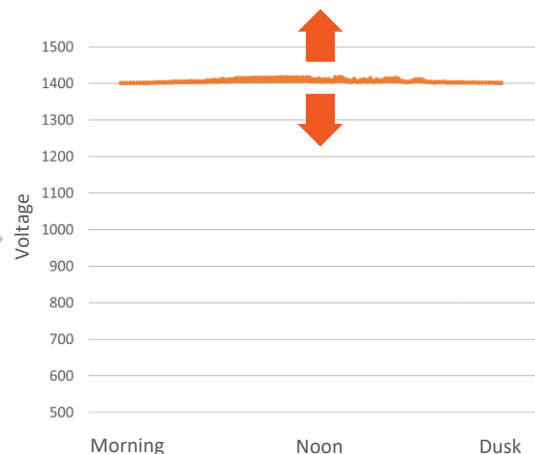


IN



OUT

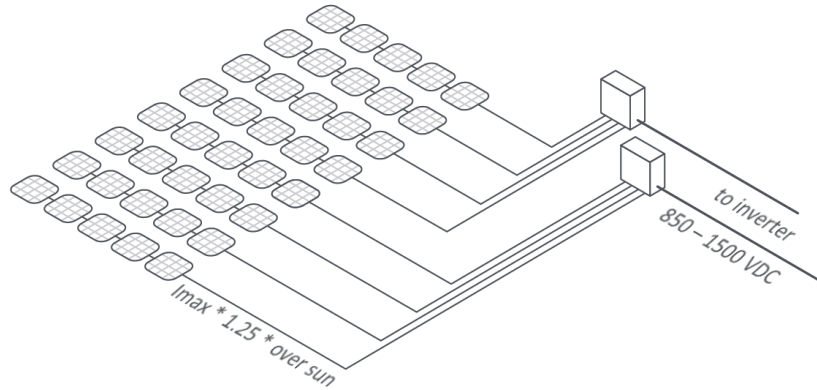
Programmable output from Ampt



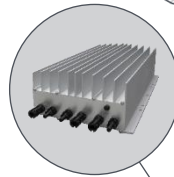
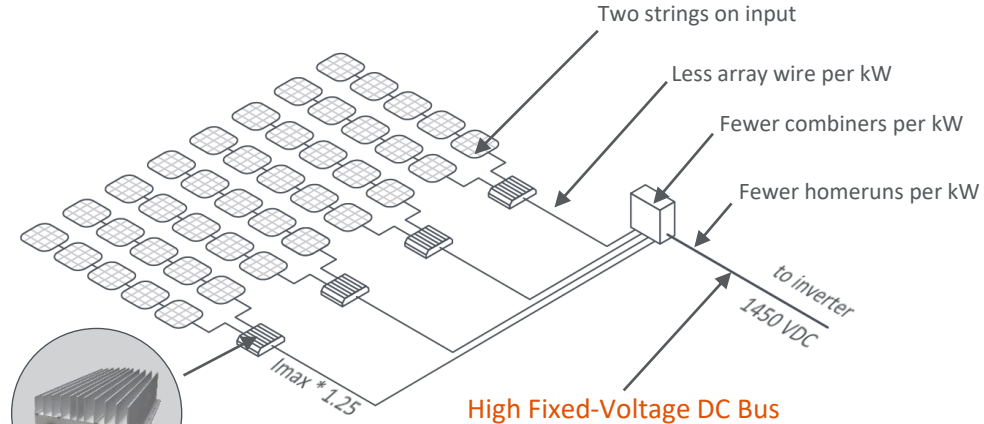
MPP Tracking on each string eliminates voltage mismatch.
Programmable output delivers high fixed-voltage output.

Lower Cost Electrical BOS

Variable Voltage



High Fixed-Voltage



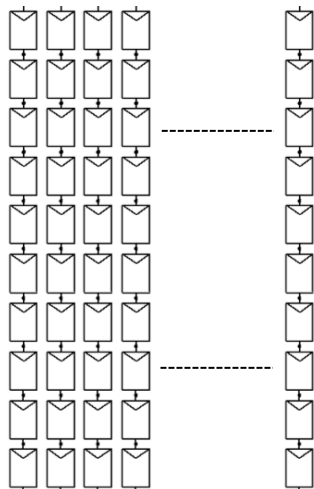
- Output current limits allow cable ampacity to be reduced as it no longer requires margin for "over sun" conditions
- High and fixed DC bus voltage lowers current ($I=P/V$)

