

Black Start

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MINGYANG SMART ENERGY Group



MINGYANG SMART ENERGY

明阳智能

地蕴天成·能动无限



PROMOTION

PROGRESS ON MESHED HVDC
OFFSHORE TRANSMISSION
NETWORKS

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MINCYANG SMART ENERGY

明阳智能

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1

MingYang Group

2

Business Case

3

Key Technology

4

On-site Implementation Plan

Contents

-  Founded in 1993
-  No. 1 offshore turbine OEM in China
-  No. 3 OEM in China & No. 7 globally
-  Own 1.0 GW wind farms asset around world
-  **23 GW** accumulated wind turbines installation
-  16 manufacturing facilities

**Source: China Energy News*

1993

Electrical
Products



2006

Wind Power



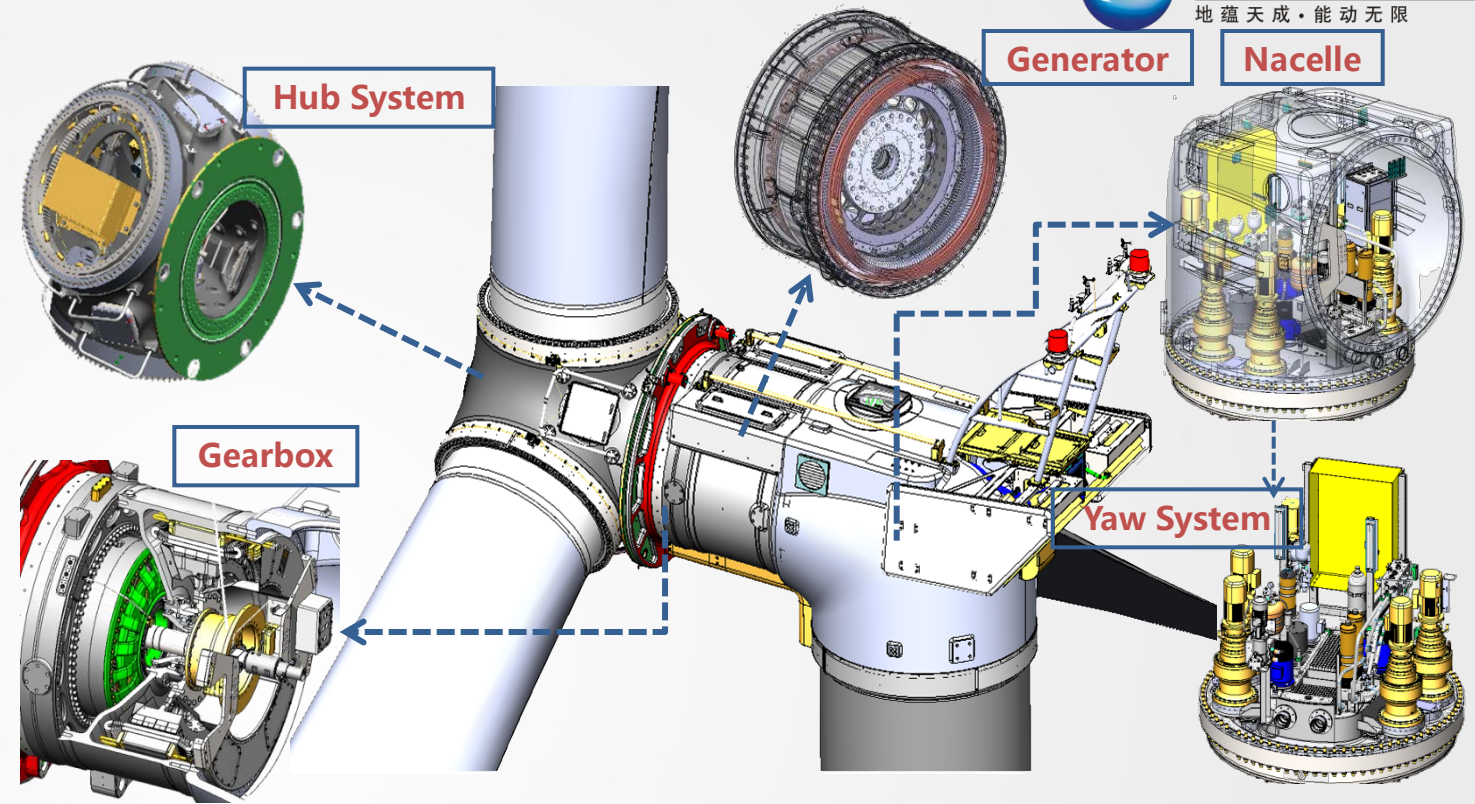
2017

Smart Energy



MingYang Group

Product Series & Structure Diagram



3.0MW Onshore

Offshore

SCD3.0-100-2A

SCD6.0/6.5-140-2B+

SCD3.0-110-3A

SCD5.0-140-1B

MySE3.0-112-S

MySE5.5-155-S

MySE3.0-121-3B

MySE5.5-181-S

MySE3.0/3.3-135-3B

MySE7.0-158-S

MySE3.2-145

8~10MW



Full-range Capacity



