

Services Description

Go strong.

DNV serving the energy industry

| THIS IS DNV |

DNV is a global provider of services for managing risk. Established in 1864, DNV is an independent foundation with the purpose of safeguarding life, property and the environment. DNV comprises 300 offices in 100 countries, with 7 000 employees. DNV Energy is one of four business areas in DNV, alongside DNV Maritime, DNV Industry and DNV IT Global Services. Our vision is global impact for a safe and sustainable future.

DNV provides world-class expertise in technology, operations, management and risk. We combine our know-how into a professional service concept designed to safely improve the performance of your business. So you can go strong on all dimensions.

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DNV SERVICES TO THE ENERGY INDUSTRY

- ▶ Enterprise Risk Management
- ▶ SHE Risk Management
- ▶ Technology Qualification
- ▶ Verification
- ▶ Offshore Classification
- ▶ Asset Risk Management
- ▶ Training
- ▶ IT Risk Management
- ▶ Certification

| SERVICES DESCRIPTION |

TARGET SEGMENTS

Through these services, our teams of highly qualified professionals deliver cutting-edge solutions to customers across the industry:

- ▶ Deep and ultra deepwater field development
- ▶ MOUs and FPSOs
- ▶ Offshore and onshore pipelines
- ▶ Natural Gas/LNG
- ▶ Refining & petrochemicals
- ▶ Power sector
- ▶ Cleaner energy and renewables
- ▶ Arctic operations & technology
- ▶ Operations Excellence



Safeguarding and



The new risk agenda entails new challenges and opportunities for all players across the energy value chain. The **demand for energy** is increasing faster than ever before. At the same time the access to energy sources is getting increasingly difficult. With unprecedented **concerns for energy supplies** energy companies must venture into uncharted territories. Mounting local and global **environmental challenges** add to this already complex picture. All this spurs an unparalleled need for **new technologies, work processes** and **business practices**. This new risk reality belongs only to those who can master risk in all dimensions.

improving business performance

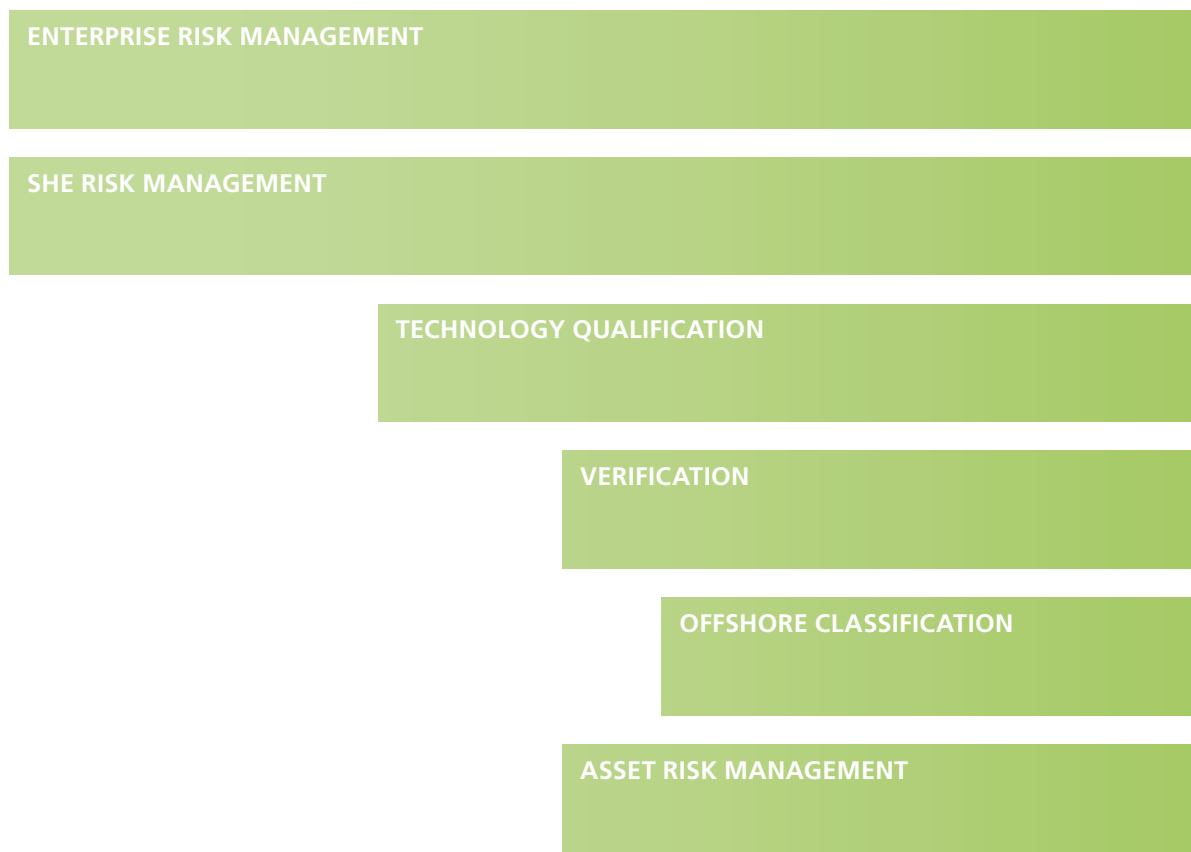
DNV offers the **whole range** of energy and process-related services. We provide world-class expertise in **technology, operations, management** and **risk**. But even more importantly, we combine our know-how into a professional service concept designed to safeguard and improve the performance of your business. Through our world-wide organisation we provide **global impact**, supporting you **all the way** from **strategic considerations** to **decommissioning**.

