This is DNV GL
Taking the broader view
Organized to maximise value for our customers

MARITIME

OIL & GAS

ENERGY

BUSINESS ASSURANCE

SOFTWARE

RESEARCH & INNOVATION
Short facts about DNV GL
Highly skilled people across the world

150 years of operation
300+ offices
100 countries
16,500 employees
Industry focused organization

DNV GL Group
Headquarter: Oslo, Norway
Group President & CEO: Henrik O. Madsen

63.5%

DNV Foundation
Headquartered in Hamburg, Germany

Mayfair
Headquartered in Høvik, Norway

36.5%

Software

Maritime
Headquartered in Hamburg, Germany

Oil & Gas
Headquartered in Høvik, Norway

Energy
Headquartered in Arnhem, Netherlands

Business Assurance
Headquartered in Milan, Italy

Global Shared Services
An Energy Powerhouse
Uniting DNV KEMA, GL Garrad Hassan, GL Renewables Certification
Combined strength to support Energy customers

3000 energy experts help customers throughout the electrical power industry realise efficient, reliable and clean energy for today and the future.

*Renewables Certification services are offered separate from remaining services to ensure impartiality and to fulfil accreditation requirements of DIN EN ISO IEC 17065:2013.
Transition to a safer, smarter and greener energy future

- Increasing global demand for energy
- Integration of energy markets
- Climate change & extreme weather
- Increasing role of renewables
- Security and ageing assets
Assisting companies in solving the energy trilemma

Affordability

Reliability

Sustainability
A global service portfolio

- Power testing, inspections and certification
- Renewables certification
- Renewables advisory
- Energy advisory
- Sustainable energy use
An energy technology powerhouse

- **No. 1**: in high power and high voltage testing
- **25**: Leading certification body with more than 25 standards and guidelines published
- **Largest**: independent technical advisor on renewable energy
- **3000**: independent energy experts
- **10**: laboratories including world’s largest high power and high voltage test lab
- **90**: years experience, including 30 years in energy efficiency and wind energy
Power testing, inspections and certification
Power testing, inspections and certification

Accredited testing and certification of equipment for transmission and distribution of electricity

- High power testing
- High voltage testing
- Battery and energy storage testing
- Inspections
- Calibration and metering

- World renowned laboratories, largest short circuit laboratory in the world
- Tests are based on internationally accepted standards (like IEC and IEEE)
- Extreme testing capacity in development for ultra-high power equipment (1200kV) for super grids
High power testing

Independent testing and certification of medium, high and ultra-high voltage components used in transmission and distribution power networks

- No. 1 and largest High Power Laboratory in the world
- Largest High Power Laboratory in the Americas
- EUR 70 million investment for extreme 800 kV testing market
- Up to 1200 kV circuit breaker testing
- Unique testing method for large power transformers
- Complete type test of LV assemblies
- High Power Test Laboratories located in Arnhem, Prague and Chalfont
- Fully accredited Laboratories
- KEMA Type Test Certificate, Report of Performance
High voltage testing

Independent testing and certification of medium, high and ultra-high voltage components used in transmission and distribution power networks

- Largest commercially operated High Voltage Laboratory in the world
- Specialized in high voltage AC and HVDC cable testing
- Test bays for PQ tests
- Various trailers for on-site commissioning testing

- High Power Test Laboratories located in Arnhem, Prague and Chalfont
- Fully accredited Laboratories
- KEMA Type Test Certificate, Report of Performance
Battery and energy storage testing

Partnership with NY-BEST to launch a test and certification facility to serve the rapidly emerging energy storage industry

Battery and Energy Storage Technology (BEST) Testing and Commercialization Center will perform testing from single cells to megawatt systems and will focus on:

- Performance validation and certification testing
- Environmental testing capabilities
- Battery lifetime testing

- Battery and Energy Storage Testing located at Eastman Business Park in Rochester, NY
- Accredited laboratory
Inspections

Inspection of high voltage tests performed at non-DNV GL laboratories as per international standard

- Top-technical inspection services
- Component and Power System Verification

- Inspection Services based in Arnhem and Shanghai Accredited laboratory
- Fully accredited service
Calibration and metering

