



Lower Cost and Higher Performing PV Systems



Optimize PV Systems



Repower PV Systems

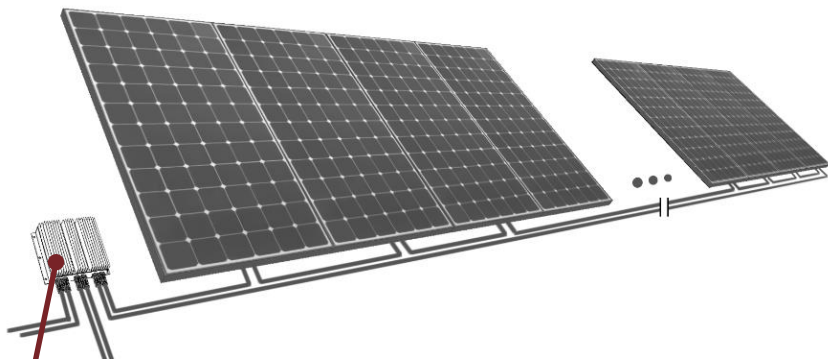


DC-Coupled Storage



Monitoring and O&M

Ampt String Optimizers Deliver Unmatched Value



Optimize PV Systems



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DC-Coupled Storage

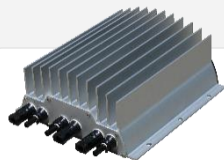


Monitoring and O&M



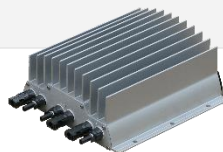
V1500 Series

Max system voltage: 1500 V
Max output power: 27.7 kW



V1000 Series

Max system voltage: 1000 V
Max output power: 11.4 kW



V750 Series

Max system voltage: 750 V
Max output power: 8.7 kW



V600 Series

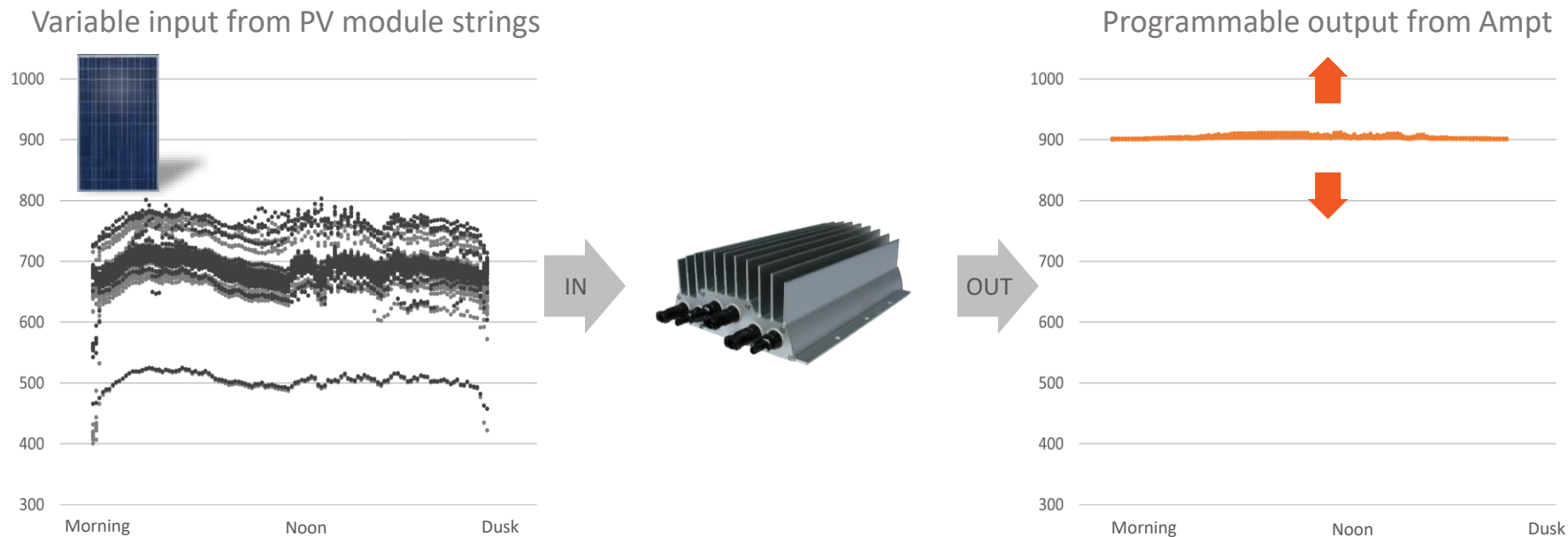
Max system voltage: 600 V
Max output power: 6.8 kW



Ampt CU

Two-way Wireless (RF)
String-level data for O&M

Innovative DC power management

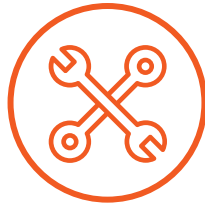


MPP Tracking on each string eliminates mismatch.

Programmable output adapts to meet inverter and energy storage requirements.