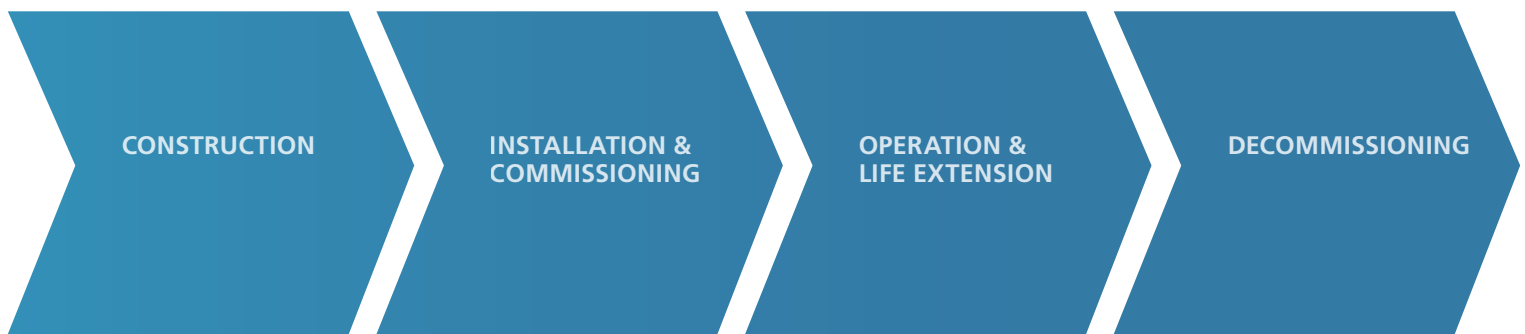
DNV – assisting companies in the energy industry along the entire life cycle to safeguard and improve business performance

PROJECT PHASES:



DNV ENERGY DELIVERIES:





We provide a complete understanding of your organisation's total risk exposure and suggest how to manage these risks in an integrated way.

We help you develop, implement, maintain and continually improve best practices in SHE management.

We help you ensure that new technology will function within specified limits and with an acceptable level of confidence.

Through a transparent, global and fully independent approach to verification, certification, quality surveillance and marine warranty, we help you reduce and manage risk, thereby increasing the likelihood of success.

We assure owners, authorities and other stakeholders that the facility complies with classification rules and requirements, enabling an optimum approach for both harsh and benign units.

We support you in responsibly obtaining maximum value from your facilities, equipment and people without compromising safety or the environment.

