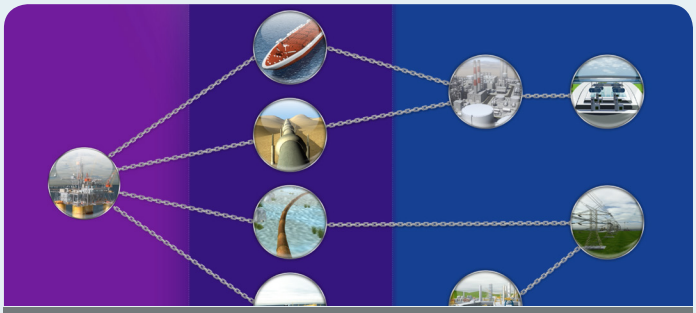
ENERGY-FUTURE

Supercharged Learning

Supercharged Learning

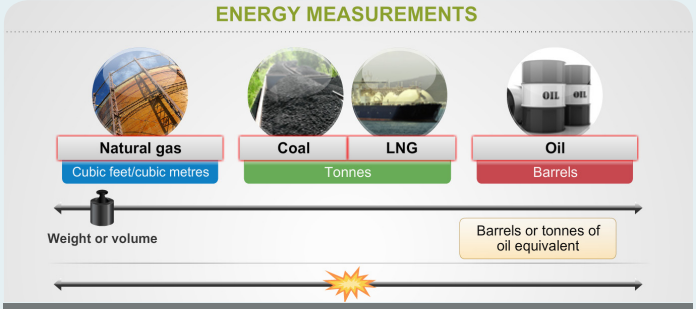
OVERVIEW



Short training videos

Upstream, midstream and downstream - 5:07 mins

The oil and natural gas value chain's complex web of activity is often thought of in three segments: upstream, midstream and downstream. Which parts of the chain does each term cover?



Interactive online courses

UNDERSTANDING ENERGY (UND) - 40 mins - 0.5 credit

Course learning objectives

This single-lesson introductory course presents some of the key energy concepts covered in more detail in other Energy Future courses.

Identify the main forms of energy and the principle of conservation of energy.

Recognise the main forms of renewable and non-renewable energy and how they are measured

UND assessment: 10 mins

UPSTREAM CONTRACTS

Short training videos

Introduction - 3:15 mins

Get to grips with the difference between a concession contract and a PSC, and the advantages and disadvantages of joint ventures and services contracts. This video introduces a seven-video course covering the basics of upstream oil and natural gas contracts, what goes into them and the merits of each contract type – as well as the circumstances under which a particular contract model is likely to be used.

Concessions - 2:31 mins

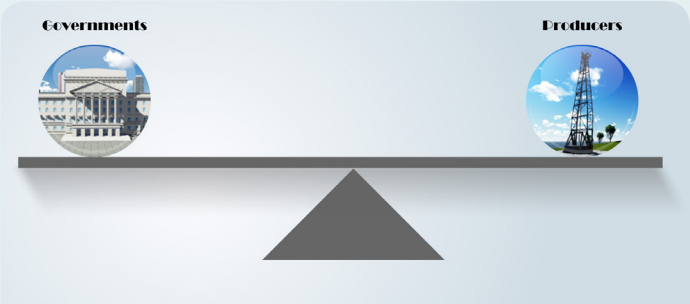
Concession contracts give an oil company the right to explore for, produce, develop and sell the oil or gas from a prospect over a certain period – sometimes decades. They prevailed in the early years of the oil industry and, because they tend to be favourable to the company, helped establish it. What are their pros and cons?

Services agreements - 2:47 mins

In recent years, resource owners have become increasingly determined to use contracts that try to keep more of the wealth at home, which services agreements achieve by paying oil companies to provide a service – the development of an oil or gas prospect – without ceding ownership of the resource. But they tend to appear only in countries with premium geology and during periods of high oil prices. Find out why.

Joint ventures - 1:26 mins

Joint ventures tend to be open-ended, often expressing more the intent of areas of cooperation between an IOC, and a national oil company. But, partly for reasons of legal complexity, these contracts tend to be the least common of the principal types of upstream contract.



Interactive online courses

UPSTREAM CONTRACTS (UCO) - 1.5 credits

Course learning objectives:
This four-lesson course instructs the learner to recognise, and distinguish between, the main contract models in use in the oil and natural gas industry, identify the advantages and disadvantages of each model, and explain the circumstances under which each would be likely to be be applied.

