



NBTC – ITU Training on Building IoT solutions for e-applications



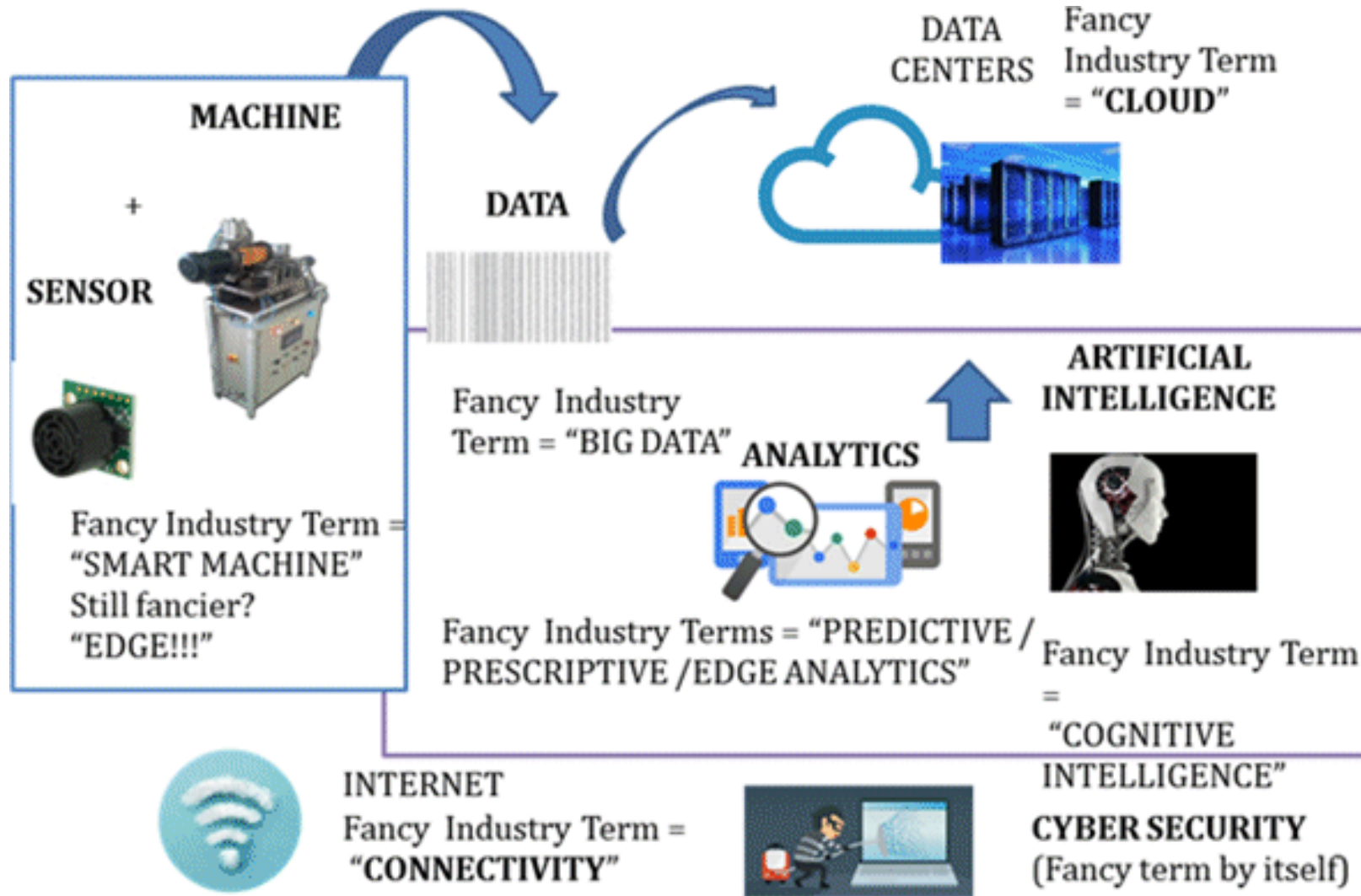
Session 2b: Internet of Things and the Future of Oil & Gas Industry

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IoT Academy of Iran





Industrial Internet of Things





IoT Trend (Gartner Hype Cycle for Emerging Technologies)





IoT Trend (Gartner Hype Cycle for Emerging Technologies)



Plateau will be reached in:

○ less than 2 years ● 2 to 5 years ● 5 to 10 years ▲ more than 10 years ⊗ obsolete before plateau





IoT Trend (Gartner Hype Cycle for Emerging Technologies)



As of July 2016

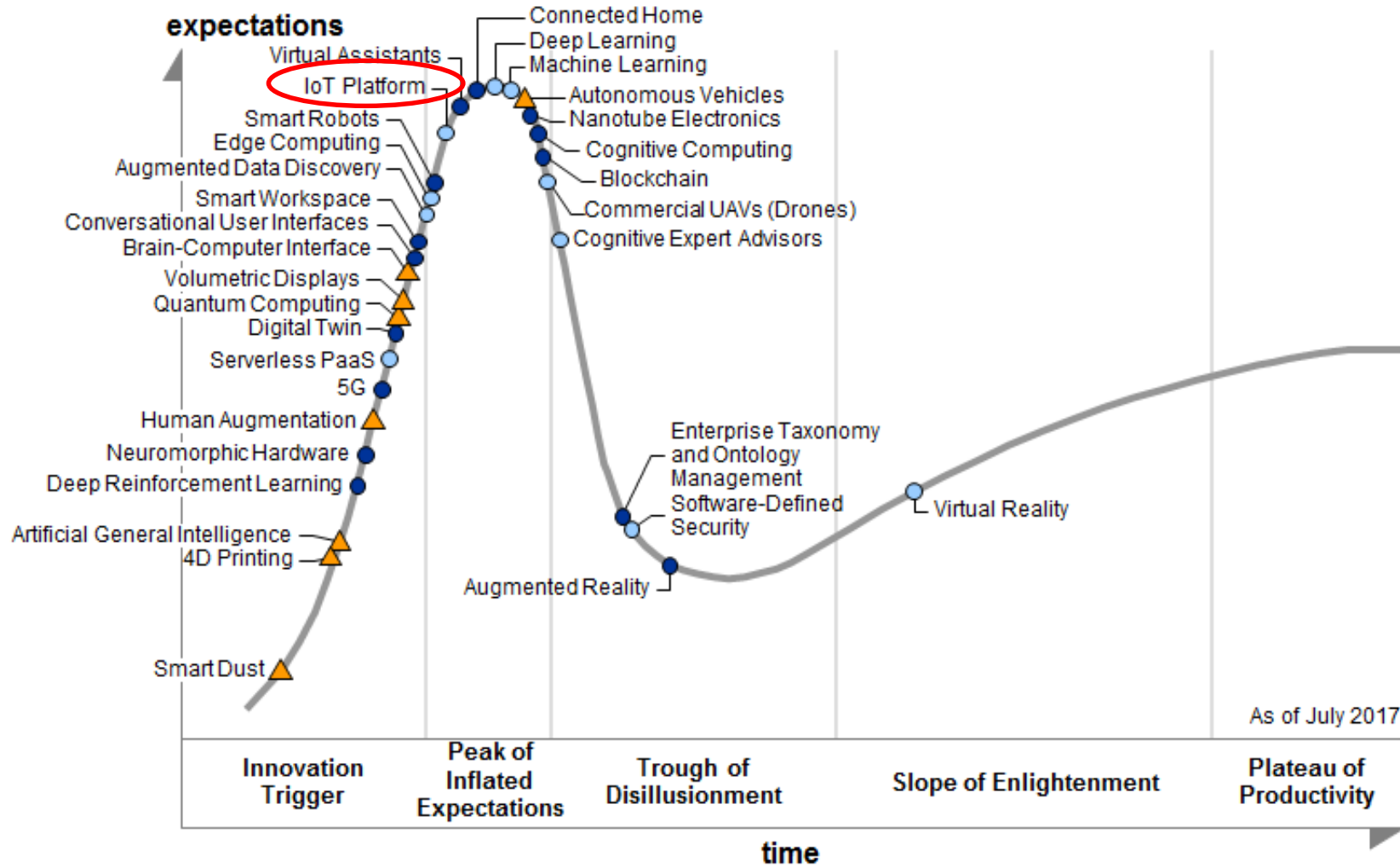
Years to mainstream adoption:

- less than 2 years
- 2 to 5 years
- 5 to 10 years
- ▲ more than 10 years
- ⊗ obsolete before plateau





IoT Trend (Gartner Hype Cycle for Emerging Technologies)

