BESS Business Introduction
In China, for Asia
Grid connected energy storage applications

- **Load leveling** 平抑负荷
  for generation utilization 发电厂应用
  10-1000 MW, 1-8h

- **Spinning reserve** 备用
  In case of line loss 防止断电
  10-500 MW, 0.25-1 h

- **Load center** 负荷中心

- **Integration of Renewables** 新能源接入
  1-100 MW, 1-10h

- **Stabilization** 稳定系统
  0.1-5 MW, 5 min

- **Frequency regulation** 调频
  1-50 MW, 0.25-1h

- **Peak shaving** 削峰填谷
  0.5-10 MW, 1h

- **Industry/Large commercial** 工业、大型商业
  1-1000 MW, 1-8h

- **Residential/Small commercial** 民用或小型商业
  1-100 kW, 2-6h

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PCS for Energy Storage Design Components
Leveraging ABB’s product strengths & expertise

Transformer

Protective Relay

PLC Based Control

AC/DC Circuit Breaker

Inverter Module
# Energy Storage Integration

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<th>System Components</th>
<th>Description</th>
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<td>Converters</td>
<td>Wide range of leading edge converters systems</td>
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<td>Batteries</td>
<td>Optimal battery technology for every application</td>
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<td>Control systems &amp; algorithms</td>
<td>Integrated EssPro Grid control system enables manual and automatic operation</td>
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<td>Protection equipment</td>
<td>State-of-the-art protection systems for AC and DC equipment</td>
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<td>Transformers and switchgear</td>
<td>LV, MV, &amp; HV switchgear ensures safe and reliable grid connection. Full range of transformers for any local standard</td>
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<td>Modular and scalable</td>
<td>Scalable &amp; flexible systems facilitate easy and safe operation</td>
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ABB’s EssPro™ Power Conversion System
System Sizes from 10 kW to 50 MW

Indoor Units | Outdoor Enclosures | Outdoor system solutions
ESS Container Design View - ISO 20’ Container Solution with Inverters, cooling, controls, breakers, transformer

- PCS100 Inverter Lineups
- AC & DC Circuit Breakers
- Step up Transformer
- Control Cabinet
- Fans and Ventilation
- Disconnect and Ground Switch
ESS Container Design View – ISO 40’ Container Solution with Inverters, cooling, controls, breakers, transformer
ABB Energy Storage Experience
100kW ESS Pro Taiwan Project

- **Customer Requirement**
  - Provide support for micro-grid during interruption of electric supply
  - Power flow control
  - Island mode and black start function

- **ABB Solution**
  - 150kW standard cabinet
  - Control unit integration locally
  - Remote control function

- **User Benefit**
  - ESS provide power supply during interruption of grid
  - Black start function
  - Power flow control of micro-grid

- **Location**
  - Taiwan, China

- **Status**
  - Installed in 2011
ABB Energy Storage Experience
10*250kW ESS Pro SGCC Project

- **Customer**
  - SGCC

- **Customer Requirement**
  - Smooth renewables output power (wind and solar)
  - Peak shaving
  - Frequency regulation
  - Flow battery

- **ABB Supply Scope**
  - ESS, transformer, circuit breaker and controller (PLC)

- **Status**
  - Installed in 2012
ABB Energy Storage Experience
2*200kW ESS Pro Indonesia Project

- **Application**
  - Grid connection
  - Integration of renewable energy

- **Location**
  - Indonesia

**Status**
- Installed in 2011
ABB Energy Storage Experience
100kW ESS Pro Flow Battery Project – Korea & Slovakia

- Application
  - Grid connection
  - Integration of renewable energy

- Location
  - Slovakia & Korea

- Status
  - Installed in 2012
ABB Energy Storage Experience
2MW ESS Pro Raypower Project

- Application
  - Frequency Regulation
  - A123 battery

- Location
  - Beijing, China

- Status
  - Installed in 2013
  - Running
ABB Energy Storage Experience
250kW ESS Pro Jereh Project

- Application
  - Micro. Grid
  - Frequency Regulation
  - Power Quality

- Location
  - Yantai, China

- Status
  - Installed in 2014
  - Ran on site in Xianjiang, China
ABB Energy Storage Experience
3x2.5MW ESS Pro Raypower Project

- **Application**
  - Frequency Regulation
  - Li-iron battery

- **Location**
  - Shanxi, China

- **Status**
  - Installed in 2015
  - Running
ABB Energy Storage Experience
500kW ESI Jewei Project

- **Application**
  - Peak Shaving
  - Battery Secondary Usage
  - Li-ion battery

- **Location**
  - Tianjin, China

- **Status**
  - Installed in 2015
  - Running
ABB Energy Storage Experience
500kW ESS Pro NEC Project

- **Application**
  - Power ramp control of solar generation
  - Li-ion battery
  - Outdoor solution

- **Location**
  - Kumamoto, Japan

- **Status**
  - Installed in 2015
  - SAT is planning
ABB China Project Under Execution
31MW ESS Pro of Hokkaido Chitose International Airport Solar Power Station

Customer
- Hokkaido Electric Power Company

Customer Requirement
- Smooth solar output power
- Integration of 66kV solar and ESS system
- Remote monitor and maintenance
- Li-ion Battery

ABB Supply Scope
- ESS Transformer, Circuit breaker and Control Unit (PLC)
- High voltage integration
- Remote monitor and maintenance
- Outdoor installation cabinet

Status
- Plan to complete installation at the end of year 2016
ABB Energy Storage Experience
Power Converters Global Outlook - Total > 100MW > 60 units
Power and productivity for a better world™