



Como promover y construir fotovoltaica con almacenamiento

FLUENCE

A Siemens and AES Company

Introducing Fluence, the global leader in energy storage



10+ Years



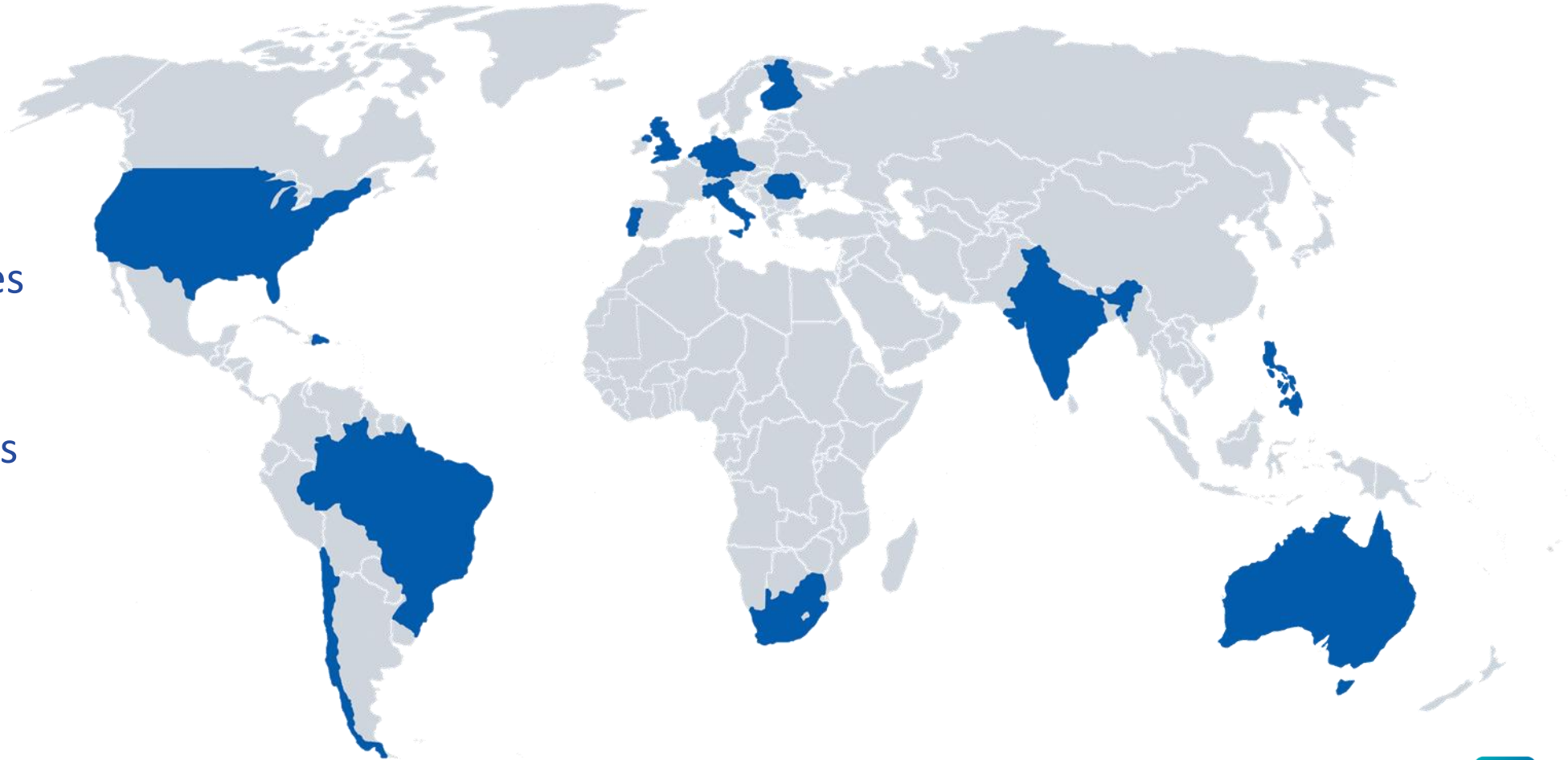
16 Countries



50+ Projects



500+ MW



Solar + storage system configuration depends on use case

DC-coupled system is the optimal system configuration for providing firm renewable energy for long blocks of time