- Recognise the fundamental aims of upstream oil and natural gas contracts and how they relate to the principal stages of development in upstream projects
- Recognise the key features of concession, services and JV contracts, when they are used and their relative merits as contract models
- Recognise the key features of production-sharing agreements (PSAs), when they are used, and their merits as a contract model
- Identify some of the complications and risks that must be addressed in successful upstream oil and gas contracts

Introduction (UCO1) - 10 mins

Lesson learning objectives
Recognise the core purpose of upstream oil and gas contracts

Concessions, services & JV contracts (UCO2) - 12 mins

Lesson learning objectives
Recognise the fundamental features of concession, services and JV contracts

PSA contracts (UCO3) - 10 mins

Lesson learning objectives
Identify the principles of PSA contracts and recognise how they function

UPSTREAM CONTRACTS

PSAs explained - 3:34 mins

Production-sharing agreements – known as PSAs – have become common throughout the oil industry. PSAs should, in principle, be a successful contract model, because they encourage the IOC to maximise its productivity, while removing much of the up-front financial risk for the state. But they're not without pitfalls. What are the pros and cons of PSAs?

PSAs in action - 3:14 mins

PSAs entitle the IOC to use initial flows of oil to recover its exploration and development costs and, after cost recovery, to receive a share of production. The state, meanwhile, makes money by earning a share of production – once the cost-recovery phase is complete – and from royalties and tax. This video explains the basic mechanisms for rewarding IOC and state under a PSA.

Contracts and risk - 3:02 mins

A good upstream contract will include provisions that reduce liabilities, pre-empt disputes – and above all – mitigate risks. What kinds of risks must be taken into account in order to strike a mutually beneficial balance between the interests of the host nation and those of the contractor?

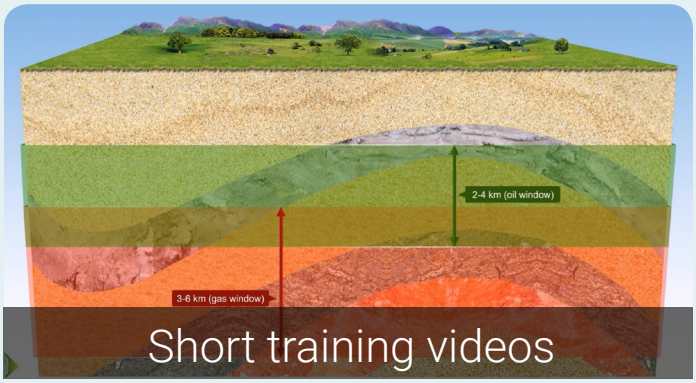
Aims and complexity of contracts (UCO4) - 20 mins

Lesson learning objectives

Recognise ways in which contracts mitigate risk

UCO assessment - 12 mins

EXPLORATION AND PRODUCTION



Short training videos

The formation of oil, gas and reservoirs - 5:19 mins

How are hydrocarbons formed, and what geological conditions are required for the formation of oil and gas reservoirs?

Seismic - 3:25 mins

Seismic has reduced the number of dry or non-optimal wells by enabling geophysicists to form a detailed picture of subterranean rock layers before expensive drilling operations take place – reducing costs, raising recovery rates and improving exploration results. What are the principles behind it?

Drilling for oil & gas part I - 4:15 mins

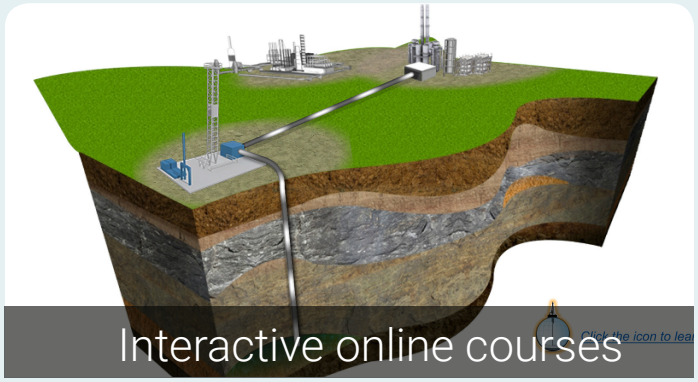
Virtually all oil and gas wells are drilled using the rotary drilling method. Above ground stands a derrick, the familiar framework that supports the drill string and other apparatus. And, at the end of the drill string is the drill bit, which cuts, grinds, scrapes and crushes its way through rock layers. How do these pieces of equipment work together to drill wells?

Drilling for oil & gas part II - 3:17 mins

Understand the vitally important functions of drilling mud, and learn about well logging and other tests that can be carried out to measure the properties of the rock around the borehole and bring the picture of the subsurface geology into ever-sharper focus. Understand the process of casing and cementing during well construction.

