



Ingeteam
ELECTRIFYING
A SUSTAINABLE FUTURE

Energynomics BESS 26 September 2024

Mauro Rivola - VP International Sales Export Director Solar PV, BESS & H2
Ingeteam



ABOUT US

Ingeteam is an international technological Company specialized in electric power conversion, with state-of-the-art technology on Rotating Machines, Power Electronics, Automation and Control, and Services (Operation & Maintenance services).

We strive to understand our clients' needs, to offer the most suitable and competitive products, systems and services.

Our people is key for our success.

We apply Continuous Innovation to continuously streamline the operations, processes and organization, to stay lean, nimble, and be competitive.

Our aspiration is to be a reference in the generation and conversion of electrical energy in all the targeted business sectors.





KEY FIGURES



Present in **16 countries** and new markets



3,500 employees around the world



5.5% of turnover invested in R&D every year. **+500** R&D engineers



More than **80 years** in the electrical sector

Ingeteam



Battery Energy Storage Systems (BESS)



13 years' experience in utility-scale installations



Over 2.3 GW / 6.25 GWh of BESS installed worldwide in generation and distribution substations



In-house converter technology for residential, industrial and utility scale application.



+10 GW of power plants controlled with our PPC worldwide

- > Power generation, transmission & distribution
- > Power electronics leadership: DC/AC inverters & DC/DC converters
- > Full control capabilities (EMS, PPC...)
- > Hybrid systems with RE plants
- > DC-coupled and AC-coupled systems
- > ESS solutions for Energy, Industry, Marine and Commercial sectors
- > Advanced functionalities (black start, synthetic inertia...)

Ingeteam BESS

More than 6.25 GWh Worldwide

USA & CANADA :
650 MW-1 GWh

MEXICO :
12 MW-24 MWh

CHILE : 410MW-2,3 GWh

ITALY : 320 MW-1,34 GWh
SPAIN : 45 MW-131 MWh
UK : 240 MW-360 MWh
FRANCE : 18 MW-26 MWh
GERMANY: 100 MW-100 MWh
ROMANIA: 55 MW-205 MWh
SWEDEN: 110 MW-100 MWh
Others EUROPE : 35 MW-38 MWh

AUSTRALIA : 135 MW-250 MWh
INDIA : 16 MW-20 MWh
SOUTH AFRICA : 30 MW-7 MWh

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Ingeteam BESS complete solutions

Your key technological partner in all the project stages



Equipment supply could be comprised of:

- ✓ *Solar PV inverters*
- ✓ *Storage inverters*
- ✓ *Rectifiers for green H2 plants*
- ✓ *MV power stations*
- ✓ *PPC (Power Plant Controller)*
- ✓ *SCADA monitoring system*

Ingeteam BESS

PRODUCT PORTFOLIO



Ingeteam BESS complete solutions

Storage inverter range (on-/off-grid)

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RESIDENTIAL



STORAGE 1Play
3-4.5-6 kW
Hybrid inverter



STORAGE ALL-IN-ONE
3-4.5-6 Kw / 4.8-24 kWh
Hybrid inverter + battery



STORAGE 3Play
10-15-20-30 kW
Hybrid inverter

COMMERCIAL & INDUSTRIAL



STORAGE 3Play
100 kW

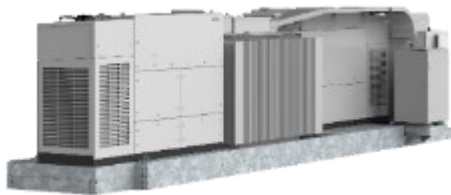


STORAGE 3Play
320 kW
(available in Q4 2024)



STORAGE BATTERY
21.2 -1200 kWh

UTILITY SCALE



MV Power Station
STORAGE FSK C Series
7860 kW
1300Vdc & 1500Vdc HV



STORAGE 3Power C Series
3930 kW
1300Vdc & 1500Vdc HV



STORAGE Power B Series
1715 kW
STORAGE Power DC-DC
1700 kW DC-coupled PV+BESS
1300Vdc



STORAGE 3Play
350 kW 1500Vcc
(available in Q4 2024)



STORAGE Play DC-DC
430 kW
(available in Q1 2025)
1500Vdc
Stand-alone BESS
DC-coupled PV+BESS