	AC-COUPLED	DC-COUPLED
STANDALONE	1 <ul style="list-style-type: none">• Grid services• Flexible capacity	<i>Not possible</i>
COLLOCATED	2 <ul style="list-style-type: none">• Grid services• Renewable plant stability	3 <ul style="list-style-type: none">• Renewable firm energy



30 MW of energy storage for San Diego Gas & Electric, California, United States

- Largest energy storage project in the world
- Contract to online in 6 months
- Sited on 1 acre, where a power plant could not be permitted



Critical Grid Stabilization

Santo Domingo, DR

10MW / 5MWh

Improving grid efficiency

SERVICES:

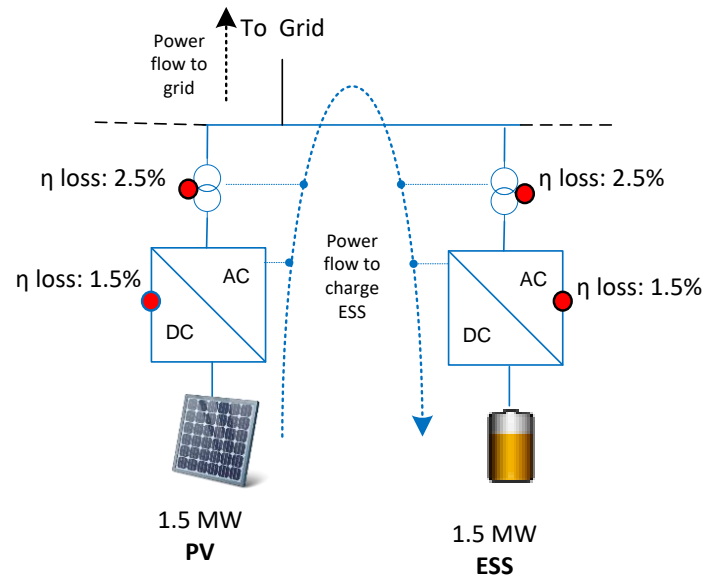
- Capacity release for generation facility
- Ancillary services



DC-DC interface

Architecture comparison

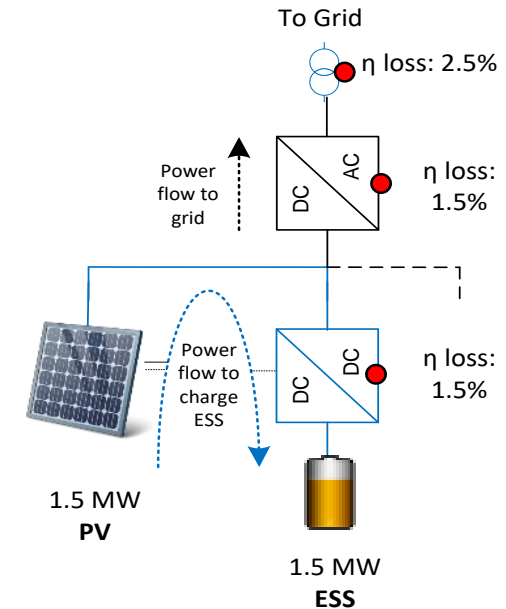
AC-Coupled System



Charge loss: 8% (excludes battery losses)
Discharge loss: 4% (excludes battery losses)
Total losses: 12%

DC: 5% less Losses

DC-Coupled System



Charge loss: 1.5% (excludes battery losses)
Discharge loss: 5.5% (excludes battery losses)
Total losses: 7.0%