Optimize PV Systems



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DC-Coupled Storage

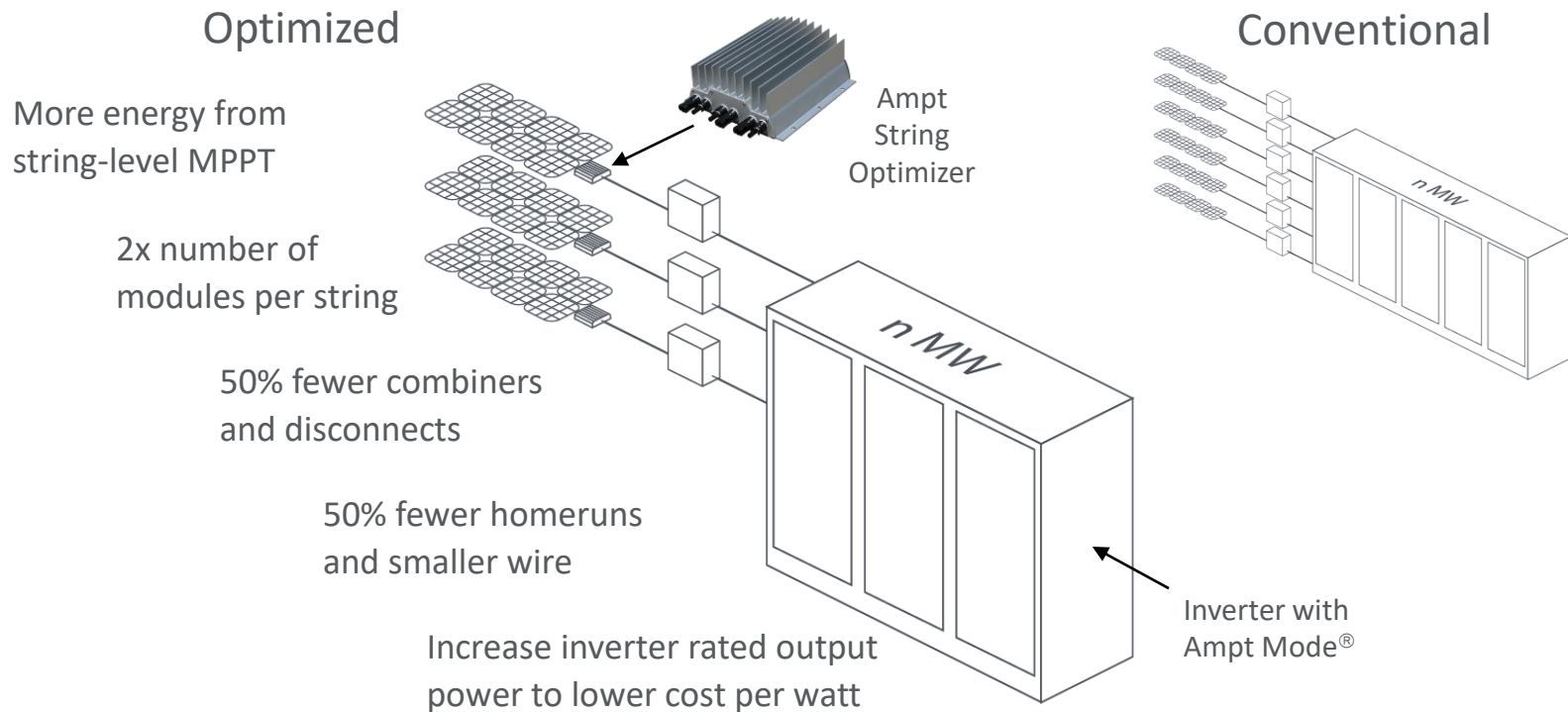


Monitoring and O&M



Optimize PV Systems

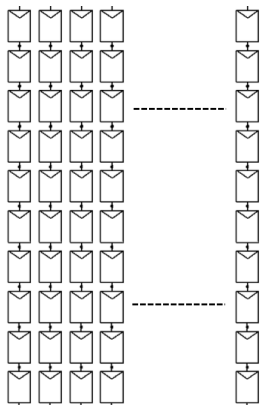
Advantage of Optimized vs. Conventional Designs