Environmental Adaptability



Different Blade Length



Multiple Hub Height



Typhoon Resistance



Low/High Wind Speed

MingYang Group

Typhoon Resistance

Conventional GFRP Nacelle

Characteristics :

Larger nacelle

Effect :

Large windward area, extremely vulnerable under the typhoon condition , which can cause the exposure of electrical system directly in the storm, thus causing the damage of nacelle.



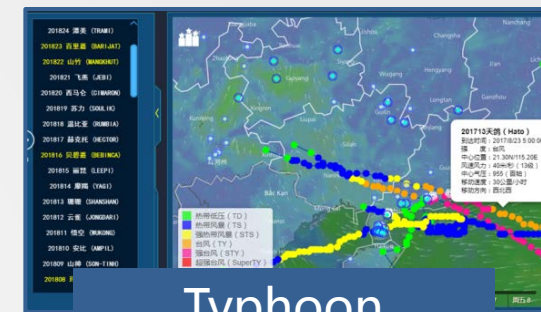
MySE All Steel Nacelle :

Characteristics :

Smaller volume, smaller windward area, higher strength, better toughness

Effect :

Typhoon resistance certification, higher reliability.



Typhoon Forecast



Fault PreWarning



Project Monitoring

More than 1,000 wind turbines in the typhoon area, and they have suffered many typhoon each year.



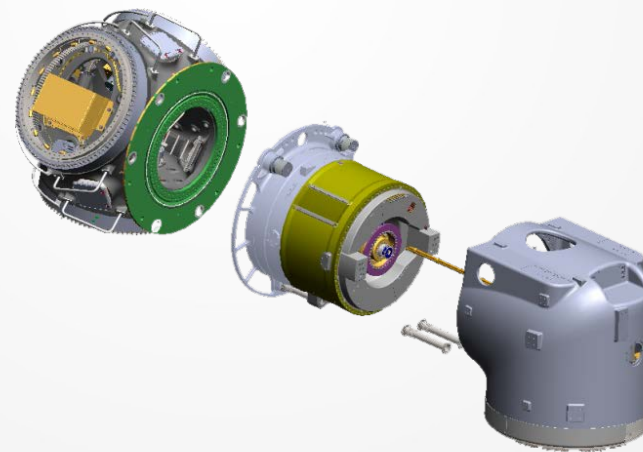
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Mechanical failure with turbine installed more than 3 month



Sunbathing of onshore/
offshore wind turbines

Rust surface of gear box after lubricating



Enlarged image of motor oil mud, iron scrap (rust)