Offshore E&P platforms: an overview part I - 3:49 mins

Offshore E&P platforms are offshore real estate, providing a surface for E&P companies to carry out the same operations as those undertaken onshore: drilling wells and producing from them, and processing, storing and exporting oil and gas. Some stand on the seafloor. Others float on the surface of the water and are moored by cables or kept in place by dynamic positioning. The choice lies at the ever-shifting nexus of technology and economics. Learn about the main designs of platform.



Interactive online courses

EXPLORATION AND PRODUCTION (EP) - 2 credits

Course learning objectives

Through this course, split into six accessible, bite-sized lessons, learners will gain a high-level view of the geology of oil and gas, and technical steps involved in the exploration and production of oil and gas, from identifying potential drilling sites and conducting seismic surveys to drilling and production operations. The course also introduces learners to economics and business risks and opportunities through the upstream value chain.

- Recognise the geological conditions that lead to the formation of hydrocarbons, and the main characteristics of oil and gas fields
- Recognise the process by which exploration companies identify drilling targets and how wells are drilled, cased and cemented
- Recognise how a discovery is appraised and how reserves are proved up, and identify the main designs of offshore E&P platform
- Recognise the main processes in well completion and the equipment typically used
- Identify the key steps in the reservoir-management process and the various phases of recovery
- Identify the key characteristics of unconventional oil and gas deposits and the main production techniques required

Reservoir and geology (EP1) - 10 mins

Lesson learning objectives

Identify the key features of oil and natural gas formation and reservoirs

EXPLORATION AND PRODUCTION

Offshore E&P platforms: an overview part II - 5:27 mins

When an offshore discovery is made, a well is usually sealed with plugs until a more permanent structure can be moved to site for the production phase and for further drilling. Numerous platform designs exist – from fixed platforms that stand on the seabed to a variety of floating platforms that can operate hundreds of miles offshore in waters thousands of metres deep. The choice is a complex one, based on a matrix of economic and technical factors. Learn about tension-leg platforms, semi-submersibles, spars and FPSOs – and when they might be used.

Introduction to subsea production - 5:14 mins

Since the first subsea well was completed, over 50 years ago, the subsea industry has flourished and expanded. In a subsea completion, production equipment such as the wellhead is installed on the seafloor instead of on the topsides of a platform. Find out what operations can be relocated to the seafloor — and why subsea completions can often prove advantageous.

MEET THE UPSTREAM EXPERTS

Well completion part I - 3:37 mins

Discover how production facilities at the surface are connected with the reservoir through the well- completion process and how a drilled well is equipped to become a producing one. Interviews with senior Schlumberger completion engineers, supported with explanatory animations.

Well completion part II - 4:09 mins

Understand different types of well completion, from barefoot completions to intelligent completions in multilateral wells. What makes them differ and what do they have in common? Interviews with senior Schlumberger completion engineers, supported with explanatory animations.

Well completion part III - 3:00 mins

Discover how an intelligent completion enables you to control multiple producing zones from the surface – potentially from your desktop computer. Interviews with senior Schlumberger completion engineers, supported with explanatory animations.

Exploration i (EP2) - 20 mins

Lesson learning objectives

Recognise techniques for identifying potential oil and gas deposits

Identify the main steps in the process of drilling wells

Exploration ii (EP3) - 15 mins

Lesson learning objectives

Identify processes and data used to assess the geological and commercial potential of oil and gas discoveries

Recognise platform types and key concepts in offshore exploration

Production i (EP4) - 10 mins

Lesson learning objectives

Define the basics of well completion

Production ii (EP5) - 15 mins

Lesson learning objectives

Recognize the different phases of production and how reservoirs are managed

Production iii (EP6) - 45 mins

Lesson learning objectives

Recognise the principal techniques used to produce from unconventional oil and gas deposits

EP assessment - 25 mins

Sand control part I - 2:59 mins

Discover the damage sand from weak formations can cause in producing wells and why controlling the flow of sand from unconsolidated formations is among the most critical challenges in well completion. Interviews with senior Schlumberger completion engineers, supported with explanatory animations.

Sand control completion part II - 3:35 mins

Find out more about different methods for controlling sand in well completions – from downhole screens and gravel packs to frackpacks. What are they and how do they work? Interviews with senior Schlumberger completion engineers, supported with explanatory animations.

FINANCING OIL & GAS

platts REUTERS Bloomberg argus

Short training videos

Oil markets I: The forces that drive oil prices - 4:24 mins

The oil price is determined by the relationship between supply and demand. But the elements that compose those two market forces form a picture of enormous complexity – from geopolitical events to refinery outages, and from GDP data today to long-term trends in vehicle use. This video assesses the economic fundamentals that determine the oil price, introducing a seven-part video course analysing the fundamentals of global oil markets.