More Energy Through Mismatch Correction

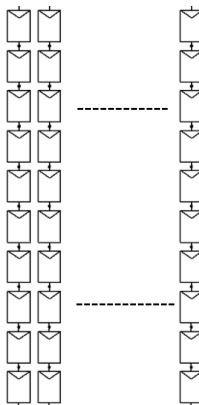
Central Inverters

1000's of Modules per MPP Tracker



Large String Inverters

100's of Modules per MPP Tracker



Ampt String Optimizers

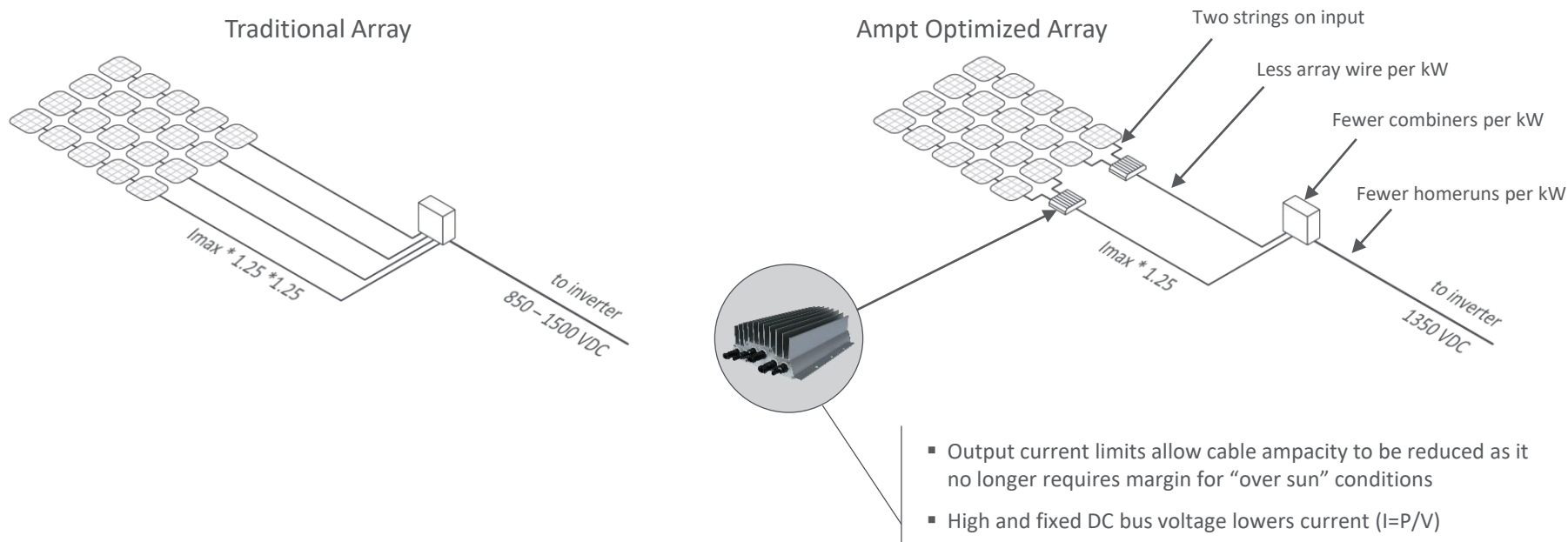
10 - 30 Modules per MPP Tracker (72 cell)



More Energy

Smaller MPP zones = better correction for mismatch

Ampt String Stretch® Technology Allows 2x Longer Strings



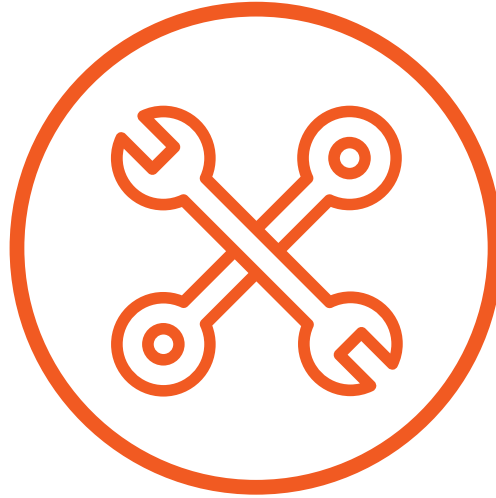
50% fewer combiners and less cabling to save on cost

Lower Cost Inverter with Ampt Mode®



	Standard	Ampt Mode®
DC electrical		
Max array input voltage	1500 V	1500 V
Input voltage range	850 - 1500 V	1350 V Fixed
Rated input voltage	850 V	1350 V Higher
Max operating input current	3200 A	3200 A
AC electrical		
Rated output voltage	600 V	800 V Higher
Rated output current	2300 A	2300 A
Rated output power	2400 kW	3200 kW 33% ↑

Increasing inverter rated output power lowers cost per watt



Repower PV Systems

Repower Existing PV Systems

Improve System Performance

More energy with dual MPPT

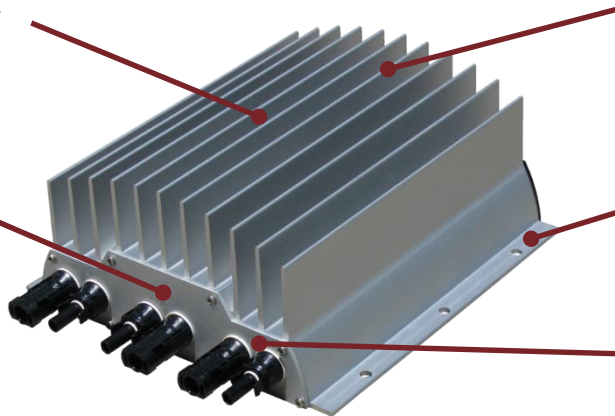
Ampt delivers full available power at voltage set by existing inverter
(no communications required)

Low Cost Solution

Enhanced O&M with string-level data via optional wireless communication

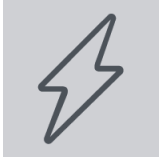
Mounts easily

Low cost retrofit uses existing cables and half the number of combiner circuits



3 Ways to Repower Systems with Ampt

Recover Energy



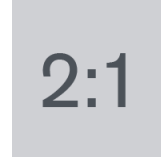
Recover energy lost from mismatch and degradation to increase production.