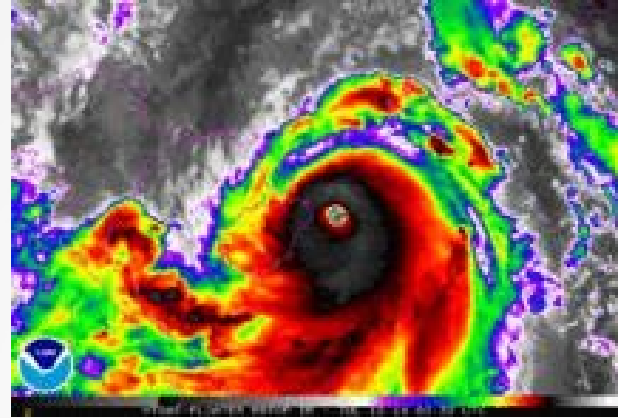
Need to lubricate once each month

Bearing Roller Failure

Humidity increases in electrical cabinet

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After typhoon



If the wind turbine lost powered for more than 2 hours, it is necessary to use the small diesel to charge the wind turbine;

For long-term power outages need to be heated and dehumidified before operation, which takes 3~4 hours.

The cost of using the maintenance ship is about 10,000 RMB per day.



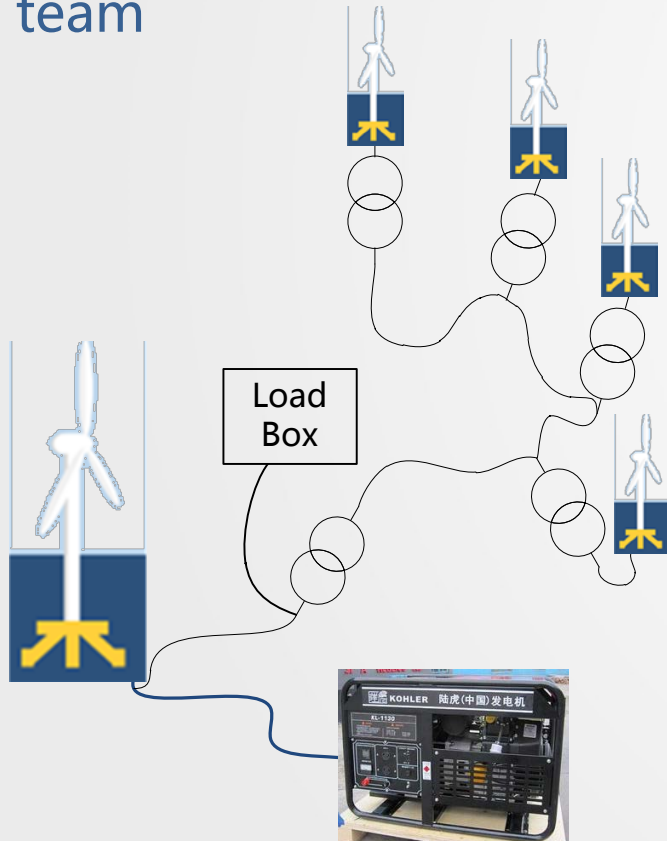
Humidity increases in electrical cabinet