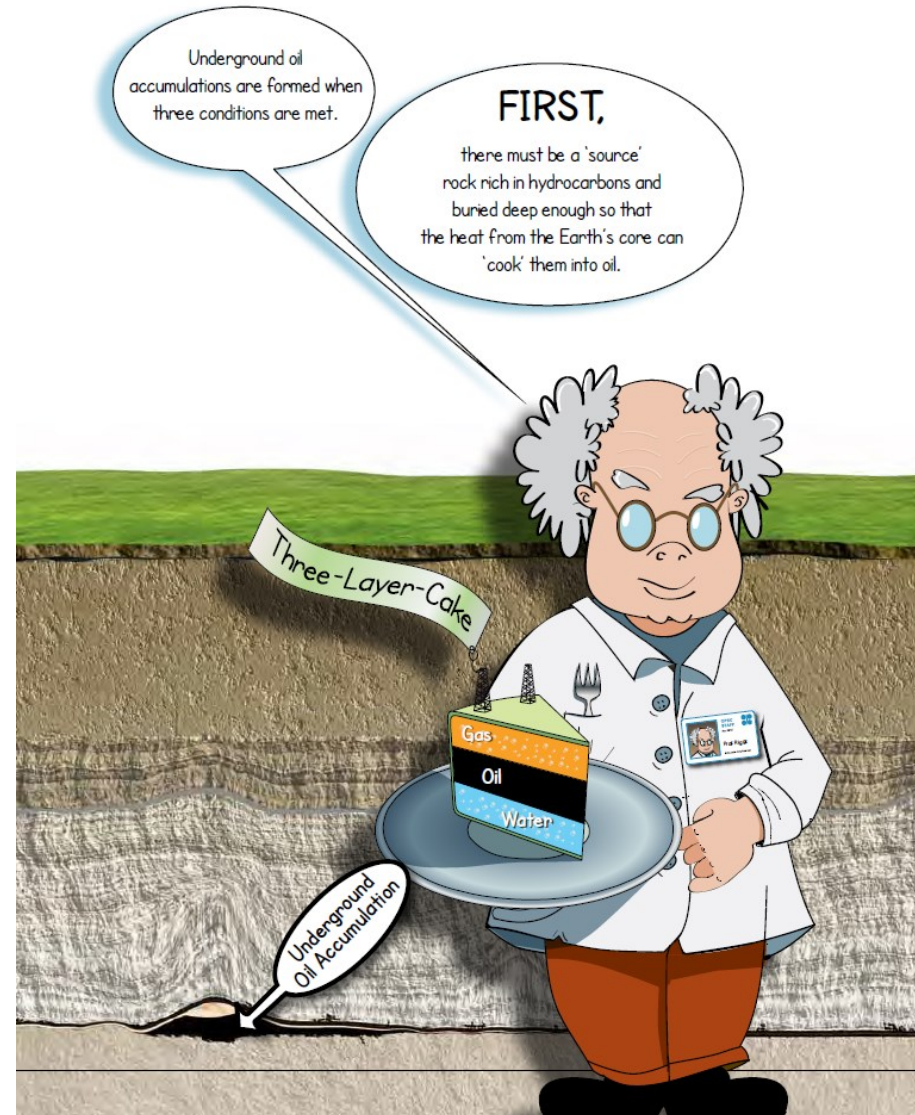
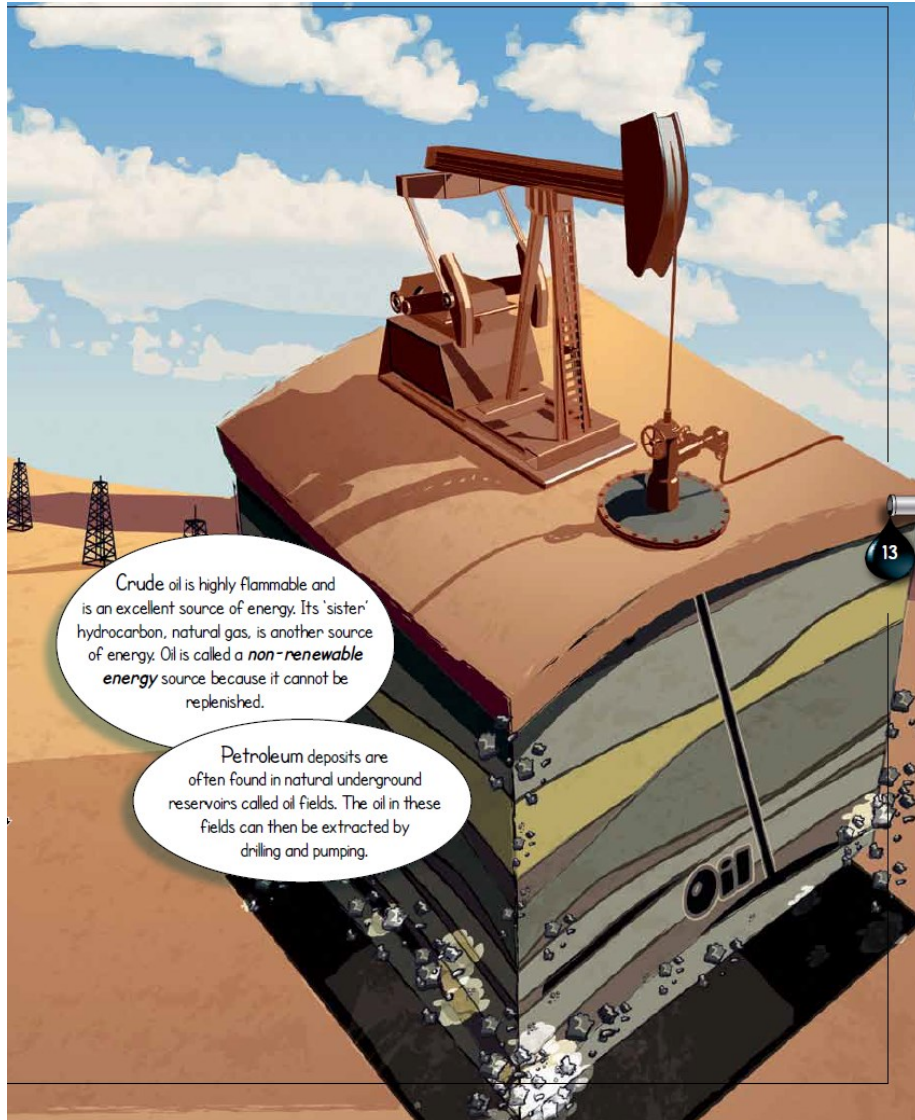


As of July 2017

Years to mainstream adoption:
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Oil & Gas Industry Introduction



Oil & Gas Industry Introduction

Upstream



- Exploration & Production (E&P)
- Firms explore new hydrocarbon fields
- Discovered fields developed and petroleum produced

Midstream



- Transportation of oil and natural gas
- Shipping
- Pipelines
- LNG Terminals

Downstream



- Refinery processes crude oil to produce different products
- Petrochemical plants
- Polymers, Plastics and other products

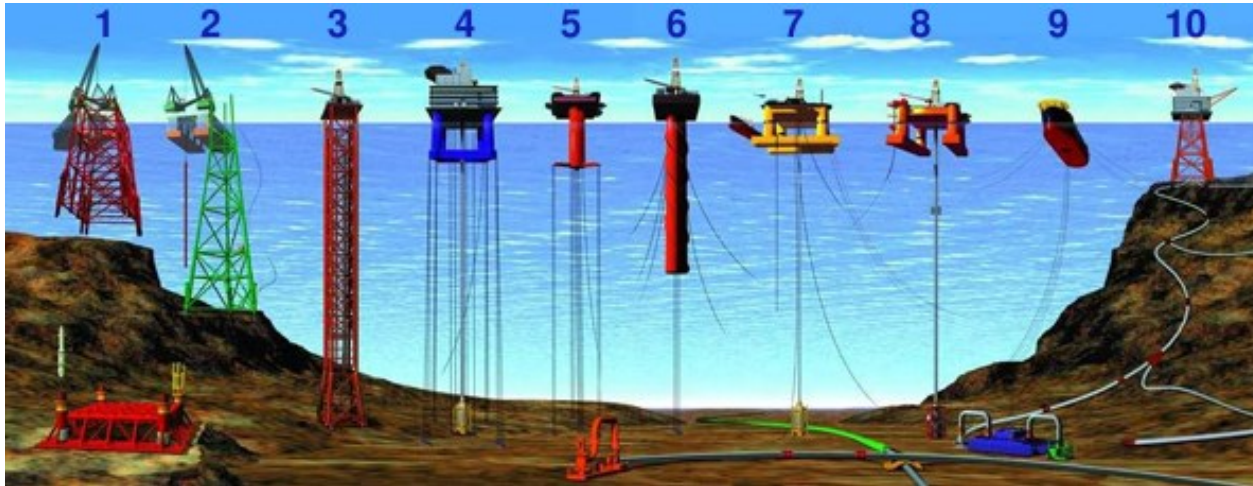


Oil & Gas Industry Introduction





Oil & Gas Industry Introduction (offshore)