Upgrade Inverters



Upgrade inverters over time as each one ends its lifecycle with the newest inverter technology

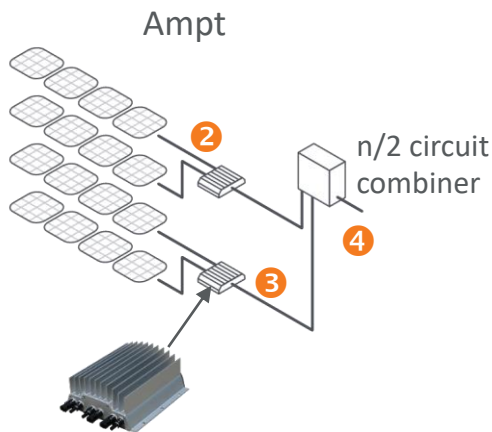
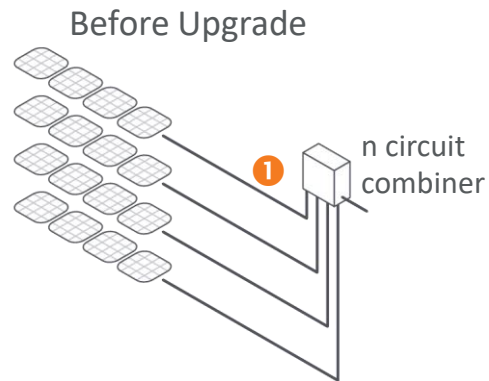
Expand to High DC/AC Ratio



Expand array size mixing new and legacy modules without overloading inverter to increase revenue



Deploy on Existing Wiring, Combiners & Inverter

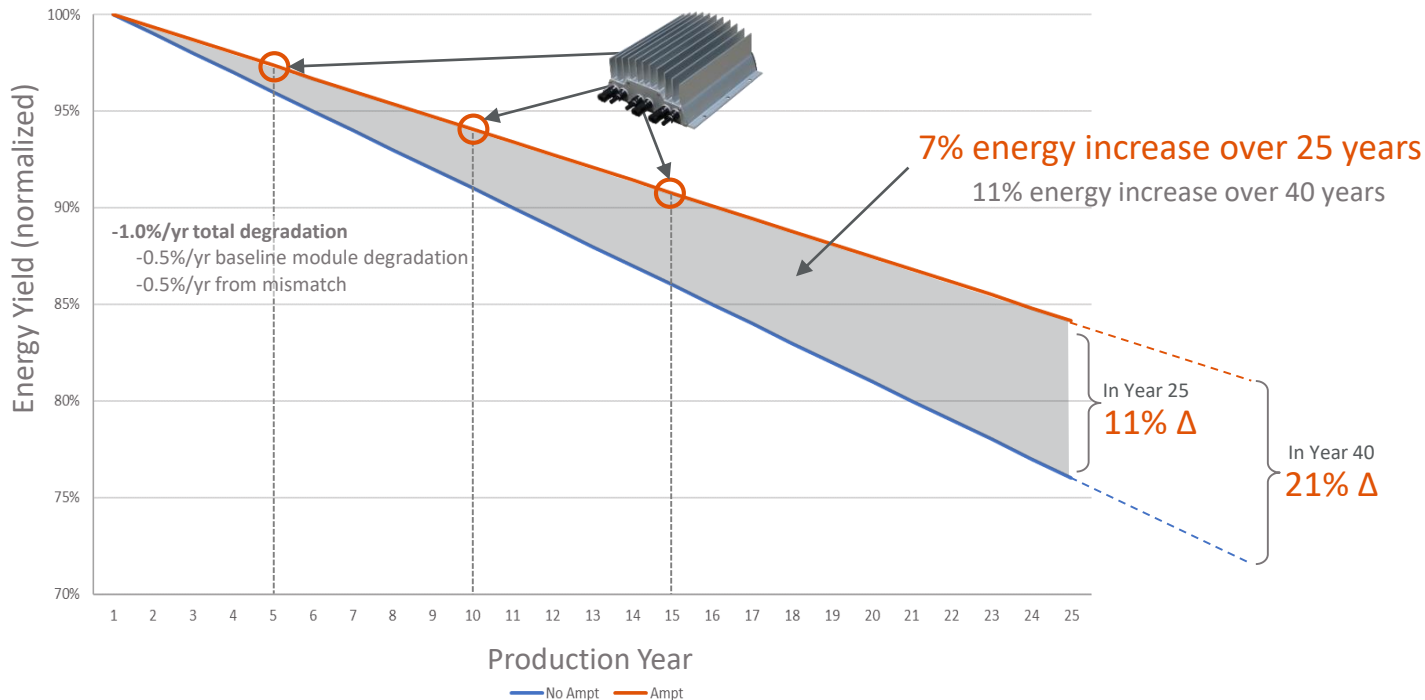


- 1 Disconnect strings from combiner
- 2 Connect one string to each Ampt input using existing cables
- 3 Connect Ampt output to combiner
- 4 Set inverter to constant or narrow-range voltage operation