Ingeteam BESS utility scale solutions

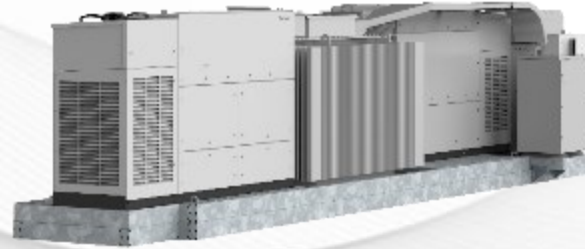
Always

Power Converters (DC/AC & DC/DC)



Preferred

MV Power Conversion Solution



Local SCADA



EMS / Power Plant Controller

Advance engineering services

Battery Interface Integration

Factory Integration Tests

Grid Modelling

After Sales Services



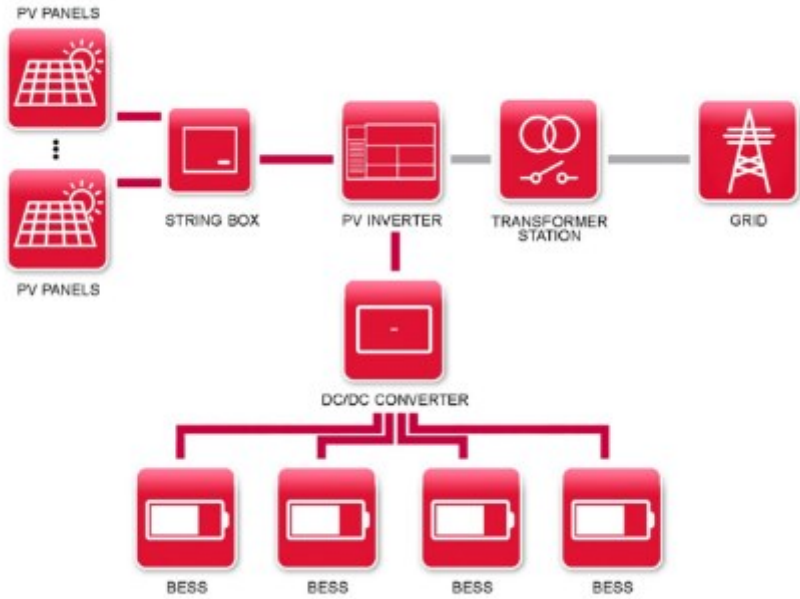
Storage inverter for 1300 and 1500V BESS

STORAGE 3Power C Series and HV C Series

With +55 GW of liquid-cooled power converters supplied worldwide, Ingeteam applies now this cooling technique to its PV & storage inverters. This storage inverter offers the highest power density in a single power block, for 1,500V battery storage systems.



- > **Max. Power: 3,825 kVA and 3,930 kVA**
- > **IP65 thanks to its liquid cooling system**
- > **Max. Efficiency: 98.9%**
- > **IEC and UL versions**
- > **Inverter for PV or battery systems**
- > **Power density: 492 kW/m³**



DC/DC converter for 1500V BESS

STORAGE Play DC-DC

Utility scale solution for stand-alone or PV-coupled 1500V energy storage systems.

Modular design

It features a modular design that combines up to four 90 A power conversion modules that could operate in parallel or independently. Thus, providing 360 A of total current. This modularity means that a single DC/DC converter could be connected to one battery system or to two or four independent battery systems / racks. Parallel battery energy storage systems could be added without limitation, increasing dramatically the number of hours of capacity of the overall system.