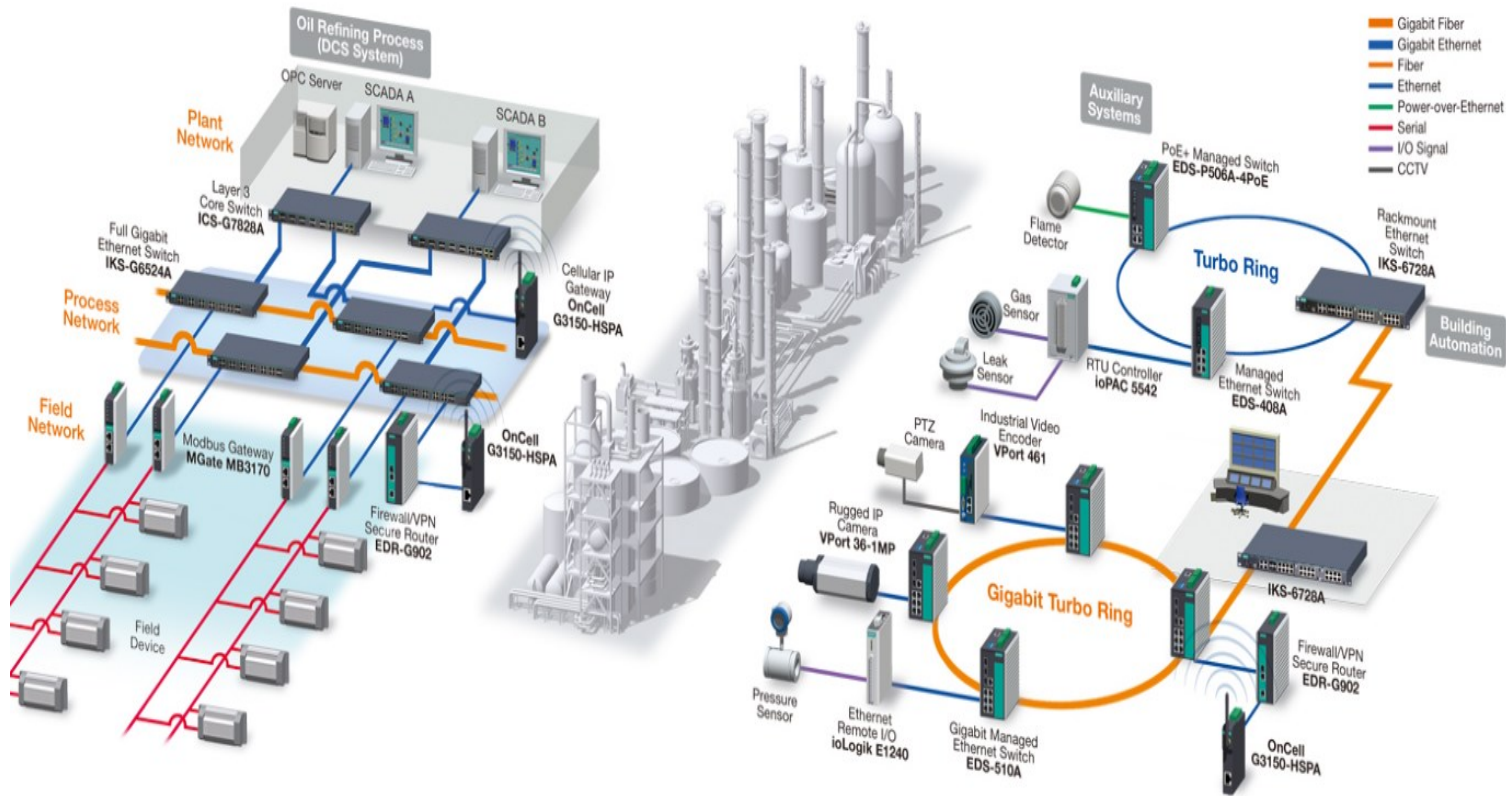


Sea-based offshore platforms and drilling rig for oil



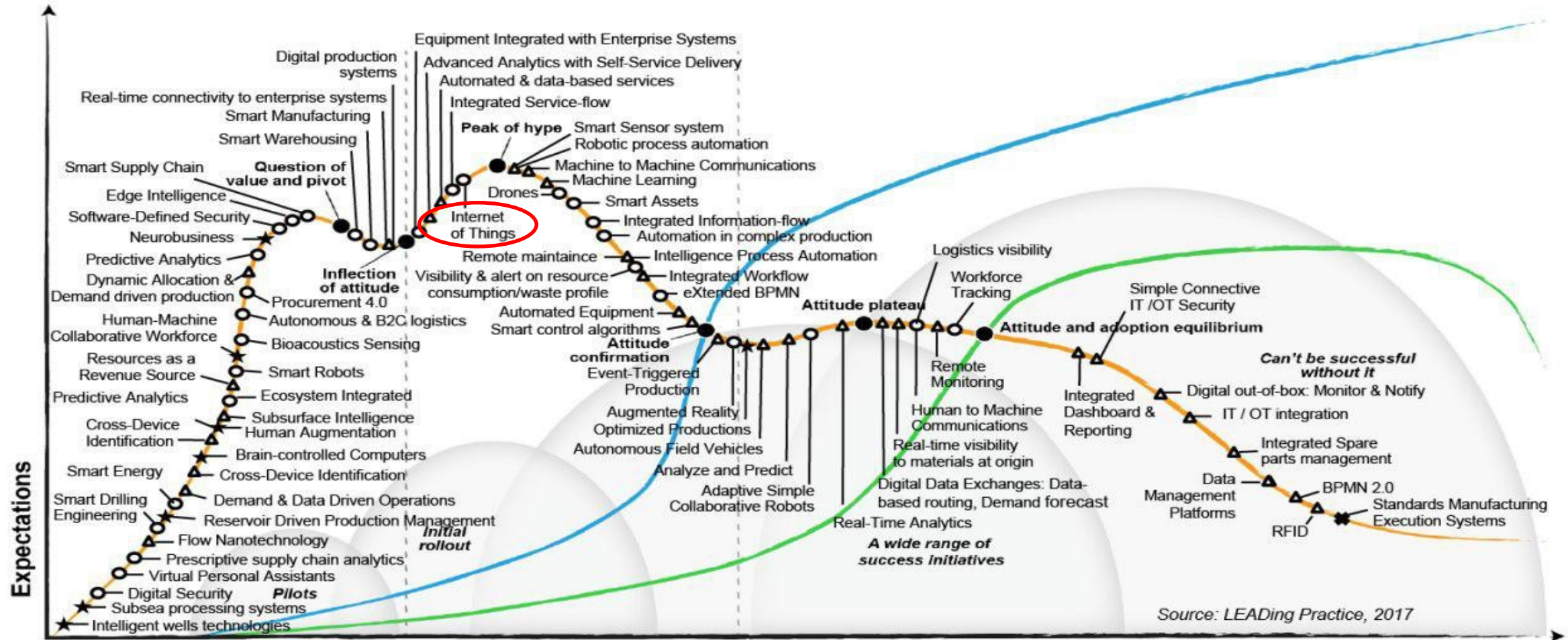


Oil & Gas Industry Introduction (onshore)