- High-voltage and high-current calibration
- Certification of kWh meters
- Verification of calibration services for kWh meters for domestic and industrial use

- Calibration and metering services based in Arnhem
- Fully accredited services
- KEMA Certificate, Report of Performance
Renewables certification
Renewables certification

Accredited certification of equipment (products), services and projects in renewable energy

- Component certification
- Prototype certification
- Type certification
- Project certification

Certification is based upon:
- Internationally accepted standards
- Various national certification systems
- DNV standards and GL guidelines

- Onshore wind
- Offshore wind
- Wave and tidal
- Solar/PV
Component certification

Accredited certification of components, structures and systems in renewable energy

- Design verification / assessment / evaluation
- IPE / manufacturing evaluation
- Component certification

Certification is based upon:
- Internationally accepted standards
- Various national certification systems
- DNV standards and GL guidelines

- Onshore wind
- Offshore wind
- Wave and tidal
- Solar/PV
Accredited type certification of wind turbines is tailored to the stages of the wind turbine product development:

- Type Certification according to GL guidelines
- IEC/DNV Type Certification
- IEC/GL Type Certification

- Concept evaluation
- Design evaluation/assessment
- Prototype approval
- Type certification for 0-series
- Type certification for serial production

Type certification is based on IEC or GL certification scheme including:

- Review of design documentation
- Independent analyses
- Full-scale component testing
- Prototype measurements and testing
- Manufacturing evaluation/ PE
- Maintenance of Type certificates
Project certification

Modular service provision for onshore and offshore wind projects based on client’s needs

- Site specific design conditions
- Site specific design assessment
- Surveillance during production
- Surveillance of transport and erection
- Surveillance during commissioning
- Project certificate
- Periodic monitoring

- Longest history in wind energy
- Own standards/guidelines
- Biggest workforce and highly qualified teams
- Avoiding damages/reducing financial risks/securing investment

Certification is based upon:

- International standards
- Various national certification systems
- DNV standards and GL guidelines
- Customer’s specifications
Renewables certification - Research & Innovation

Development of standards and new services

Innovative methods to achieve highest quality in certification

- Research, Joint Industry Projects (JIP)
- Development Accompanying Assessment (DAA)
- Development of DNV GL, national and international standards
- Innovative assessment methods and tools

Support certification in:
- Onshore and offshore wind
- Wave and tidal energy
- Solar/PV

Expertise in:
- Aero- and hydrodynamics
- Load and control analysis
- Materials, structural analysis
- Mechanical engineering
- Electrical engineering
- Risk assessment
Renewables advisory
Renewables advisory

Analysis, advice, testing, data collection, and trusted expert opinions for the renewables markets

- Project development & engineering
- Asset operations & management
- Measurements
- Solar
- Offshore

Core expertise:
- Onshore wind
- Solar PV & CSP
- Offshore and floating wind
- Marine energy
- Renewables policy and markets

Services include:
- Energy production assessment
- Technical due diligence
- Short-term forecasting
- Resource and turbine measurements
- Support for engineering and implementation of technology
- Software
Renewables advisory - Project development

Analysis, strategy, and trusted expert opinions for the renewables markets

- World leaders in energy assessments with more MW analysed than any other technical advisor - cutting-edge tools for lowest uncertainty
- Delivering our unique expertise and experience into the hands of the decision-makers
- Unparalleled global breadth, depth and scale

Key services:
- Energy production assessments
- Environmental and permitting services
- Strategic and policy services
- Training
- WindFarmer world-class software

Core expertise:
- Wind analysis
- Complex flow modelling
- Offshore and floating wind
- Renewables policy and markets
- Wind farm design & development
Renewables advisory - Project engineering

Analysis, advice, and trusted expert opinions for the renewables markets

- More due diligence assessments (1500+) than any other technical advisor
- Unparalleled global breadth, depth and scale
- Customer-focused and solution-oriented
- Commercially-focused advice
- Spans the entire project lifecycle

Key services:
- Design review
- Project inspection and audit
- Technical due diligence for financing or acquisition in onshore and offshore wind, solar PV, wave and tidal
- Advice on market benchmarks
- Project management and support