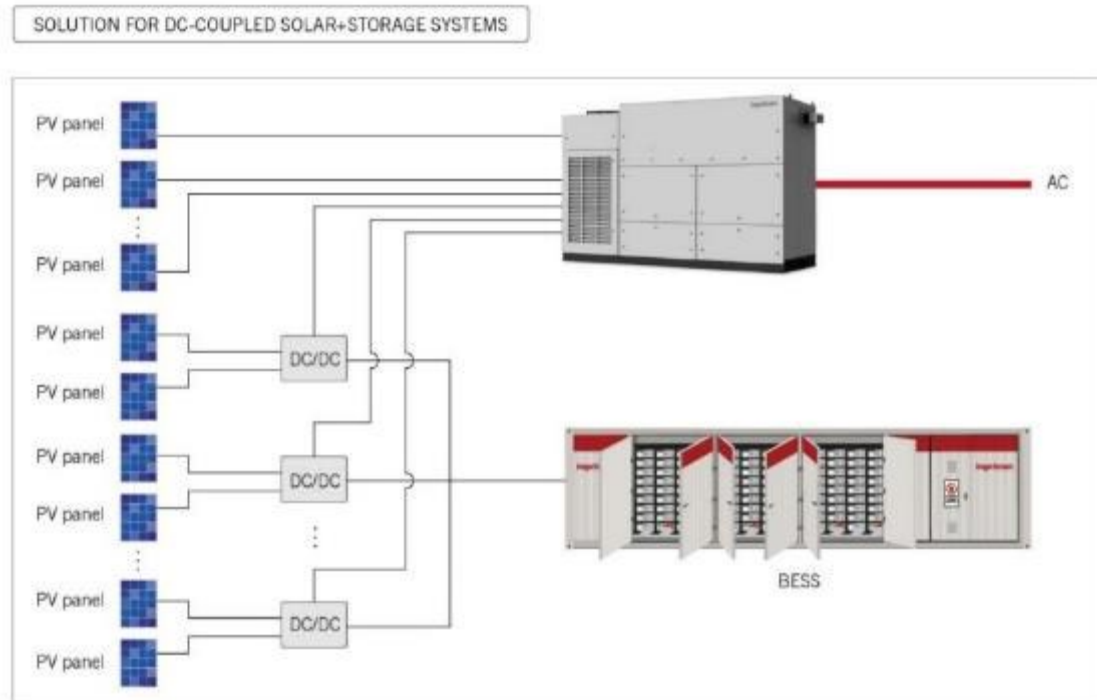
BESS augmentation strategy

This converter allows for deploying a modular BESS augmentation strategy to compensate battery degradation over time.

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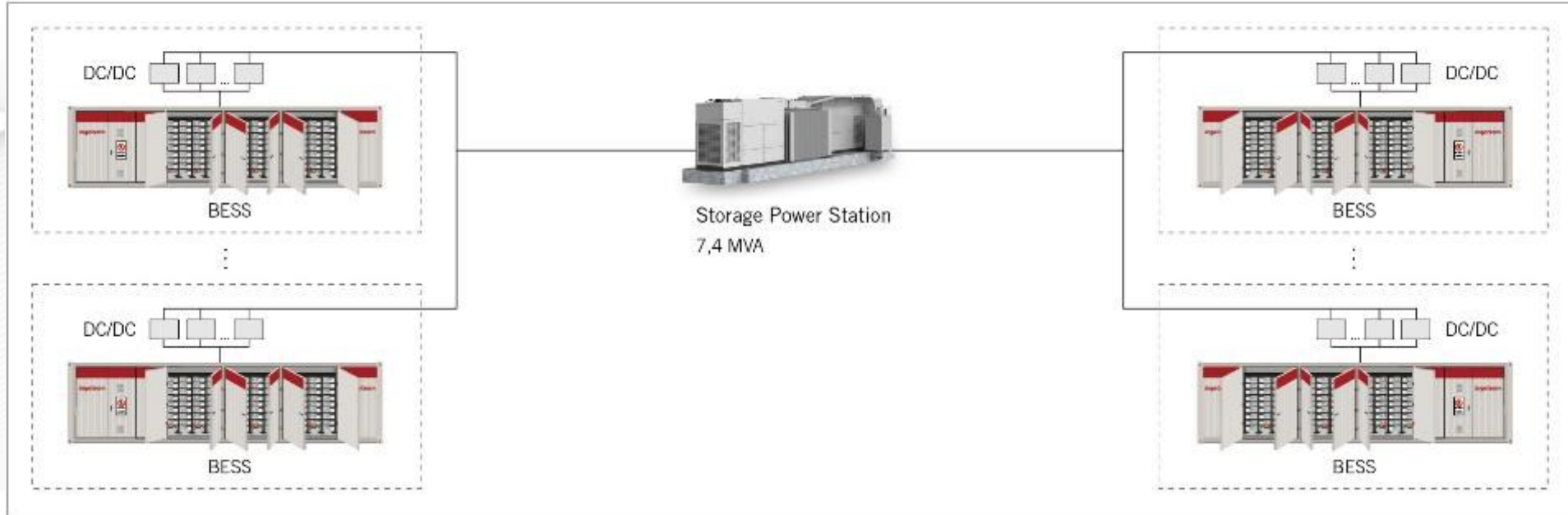
DC/DC converter



