



DNV GL Energy
2020-12-08, Mathias Steck



DNV GL Renewables Germany – Mathias Steck

DNV·GL

Journalist und Bauingenieur, seit 18 Jahren beim DNV GL:

- Spezialist für Onshore- und Offshore Wind Fundamente und Türme
- Head of Group Civil Engineering Renewables Certification
- Regional Manager Renewables und Energy Advisory APAC (Mumbai, Bangalore, Shanghai, Singapore)
- Regional Manager Digital Hub Asia (Singapore)
- Geschäftsführer GL Garrad Hassan Deutschland GmbH (Hamburg)



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A global quality assurance and risk management company

OUR PURPOSE

To safeguard life, property
and the environment

OUR VISION

A trusted voice to tackle
global transformations

DNV GL provides a lot of reports, guidelines and data



DNV GL: a quality assurance and risk management company



150+ years

100+ countries

100,000 customers

12,000 employees

5% of revenue spent on R&D

MARITIME

A white silhouette of a large cargo ship sailing on the water.

OIL & GAS

A white silhouette of an offshore oil and gas platform.

ENERGY

A white silhouette of three wind turbines and a high-voltage power line tower.

BUSINESS ASSURANCE

A white silhouette of a city skyline with several buildings.

DIGITAL SOLUTIONS

A white silhouette of a person sitting at a desk with a computer monitor and keyboard.

70% of DNV GL's business is related to energy

2300 energy experts

In wind, solar, grids, storage and energy management

30 offices

30 energy offices, presence in all continents

90 years

90 years' experience in the power industry, including 40 years in wind energy and energy management and more than 20 years in solar

Creating confidence across the energy value chain

WIND



SOLAR



TRANSMISSION & DISTRIBUTION



STORAGE



ENERGY MANAGEMENT



FINANCE



Helping to accelerate the energy transition



Generation

**Transmission &
Distribution**

Use

Global services to the renewables and power sector

Advisory services

- Power systems and renewables
- **Data analytics, digitalization** and software
- Asset performance and monitoring
- Energy use and management

Inspection, testing, verification and certification

- Wind
- Solar
- Energy storage
- Power grids

Our customers (Excerpt)



WIND



65GW

We have analysed over 65GW of operational wind projects

2400+

We conduct over 2,400 wind inspections each year

1GW

We are technical advisor to the lenders on Fosen, the world's largest onshore wind farm at 1GW

90%

90% of certified offshore wind farm projects utilized our project certification

No. 1

Our BLADED tool is the world's best-selling design tool for wind turbines

1st

We conducted the world's first hardware-in-the-loop testing for an entire wind farm

Broad and deep expertise to help financiers, investors and developers



STRATEGY/FEASIBILITY

- > Strategic development
- > Market penetration assessment
- > Feasibility studies
- > Market studies
- > Technology evaluation & cost studies
- > Wind resource studies
- > Energy production assessment

DEVELOPMENT

- > Energy production assessment
- > Capex & opex assessment
- > Technology selection
- > Technical due diligence
- > Environmental impact & assessment

ENGINEERING

- > Tender preparation
- > Bid evaluation
- > Technology assessment
- > Contract review
- > Project due diligence
- > Environmental & social due diligence
- > Market pricing evaluation

CONSTRUCTION

- > Lender's engineer
- > Interface & risk management
- > System acceptance

OPERATION

- > Inspections
- > Forecasting
- > Operations & maintenance strategy
- > Operations monitoring
- > Performance optimization
- > Refurbishment & decommissioning assessment
- > Lifetime extension
- > Project due diligence
- > Energy trading

Broad and deep expertise in onshore wind projects



FEASIBILITY

- > Market intelligence
- > Strategic advice
- > Technology evaluation/Technology qualification
- > Certification of wind turbines and components

DEVELOPMENT

- > Concept selection
- > Measurements
- > Resource and energy optimization
- > Technical due diligence
- > Pre-construction energy assessment
- > Certification of wind turbines and components

ENGINEERING

- > Project engineering optimization
- > Operation and maintenance planning
- > Turbine consulting
- > Interconnection review
- > Grid code compliance
- > Certification of wind turbines and components

CONSTRUCTION

- > Construction optimization
- > Project management
- > Construction monitoring
- > Banks' engineer
- > Certification of training systems
- > Certification of wind turbines and components