Oil & Gas Emerging and Disruptive Trends



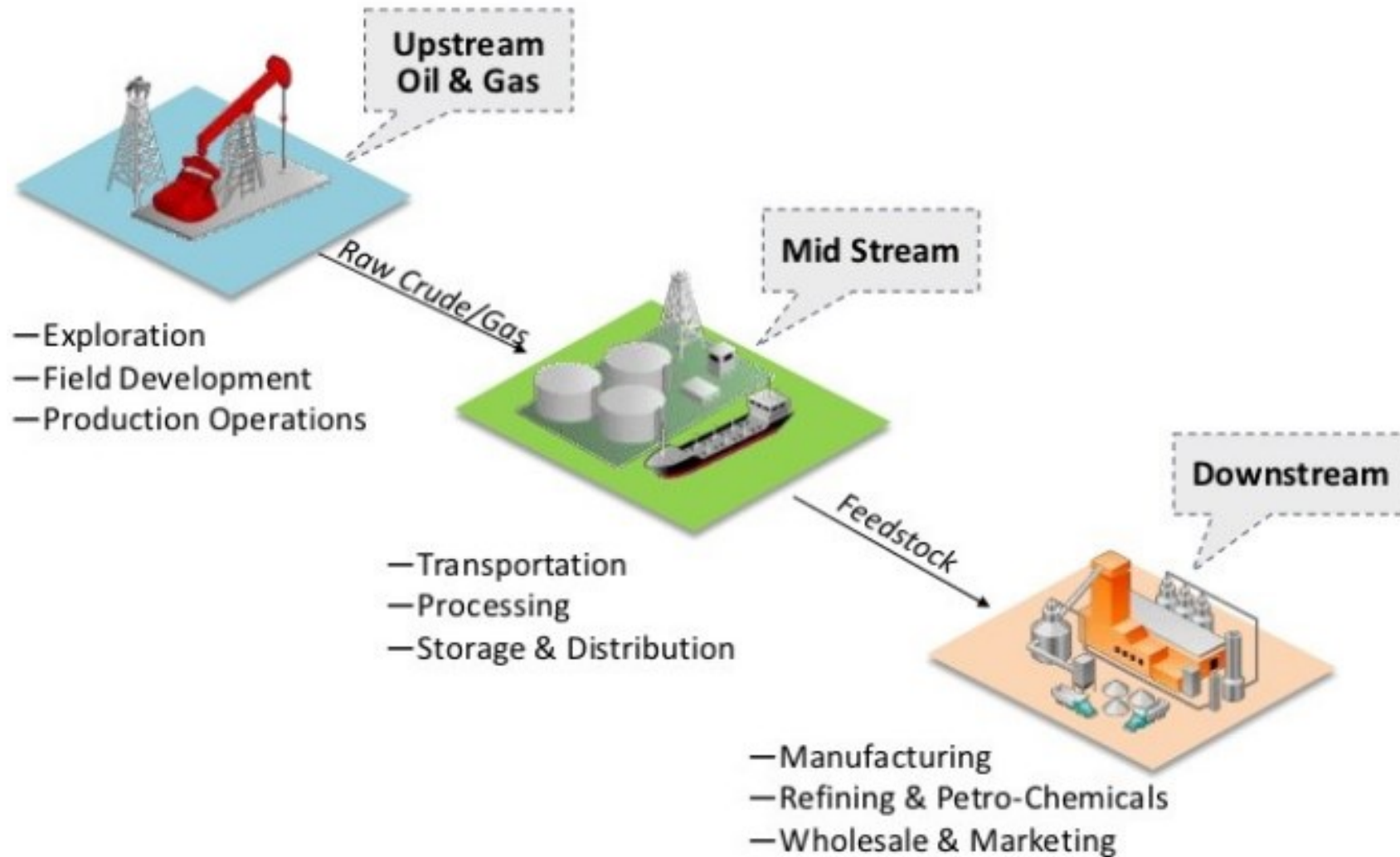
Real-time connectivity to enterprise systems
Smart Manufacturing
Smart Warehousing
Smart Supply Chain
Edge Intelligence
Software-Defined Security
Neurobusiness
Predictive Analytics
Dynamic Allocation & Demand driven production
Human-Machine Collaborative Workforce
Resources as a Revenue Source
Predictive Analytics
Cross-Device Identification
Smart Energy
Smart Drilling Engineering
Intelligent wells technologies

Question of value and pivot
Inflection of attitude
Initial rollout
Pilots

Equipment Integrated with Enterprise Systems
Advanced Analytics with Self-Service Delivery
Automated & data-based services
Integrated Service-flow
Peak of hype
Smart Sensor system
Robotic process automation
Machine to Machine Communications
Machine Learning
Smart Assets
Automation in complex production
Intelligence Process Automation
Logistics visibility
Workforce Tracking
Simple Connective IT / OT Security
Can't be successful without it

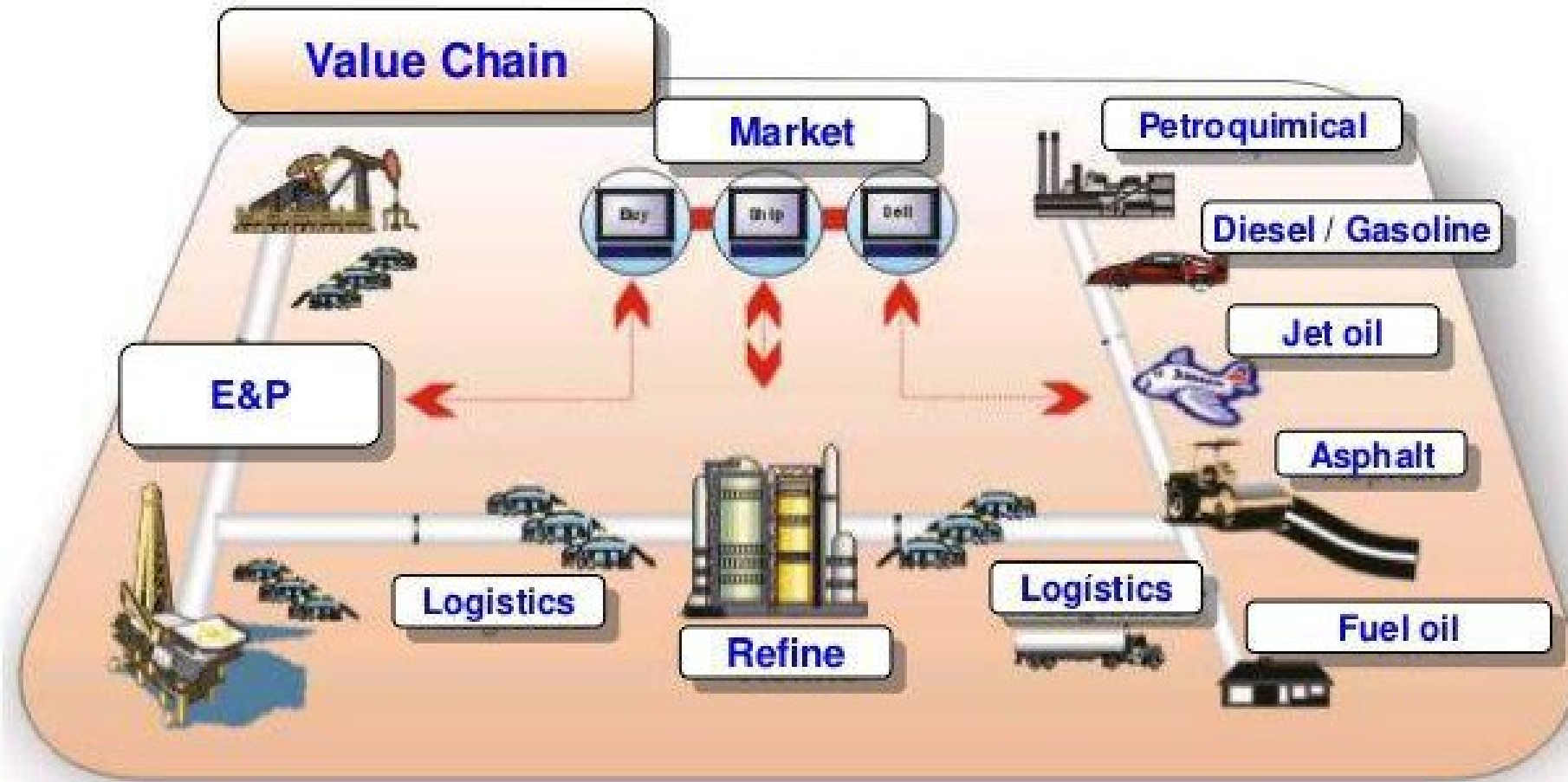
Internet of Things
Drones
Remote maintenance
Visibility & alert on resource consumption/waste profile
Automated Equipment
Smart control algorithms
Attitude confirmation
Event-Triggered Production
Augmented Reality
Optimized Productions
Autonomous Field Vehicles
Analyze and Predict
Adaptive Simple Collaborative Robots
Attitude plateau
A wide range of success initiatives
Real-Time Analytics
Digital Data Exchanges: Data-based routing, Demand forecast
Real-time visibility to materials at origin
Human to Machine Communications
Remote Monitoring
Integrated Dashboard & Reporting
IT / OT integration
Integrated Spare parts management
Data Management Platforms
BPMN 2.0
Standards Manufacturing Execution Systems
RFID