- > Bidirectional buck-boost converter
- > 360A total output current (4x90A power modules)
- > Modular design: 4 power modules to connect to 1, 2 or 4 independent BESS
- > Three-level topology
- > Rack-level battery management
- > PV input optional

STORAGE Play DC/DC

SOLUTION FOR BATTERY CONTAINERS WITH A SINGLE OUTPUT:
converters with battery input and DC bus input in parallel



SOLUTION FOR INDEPENDENT RACKS:
Converters with DC bus input in parallel



AC/DC string inverter for 1500V BESS

STORAGE 3Play 350 TL

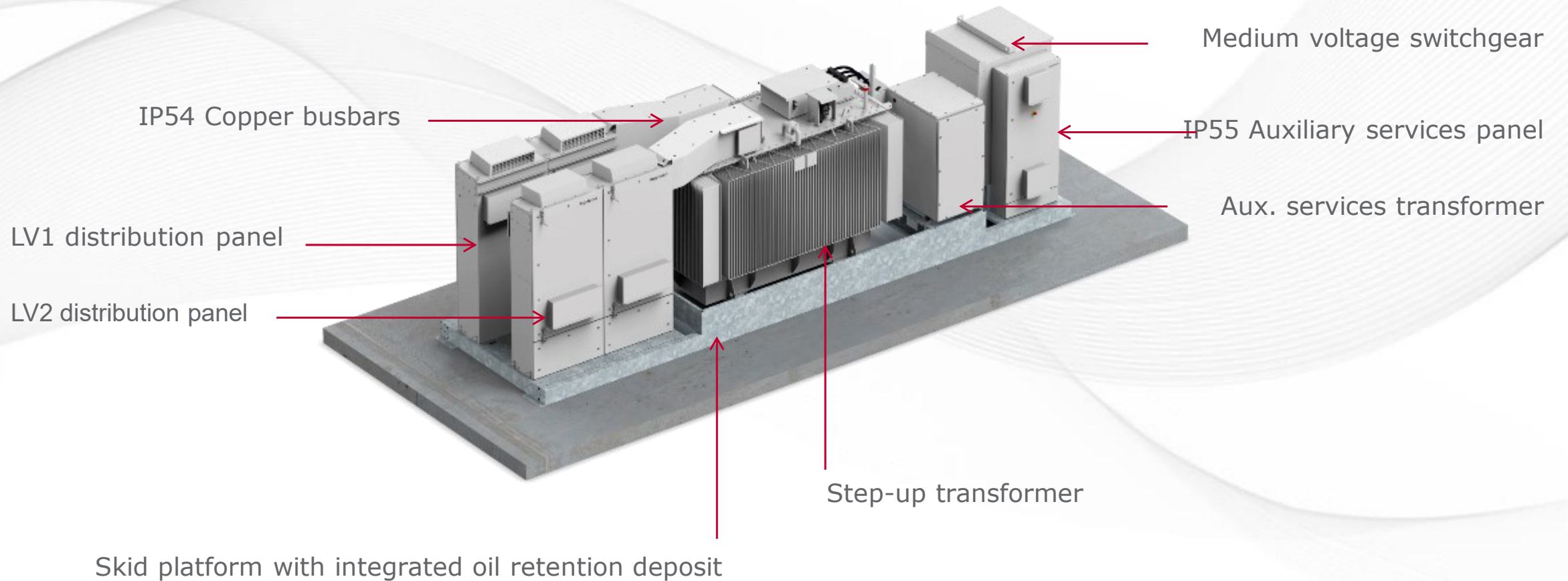
Utility scale solution for 1500V energy storage systems.