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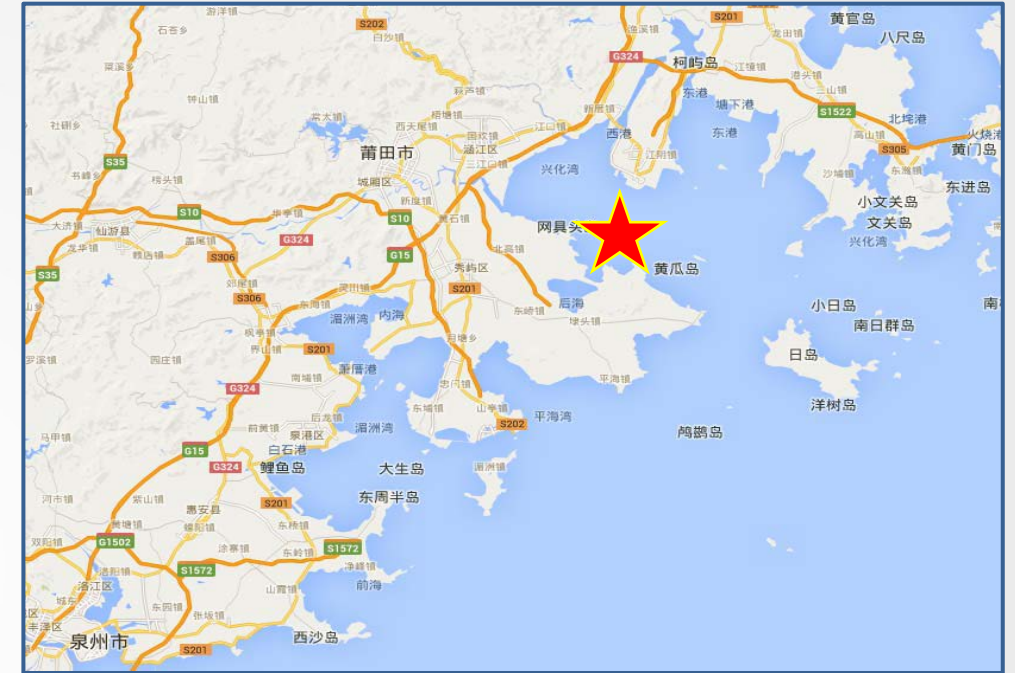
Pre Dynamic Commissioning

Dynamic Commissioning takes at least one hour

For wind farm with 55 sets of 5.5MW WTGS will take more than 10 days with one commissioning team



Pre Dynamic
Commissioning
Car



5.5MW wind turbine can earn 52.8 thousand RMB per day

Wind farm with 55 sets of wind turbines can earn 2.90 million RMB per day

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Function of VSG(Virtual Synchronous Generator) technology