Oil markets II: Anatomy of the global oil market - 3:26 mins

Oil is the most actively traded commodity in the world – a multi-faceted, complex arrangement of overlaid and intersecting physical and paper markets. Find out more about the structure and make-up of this highly complex industry – and the much larger derivatives market that has grown up around it.

Oil markets III: Transparency, stats and guesswork - 3:08 mins

Oil markets are notoriously lacking in transparency in terms of stocks, demand and even supply. How does the market determine the value of the underlying commodity – crude oil?

Oil markets IV: The fundamentals of supply - 4:20 mins

Oil markets are notoriously lacking in transparency in terms of stocks, demand and even supply. How does the market determine the value of the underlying commodity – crude oil?

Oil markets V: OPEC - 4:54 mins

In Opec's historical attempts to control world oil prices, the group's challenge has been to find a price high enough to provide its oil-dependent members with a satisfactory level of income yet low enough to sustain oil demand and to prevent rival producers from easily grabbing its market share. To what extent has Opec been able to meet this challenge?

Interactive online courses

FINANCING OIL & GAS (FIN) - 1 credit

Course learning objectives

A high-level view of the factors that influence oil prices, and how petroleum is priced and traded.

Oil markets and pricing (FIN1) - 30 mins

Lesson learning objectives

Supply, demand and oil prices; benchmark grades and pricing crude oil; term and spot markets; pricing and costs along the supply chain; managing oil-price risk; hedging; futures, options and swaps; speculation; pricing natural gas.

Financing oil and gas projects (FIN2) - 30 mins

Lesson learning objectives

Debt and equity financing; evaluating risk in oil and gas projects; corporate loans; bonds; project finance; Islamic finance; multilateral agencies; farm-in agreements.

FIN assessment: 10 mins

Oil markets VI: The fundamentals of demand - 1:47 mins

Oil is everywhere. No industry influences the shape of the world more; it provides heat, light and mobility. And it creates quality of life. What are the principal forces that determine market demand?

Oil markets VII: IOCs: Managing the oil-price cycle - 2:50 mins

Oil companies must manage a range of costs throughout the complex oil-value chain, anticipating changes in economic cycles and timing often very large investments so that projects are ready when the market needs them. And they must make those judgments independently of the extremes of the business cycle.

OIL GEOPOLITICS

A brief history of the oil industry part I - 4:08 mins

The oil industry's origins lie in the 19th century, when "Colonel" Edwin Drake drilled the first well in 1859, in Pennsylvania. By the end of the Second World War, the business had evolved into a global industry dominated by a handful of Western companies. (1850s to 1940s).

A brief history of the oil industry part II - 4:55 mins

After the Second World War, the dominant oil-producing countries of the Middle East began to assert their influence, forming Opec and regaining control of their oil industries. Western oil companies, meanwhile, turned their attention to new sources of oil. (1950s to 1980s).

A brief history of the oil industry part III - 4:13 mins

War in Iraq in 2003 threatened world oil supply, catalysing a five-year upward spiral in oil prices.
At the same time, demand was rising, especially in China and other fast-growing Asian energy consumers. Fears that supply could not keep up with soaring demand gripped world markets. But the US's unconventional energy revolution has shifted the goalposts once again. (1990s to present).

Geopolitics (GEO) - 1 credit

Course learning objectives

This two-lesson course provides an introduction to key geopolitical events that have shaped the history of oil and oil markets, and identifies the main players in the global oil and gas industry, including Opec, NOCs, IOCs and other types of oil company.

Identify key events in the history of oil geopolitics – from the discovery of oil in the US 150 years ago to the present – and recognise how geopolitical events affect oil supply and markets.

Recognise the key aspects of Opec's role in world oil markets, the interplay between IOCs, NOCs, services firms and other types of oil company, and the consumer response to Opec.

Resource ownership and the geopolitics of oil (GEO1) - 21 mins

- Identify connections between oil markets and geopolitics by studying historical and contemporary events

Meet the players (GEO2) - 30 mins

- Recognise the key players in oil supply and their chief characteristics and roles, including multinational organisations such as Opec and the IEA, and corporate players including NOCs and IOCs

GEO assessment - 7 mins

NATURAL GAS

Short training videos

Natural gas 1: What is natural gas: 4:19 mins

Know your CH4 from your NGLs? Conventional from unconventional? In four minutes, learn about the formation of gas, its properties and versatility as a fuel, and the infrastructure needed to get it to end users.