Simple drop-in use for low-cost installation



String optimizers recover ~33% of annual losses



Repowering date determined by value of energy and degree of degradation



Upgrade Inverters

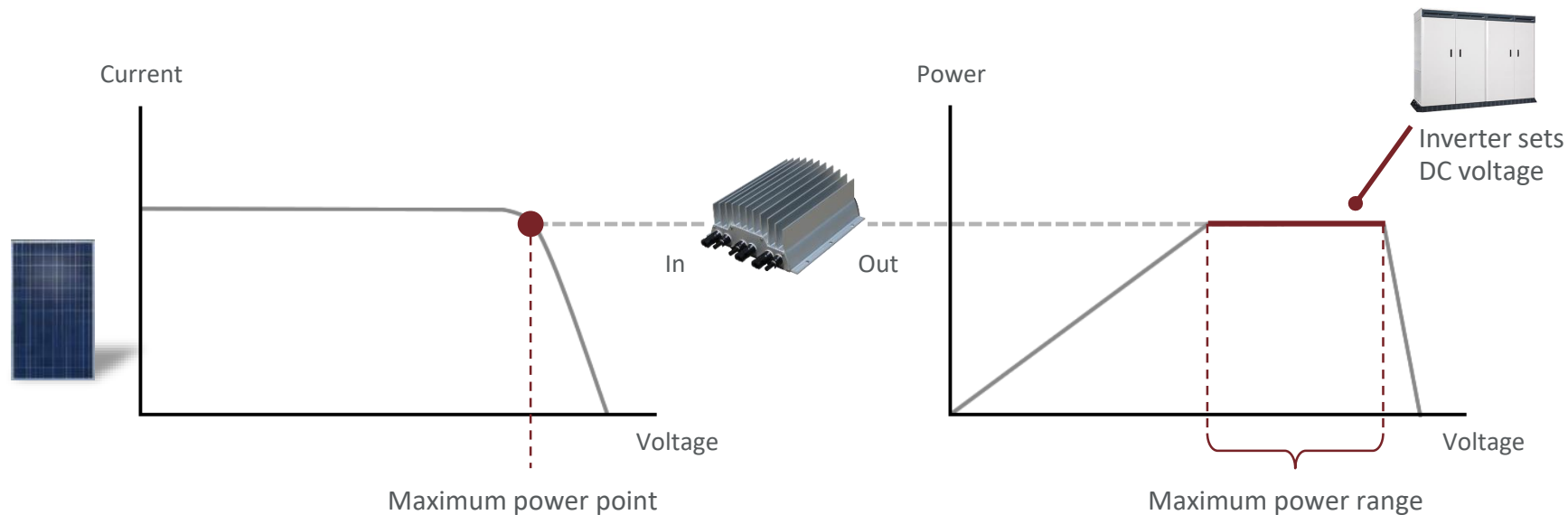


As each inverter ends lifecycle:

- Replace legacy inverters with the newest inverter technology
- Use 1000-volt inverters at full rated power in 600-volt systems
- Use 1500-volt inverters at full rated power in 1000-volt systems

Ampt avoids costly re-wiring and re-trenching while lowering the cost of replacement inverters

Optimizer delivers full available power at the voltage set by inverter



Ampt optimizers serve as an “adapter” between legacy arrays and modern inverters



Use Modern Inverters as Low-Cost Replacements

1000-volt inverter



	Standard	With Ampt
Maximum system voltage	1000	600
Input voltage at full power	480 – 850	550
Output power	500kW	500kW

1500-volt inverter



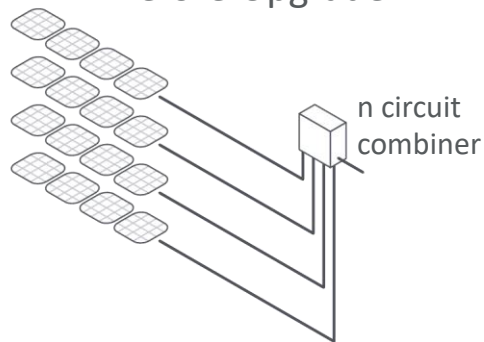
	Standard	With Ampt
Maximum system voltage	1500	1000
Input voltage at full power	850 – 1250	950
Output power	1MW	1MW

Ampt works with both central and string inverters

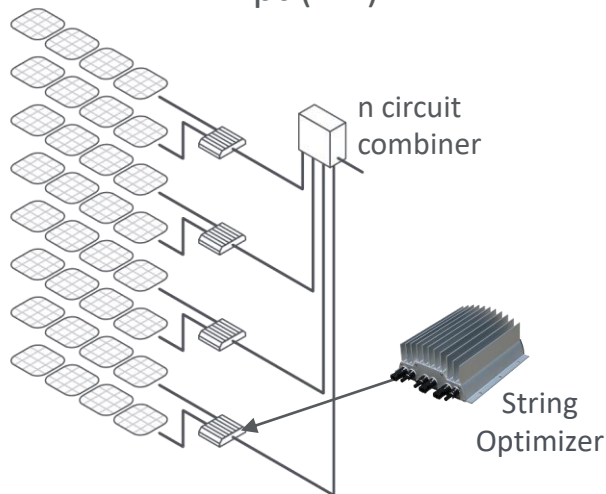


Expand to High DC Ratio

Before Upgrade



Ampt (2:1)