The importance of a complete picture based on in-depth knowledge

Complexity, uncertainty and change are prevalent within all business functions. As a consequence, the risk profile of every enterprise is constantly changing and evolving. DNV can help you identify, understand and manage each of the component risks, in order to maximise opportunities and avoid or mitigate losses.

Business strength in the energy industry has many dimensions. It's how you identify and capture opportunities. It's how you balance risk and returns. It's how you manage these risks in the face of growing complexity. It's how you push technology boundaries safely and cost-efficiently. It's how you step up to increasing environmental requirements and stakeholder expectations. It's how you operate in a highly competitive and truly global arena.

DNV provides world-class methodology and expertise in technology, operations, management and risk. But even more importantly, the know-how is converted into a professional service concept designed to safeguard and improve the operator's and supplier's business performance. This is our service portfolio to the energy industry:

- ▶ Enterprise Risk Management
- ▶ SHE Risk Management
- ▶ Technology Qualification
- ▶ Verification
- ▶ Offshore Classification
- ▶ Asset Risk Management

Our teams of highly qualified professionals deliver cutting-edge solutions with focus on the following industry sectors:

- ▶ Deep and ultra deepwater development
- ▶ MOUs and FPSOs
- ▶ Offshore and onshore pipelines
- ▶ Natural Gas/LNG
- ▶ Refining and petrochemicals
- ▶ Power Sectors
- ▶ Cleaner energy and renewables
- ▶ Arctic operations and technology
- ▶ Operations Excellence

The service portfolio is regularly reviewed and developed to determine its value to the market and fit with our strategic direction.

ENTERPRISE RISK MANAGEMENT

Complexity, uncertainty and change are prevalent within all business functions. Consequently, every enterprise has a continually evolving and fluctuating risk profile. Successful management of risk can be boiled down to one key principle: the application of robust systems by competent people.

DNV assists enterprises to identify, understand and manage each of the component risks, in order to maximise opportunities and avoid or mitigate losses. In doing so, we apply a range of qualitative and quantitative methods and techniques, in combination with advanced software tools. We strive to understand the specific issues impacting an enterprise, and then design a bespoke solution to address the hierarchy of risks.

SAFETY, HEALTH AND ENVIRONMENTAL RISK MANAGEMENT

Mere compliance with legal requirements for SHE performance is no longer sufficient for forward thinking organisations. DNV's approach tightly links SHE requirements to asset performance. It seeks to achieve significant real improvements in SHE performance through enhanced design, asset reliability and focused operational controls. In this manner, emerging societal requirements and shareholder value are seen as convergent, not conflicting, demands. Major opportunities exist for step change in safety performance.

TECHNOLOGY QUALIFICATION SERVICES

A fast-growing energy market spurs a demand for new technologies. However, you need to prove that your innovation actually works as intended. To develop new solutions and bring them efficiently, safely and credibly to the market, DNV offers a recognised Technology Qualification process. The process can be purely technical or related to the execution of a project.

We offer our know-how through a complete service concept.



VERIFICATION

Today, operators of oil, gas and energy installations face ever increasing demands for transparency and accountability, with respect to personnel safety, environmental protection and security of business critical processes. DNV's verification services assure, through independent and objective appraisals, that an activity, product or service is in compliance with specified requirements. This includes satisfying the expectations or requirements of owners, authorities and other stakeholders concerning safety, environmental protection and functionality of plants, products and operations. The approach DNV employs is risk based and transparent. We provide independent assurance throughout an asset's entire life-cycle – from concept to commissioning, operations and decommissioning.



DNV's global presence is highly valued by our customers.

OFFSHORE CLASSIFICATION

The aim of our classification services is to assure owners, authorities and other stakeholders that the facility complies with classification rules and requirements. We increase the project's value through an early-phase involvement, ensuring that relevant rules and requirements are considered and hence avoiding costly changes later in the project. DNV has developed a unique set of technical standards and a flexible regime for classification. The process fits in well with relevant shelf-state verification regimes. DNV offers classification for building and operation of MOUs (Mobile Offshore Units), FPSOs (Floating Production, Storage and Offloading) as well as for the process of converting a tanker into an FPSO.

forcing companies and governments worldwide to redefine the management of critical infrastructure. Owners that succeed in making good capital investment decisions and operate their assets more safely, reliably and efficiently than their competitors will be successful in the long run. DNV's solutions help operators look forward and manage these opportunities. By applying a range of qualitative and quantitative methods and techniques combined with advanced software tools, operators obtain maximum value from their facilities, equipment and organisation.