Natural gas 2: Past, present and future: 5:15 mins

The US's shale-gas revolution and the emergence of renewables are two forces that have fundamentally reshaped the global gas industry. But demand for natural gas remains robust, especially in power generation. Find out why the fuel has a bright future.

Natural gas 3: Glut or no glut?: 3:32 mins

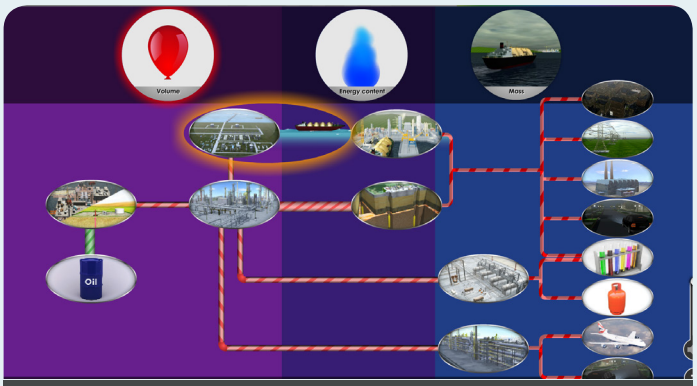
With natural gas prices still subdued, and plenty of new LNG and pipeline capacity coming on stream, gas has become a buyer's market. But, as demand gathers pace, this won't last. With China and India gasifying their huge economies, market dynamics look set to become tighter after 2020, stimulating a new wave upstream gas development.

Natural gas 4: Floating LNG: 2:35 mins

What is floating liquefied natural gas, how does it work and what potential does the technology offer? And, what challenges did Petronas experience as it undertook the world's first FLNG venture? Interview with Datuk Abdullah Karim, leader of Petronas's pioneering PFLNG Satu project.

Natural gas 5: Floating regasification: a game changer: 2:52 mins

Importing LNG used to be a business for big countries with big budgets. Floating, storage and regasification units, FSRUs, are an economic way of importing gas without a costly onshore regas terminal. In the past few years, FSRUs have gone mainstream, giving smaller consumers quick and affordable to access to LNG - and generating an invaluable source of additional demand for the wider LNG and natural gas markets.



Interactive online courses

NATURAL GAS (NG) - 1.5 credits

Course learning objectives

This three-lesson course covers the natural-gas value chain, from the formation of natural gas and the exploration and production of natural gas through to its use by end consumers. It provides a valuable overview of the geography of natural gas resources and introduces learners to the economics and business risks and opportunities in the natural-gas market.

- Recognise how natural gas is formed and measured, and the main links in the natural-gas value chain
- Recognise how natural gas resources are distributed globally and processed, and identify non-marketed uses of natural gas and fundamental corporate structures
- Recognise the principal alternatives for natural-gas transportation and the fundamentals of industry economics, end-use and trading

The formation and properties of gas (NG1) - 20 mins

Lesson learning objectives

Identify the main elements of the natural gas value chain
Recognise the properties of natural gas and how it is formed

Gas resources and marketing i (NG2) - 15 mins

Lesson learning objectives

Recognise the distribution of natural gas resources globally
Identify the main steps in natural-gas processing

Gas resources and marketing ii (NG3) - 35 mins

Lesson learning objectives

Identify the main means of natural-gas transportation
Recognise key features of natural gas marketing and pricing

NG assessment - 16 mins

LNG

Introduction to LNG - 3:02 mins

What is liquefied natural gas, how it is made, transported, used and why is it an increasingly important part of world natural gas supply? A fun, animated introduction to the costly and complex LNG value chain.

LNG: the liquefaction process - 5.17 mins

The liquefaction step in the value chain chills natural gas to extremely low temperatures in a series of units collectively known as a liquefaction train – turning the gas into a liquid that can be shipped in large volumes by tanker. Discover the main steps in the liquefaction process.

LIQUEFIED NATURAL GAS (LNG) - 1 credit

Course learning objectives

This two-lesson course provides an introduction to the infrastructure and processes involved in the purification and liquefaction of natural gas; the shipping of LNG to markets; and its regasification and onward distribution. The learner will also gain an understanding of the economic and commercial drivers of the LNG business, including pricing and contracts, and international LNG trade flows.