Existing Inverter

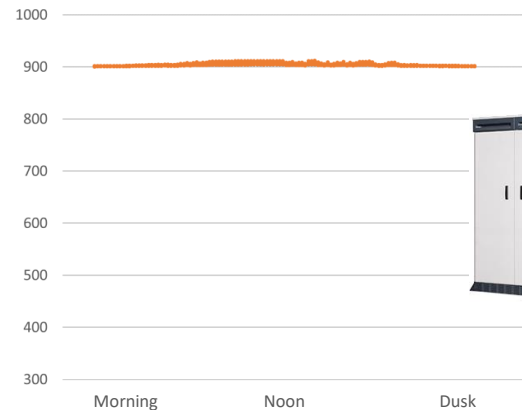
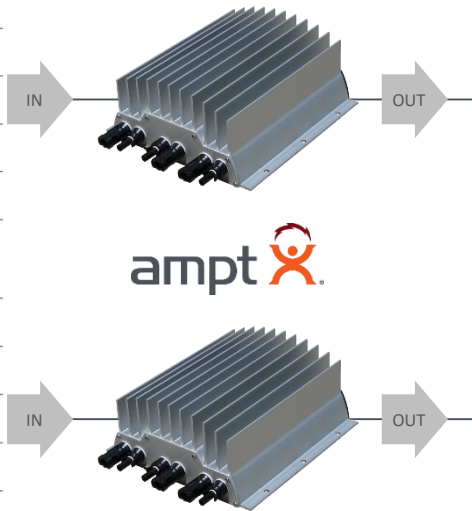
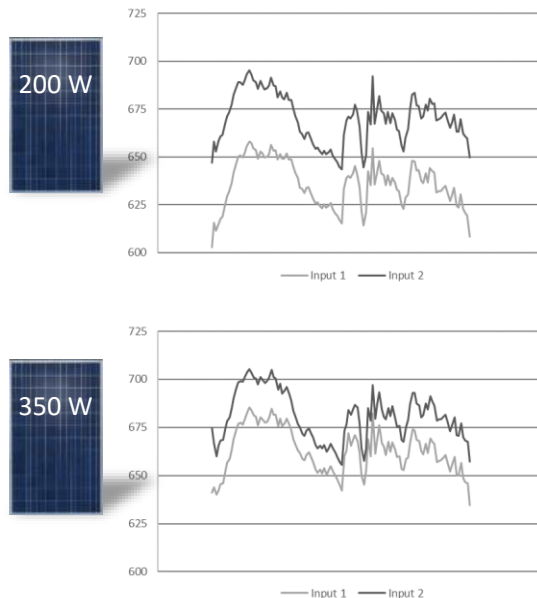


- Add higher power modules to existing strings
- Add new strings to existing combiners
- Save 50% on EBOS when adding new sub-arrays

- Protects existing inverter from exceeding DC loading limits
- Eliminate mismatch losses between strings

Mix new and legacy modules on the same inverter

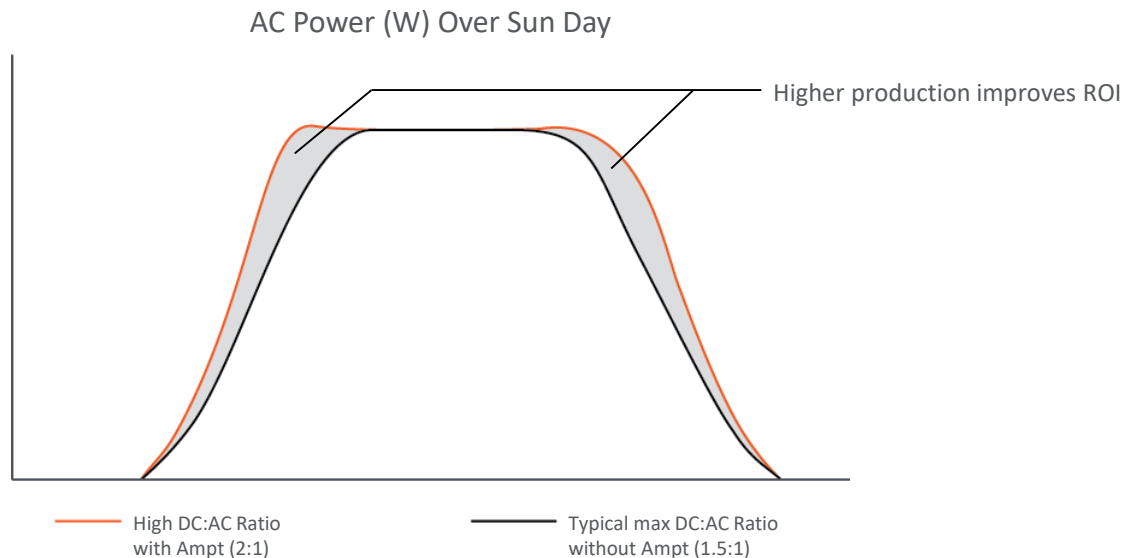
MPPT eliminates mismatch between strings