GLOBAL REACH

We believe that the opportunities in the global energy market belong to those who approach them with a comprehensive understanding of risk. Equally important is the ability to implement solutions and uniform standards across geographies. Which is why DNV's global presence – comprising 300 offices worldwide – is so highly valued by the international energy sector.

ASSET RISK MANAGEMENT

Business unit managers and asset managers constantly look for new opportunities to improve operational results and control the risks associated with their operation. Further, 'Security of Supply' is of increasing concern,

- ▶ Enterprise Risk Management
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Enterprise Risk Management

▶ COMPANY-WIDE RISK MANAGEMENT

In a challenging business environment, effective risk management is a fundamental prerequisite for success. The best managers view their business from an overall perspective and govern their risks across functional and organisational borders. DNV has developed a CwRM system where technology, activities, systems and business environments are seen as a whole and the risk pictures of relevance are established at all organisational levels.

▶ INTEGRATED RISK MANAGEMENT

Investments involve significant uncertainties from a wide range of sources which make impact at different points in time, and often are very different in nature (e.g. technically, economically, market, credit, performance, etc). Quantifying and assessing the total risk of the investment is the objective of DNV's integrated risk management approach.

▶ PROJECT RISK MANAGEMENT

Effective project management demands rapid decisions about uncertain future events, often based on inadequate information. Failure to manage the right variables at the right time during the project may result in overspend, delays and poor delivery. Project risk management seeks to anticipate the development of projects and to implement suitable controls early enough to positively influence the outcome. DNV helps clients manage project risks through the delivery of advanced project risk management services.

▶ CHANGE MANAGEMENT AND PROCESS IMPROVEMENT

In today's dynamic and demanding business environment, a company's ability to align its organisation and processes to the demands of its customers is essential to achieve business success. Recognising and managing change while improving the business delivery processes is not only critical to business survival but also a catalyst for growth. Through our services for change management and process improvement, we assist organisations in achieving their business objectives through process alignment within a controlled change environment.

▶ DUE DILIGENCE

Due diligence is an investigation or audit prior to an investment transaction. It confirms that all material facts are correct and therefore reduces the probability of unnecessary harm to either party or entity involved in the transaction. Companies considering acquiring, investing or providing project finance often commission independent expert consultants to provide due diligence services. At DNV, we provide an improved understanding of the risks and risk mitigation measures, thereby contributing to improved investment decisions.

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SHE Risk Management

▶ RISK-BASED DECISION SUPPORT

DNV offers a full range of services to support clients, ranging from early stage hazard identification, consequence assessment, likelihood estimation, through to advanced risk-based decision support, and all the steps in between. These services meet compliance needs and go beyond when necessary to assure appropriate investment and management of hazards protecting staff, the public, the environment, the asset, and the corporate reputation.

▶ MANAGEMENT SYSTEMS AND PERFORMANCE MEASURES

Every company has a management system. The challenge is to develop, implement, review and improve systems to enhance business performance. DNV has over 25 years experience helping organisations realise the benefits of an effective management system. We set the standard in helping clients achieve their business objectives.

▶ ENVIRONMENTAL MODELS AND MANAGEMENT

Pressure is growing on all organisations to effectively manage the environmental and social impact of their operations. Environmentally responsible conduct is now recognised as an essential part of good business. DNV manages today's environmental issues and helps deliver experience-based solutions to solve the challenges facing all environmental stakeholders.

▶ EMERGENCY PLANNING AND ACCIDENT INVESTIGATION

Effective planning for emergencies and other undesired events is an essential part of good business management. Companies need to prepare for situations that could cause potential losses to people, assets, income, company reputation or harm to the environment and society at large. DNV, as an integral part of its risk management services, assists companies in developing and maintaining effective response plans, in order to control their risk exposure.