OPERATION

- > Asset management optimization
- > Operation and maintenance optimization
- > Performance and condition monitoring
- > Inspections and audits
- > Operational energy assessments
- > Project portfolio due diligence
- > Certification of wind turbines and components
- > Certification of service providers
- > Life-time-extension

Broad and deep expertise in offshore wind projects



FEASIBILITY

- > Market intelligence
- > Strategic advice
- > Technology evaluation/Technology qualification
- > Certification of wind turbines, offshore substation and cables

DEVELOPMENT

- > Concept selection
- > Measurements
- > Resource and energy optimization
- > Technical due diligence
- > Pre-construction energy assessment
- > Certification of wind turbines, offshore substation and cables

ENGINEERING

- > Project engineering optimization
- > Operation and maintenance planning
- > Turbine and support structures consulting
- > Interconnection review
- > Certification of wind turbines, offshore substation and cables

CONSTRUCTION

- > Construction optimization
- > Monitoring and marine warranty
- > Project management
- > Construction monitoring
- > Banks' engineer
- > Certification of wind turbines, offshore substation and cables

OPERATION

- > Asset management optimization
- > Operation and maintenance optimization
- > Performance and condition monitoring
- > Inspections and audits
- > Operational energy assessments
- > Project portfolio due diligence
- > Certification of wind turbines, offshore substation and cables
- > Condition monitoring systems

SOLAR



> 20

We have more than 20 years' experience in the solar industry helping investors, project developers, system owners, utilities and equipment manufacturers

6000+

We have supported over 6,000 solar projects worldwide from residential to utility scale

2016

DNV GL acquires GreenPowerMonitor (GPM), a global solar monitoring company, founded in 2006 in Barcelona, Spain

14.5GW

GPM, a DNV GL company, manages 14.5GW of solar PV plants, which includes 25 mega-plants of over 100MW each

Broad and deep expertise in solar projects



FEASIBILITY

- > Feasibility studies
- > Utility grid integration
- > Environmental permitting
- > Component technology reviews
- > Component qualification testing
- > Type and component certification of PV inverters

ENGINEERING & DEVELOPMENT

- > Due diligence / Independent engineering
- > Owner's engineering
- > Energy assessment
- > Pre-construction engineering
- > Interconnection support
- > Project certification

CONSTRUCTION & COMMISSIONING

- > Due diligence/ Independent engineering
- > Owner's engineering
- > Construction oversight
- > System testing and inspection
- > Project certification and grid code compliance
- > Declaration of conformity
- > Module batch testing
- > Project certification

OPERATION

- > Performance validation
- > Resource and energy forecasting
- > Existing asset consulting, inspections and decommissioning
- > Refinancing and mergers and acquisitions advisory services
- > Forensic investigations
- > Monitoring, control and asset management
- > Project certification

STORAGE

1st

DNV GL released the industry's first annual Battery Performance Scorecard in 2018, providing independent ranking and evaluation of battery vendors

>1MW

DNV GL's Flex Power Grid Lab offers new controlled AC (up to 1MW) and DC (up to 1.3MW) independent storage/converter testing services

2019

Commercial introduction of energy storage asset monitoring and operations solution as part of GPM Horizon software for solar and wind assets

1/3

1/3 of successful battery storage projects in the UK 2016 Enhanced Frequency Response auction were advised by DNV GL