Each string delivers full available power at a higher and narrow DC bus voltage



Higher DC/AC Ratio Delivers More Energy



With Ampt, deploy high DC/AC ratio systems without overloading existing combiner boxes, cables, or inverters

Ampt Repowering Solution Delivers a High Return on Investment



15-30% return on investment

- Typical return projected over the system life

Maximized annual project revenue

- Generate more energy over the system life

Lowest cost upgrade option

- Use existing wires & combiners
- Use existing inverters

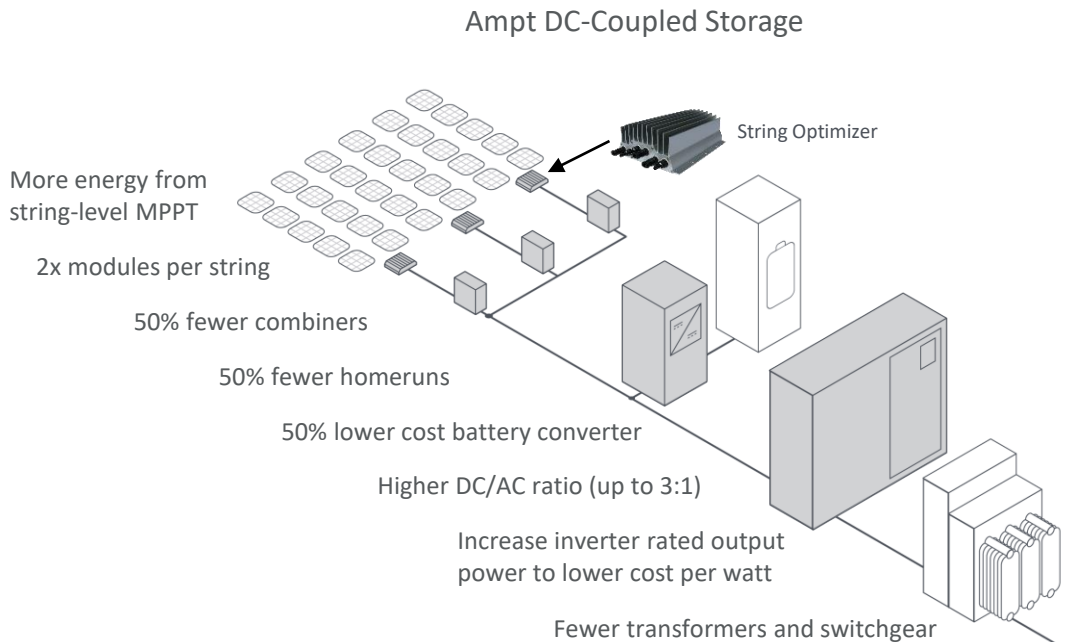
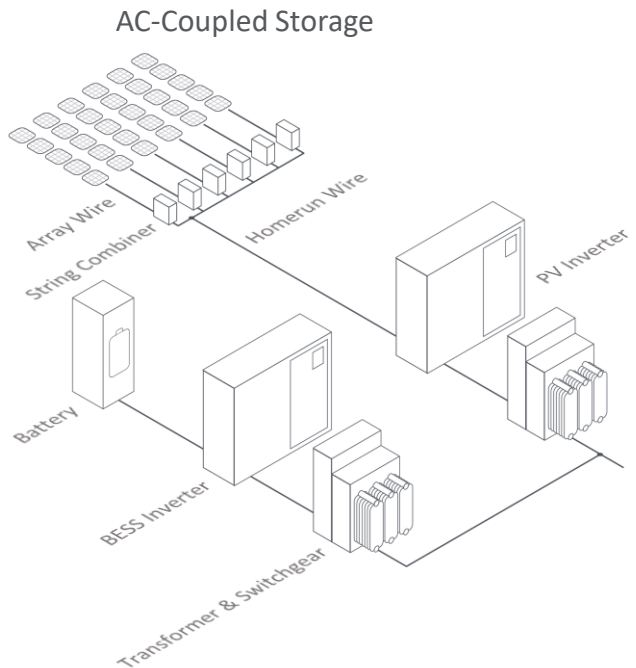
Future-proof inverter replacement

- Upgrade with low-cost, modern string or central inverters
- No re-wiring or re-trenching



DC-Coupled Storage

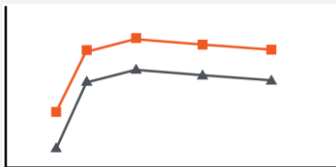
Ampt DC-Coupled Cost Advantage



Lower Cost & Higher Performance

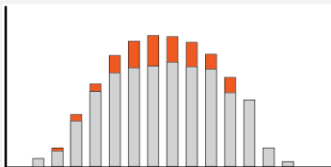
Ampt DC-Coupled Performance Advantage

Storage Roundtrip Efficiency



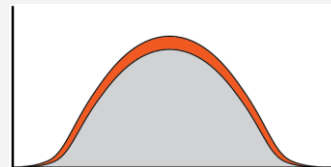
Achieve higher roundtrip storage efficiency while increasing the operating efficiency of the inverter and battery converter.