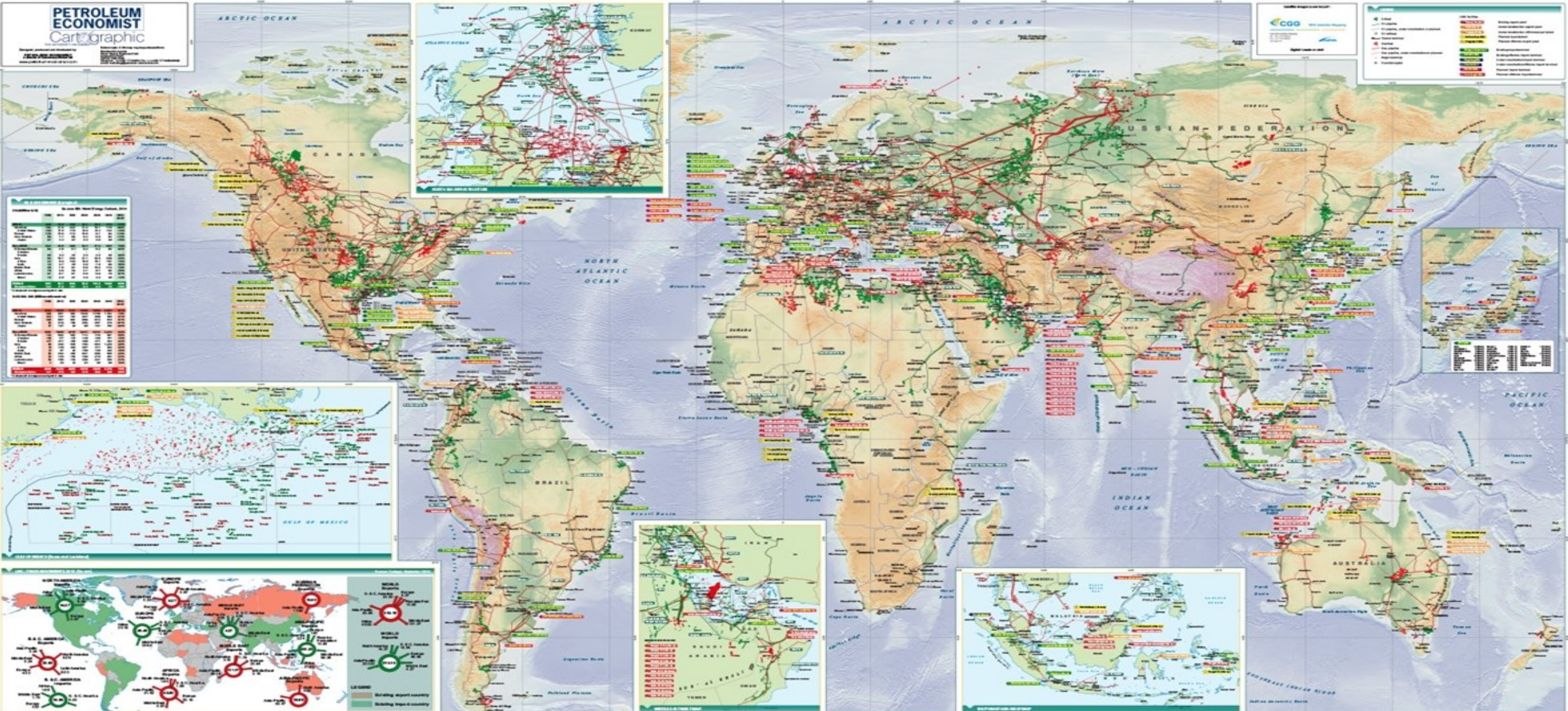
The Global Oil & Gas Value Chain





The Oil Value Chain





Legend

Oil Refineries	Oil Production Fields
Gas Refineries	Gas Production Fields
Oil Pipelines	Gas Pipelines
Oil Tankers	Gas Tankers
Oil Ports	Gas Ports
Oil Storage	Gas Storage
Oil Processing	Gas Processing
Oil Distribution	Gas Distribution
Oil Marketing	Gas Marketing
Oil Retail	Gas Retail

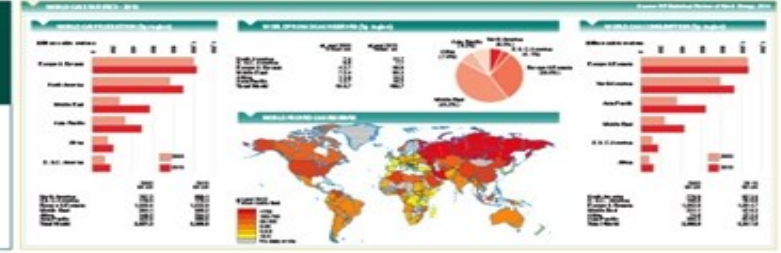


WORLD OIL & GAS MAP
4th edition

Produced by Petroleum Economist, a division of Euromoney Global Limited in partnership with

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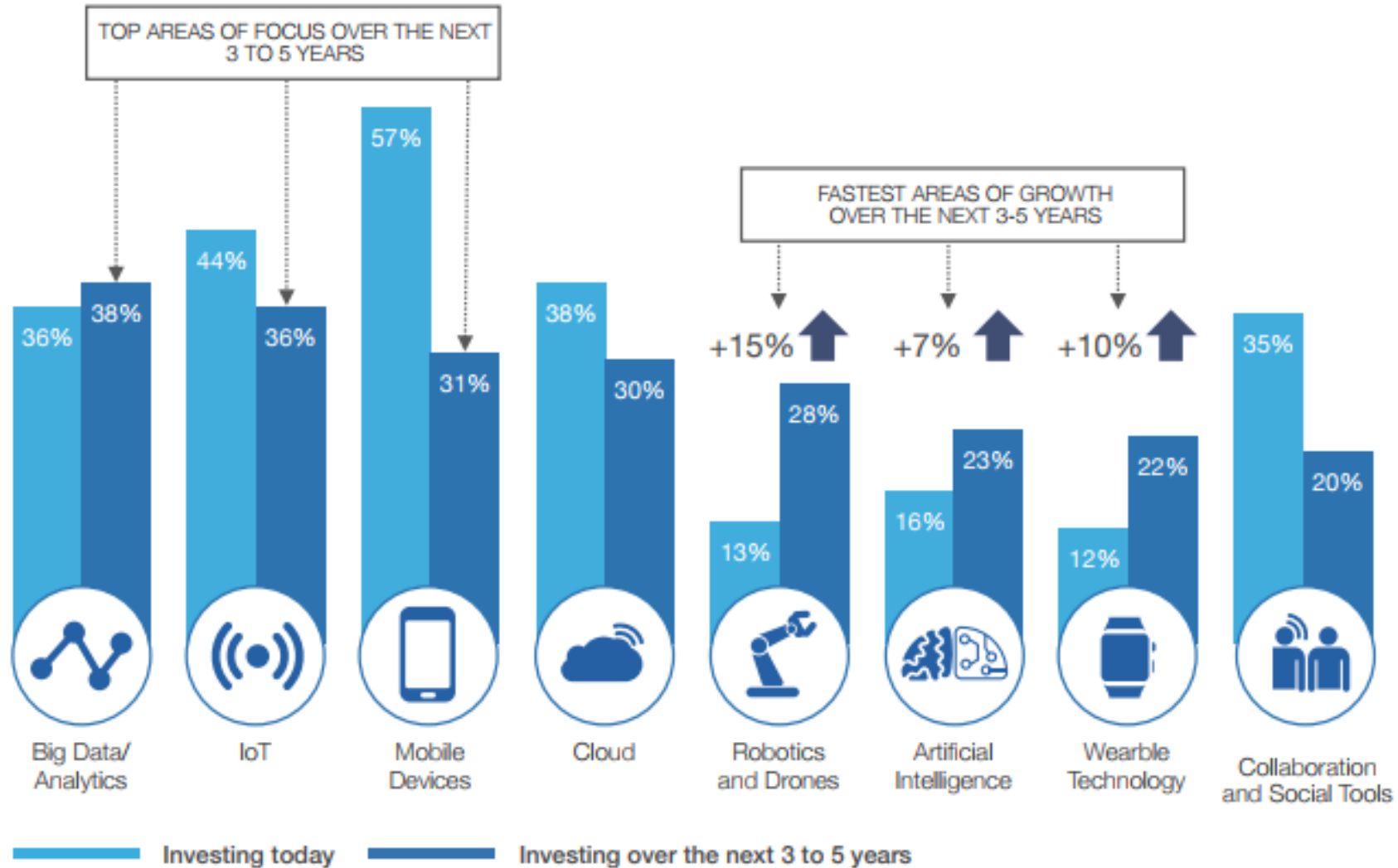