Virtual Inertia

High/Low Voltage Ride Through

High/Low frequency Ride Through

Phase Ride Through



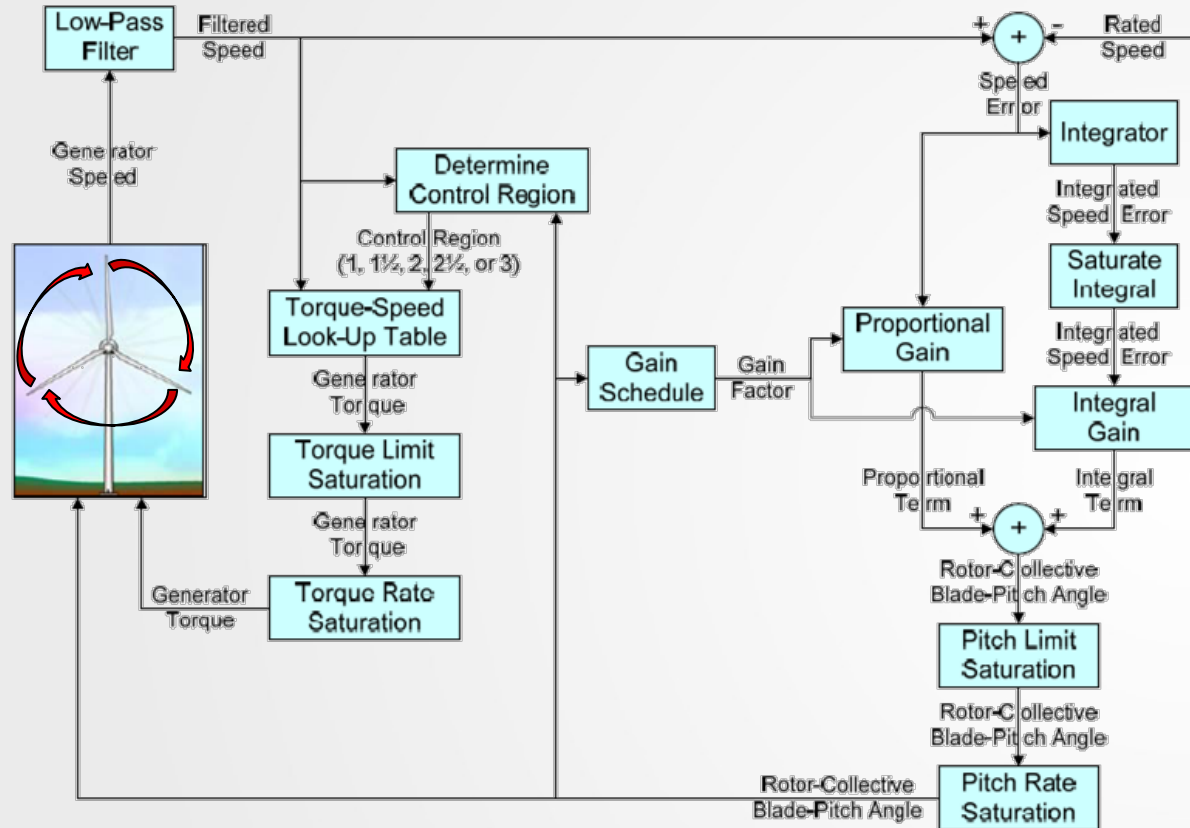
Frequency regulation

Voltage regulation

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Key Technology

Inertia of rotating blade as Energy Storage

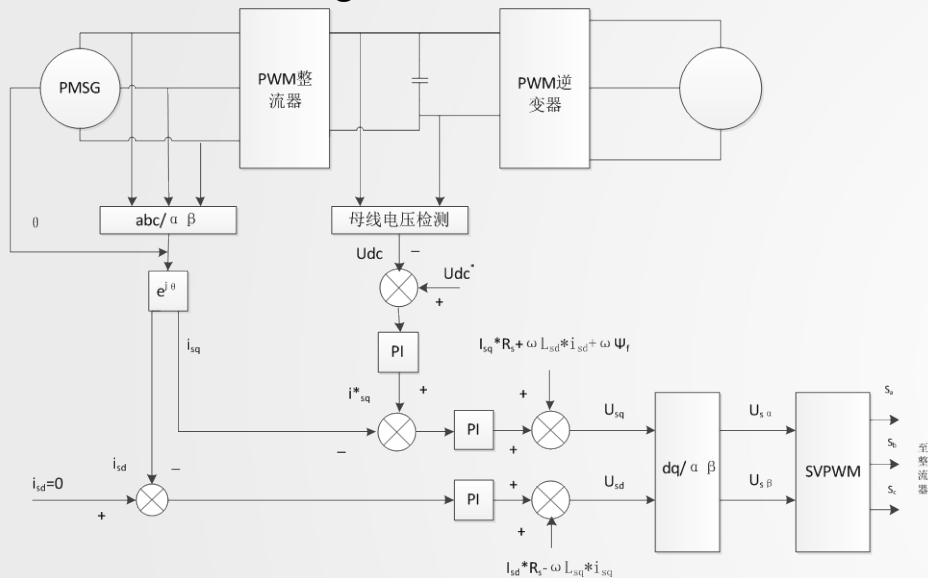


Risk:

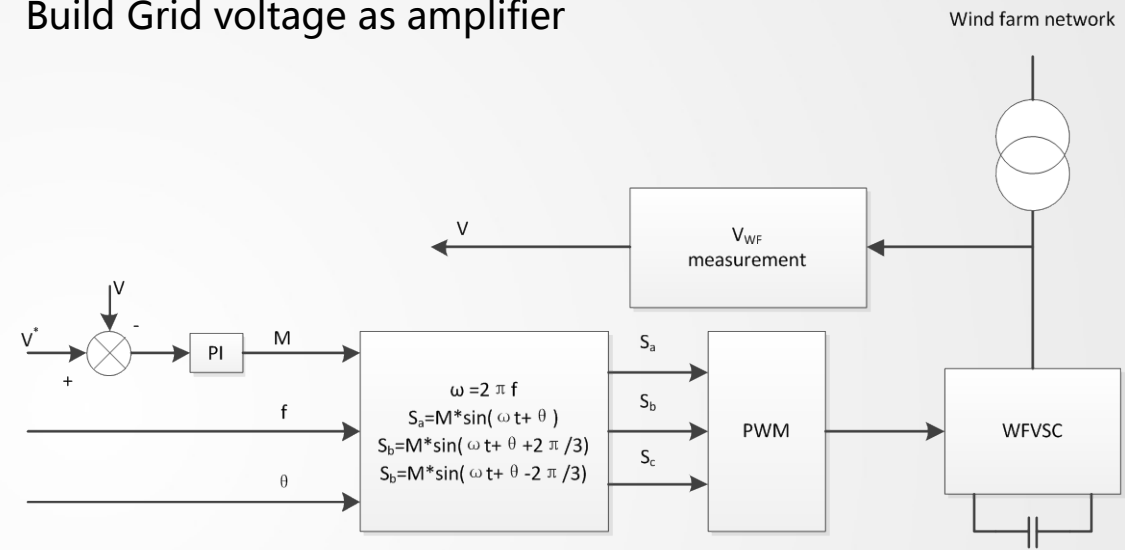
Over Speed of Wind Turbine

Over Voltage/Over Current of Converter(Hard Start Transit)

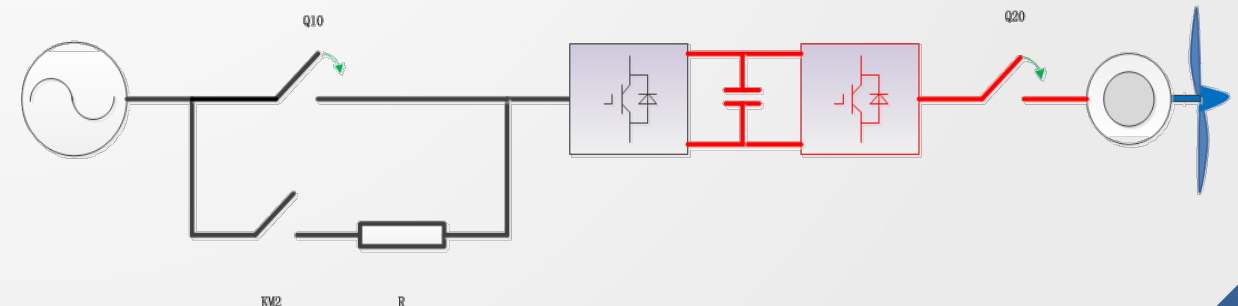
Control DC Voltage



Build Grid voltage as amplifier



- ❑ Close grid side and gen side breaker
- ❑ Pitch the blade angle, increase gen speed slowly, and use the generator inducing voltage to charge the DC bus capacitor;