- > Discharge power up to 350 kVA
- > AC Voltage range 400-800 V
- > Max. efficiency 99.05%
- > IP 66 / Nema 4
- > Parallel DC connection
- > 8,4 MVA Central Station with up to 28 inverters

String Station 3Play 350TL series

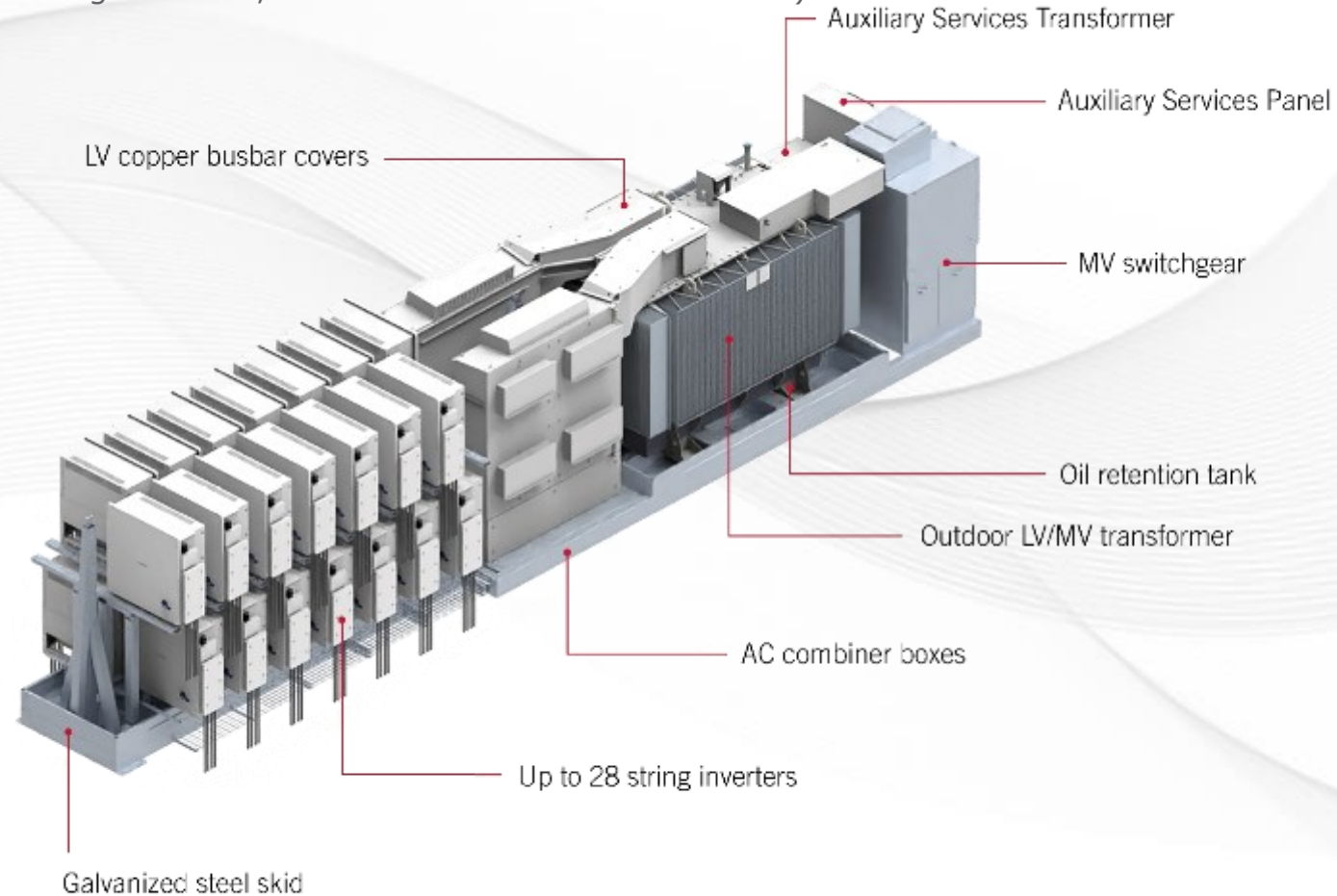
Up to 9 MVA with 32 inverters



Virtual Central Station 3Play 350TL Series

8,4 MVA up to 2 x 14 inverters

(Optional up to 9,6MV with 32 string inverters, 28 on board + 4 close to the FSK)