▶ ADVANCED SIMULATION AND MODELLING

The energy industry is expanding into new frontiers, often in extreme environments or scale of operations (arctic areas, LNG, deep water). Standard analysis methods do not demonstrate the effects of these changes with sufficient resolution and there is a need for accurate simulation able to represent higher complexity and greater detail. This is achieved for fluid flow, fire and explosion analysis by applying Computational Fluid Dynamics integrated with advanced risk models. Dynamic structural response issues are addressed with Finite Element Methods.

▶ HUMAN FACTORS AND SAFETY CULTURE

For controlling risks, preventing accidents, incidents and ill health, important efforts are taken to develop sophisticated management systems and technical solutions. But without addressing the human element and obtaining staff buy-in, the best systems will fail to deliver improvement. DNV works closely with clients helping to design processes and work systems that accommodate people issues carefully and systematically, both through development of positive cultures and through minimization of human error.

▶ OPERATIONAL SAFETY

The key current issue in SHE is one that has been persistent for over 20 years – reducing the number of major accident events. Highly publicized major accidents both onshore and offshore demonstrate that industry successes in improving occupational safety have not been mirrored in major accident performance. Most of these accidents did not result primarily from deficient design, rather it was inadequate operational safety not sufficiently addressing specific threats inherent in the operation. DNV applies the latest techniques to ensure that facilities are aware of all key operational and mechanical integrity requirements and that risks are rigorously controlled.

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Technology Qualification

▶ TECHNOLOGY QUALIFICATION MANAGEMENT

New technology should either enable a project to be realized or enhance its value. In either case the operator needs to be confident that the technology will perform as intended. The technology developer needs to build the operators confidence in the technology, who again needs to build the confidence of the other stakeholders in the project before a decision to implement it can be taken. Building this confidence requires a systematic risk-based qualification process which clearly documents the performance of the technology.

▶ TECHNICAL ANALYSES AND SIMULATIONS

In complex projects, it is essential to simulate how a structure or a system responds to certain conditions. To support this, DNV provides a wide range of analyses and simulation tools.

▶ TECHNICAL RISK AND RELIABILITY ANALYSIS

Today, systems are becoming increasingly complex, followed by a progressive impact on project risk and production availability. It is therefore imperative that the technology's risks and implementation are handled appropriately. To deal with this, DNV offers a wide range of risk and reliability services to manage both technical and project risk.

▶ MATERIALS TECHNOLOGY

Many component or system failures experienced in the energy industry are related to material selection or quality issues. DNV therefore offers a broad range of services within materials technology and laboratory testing worldwide.

▶ LABORATORY TESTING

DNV supports the global energy and shipping sectors with state of the art laboratory services, offering a wide range of testing capabilities, combined with strong multi-disciplinary knowledge and experience.

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Verification

▶ RISK-BASED VERIFICATION OF FIELD DEVELOPMENTS

Verification provides the required assurance towards stakeholders and regulatory authorities that projects are implemented right the first time. We provide you with the ability to focus your verification effort where the contribution is cost effective by employing a risk based verification approach. Our independent and competent appraisals of your field developments provide the required assurance that they are designed, constructed and installed in accordance with project objectives.

▶ RISK-BASED VERIFICATION OF PIPELINES, RISERS AND SUBSEA FACILITIES

DNV's transparent and fully independent approach to verification on pipeline, riser and subsea facilities will help to reduce and manage risk, thereby ensuring successful subsea projects.

▶ RISK-BASED VERIFICATION OF PROCESS SYSTEMS

Systems critical to process and safety may also require special attention during the in-service phase. These systems may need to be independently verified to ensure that integrity and/or compliance is continuously maintained.

▶ PRODUCT AND EQUIPMENT VERIFICATION/CERTIFICATION

With process systems or equipment delivered from around the world, it is necessary to verify them against project and regulatory requirements before they arrive at site for subsequent integration or use. Ensuring that equipment and systems arrive on site with the correct specifications and certificates is key to ensuring that unnecessary delays are avoided and that the items are used safely.