Key Technology

Test Result

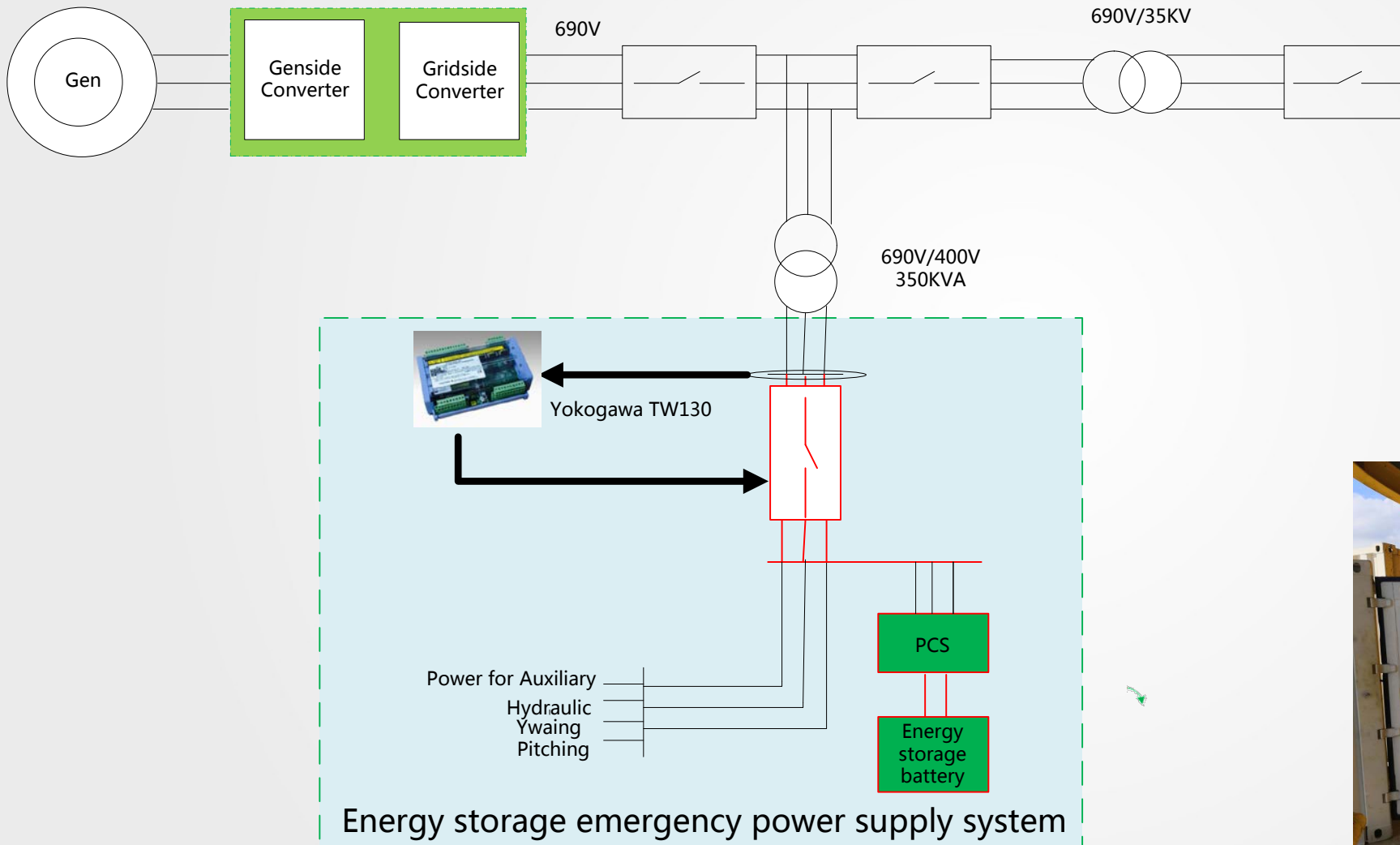
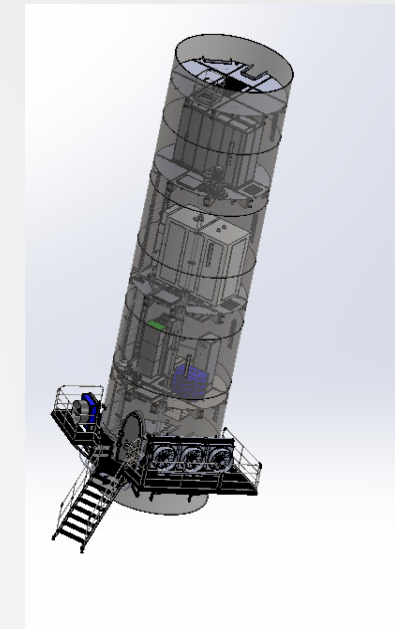
Our lovely Alejandra will show test result in next presentation





