FEED phase
Following successful option identification and assessment during the concept phase, a FEED is an essential part of the project lifecycle. A robust FEED will deliver not just the final concept to be taken forward into construction, but will also provide the estimate for final sanction together with the documentation for the next contracting phases. In addition, in the current climate where schedules are challenging and key equipment often on long delivery times, the FEED output will enable procurement activity to commence prior to main contract award.

Petrofac’s engineering teams have a broad mix of skills required to support concept development to FEED level for offshore and onshore developments, from drilling and production technology through facilities design to export options. This skill base is supported by other Petrofac capabilities in fabrication and operations. These enable design solutions to be developed that address buildability and operability issues at the earliest stage of engineering development.

Offshore FEED
Engineering approach
Petrofac is able to offer development experience from a wide range of geographic areas, from the North Sea and offshore Malaysia to the calmer waters of the Mediterranean.

We have extensive experience in executing projects for offshore oil & gas production facilities including the development of both greenfield and brownfield assets that cover the following:

- minimum facility fixed platforms
- floating production, storage and offloading (FPSO)
- integrated drilling, processing and export platforms
- mobile drilling and production units
- subsea production facilities

Our core facilities design expertise is supplemented with specialist offshore capability that includes: installation design (transportation and lifting), mooring analysis, riser design, offshore piling design, vessel motion analysis and flow assurance.

Onshore FEED
Our onshore FEEDs are supported from our in-house multi-discipline engineering resources including

- process engineering (including flow assurance and dynamic simulation)
- instrument engineering (control systems, field instruments and metering)
- electrical engineering
- metallurgy and materials engineering
- piping layout design
- piping engineering (including piping stress analysis and materials)
- civil engineering
- structural engineering
- risk, safety and environmental engineering
- pipeline engineering

Petrofac has extensive experience in the design of onshore and offshore facilities for both oil & gas treatment facilities and, therefore, is able to produce designs that are fully integrated with any downstream facilities.

Our FEED level work is supported by a cost estimating function that reflects the very latest cost information through our worldwide procurement capability. Our structured and transparent approach has been used for a variety of major operating companies, and can be customised to support individual client stage gate decision processes in terms of estimate accuracy and interpretation of risked estimates.

At both concept and FEED levels, our design teams provide robust and practical solutions which incorporate Petrofac’s extensive EPC and operations experience both onshore and offshore. This experience has been gained through executing projects in some of the most environmentally and climatic-challenging regions of the world. Using this approach ensures that the correct level of experience is mobilised at the earliest opportunity within a project where its influence can add the most value.

Global support
The Engineering Services consultancy is a company centre of excellence for conceptual development studies. Its experienced personnel provide consultancy and support from feasibility through all phases of project to all aspects of operation, maintenance and inspection to its customers around the world as well as to other Petrofac offices in Sharjah, Chennai, Mumbai, Indonesia, London and Aberdeen.
Onshore design experience
Petrofac has been involved in a variety of projects at FEED level include the following:

**Turkmenistan:** FEED for sales gas project.
Scope covered the design of 20bcma of sales gas produced from 40 operating wells and a 56 inch export pipeline, process technology and sensitivity studies, and technical reviews of process licensor packages.

**Uganda:** FEED service for oil plant and export pipeline
Production gathering, main process plant with capacity for 40,000bopd and 80km heated pipeline.

**Kazakhstan:** FEED project for gas plant project
FEED to manage the increasing Gas Oil Ratio (GOR) of the reservoir fluid with time and capturing the value in the gas reserves. Project focused on delivery of 16bcma of gas to existing customer in Russia, which entailed an increase of approximately 8bcma over previous gas export quantities.

**Russia:** FEED project for gas plant project
Project included the additional of two new remotely located well sites with production and water injection capabilities. New oil & gas treatment systems were also added to the central processing facility to ensure that the export oil and export gas specification are met. The CPF after phase III modification handled a capacity of 30,000bopd, 700,000Sm3 of gas and 60,000bwpd of injection water.

**Nigeria:** FEED for provision of LPG extraction plant
FEED included cost estimate, preparation of SOW and ITT for EPC bidders. Scope included an LPG extraction plant, with the capacity to process 400MMscfd gas, downstream of the existing flow station to service two fields to recover propane, butane and heavier hydrocarbons from the associated gas to produce a saleable liquid product.

**Algeria:** FEED design competition
FEED for oil and gas gathering system and central processing facilities to tie in to existing facilities. Peak oil production of 30,000bopd with 100MMscfd gas.

**Iran:** FEED and early production works
FEED for 8 wells producing a total of 20,000bopd. Scope involved process design including flow assurance, piping, civil and structural, HSE studies, project schedule and cost estimation.

Offshore design experience
Petrofac has been involved in a variety of projects at FEED level include the following:

**Tunisia:** FEED for normally unmanned facilities
Concept development, followed by FEED, for normally unattended facilities in 62m water depth offshore Tunisia delivering 150MMscfd gas to a new onshore processing and treatment plant. Scope included a 110km 18” multiphase subsea pipeline and FEED of the onshore facilities.

**UK North Sea:** FEED for Southern North Sea
FEED for 6 slot minimum facilities normally unattended platform in 20m water depth. The scope includes a 450t topsides and 425t conventional jacket structure together with a 45km 10” export pipeline supporting 120MMscfd gas production. The final concept included use of an innovative subsea cooler.

**UK North Sea:** FEED and EPC for tie-back facilities
Additional module for single well tie-back to support 15MMscfd production together with compression facilities and 10km subsea pipeline. Concept based on stand alone “hang off” module installed on an existing platform and was specifically designed to maximise onshore completion and commissioning thus minimising expensive offshore construction work.

**Nigeria:** FEED and detail design
FEED and detail design for shallow water fixed platforms for near shore facilities for production of 60,000bopd. The facilities included separation, utilities and power generation and were bridge linked to existing facilities. Petrofac subsequently undertook the detail design of the facilities.

**UK North Sea:** Fast track marginal field development
Fast track marginal field development in approximately 150m water depth. Final development solution comprised subsea tie-backs to an existing floating production facility (FPF) with shuttle tanker export. Petrofac scope included full FEED including upgrades to the existing processing facilities together with long lead procurement support.