DC Coupled Solar + Storage

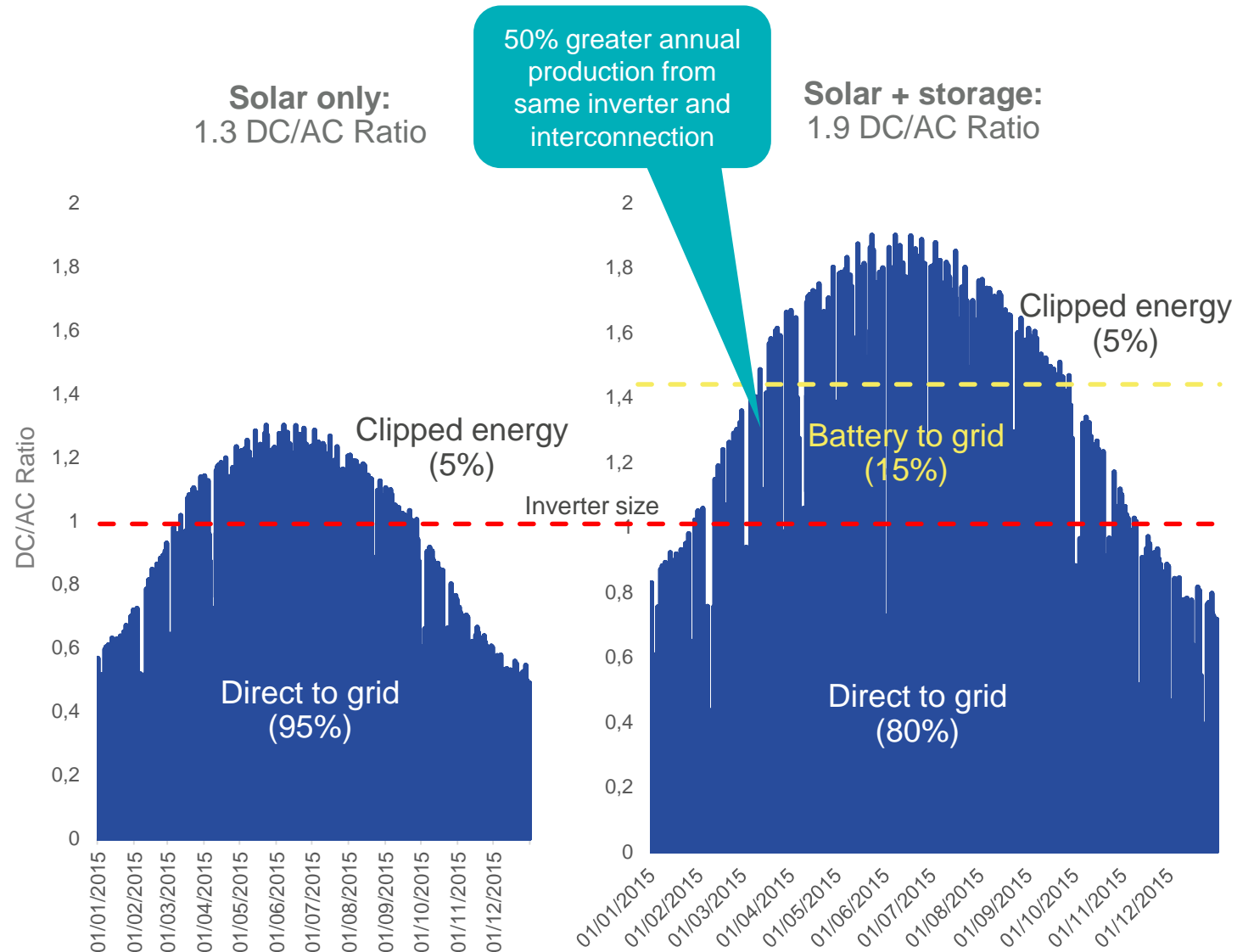
Solar + storage

Collocated DC coupled Solar + Energy Storage (“Solar + Storage”) **costs up to 30% less than separate standalone systems.**