- Identify the fundamentals elements of the LNG value chain, the fuel's strategic value and the main processes in LNG production
- Recognise key concepts in LNG shipping, regasification, trading and the geography of LNG, pricing and contracts

Value chain and liquefaction (LNG1) - 20 mins

Lesson learning objectives

Identify the strategic benefits of LNG and the principal elements of the LNG value chain

Shipping and markets (LNG2) - 35 mins

Lesson learning objectives

Identify the fundamentals of LNG shipping, trading, pricing and contracts

Recognise LNG's place within the natural-gas value chain

LNG assessment - 18 mins

Canada's oil sands part I - 4:32 mins

Canada's oil sands constitute one of the largest proved reserves of oil in the world and are a valuable and growing contributor to global oil supply. Some of the oil is produced using in situ drilling methods. But some is close enough to the surface to be mined. Find out more about the mining process and how useable oil is extracted from solid oil sand.

Canada's oil sands part II - 4:18 mins

Canada's oil sands are a valuable contributor not just to Canada's economy, but to world oil supply. Deposits close to the surface can be mined, but much of Alberta's oil is buried too deeply and must be retrieved using in situ recovery methods. Find out about SAGD, cyclic steam generation, and other production methods and challenges.

Fracking for gas - 4:07 mins

In hydraulic fracturing, fluid is pumped at high pressure into impermeable formations, creating cracks through which trapped gas or oil can flow. In tandem with horizontal drilling, it has revolutionised the development of unconventional gas in the US, bringing shale gas into the mainstream. How does it work?

UNCONVENTIONAL GAS (UG) - 1 credit

Course learning objectives

This four-module course introduces learners to the concept of unconventional gas and the main types of unconventional gas, the geological characteristics of unconventional rocks, and methods used to produce from them.

- Distinguish between unconventional natural gas and unconventional reservoirs, and identify the main types of unconventional gas – shale gas, tight gas, coalbed methane and methane hydrates
- Recognise the geological characteristics of shale-gas and tight-gas reservoirs, the fundamentals of shale-gas and tight-gas production, and the main steps and key concepts in the horizontal drilling and hydraulic fracturing processes
- Identify the geological characteristics of coalbed methane, how it is produced and the economics of production
- Identify the geological characteristics of methane hydrates and emerging techniques for producing hydrate deposits

Understanding unconventional gas - (UG1) - 10 mins

Lesson learning objectives

Identify the main types of unconventional natural-gas deposit

Shale gas and tight gas - (UG2) - 20 mins

Lesson learning objectives

Recognise the key characteristics of shale and tight gas geology

Identify the principal production techniques used to extract natural gas from tight rocks

Coalbed methane - (UG3) - 10 mins

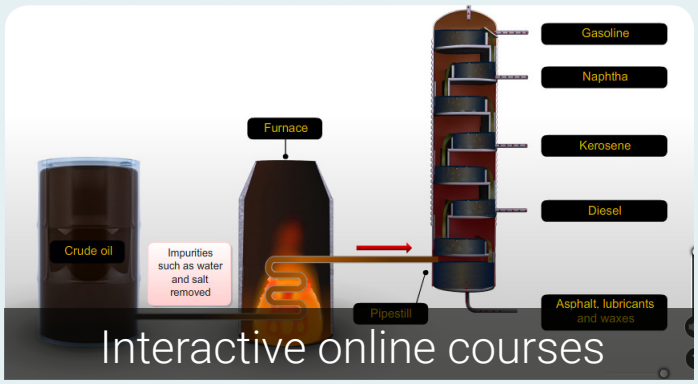
Lesson learning objectives
Identify the characteristics of coalbed methane deposits and how they are produced

Methane hydrates - (UG4) - 25 mins

Lesson learning objectives
Identify the characteristics of methane hydrate deposits and production techniques

UG assessment - 18 mins

DOWNSTREAM OIL



Oil refining part I - 6:43 mins

Refineries all perform the same three basic tasks: distilling crude oil into its constituent fractions; chemically rearranging low-value configurations of hydrocarbons molecules into high-value ones; and treating products to meet environmental standards. What does the principal treatment, atmospheric distillation, involve?

Oil refining part II - 5:19 mins

Atmospheric distillation has its limitations. It can convert only part of each barrel of oil into useful products and leaves a large amount of low-value residue. Conversion refineries are more complex. They use additional heat, pressure and catalytic treatments to extract more value from each barrel of crude oil. What is complex refining?