On-site implementation plan

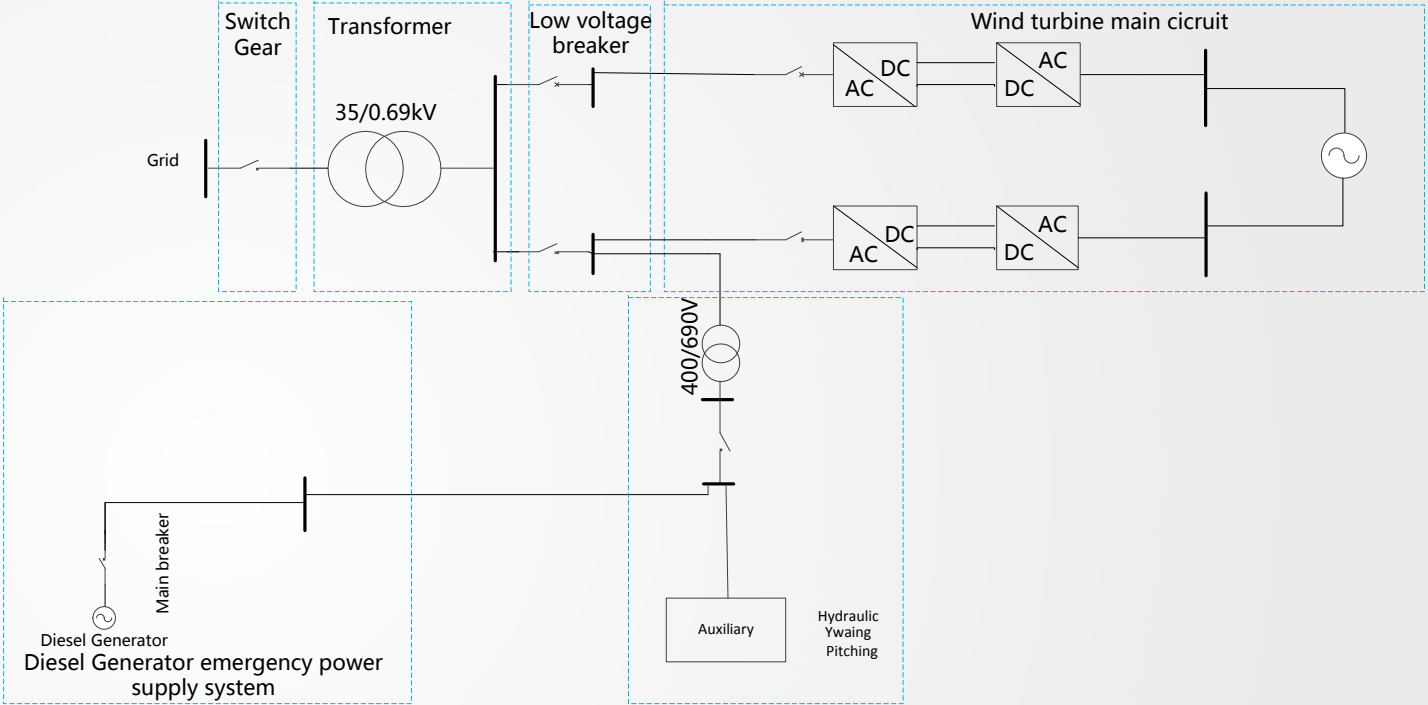
Energy storage emergency power supply system





On-site implementation plan

Diesel Generator emergency power supply system



Spread the Benefit of Smart Energy



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✓ High Power Production
✓ High Reliability
✓ Low LCOE