Coupling strategies for solar + storage hybrid projects



**Distributed
configuration**

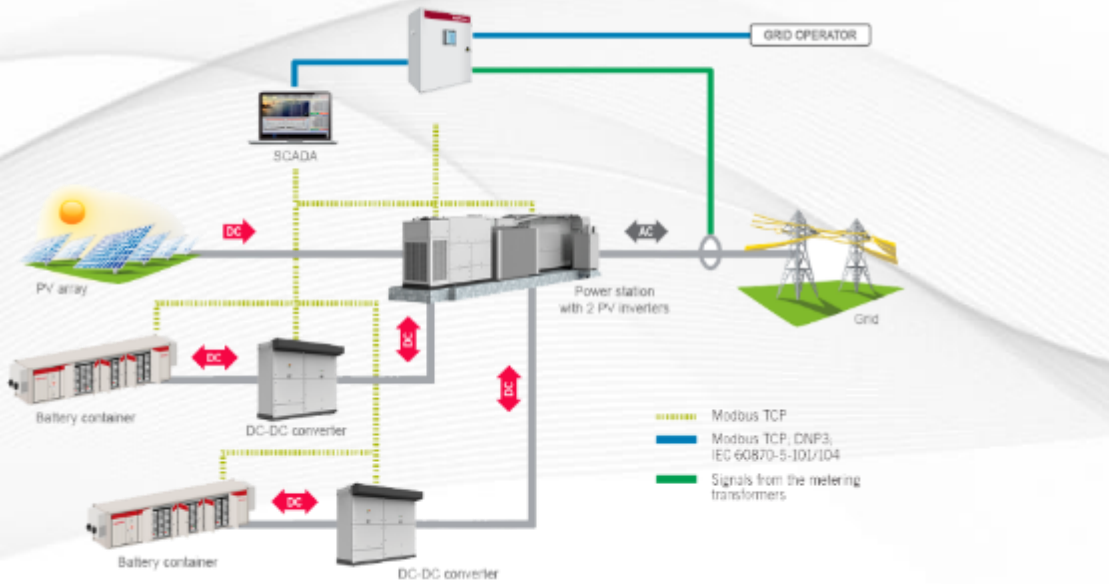


**Centralized
configuration**

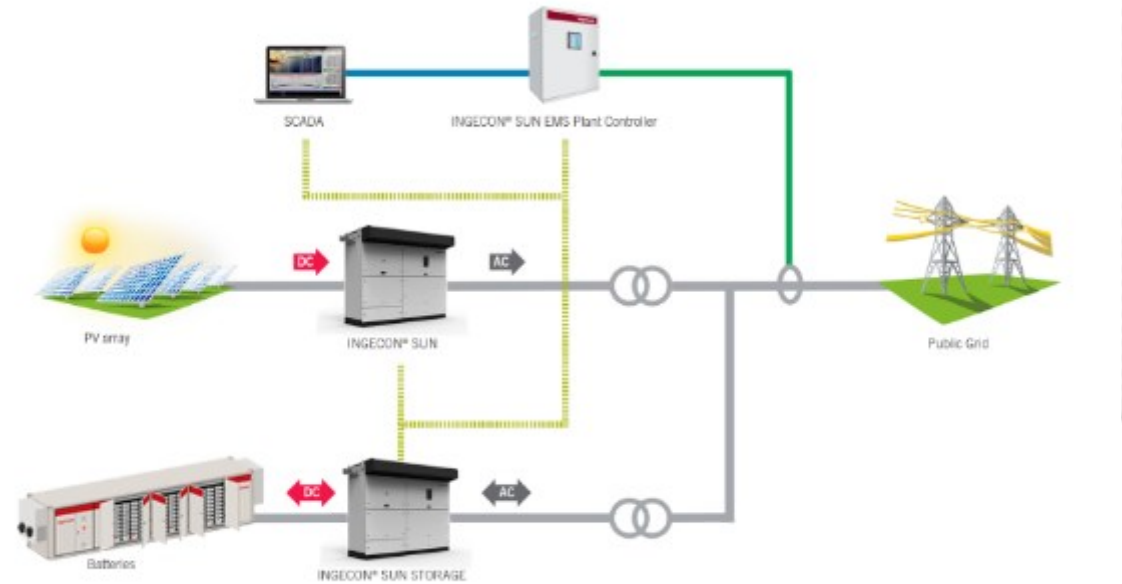
- > **Layout: Distributed vs. Centralized**
- > **Technology: DC/DC vs. DC/AC coupling**
- > **What is the best Storage Power Conversion Strategy?**