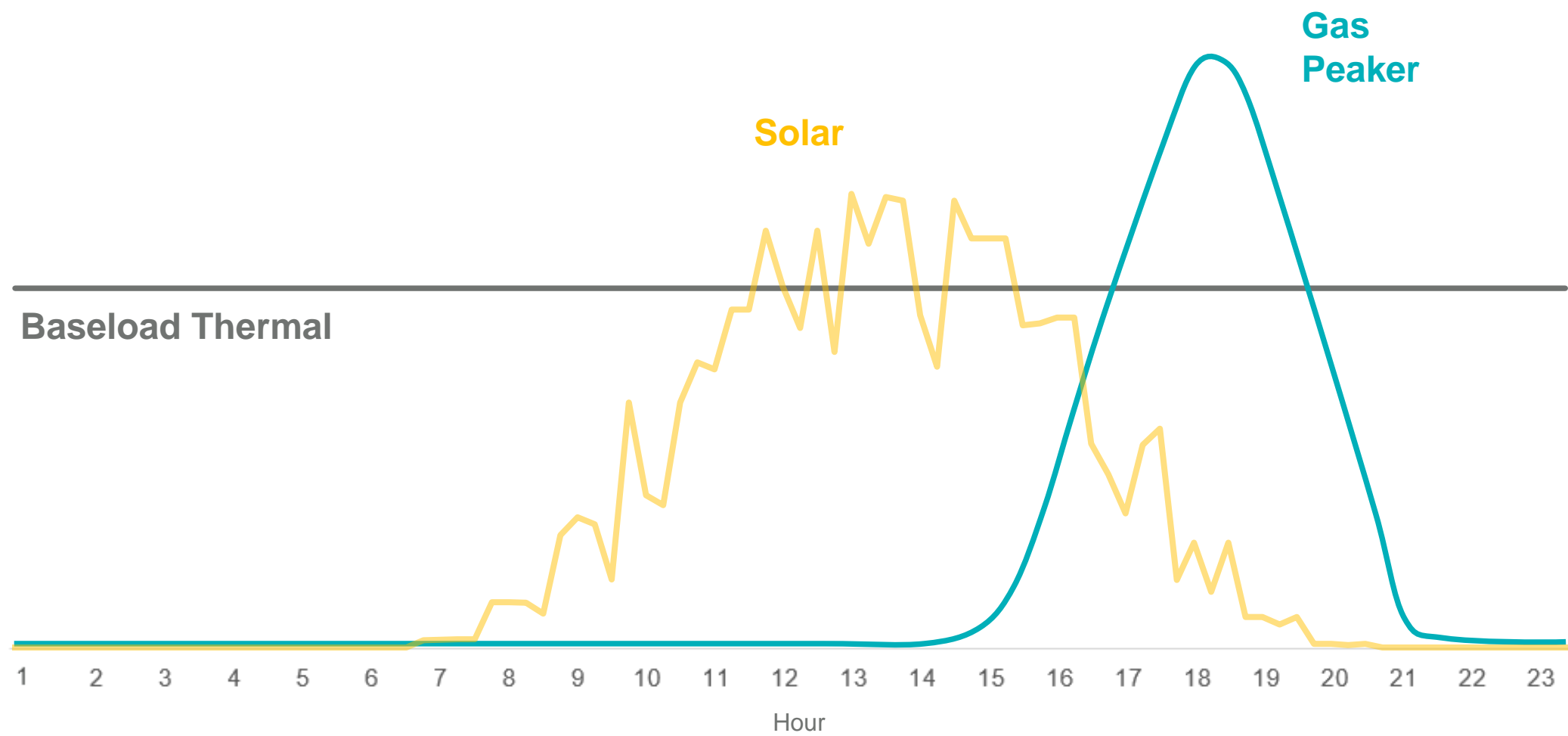
Why? Because DC coupled Solar + Storage can share inverters, land, permitting, and interconnection costs making the combined system much less expensive.

DC coupled Solar+Storage results in:

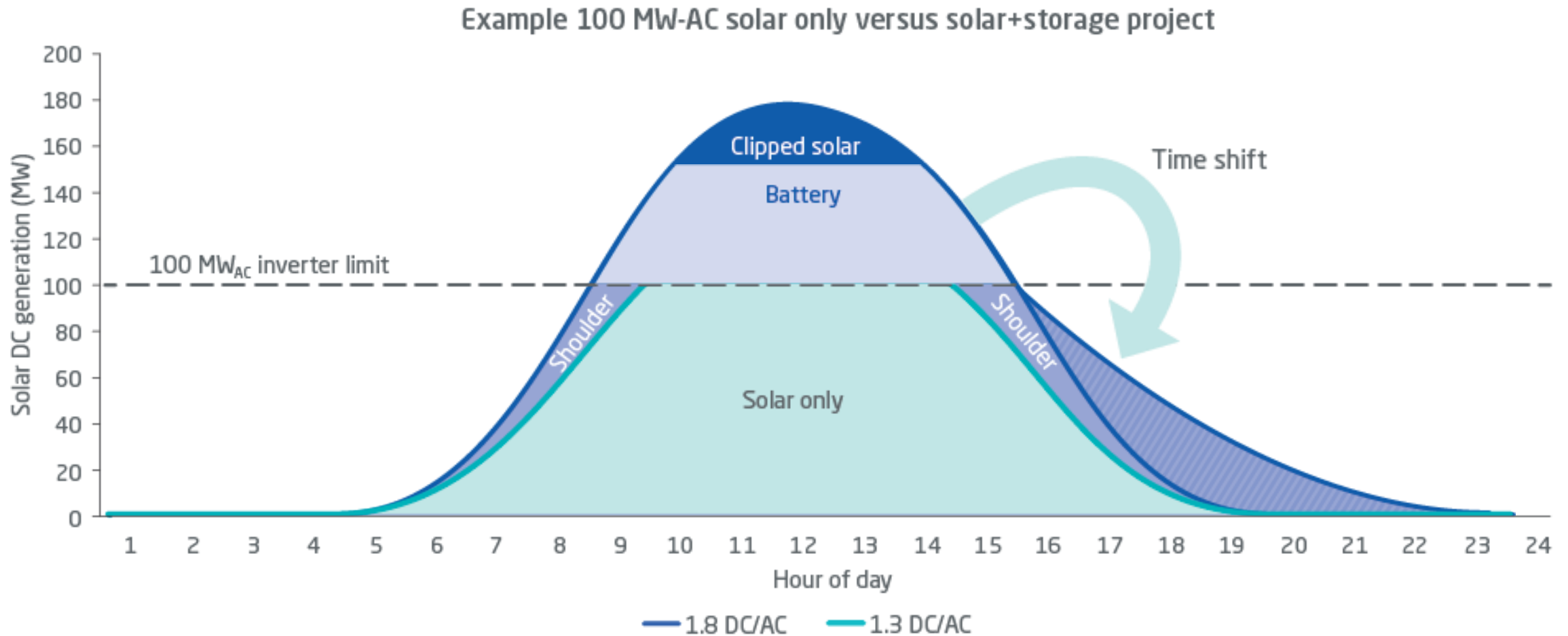
- Greater annual generation
- Up to 30% cost savings
- Higher PPA rates because resource is semi-dispatchable



Generation Profiles



Maximizing Solar with DC-Coupled Energy Storage



The Opportunity: Renewables + Storage

Increased use of variable renewable energy necessitates greater flexibility in grid systems.

Use energy storage to support renewable energy in order to provide:

- **Reduced costs**
- **Renewable firm energy**
- **Renewable plant stability**
- **Grid services**