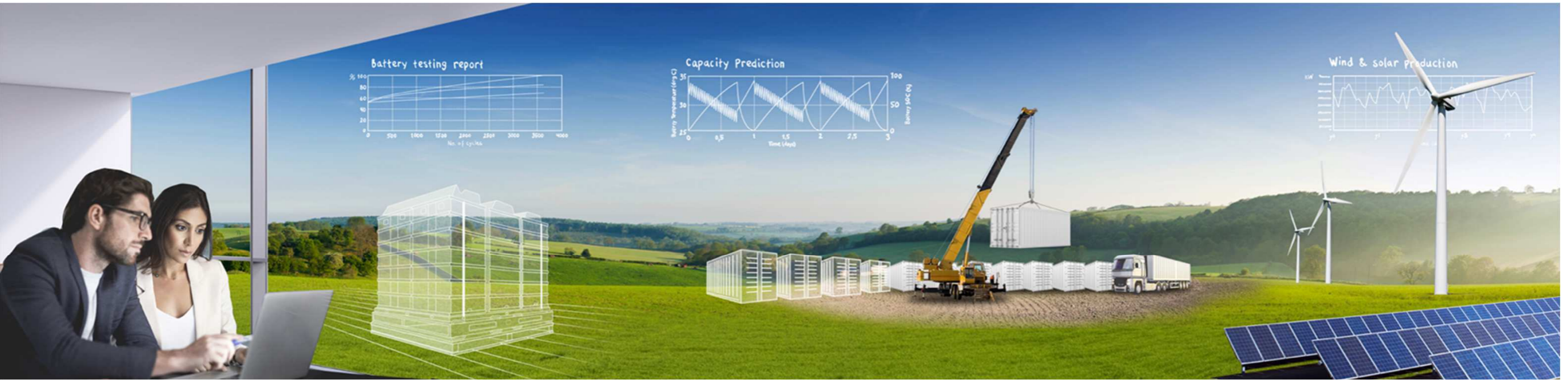
5m

More than 5 million hours of energy storage battery testing have been logged at our NY-BEST Test & Commercialization Centre since its opening in 2014

1GW+

Testing from DNV GL's Battery Performance Scorecard accounts for more than 1GW of battery chemistries deployed globally

Broad and deep expertise in storage projects



FEASIBILITY

- > Market & regulatory intelligence
- > Utility grid integration
- > Sizing, technology selection and business case modelling
- > Technology & controls review & verification
- > Technical and commercial training courses
- > GRIDSTOR & standards development
- > Type- and component certification
- > Grid code compliance
- > Energy storage certification

TESTING

- > Battery cell & module performance testing
- > Battery fire safety
- > Power electronic converter performance testing
- > Battery controls validation testing & development
- > Battery life estimation

DEVELOPMENT & ENGINEERING

- > Battery degradation assessment & warranty verification
- > Resource, energy & financial optimisation
- > Supplier due diligence
- > Project and site safety analysis & code compliance
- > Procurement and contracting support
- > Technical reviews of civil, electrical, controls and grid interconnection works
- > Project certification

CONSTRUCTION

- > Certification of equipment
- > Owner's engineer
- > Bank's engineer
- > Factory acceptance tests
- > Site acceptance tests

OPERATION

- > Inspection, test and assessment of asset condition, performance & remaining lifetime
- > Asset monitoring, operation and optimization
- > Refinancing, mergers & acquisitions
- > Forensics
- > Life extension and upgrades

TRANSMISSION & DISTRIBUTION

> 100

We are a trusted technical advisor for more than 100 large grid companies on transmission and distribution developments throughout the asset lifecycle

> 50

Our Energy Advisory team has been involved in over 50 large offshore wind farm projects, including AC/DC connection to onshore transmission systems up to 320kV

No. 1

No. 1 in transmission system control simulation, with test centres in Berlin and Duisburg

2020

We coordinate PROMOTioN, the largest energy project in the EU Horizon 2020 Programme which will contribute to a meshed offshore HVDC grid in the North Sea

Broad and deep expertise in power grid projects



FEASIBILITY

- › Vision and strategy
- › Roadmap development
- › Compliance checks
- › Power system analysis
- › Generation interconnection studies

DEVELOPMENT

- › Comprehensive project planning
- › Power system planning
- › Energy market design
- › Project risk management
- › Stakeholder communication strategy

ENGINEERING

- › Basic design support/review
- › Functional description and specification based on relevant standards
- › Manufacturer assessment and selection
- › Tender support
- › Verification and acceptance plans

CONSTRUCTION

- › Accredited testing and certification of equipment
- › Accredited communication protocol and cyber security testing
- › Verification of power systems
- › Validation of project conformity
- › Owner's engineer
- › Quality assurance and quality checking

OPERATION

- › Diagnostics and performance measurement
- › Power failure investigations
- › Asset management processes review and optimization
- › Asset condition and remaining lifetime assessment
- › Smart energy services
- › Digital system operation support
- › Training of operating and maintenance staff

Our experience in digitalization and data analytics

22GW

We manage over 18GW of real-time operational data from solar PV, wind and storage assets

65GW

We have analysed over 65GW of operating wind assets

>7.9TWh

Our data-driven energy efficiency implementation services have saved over 7.9TWh over the last 3 years