Core expertise:
- Civil engineering
- Electrical engineering
- Turbine engineering
- Commercial & financial
- Inspection and audit
- Project management
Renewables advisory - Asset operation & management

Helping clients get the most from their renewables projects

- Maximise generation through analysis and optimisation
- Maximise revenue through forecasting for traders
- Minimise costs through predictive maintenance and O&M optimisation
- Experience matters: >50 GW of operational analysis; forecasting for >40 GW; Inspections for >700 turbines per year; Largest independent provider of wind farm SCADA

Key services:
- Turbine inspections
- Operational analysis and optimisation
- Operational energy assessment
- Short-term forecasting – wind and solar power
- SCADA solutions – wind and solar
- 24x7 asset management

Core expertise:
- Inspection
- Turbine data analysis
- Turbine data processing and storage
- Meteorology and statistical modelling
Renewables advisory - Measurements

Analysis, advice, testing, data collection and trusted expert opinions for the renewables markets

Experience includes over 1,000 turbine tests
- Unparalleled global breadth, depth and scale
- Passionate and experienced staff
- One-stop-shop service
- Customer-focused and solution-oriented

Key services:
- Accredited type testing delivered globally
- Warranty testing and performance verification
- Measurements to support product optimisation
- SCADA masts and instrumentation
- Wind resource mast and campaigns
- Mast installation project management & EPC
- Remote sensing

Core expertise:
- Onshore wind
- Solar PV & CSP
- Offshore and floating wind
- Marine energy
- Measurements, analysis and modelling
Renewables advisory - Solar

Broad range of solar consulting services from a highly experienced and trusted advisor

- Experienced team has provided services for over 2,000 solar projects worldwide from residential to utility scale
- Accurate energy estimates and O&M cost modelling
- Thorough technology reviews to understand risks
- Global breadth and experience with international markets and standards
- Services for PV and CSP technologies

Key services:
- Energy assessment
- Independent engineering
- Technical due diligence
- Project implementation assistance
- Technology review
- Project management and support

Core expertise:
- Resource assessment & modelling
- Due diligence and strategic support
- Solar technology and standards
- Support for engineering and implementation of technology
- Solar power plant inspection
Renewables advisory - Offshore renewables

Applying experience and expertise to help make offshore renewables a sustainable industry

- Maximising the value of our combined heritage
- Creating trust between stakeholders, policy makers, and the supply chain
- Transferring experience through our standards, RP’s and guidelines
- Leveraging on the depth and breadth of our service portfolio

Key services:
- Project development
- Project risk management
- Technology qualification
- Operation & maintenance
- Due diligence and strategic advice
- Modelling to optimise operations

Core expertise:
- Offshore wind construction and project operations
- Floating wind and marine energy
- Structures and geotech
- Installation vessels
- Offshore power transmission
Turbine engineering support
Turbine engineering support

Engineering assistance to new wind energy and marine renewables technology

Services:
- Technology evaluation
- Design load analysis
- Control system development
- Mechanical engineering design support
- Wave & tidal technical services

Software tools:
- Bladed software for integrated analysis of wind & tidal turbines
- Wavedyn software for analysis of wave energy convertors
Energy advisory
Energy advisory

An energy powerhouse, supporting the energy industry across the value chain, from policy to use, with strategic advise, planning, implementation and energy delivery optimization

- Market and policy development
- Power system planning
- Project management and technical services
- Operational excellence

Key deliverables:
- Business strategy across all markets
- Power system design and modelling
- Technology implementation services
- Operations and systems optimization

Innovation accelerators:
- Smart grids and smart energy cities
- Super grids and micro grids
- Energy storage and renewables
- Data analytics and cyber security
Market and policy development (MPD)

Unique insights into market design and the development of energy markets, providing defensible and sustainable business strategies

- Market policy, design, and regulatory support services
- Renewables market analysis and business impact advisory services
- Strategic market planning and due diligence services

Key services:

- Future market design and modeling analysis for electric and gas markets focused on bulk energy and retail markets
- Regulation, policy, advisory services assess business impact of current and future policy in regulated and deregulated markets
- Business & technology strategy developing sustainable revenues in new markets based on competitive analysis, benchmarking and risk assessed scenarios
Power System Planning (PSP)