Standard solar + storage turnkey solution

DC coupling



AC coupling



- ✓ Buck - boost DC/DC required
- ✓ Lower CAPEX eliminating BESS MV transformer
- ✓ Slightly higher efficiency (~1%) BESS Energy
- ✓ Less flexibility in ancillary services

- ✓ Great flexibility in ancillary services

Making smarter your renewable power plant

Power Plant Controller / Multi-Plant Controller

These PPCs allow the grid operator to manage the operation of the power plant, while guaranteeing the quality and stability of the electric system.

Different control solutions:

- ❖ **Power Plant Controller.** PPC to manage and control power generation plants.
- ❖ **Multi-Plant Controller.** Master PPC for hybrid systems such as wind+BESS, solar+BESS or wind+solar+BESS.

- > **In-house development**
- > **O&M work station**
- > **PLC**
- > **Power analyzers**
- > **Communication switch**
- > **Protections**



INGECON SUN Monitor

Ingeteam's monitoring application

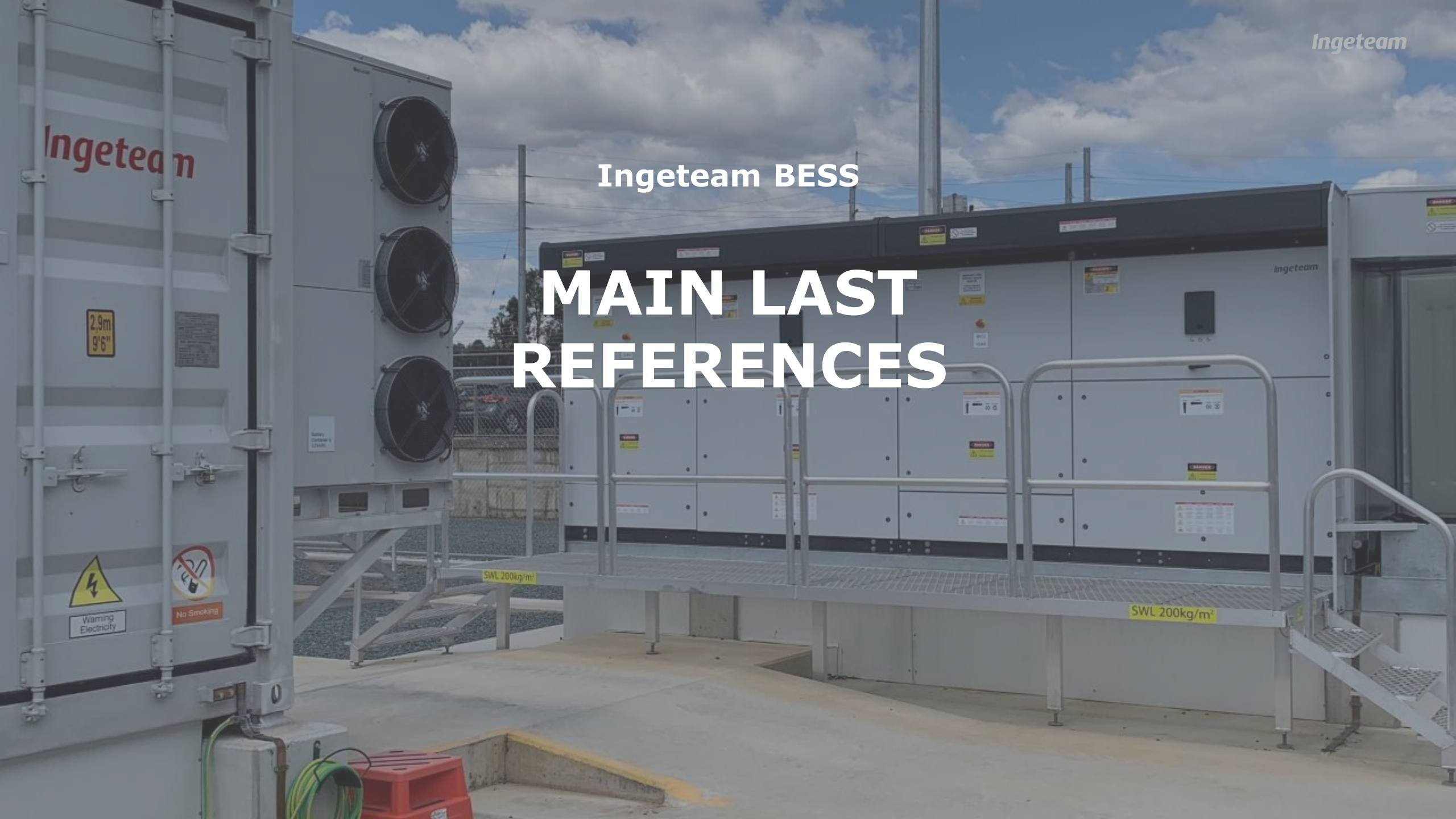
Suitable for all kind of PV and hybrid solar-plus-storage systems