Case 1: Renewable Plant Stability

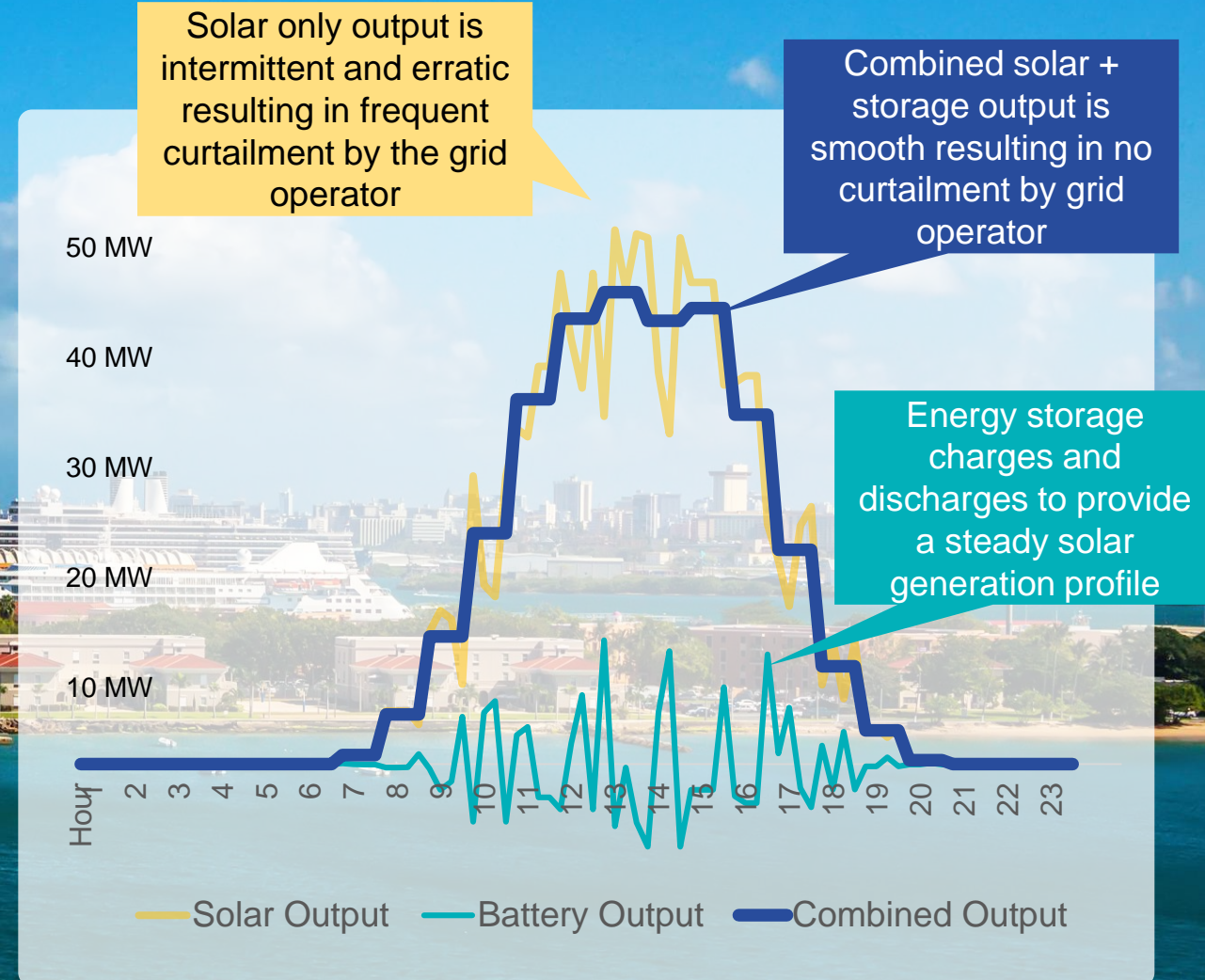
Caribbean Island

Challenge:

- 60 MW solar facility frequently curtailed by utility when generation decreases more than allowable amount—up to 10% curtailment/year
- Due to increasing renewable energy penetration, utility requires ramping controls on all new solar PV park interconnections.

Solution:

- 15 MW, 30 min ES system to smooth solar generation
- Solar facility no longer experiences curtailment, boosting annual revenue by 10%.



Case 2: Renewable Firm Energy

Solar + storage to reduce procurement costs

Background:

- Southwest US utility looking to purchase solar and storage to time shift solar energy

Problem:

- Utility seeking affordable, flexible renewable energy for rate payers

Solution:

- Solar + storage DC-coupled solution shares inverters, land, interconnection to reduce total system cost by 30%
- Increases capacity value of solar production for higher PPA rates



Case 3: Renewable Firm Energy

Solar + storage on Kauai, Hawaii

Background:

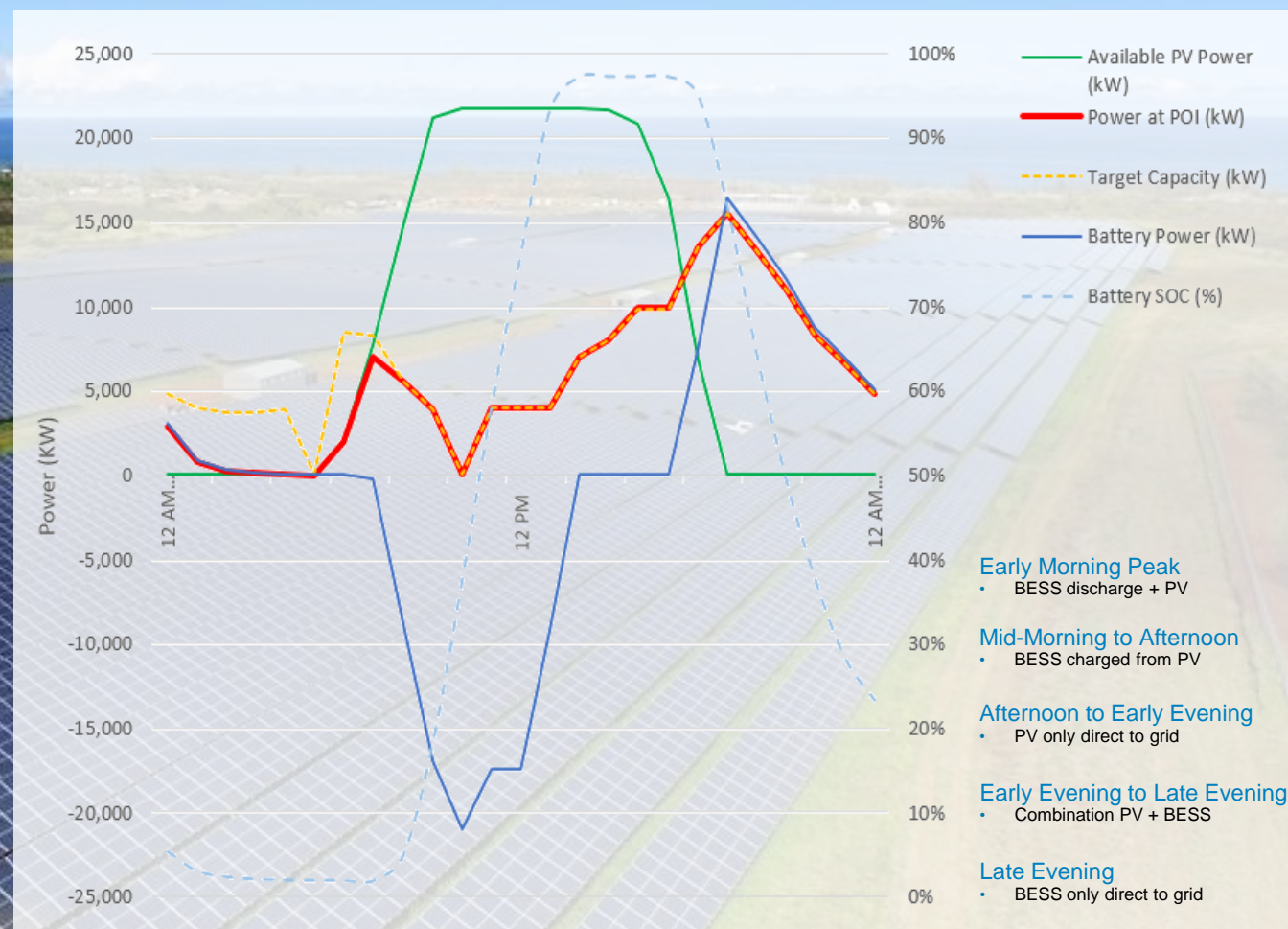
- Population of 66,000
- 125 MW of generation capacity

Problem:

- Electricity is expensive, ~ 33 cents/kWh
- Utility reliant on expensive fossil fuel generators to cover peak load.

Solution:

- 28 MW solar + 20 MW, 5 hour (100 MWh) energy storage solution
- “Renewable peaker” offers flexible but firm capacity to meet demand
- PPA is \$110/MWh, ~11 cents/kWh



Case 4: KIUC “Kekaha” Project: Utility Project with Microgrid Capability

Alternative Dispatch : Baseload Mode

Dispatch between 20% and 30% of nameplate capacity all hours of the day.

This mode makes less efficient use of daytime energy, but allows the plant to function as base-load generation to Navy facility in event of grid outage – replacing expensive diesel back-up generators.

Average Actual Capacity (MW) (Red = Combined System Output)

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	3	3	3	3	3	3	3	4	5	5	5	5	5	5	5	5	5	4	4	4	4	4	4	3
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12	3	3	3	3	3	3	2	3	4	5	5	5	5	5	5	5	5	4	4	4	4	4	4	4



Thank You