Oil & Gas IIoT and Digital Transformation





Investments in Digital Technologies

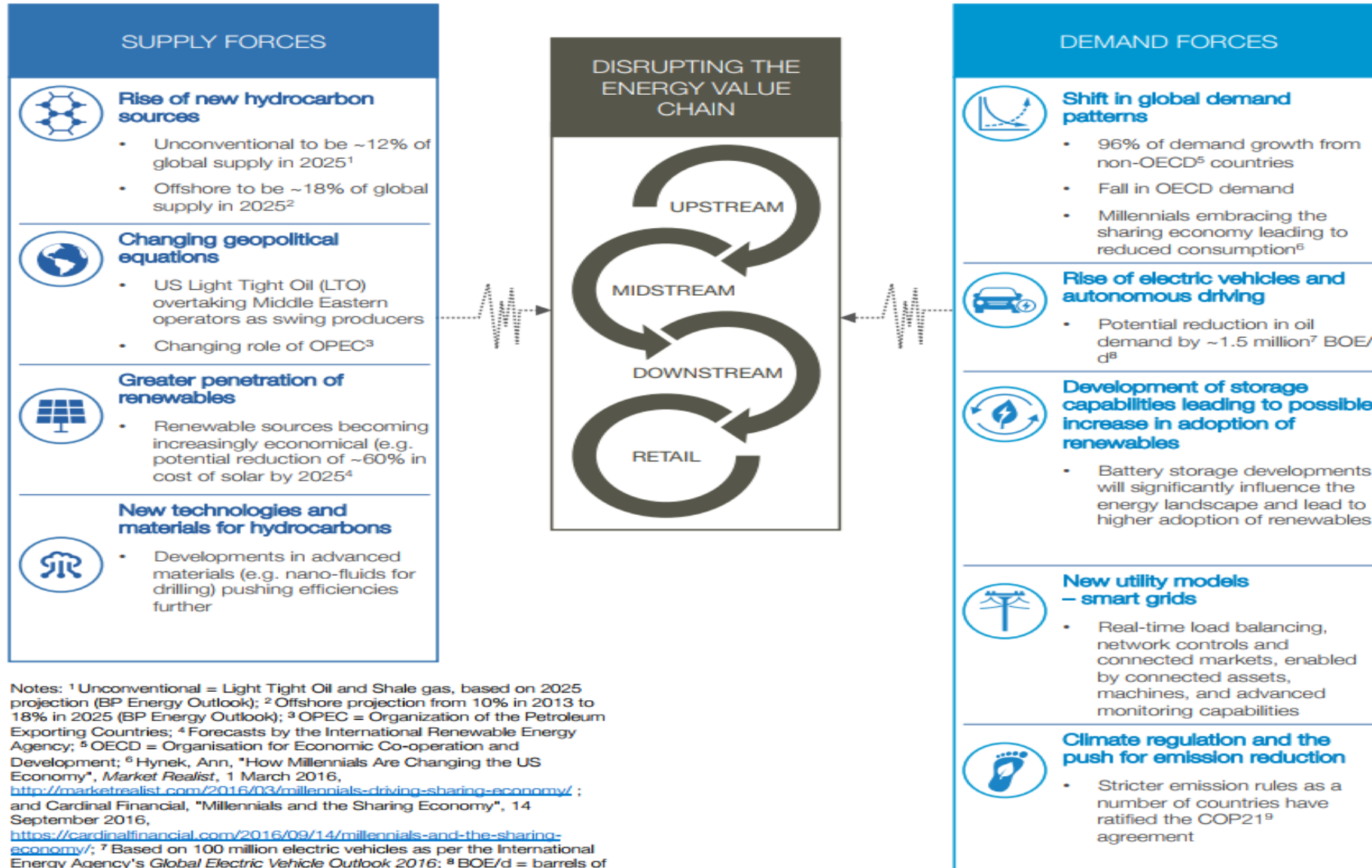


Ref: World Economic Forum, 2017





Shifting Trends in Supply and Demand Are Reshaping the Oil and Gas Industry





Total Return to Shareholders across Industries

10-Yr TRS CAGR (09/2006 – 09/2016)		5-Yr TRS CAGR (09/2011 – 09/2016)		3-Yr TRS CAGR (09/2013 – 09/2016)		1-Yr TRS CAGR (09/2015 – 09/2016)		MARKET CAP (09/2016; USD Bn)	
Technology	9.0%	Healthcare	17.1%	Technology	13.6%	Mining	32.0%	Bank	5,351
Healthcare	8.8%	Technology	14.4%	Healthcare	11.1%	Technology	19.8%	Healthcare	4,506
Retail	8.2%	Machinery	11.6%	Machinery	6.9%	Chemicals	15.5%	Technology	4,241
Machinery	7.1%	Retail	11.5%	Utilities	4.8%	Oil and Gas	14.9%	Oil and Gas	2,567
Chemicals	6.8%	Bank	9.2%	Retail	4.3%	Machinery	11.6%	Telecom	2,523
Telecom	6.8%	Auto	8.5%	Telecom	3.6%	Telecom	11.0%	Retail	2,421
Mining	4.3%	Chemicals	8.0%	Chemicals	2.9%	Utilities	7.4%	Utilities	1,831
Auto	2.7%	Telecom	7.5%	Bank	0.6%	Healthcare	5.9%	Chemicals	1,608
Utilities	2.3%	Utilities	5.2%	Auto	-1.7%	Auto	4.3%	Auto	910
Oil and Gas	0.0%	Oil and Gas	0.2%	Oil and Gas	-5.3%	Retail	0.6%	Mining	823
Bank	-0.3%	Mining	-7.8%	Mining	-6.3%	Bank	0.4%	Machinery	557

TRS: Total Return to Shareholders

CAGR = Compound Average Growth Rate

Ref: World Economic Forum, 2017





Investments in Digital Technologies

Global \$30.57 Billion Internet of Things (IOT) In Oil and Gas (O&G) Market - Analysis And Forecast: 2017-2026

**Focus on: IoT solutions such as platforms and analytics,
Applications such as Upstream, Midstream and Downstream**

RESEARCHANDMARKETS
THE WORLD'S LARGEST MARKET RESEARCH STORE

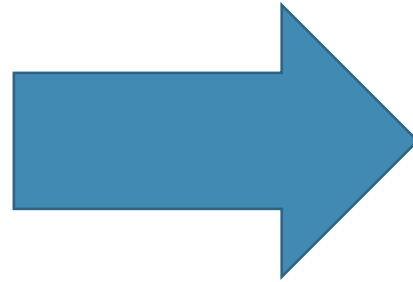




IoT Applications in Oil & Gas Industry (upstream)

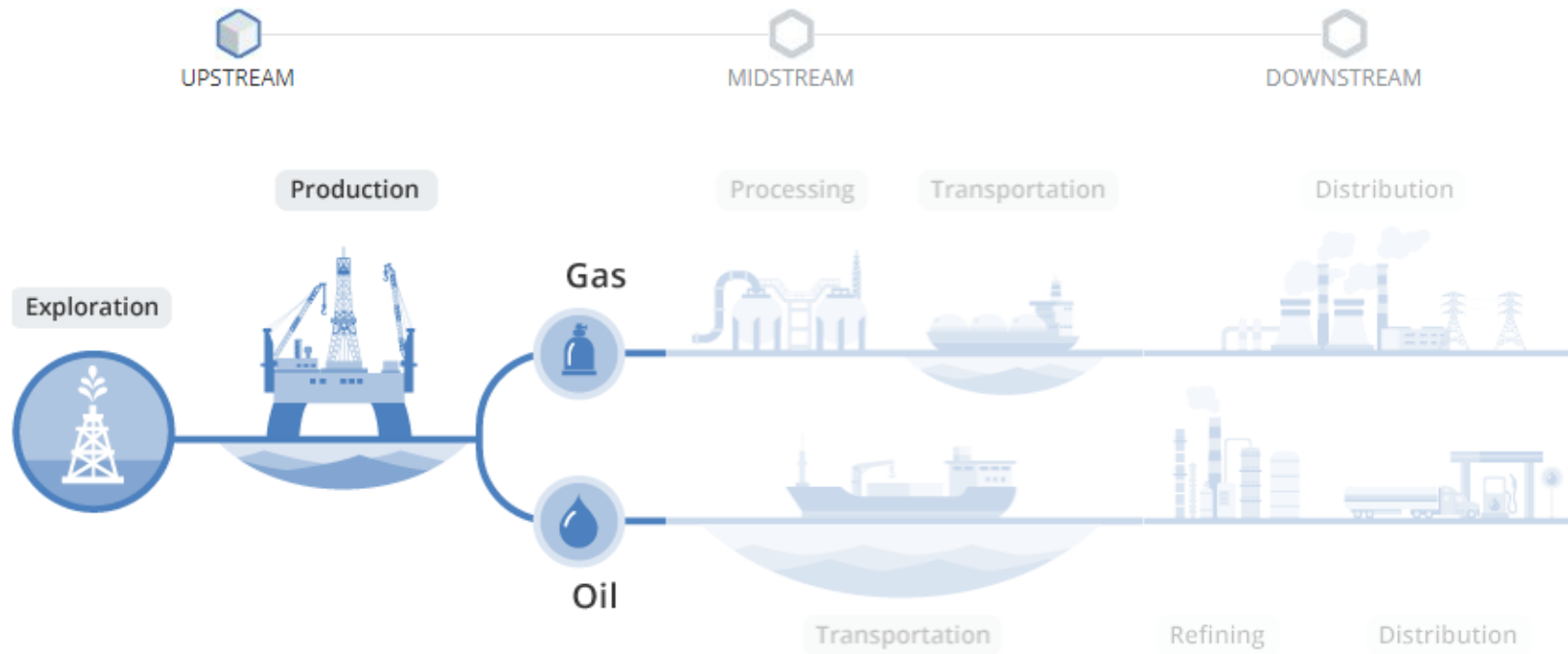
The upstream industry Problem:

- loses billions of dollars every year due to nonproductive time (NPT)
- Deadly Accidents
- Processes are not optimized



IoT Solution:

- With the use of IoT, refineries can plan their shutdowns, minimize their downtime, and improve safety records
- Accidents can be prevented
- processes can be optimized





IoT Applications in Oil & Gas Industry (upstream)

Upstream

Exploration

Exploration is always risky - make it an informed risk with Quintiq.