Curtailment Harvest



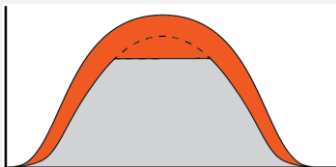
Capture array power that would normally be lost by charging the battery during periods of AC power curtailment.

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. Ampt enhances this benefit with higher DC/AC ratios (up to 3:1).

Low Voltage Harvest



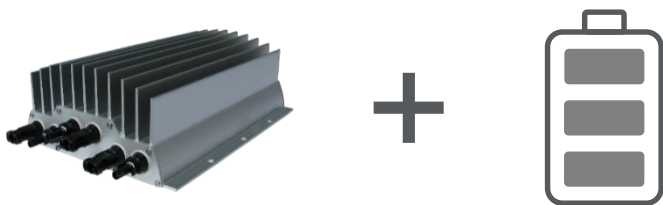
Charge the battery storage system when the array voltage is below the inverter turn on voltage to maximize energy production.

Mitigate Degradation



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

Superior Storage with Ampt



Performance advantage

- Higher roundtrip efficiency
- Capture more energy
- Mitigate degradation

Reduced system cost and complexity

- Lower cost power conversion
- Standard or bi-directional inverter
- Lower cost EBOS

Scalable and flexible

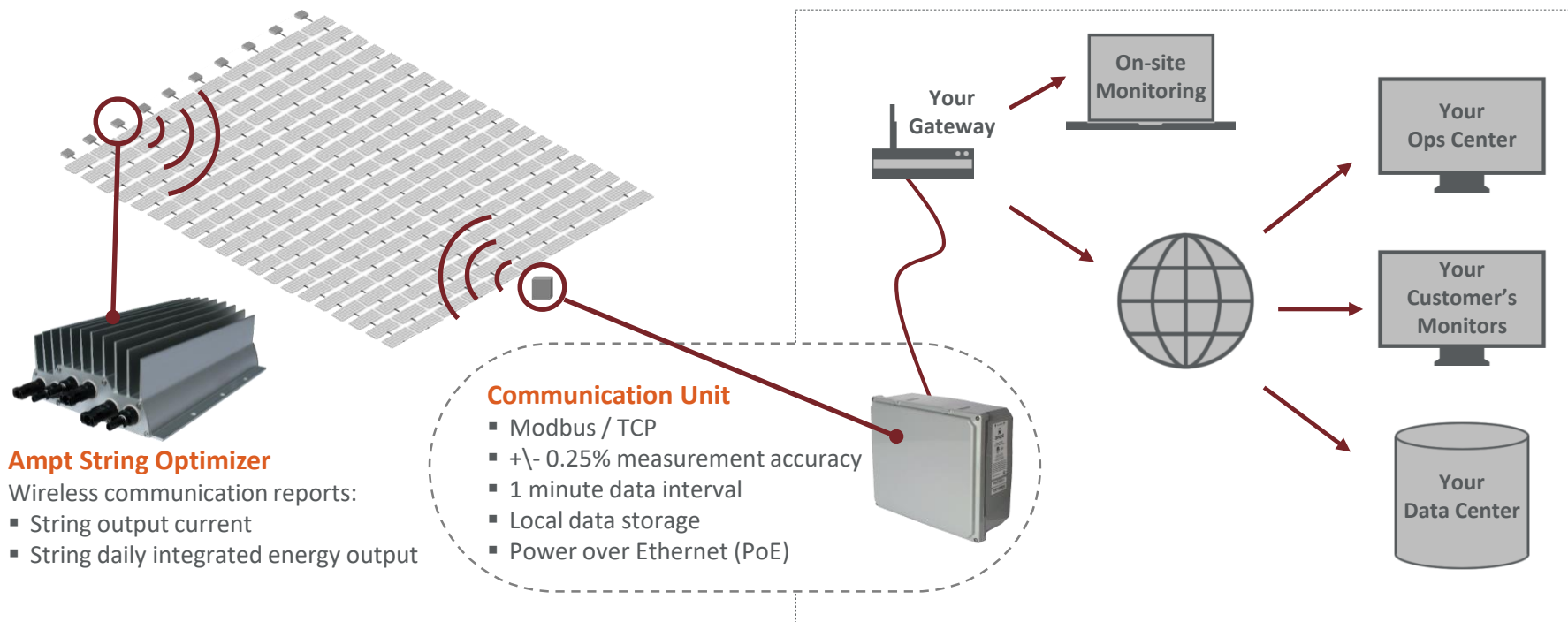
- Micro-grid to large power plants
- Add storage over time with less hardware cost
- Battery technology independent

With Ampt, the PV array is Storage-Ready™ and scalable in the future



Monitoring

Optional String-Level Data for Improved O & M





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