DOWNSTREAM OIL (OIL) - 1 credit

Course learning objectives

- Recognise how oil is distributed globally and identify fundamentals of oil economics
- Recognise how fuels are made and used
- Recognise the main steps in the downstream oil-value chain from refining to end distribution

OIL1- 15 mins

Lesson learning objectives
Identify key oil-price drivers and economic fundamentals of the oil business

OIL2 - 15 mins

Lesson learning objectives
Recognise the main processes in the refining of crude oil
Identify the principal refined products and their uses

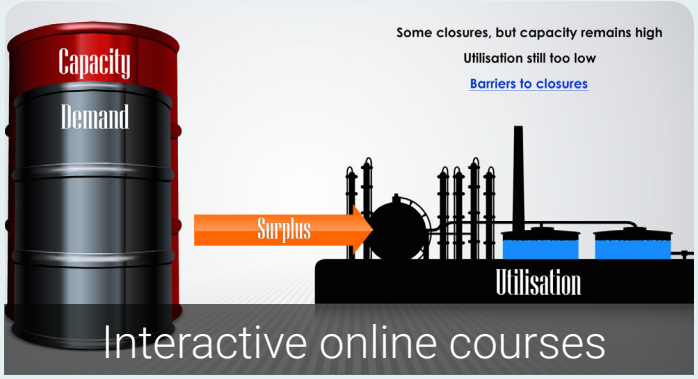
OIL3 - 30 mins

Lesson learning objectives
Recognise the principal systems for oil transportation and products distribution

OIL assessment – 15 mins

REFINING AND REFINERY ECONOMICS

Short training videos



Interactive online courses

Refinery economics: margins, spreads and profits - 4:14 mins

Day-to-day operation of a refinery involves responding quickly to price movements so as to maximise production of the most valuable streams, while using the lowest-cost crudes available. Learn about refining margins and crack spreads, and the world's main refining hubs – in the US Gulf Coast, Rotterdam and Singapore.

REFINING & REFINERY ECONOMICS (REF) - 1 credit

Course learning objectives

This two-lesson course introduces basic refining concepts, including processes such as fractional distillation, vacuum distillation, cracking and coking. It then explains the fundamentals of refinery economics and analyses how the refining industry is evolving.

- Identify the main refining processes and recognise emerging patterns in world trade in petroleum products
- Recognise key concepts in the economics of the refining industry

Overview and processes (REF1) - 25 mins

Lesson learning objectives

Recognise evolving business trends in global refining

Identify the principal processes in refining

Profits and quality (REF2) - 23 mins

Lesson learning objectives

Identify key concepts in the fundamentals of refinery economics

REF assessment - 13 mins

PETROCHEMICALS

Petrochemicals I : Chemistry and processes - 3:26 mins

Petrochemicals are used to manufacture plastics, solvents and numerous other materials, with applications in industries ranging from car manufacture, construction and agriculture to electronics and healthcare. They are chemicals derived from crude oil or natural gas. Find out about their chemistry and the main production processes.

Petrochemicals II : Feedstocks - 3:29 mins

The relative cost of the two feedstocks — oil or gas — has a considerable impact on the profitability of petrochemicals operations in the different regions, and costs can change rapidly. Discover the economic fundamentals of different feedstocks and how feedstocks vary by producer region.

Petrochemicals III : Markets and uses - 3:35 mins

The petrochemicals industry's products fall into three main categories — basic chemicals, speciality chemicals and consumer chemicals. What are they for and how is demand for each type changing?

The petrochemicals industry (PET) - 20 mins - 0.5 credit

Course learning objectives

This single lesson course gives learners a succinct, bite-size introduction to the petrochemicals industry, covering industry fundamentals – chemistry and feedstocks, uses, and economics, business and market trends.

- Recognise the main types of petrochemicals and their uses, and identify key market trends in the petrochemicals industry.

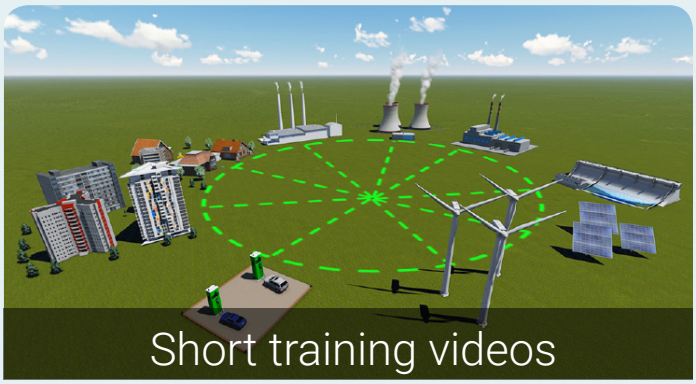
The Petrochemicals Industry (PET1) - 30 mins

Lesson learning objectives

- Recognise the main types of petrochemicals, their uses and chemical make-up
- Identify fundamental economic patterns and market trends in the petrochemicals industry

PET assessment: 10 mins

THE POWER INDUSTRY



Solar PV - 3:47

Solar photovoltaic, the dominant solar technology, is growing rapidly. Discover how photovoltaic cells in solar panels convert sunlight into electricity – and how the technology is used.