State-of-the-art power flow modeling evaluating technology, economics and business case for generation, transmission and distribution investments

- Generation interconnection
- Long-term and short-term T&D Planning
- Balancing supply and demand
- Transmission congestion and economic assessment
- Expert design & engineering solutions

Key services:

- Transmission project feasibility studies addressing congestion and investment economics and due diligence services
- Generation interconnection, and renewable resources integration studies, addressing the optimum configuration of the grid interconnection
- B&D conceptual design, system modeling and reliability assessment with protection studies and transient stability analysis
Project Management & Technical services (PMT)

Ensuring high quality implementation services for the deployment of power projects with risk mitigation and management, leveraging new technologies

- Risk & quality management
- Grid technology solutions
- Climate change adaptation
- Large/complex project management and implementation support

Key services:
- Owners engineer services from basic design, system specifications, procurement support, contract development, and testing to ensure quality implementation
- Project Management (PMO) services for large/complex projects and programs
- Risk mitigated project management with unique technical services considering and assessing operational risks
Operational Excellence (OPE)

Optimization of operational systems to effectively operate and maintain an efficient and sustainable energy delivery business.

- Operational technology and cyber security systems advisory services
- Smart grid.smart meter and telecommunications network design
- Advance asset management
- Strengthening the grid

Key services:
- Power system operations and control systems architecture and telecommunications network design and testing services
- System integration of transmission, distribution grids, substation automation to end use using advance digital technology with integrated cyber security risk management
- End to end power system efficiency optimization using advanced asset management techniques
- Technology deployment roadmaps optimizing distributed energy resources
Sustainable energy use
Sustainable energy use

Advice, analysis, and implementation assistance for energy efficiency programmes and measures

- Policy advisory and research
- Program development and implementation
- Sustainable buildings and communities
- Industrial energy management

- Design and deliver turnkey energy efficiency programs that produce verifiable savings and meet utility goals
- Develop innovative approaches for data collection and analysis that extract more value and support policy decisions
- Reduce building operating costs, increase property values, manage risks and meet expectations of investors and customers
Program development and implementation

Advice, analysis, and implementation assistance for energy efficiency programmes and measures for utilities

- Turnkey programme staffing
- Energy opportunity assessments
- Direct install of measures
- Marketing & outreach
- Training & technical services
- Pilot and niche programmes

- Deliver turnkey energy efficiency programmes that transform markets
- Produce verifiable energy savings to meet utility objectives
- Create innovative, flexible solutions that respond to changing market conditions
- Achieve high customer satisfaction through commitment to customer service and continuous improvement
**Policy advisory and research**

Advice, analysis, and evaluation assistance for energy efficiency programmes and measures

- Technology, market assessments
- Conservation potential studies
- Programme design and planning
- Programme and portfolio evaluation
- Measurement and verification
- Interval load data analysis

- Deliver credible information to planners and policy makers for designing programmes, determining budgets, and establishing strategic priorities
- Produce proven framework, tools and quality control processes to support programme evaluation
- Continuously develop innovative approaches for data collection, forecasting, end-use estimation, data visualization, and engineering analysis
Sustainable buildings & communities

Technically-sound, practical sustainability consulting services for governments, architects, developers, building and business owners

- Climate action planning
- Energy master planning
- High performance buildings
- Sustainable building portfolios

- Provide conceptual design, advisory and commissioning activities to help set and achieve a building owner’s sustainability objectives
- Reduce operating costs, increase property values, identify and manage risks, and meet expectations of investors and customers
- Offer technical expertise and capacity building for multi-government associations and peer networks for climate action planning coordination
Industrial energy management

Advice, analysis, and implementation support to industrial end-users, leading to effective and sustained energy performance improvement

- Energy & carbon roadmaps
- Energy management system support
- Energy efficiency & carbon assessments
- Energy culture assessments
- Energy productivity management training
- Independent project assessment

- Utilise our proprietary Energy Saving Identification Tool (ESIT) to support identification, analysis, and documentation of energy saving opportunities
- Help corporate and plant managers define a credible position for energy and emission management
- Provide recommendations that lead to improved legal compliance, greater energy security, stronger competitiveness, and an enhanced corporate image