>12,500

Our analysts review over 12,500 wind, solar and grid sensors each week

>99%

DNV GL's Smart Cable Guard detects the location of electrical cable network failures with an accuracy of greater than 99% and can prevent 65% of such failures

Integrated monitoring solution – provided by DNV GL



 **GreenPowerMonitor**
a DNV GL company

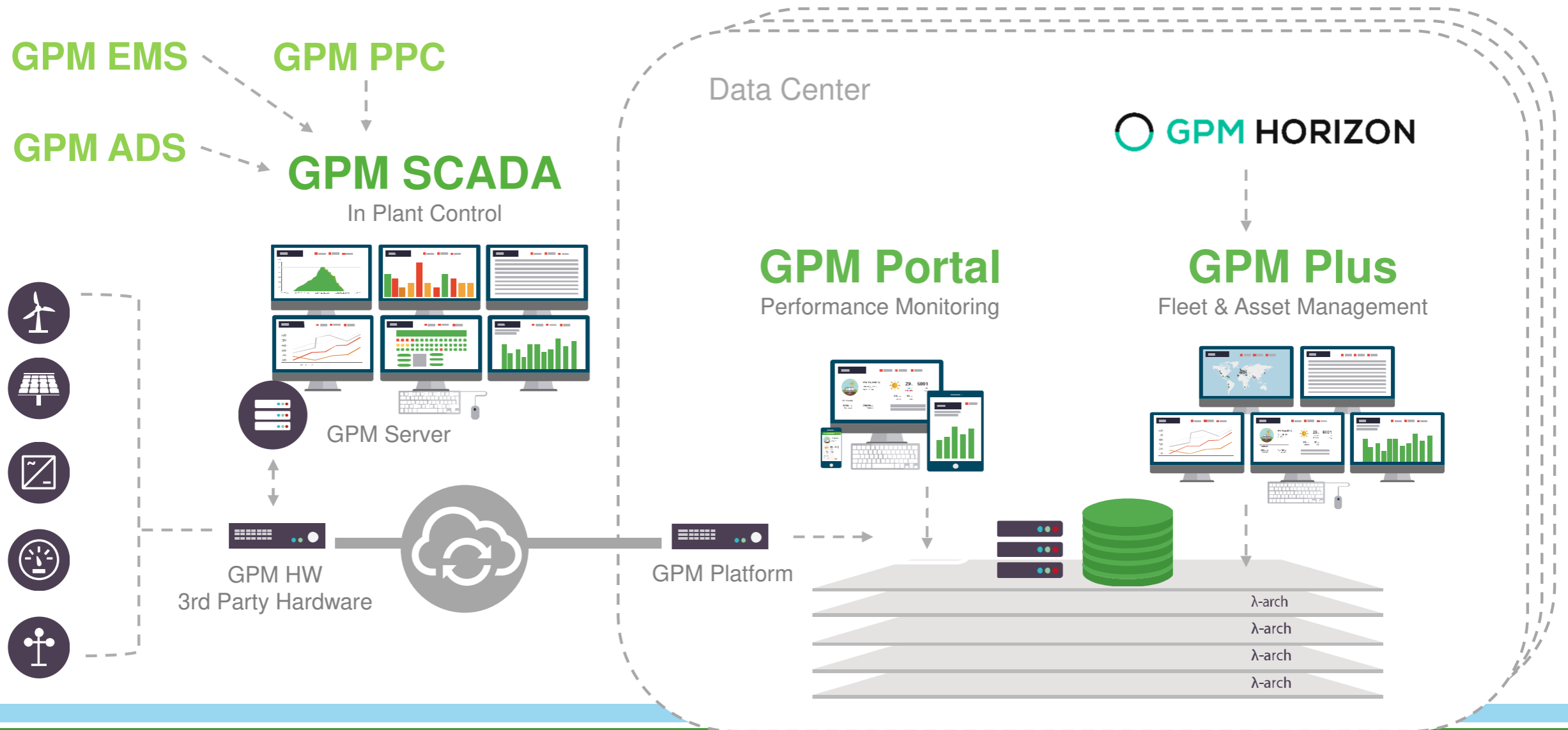
GPM HORIZON

One tool. A world full of possibilities

Web-based monitoring and asset management platform for renewable energy portfolios.

GPM Horizon has multi-technology capabilities and supports solar, wind, and storage.

Architecture overview





Global impact for a safe and sustainable future

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SAFER, SMARTER, GREENER



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