▶ MARINE OPERATIONS AND WARRANTY

Accidents or unexpected occurrences during temporary phases involving offshore marine operations can have devastating financial and safety consequences. This fact alone emphasises the importance of a well-defined marine operations verification scope, a recognised technical reference, competence and experience, and quality of service.

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Offshore Classification

▶ PRE-CONTRACT SERVICES

Getting things right the first time is key in today's hectic business environment. Designing and building offshore drilling or production units is no exception. The earlier errors are detected, the lower the cost of change. DNV's pre-contract services offers valuable insights into key challenges up-front, thus significantly reducing the downside risk in the projects.

▶ DESIGN APPROVAL

Operating MOUs and FPSOs requires zero tolerance to failure. At the same time one must not over-specify requirements. DNV's classification services assure owners, authorities and other stakeholders that the facility complies with classification rules and requirements, independent of location. A flexible regime ensures that appropriate rules and criteria are used and that an optimum design verification approach is applied.

▶ FABRICATION SURVEY AND COMMISSIONING

DNV will assess the set-up and control at the yard and major sub-contractors prior to start of fabrication. We will carry out frequent surveys and audits to ensure that approved drawings and plans are being followed. The aim of the activities is to confirm that the unit is built in accordance with DNV class rules.

▶ CERTIFICATION OF MATERIAL AND COMPONENTS (CMC)

Systems or equipment delivered from around the world require certification to meet class and regulatory requirements before they arrive at the yard or site for subsequent installation and integration. Ensuring that equipment and systems comply with correct specifications and have the right certificates is key to ensuring that unnecessary delays are avoided.

▶ IN-SERVICE SURVEYS

Confirming that an offshore unit meets applicable requirements at all times is key to ensuring safety of lives at sea. DNV develops a tailor made In-service Inspection Program (IIP) for each mobile offshore unit, and carries out regular surveys to ensure that the unit is properly maintained. Reported damages such as cracks, serious corrosion, indentations etc. are logged in a central damage database. The data are used for continuous improvement of our services to owners and operators of offshore units.

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Asset Risk Management

▶ **ASSESSMENT AND BENCHMARKING OF ASSET OPERATIONS**

If you want to know your assets’ strengths and weaknesses, you have to ask tough questions. We in DNV live by our corporate values, which stress integrity and objectivity. We can help you ask the right questions to discover real performance, compare it with industry best practices and identify improvement opportunities.

▶ **ASSET OPERATIONS MANAGEMENT**

Today’s demanding business environment requires better and faster decisions to meet business goals and stakeholder expectations. Cross-disciplinary work processes and extensive cooperation with partners must be managed through common asset operation strategies and management systems supporting efficient collaboration and decision processes. In supporting the management of asset operations, we recognise the need for continuous improvement and change management while at the same time improving the business delivery processes.

▶ **PRODUCTION OPTIMISATION**

The world is changing at an ever-increasing pace, and more and more of the changes are driven by technology. The benefits of new technology are often higher revenues, lower CAPEX, reduced OPEX and/or improved SHE performance. DNV helps clients analyse the potential of new technology before significant investments are made. We design processes to manage key uncertainties during the implementation. DNV also works closely with clients to improve production capacities and system regularity in the operations phase.

▶ **MAINTENANCE AND INSPECTION MANAGEMENT**

In a challenging business environment, the assets must generate higher return on investments. DNV helps build customised solutions to optimise maintenance and inspection activities to maintain and improve the safety integrity of the assets.

▶ **DEVELOPMENT OF SOLUTIONS TO FAILURES**

Materials technology, combined with the understanding of degradation processes in different operating conditions, enables us to design durable constructions and components. Still failures may occur, leading to production loss and threats to life and the environment. DNV is a credible partner with highly technical expertise that can reveal root causes and create innovative solutions to reduce risk of material damages with subsequent consequences to business interruptions and economical loss.

DNV locations

DNV serves the energy industry from more than 40 primary locations worldwide. In addition, we draw on DNV's entire worldwide network of 300 offices in 100 countries.





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