Solar CSP - 1:55

Concentrating solar power converts solar energy into electricity by using mirrors to reflect and concentrate sunlight on a single point, generating heat that can be used to turn water into steam and drive a turbine.

Wind Power - 3:54

Wind power provides renewable and clean electricity. And, although it supplies energy in unpredictable, intermittent bursts, its role in global electricity supply is expanding, as technology develops and economies of scale take root. Discover how wind power works and how it is contributing to a greener energy mix.

THE POWER INDUSTRY (POW) - 2 credits

Course learning objectives

The learner will gain a high-level view of the energy systems that supply electricity, how the power mix may change in view of the need for a greater pro- portion of renewable energy, how electricity is generated and transmitted to end users, and how the economics of generating electricity vary by energy source. The course covers a range of power-generation sources, including coal, natural gas, nuclear and renewables, identifying the pros and cons of each.

Power overview (POW1) - 25 mins

Lesson learning objectives

Global electricity demand; carbon impact of power generation; power supply by fuel type; power supply by country; how electricity is generated; economics of power generation.

Non-renewable power (POW2) - 25 mins

Lesson learning objectives

Coal; gas; nuclear; cogeneration.

Renewable power (POW3) - 45 mins

Lesson learning objectives

Economics of renewable power; renewable power outlook; hydropower; wave

power; tidal energy; wind power; solar power; geothermal power; biomass; hydrogen power.

Power distribution (POW4) - 45 mins

Lesson learning objectives

Transmission grids; distributed power; local networks; load matching; grid management; smart grids; electricity trading; power storage; electric vehicles.

Short training videos

Energy transition part I - 3:32

Providing the energy developing nations need in order to attain the same living standards as those in the developed world, while keeping up with demand in industrialised nations, all in the context of a low-carbon future, is at the heart of the energy transition.

Energy transition part II - 3:03

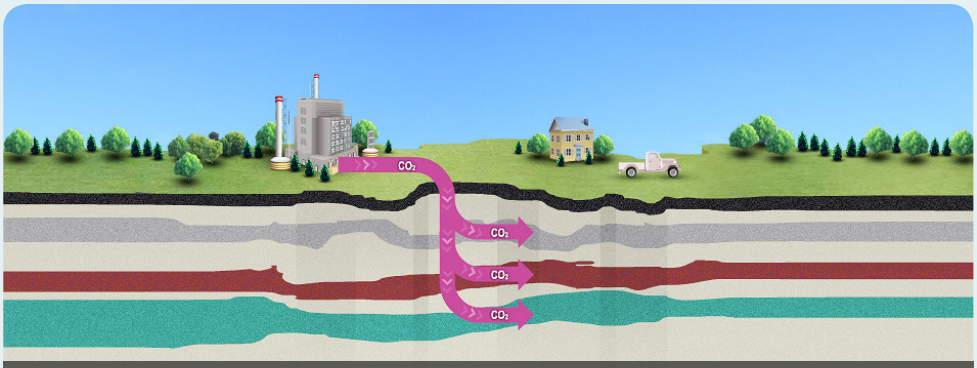
The economics of renewables have, historically, struggled to match those of fossil fuels in power generation. But – as the technology and economics of green energy improve - solar, wind and other renewables are making ever greater inroads into energy supply.

Digital Grids - 5:27

The central power distribution model is no longer equipped to deal with new market pressures and realities. As the make-up of energy supply changes – in response to forces like climate change and the emergence of disruptive technologies – grids must evolve so that utilities can supply energy sustainably, affordably and reliably. Digital grids are at the heart of that transition.

Virtual Power Plants I - 4:28
Virtual Power Plants II - 4:01

Virtual power plants aggregate together various sources of electricity supply to operate, collectively, with the kind of output more readily associated with a large conventional power plant. Learn how VPPs could transform energy supply and put marginal sources of energy on a competitive commercial footing with conventional power.



Interactive online courses

Energy and the environment (ENV) - 1 credit

Course learning objectives
This two-lesson course examines environmental risks associated with oil and natural gas production and use, focusing particularly on greenhouse gas emissions and political and technological solutions to climate change.

Energy, climate change and environmental risk (ENV1) - 20 mins

- Identify the main greenhouse gases and how they are contributing to climate change through the greenhouse effect.
- Recognise the main political bodies tasked with combating climate change."

Solutions for a low-carbon future (ENV2) - 35 mins

- Identify the principal technology and market-based solutions for decarbonising energy production and use, including carbon capture and storage, renewable energy, smart grids, cap-and-trade and carbon taxes.

ENV assessment: 15 mins

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