- > Energy generation, consumption & storage
- > Self-consumption systems
- > Grid-tied systems
- > Stand-alone systems
- > Alarms notification
- > Real-time production
- > Regular email reports
- > Historical data

Ingeteam BESS

MAIN LAST REFERENCES



Main 2023-2024 references under construction

Romania 48 MW / 4h

Sweden 110 MW / 1h

USA 260 MW / 2h

Germany 100 MW / 1h

Chile 200 MW / 5h

Scotland 50 MW / 1h

England 50 MW / 2h

Guyana 30 MW / 2h

Australia 60 MW / 2h

Italy
Stand alone project

EU largest BESS project

Under commissioning

220MW – 880MWh
Water cooled batteries–LFP
Installation grid-connected

- > **Functionality:**
Capacity market
- > **Scope of supply:**
Power Conversion System
Control
Installation supervision
Commissioning

Texas (USA) Linked to solar farm

Under commissioning

110MW – 200MWh
Indoor air-cooled batteries–LFP
Installation grid-connected

- > **Functionality:**
Confidential
- > **Scope of supply:**
Power Conversion System
Control
Battery system
Installation supervision
Commissioning

Whitelee – Scotland (UK) Linked to wind farm

UK largest onshore wind farm

50MW – 50MWh
Water cooled batteries–LFP
Installation grid-connected

- > **Functionality:**
 - Renewable Penetration & Management
 - Frequency Regulation
- > **Scope of supply:**
 - Power Conversion System
 - Battery system
 - Control
 - Installation supervision
 - Commissioning
 - Maintenance services

Puertollano (Spain) Linked to solar farm

EU largest Green H2 production plant

5MW – 20MWh
Water cooled batteries–LFP
Installation grid-connected

100MWp PV Power
20MWh LFP batteries
20MW Green H2

- > **Functionality:**
 - Renewable Penetration & Management
 - Frequency Regulation Market
 - Energy Shifting
 - Ramp-rate control
- > **Scope of supply:**
 - Power Conversion System
 - Control
 - Battery system
 - Electromechanical installation
 - Commissioning
 - Maintenance services

Arañuelo III (Spain) Linked to solar farm (DC coupled)

Spain's first hybrid (solar+storage) plant

3MW – 9MWh
Air cooled batteries–LFP
Installation grid-connected

40MWp of bifacial PV modules
9MWh LFP batteries

- > **Functionality:**
 - PV Clipping Recapture
 - Energy Shifting
 - Ramp-rate control
- > **Scope of supply:**
 - Power Conversion System
 - Control
 - Battery system
 - Civil works
 - Electromechanical installation
 - Commissioning
 - Maintenance services



Isle of Wight (Southern UK) Linked to gas generation

Black Start - Synthetic inertia

8,5MW - 4,72MWh

- > **Functionality:**
BESS in GTG for Black Start -
Synthetic inertia - Grid code
fullfilment
- > **Scope of suply:**
Power Conversion System
Control

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www.ingetteam.com