Scenario planning

Assess the profitability of exploration wells by comparing different demand and supply scenarios and plant capabilities



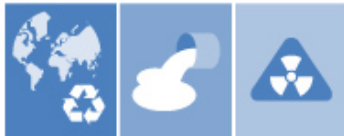
Decision support

Compare the potential profitability of various sites in order to make the best decision for the future of your organization



Multi-resource optimization

Optimize the scheduling of field services equipment and contractors to control costs



Real-world plans

Create practicable plans that incorporate all business goals, rules and legislation





IoT Applications in Oil & Gas Industry (upstream)

Production

How do oil & gas producers cope with fluctuating prices and turbulent markets? Smart production planning is key to success - this depends on the ability to make reliable estimates of future demand.

- **Scenario planning**

Explore what-if scenarios such as significant changes in demand to predict the impact on your short- and long-term plans, and prepare for scheduling disruptions

- **Demand forecasting**

Forecast future requirements in order to determine capacity, expansion and contraction

- **Inventory optimization**

Determine the optimal amount of inventory to be stored in each location based on existing and forecasted demand and the costs involved in each alternative, monitor and manage reservoirs and pipelines

- **Logistics optimization**

Optimize production in collaboration with distribution and fleet and vessel operations

- **Flexibility and responsiveness**

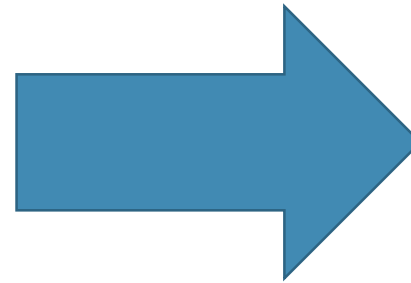
Respond quickly and efficiently to opportunities in the dynamic commodities market



IoT Applications in Oil & Gas Industry (midstream)

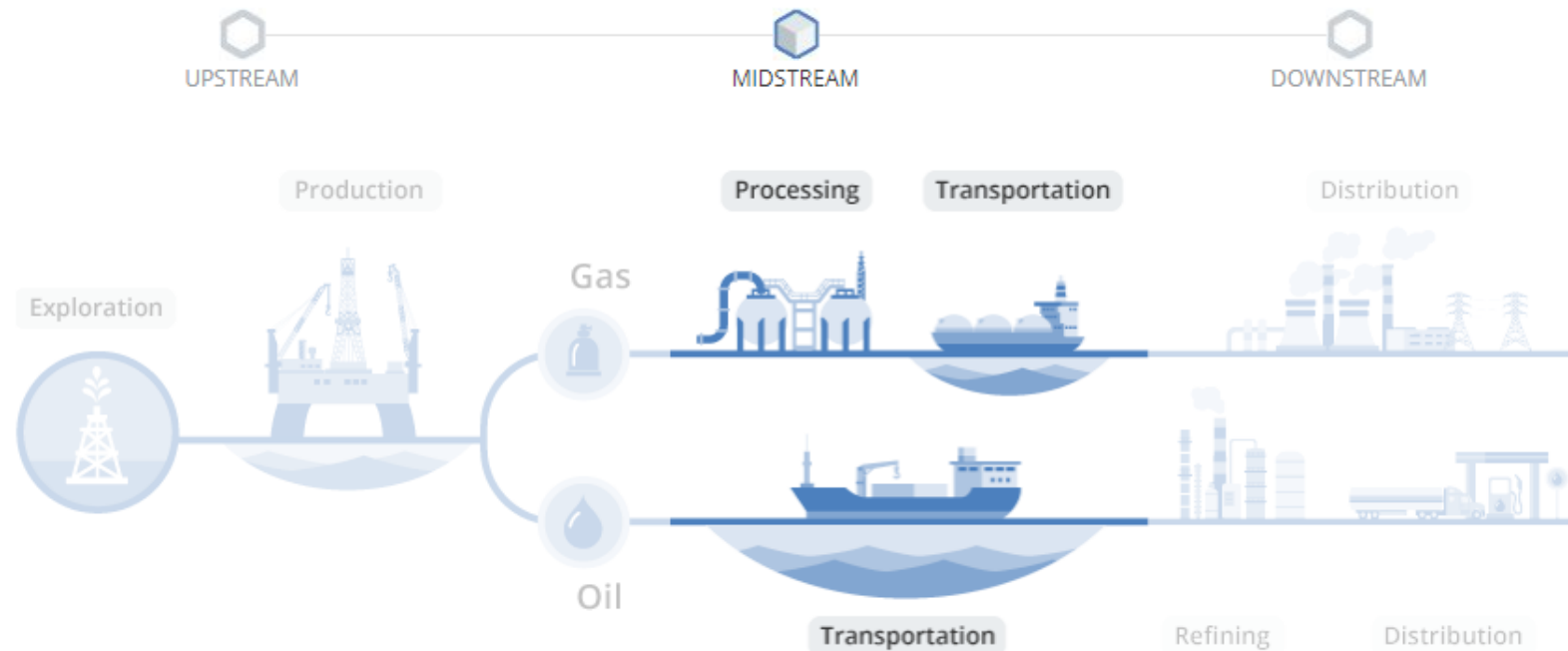
The midstream industry Problem:

- has the challenging task of transporting variable volumes and grades of products from multiple locations to new end-users and markets
- Connecting pipeline networks, sensors, leak detection, alarms, and emergency shutdowns to interact seamlessly



IoT Solution:

- With the use of IoT, To be available for analysis and interpretation in real time would significantly reduce some of the major risks that this sector of the industry deals with





IoT Applications in Oil & Gas Industry (midstream)

Midstream

Processing

Align LNG plant operation plans with production and storage facilities, and ports and terminals, in order to achieve impressive results.



Simulation

Simulate and model LNG, condensate and LPG tankage to predict Days to Tank Top and Days to Bottoms



Scenario planning

Explore production cut-back simulations in order to prepare for scheduling disruptions, such as inclement weather or route changes



Agility

Adjust processing facility schedules in real time to accommodate for disruptions and capacity constraints



All planning horizons

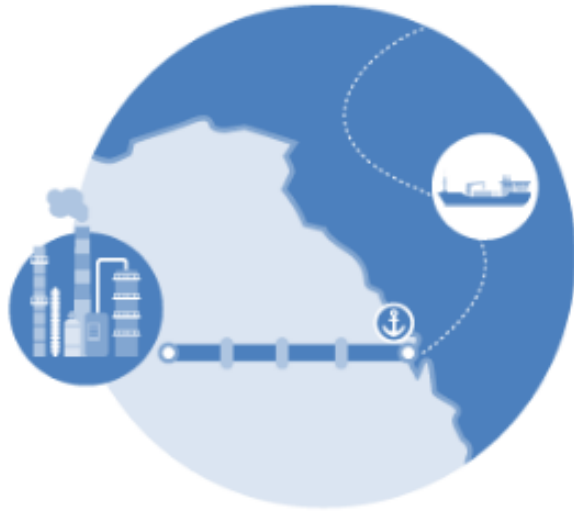
Generate long-term, mid-term and short-term plans, from production scenario planning and forecasts to annual delivery plans to daily schedules





IoT Applications in Oil & Gas Industry (midstream)

Shipping



Optimize transportation plans and utilization to maximize profits.

- Plan and optimize all modes of transportation including pipeline, rail, road and sea
- Design an optimal fleet network
- Maximize the utilization of every tank
- Minimize vessel idle time, cleaning and maintenance times, and bunker costs
- Optimize annual delivery plans and operational schedules to take advantage of lucrative out-charter and spot-market opportunities for your fleet
- Create plans which reflect all vessel, port, compartment and cargo specifications and constraints
- Accommodate last-minute changes with minimal impact on your fleet
- Explore what-if scenarios and simulate the impact of future events on fleet and production plans
- Plan and optimize trains and rail cars
- Optimize crude pipeline schedules

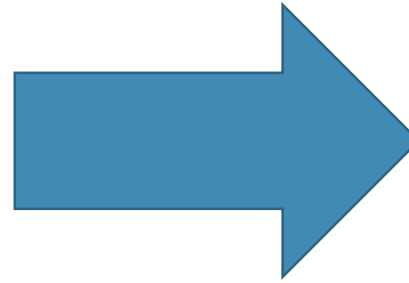
An optimal plan is not only a plan that takes into account the business rules and constraints impacting your fleet; it's also a plan that is flexible, enabling you to take advantage of daily fluctuations in supply, demand and other market conditions. Quintiq provides you with the comprehensive planning support you need to ensure that all decisions regarding the utilization of your vessels are timely, profitable and optimal. Find out more when you download your guide to LNG transportation planning with Quintiq.