Fewer combiners and less cabling to save on cost

More Energy Through Mismatch Correction

Central Inverter MPPT

3752 Modules per MPPT



String-Level MPPT

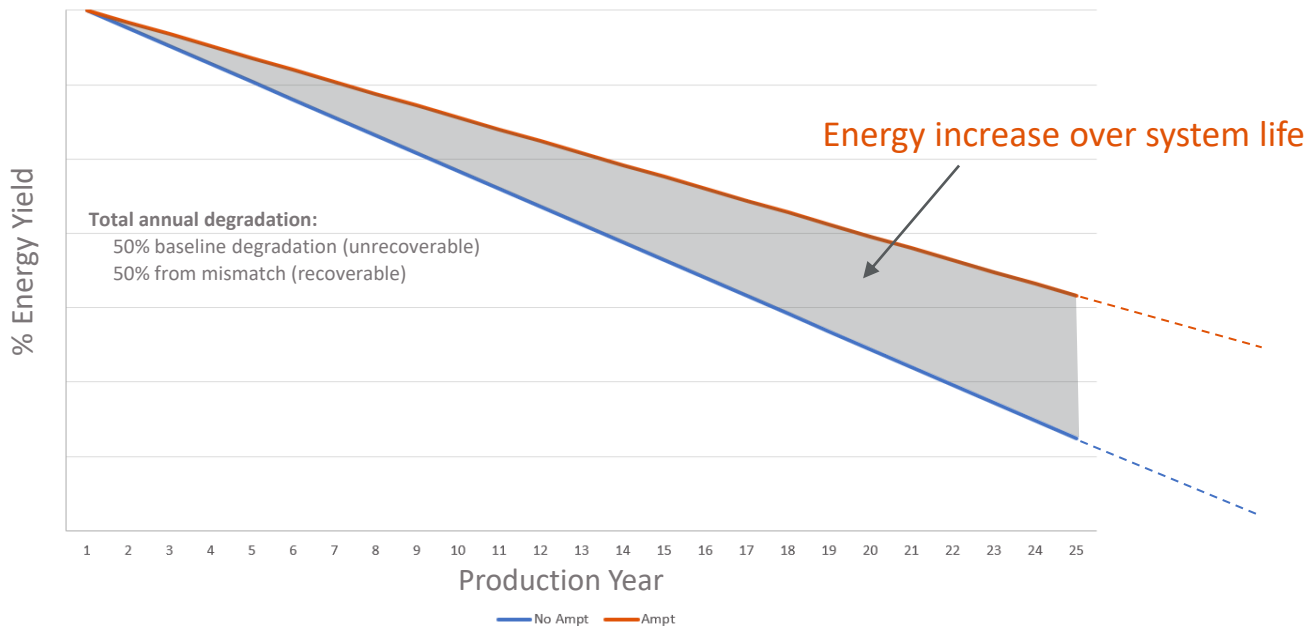
28 Modules per MPPT



More Energy

134x higher resolution MPPT improves performance

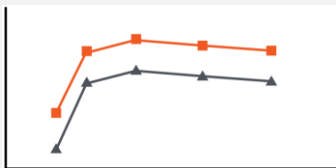
String-Level MPPT Recovers Mismatch Losses



String optimizers recover ~33% of annual losses

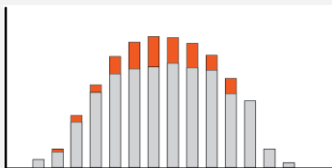
Performance Advantage of our DC-Coupled Solution

Storage Roundtrip Efficiency



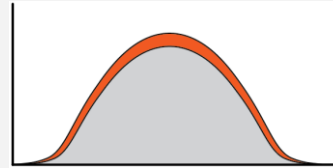
Achieve higher roundtrip storage efficiency while increasing the operating efficiency of the inverter and battery converter.

Curtailment Harvest



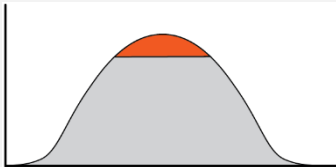
Capture array power that would normally be lost by charging the battery during periods of AC power curtailment.

Mismatch Recovery



Deliver more energy by recovering mismatch losses from various sources with string-level maximum power point tracking (MPPT).

Clipped Energy Harvest



Charge the battery when the PV inverter is clipping output power. Capture array power that would otherwise be lost.

Low Voltage Harvest



Charge the battery storage system when the array voltage is below the inverter turn on voltage to maximize energy production.

Mitigate Degradation



Recover energy losses caused by variable degradation of PV cell and modules within a system to improve lifetime system performance.

Higher performance compared to AC-coupled solutions

Smart PV + DC-coupled Storage Solution



Lower total system cost



Increase PV performance



Fewer and lower cost inverter & transformer



More efficient energy storage



Lower cost battery converter



Improved O&M



Decrease EBOS costs



Simplified DC controls for improved grid response

Advancing Renewable Energy Around the World

Thank You



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