IoT Applications in Oil & Gas Industry (downstream)

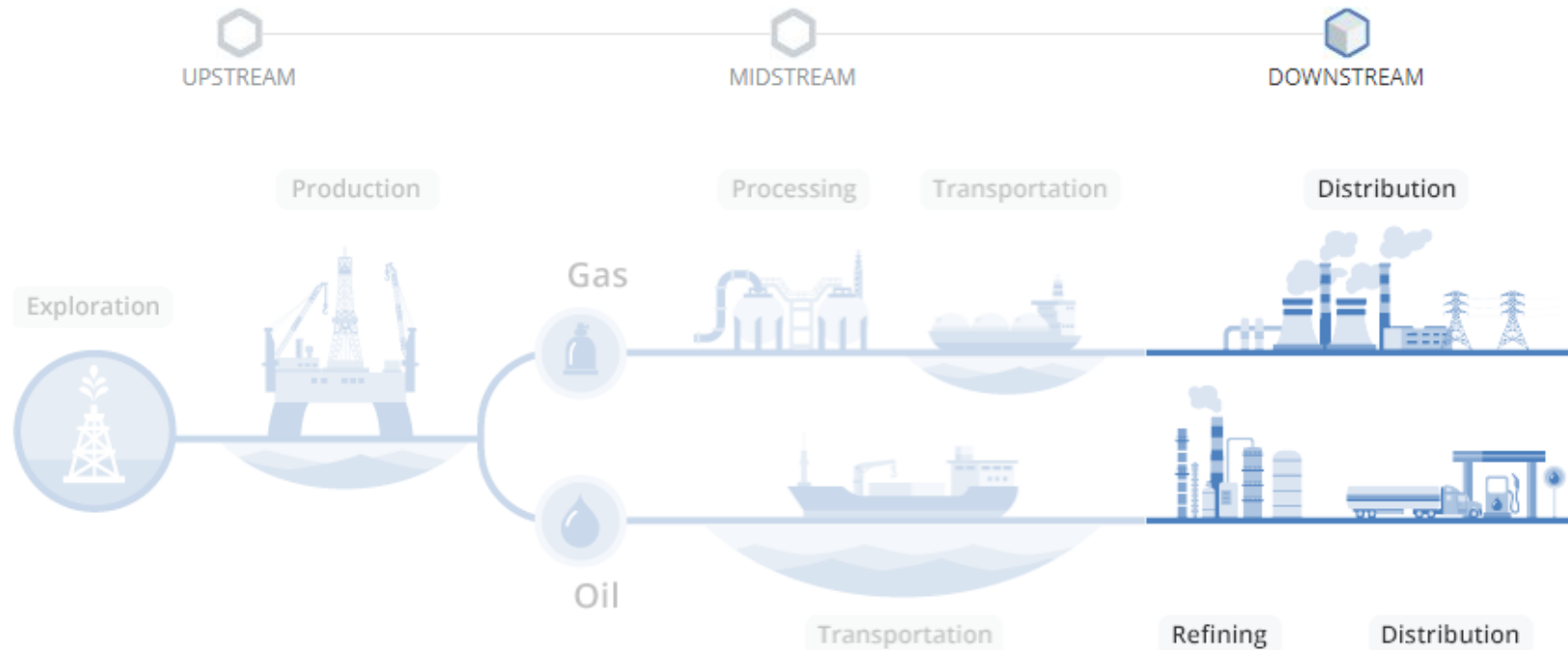
The downstream industry Problem:

- Refinery shutdowns, handling various grades of crude oil, and changing environmental regulations are pushing gross refining margins down to a bare minimum



IoT Solution:

- With the use of IoT, refineries can plan their shutdowns, minimize their downtime, and improve safety records

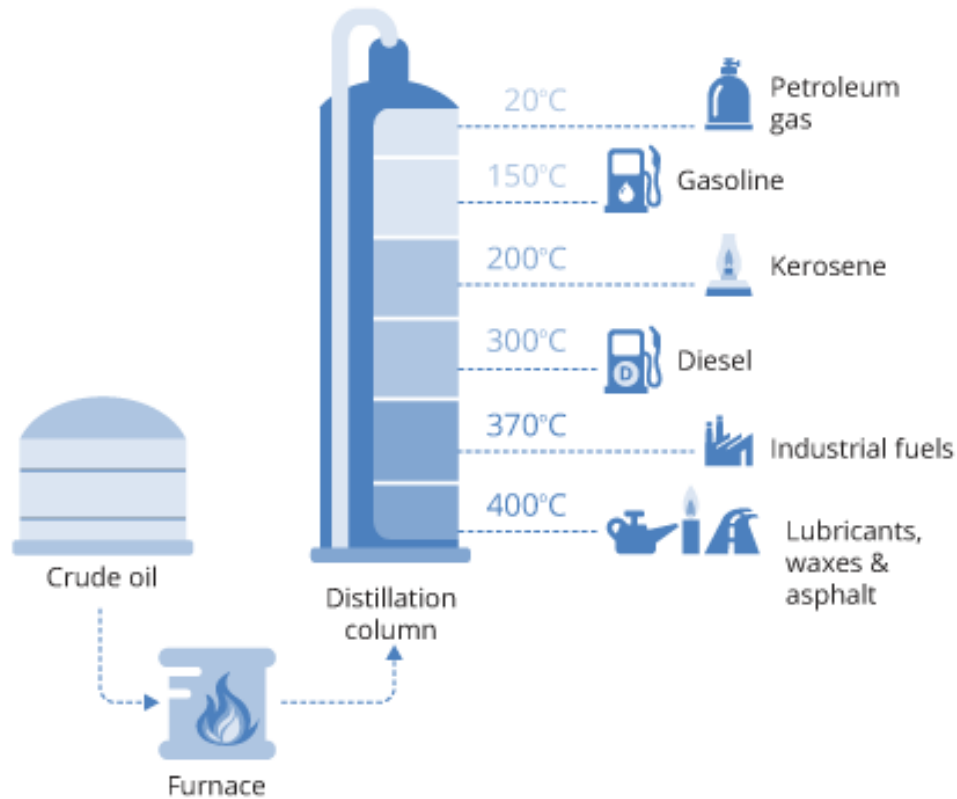




IoT Applications in Oil & Gas Industry (downstream)

Downstream

Refining



Quintiq's integrated planning system for oil refineries enables you to:

- Simulate and optimize refinery processes to predict total processing time
- Explore production cut-back simulations in order to prepare for disruptions, such as equipment failure or feed stock shortages
- Adjust processing facility schedules in real-time to accommodate for disruptions and capacity constraints
- Generate long-term, mid-term and short-term plans, from multi-year investment planning to monthly supply and production planning to daily production scheduling
- Support traders in determining what feed stocks to purchase and what products to sell and at what price



IoT Applications in Oil & Gas Industry (downstream)

Distribution

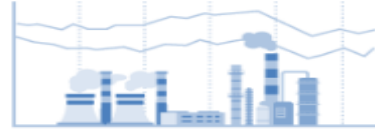
How do you cope when market conditions upset the fine balance of your integrated supply chain? How do you minimize transportation and inventory costs associated with the primary distribution of fuels?

Quintiq's planning and optimization software for oil & gas distribution supports:



Optimization

Achieve the right balance of inventory levels, transportation costs and customer service



Responsiveness

Maintain an optimal operating schedule throughout the year in line with supply contracts and seasonal fluctuations



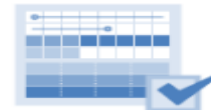
Forecasts

Optimize primary and secondary distribution plans to take advantage of forecasted demand and lucrative market opportunities



Optimize logistics

Optimize truck and rail car utilization, minimize empty mileage



Flexibility

Amend schedules on the go without impacting your entire operation



Asset utilization

Ensure gas station stock replenishment while maximizing utilization of your truck fleet



Scenario planning

Explore what-if scenarios and simulate the impact of future events on capacity



Task optimization

Minimize vessel idle time and optimize maintenance schedules



There are countless opportunities for IoT Oil & Gas Industry

Upstream	Midstream	Downstream
Asset Tracking	Tank Farm Monitoring	Perimeter Security Sensors
Vehicle Monitoring	Field Crew Monitoring	Perimeter Video Camera
Remote Video	Remote Video	Mobile Asset Tracking
Machine Monitoring	Pipeline Monitoring	Vehicle Monitoring
Site Monitoring	Terminal Access control	Production Sensors
Well Head Monitoring	Asset Tracking	IoT Cloud Storage
Security/Access Sensors	Flow Meter Connectivity	Lone Worker Wearables
Lone Worker Tracking	Pipeline Monitoring	Contractor Tracking
Rig Monitoring	Wellhead Monitoring	Refinery Monitoring
Tank Monitoring	Cargo Shipping Monitoring	





Abadan Oil Refinery, Iran's largest refinery





Thank You

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