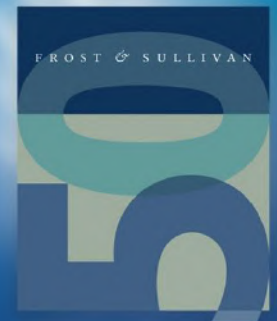


Oil and Gas Trends and their Impact on the Generator Set Market

The generator set market for oil & gas will start stabilizing and witnessing slight growth from 2018

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July 2016



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Executive Summary



Executive Summary

1

Oil prices have fallen again due to a lack of demand amid a weak global economic outlook. The oil prices will remain below \$50 for the next two years.

2

One of the main challenges confronting the market is the political instability in Middle East, which affects investment in the region.

3

Low oil prices have stalled new exploration investments across the world.

4

Oil and Gas companies are, however, investing in solutions that provide improved productivity and cost management across operational areas that include production optimisation and flow assurance.

5

The industry will gradually rise to the adoption of shale. Shale gas has the potential to provide greater energy security, growth and jobs with rising technological investment in fracking.

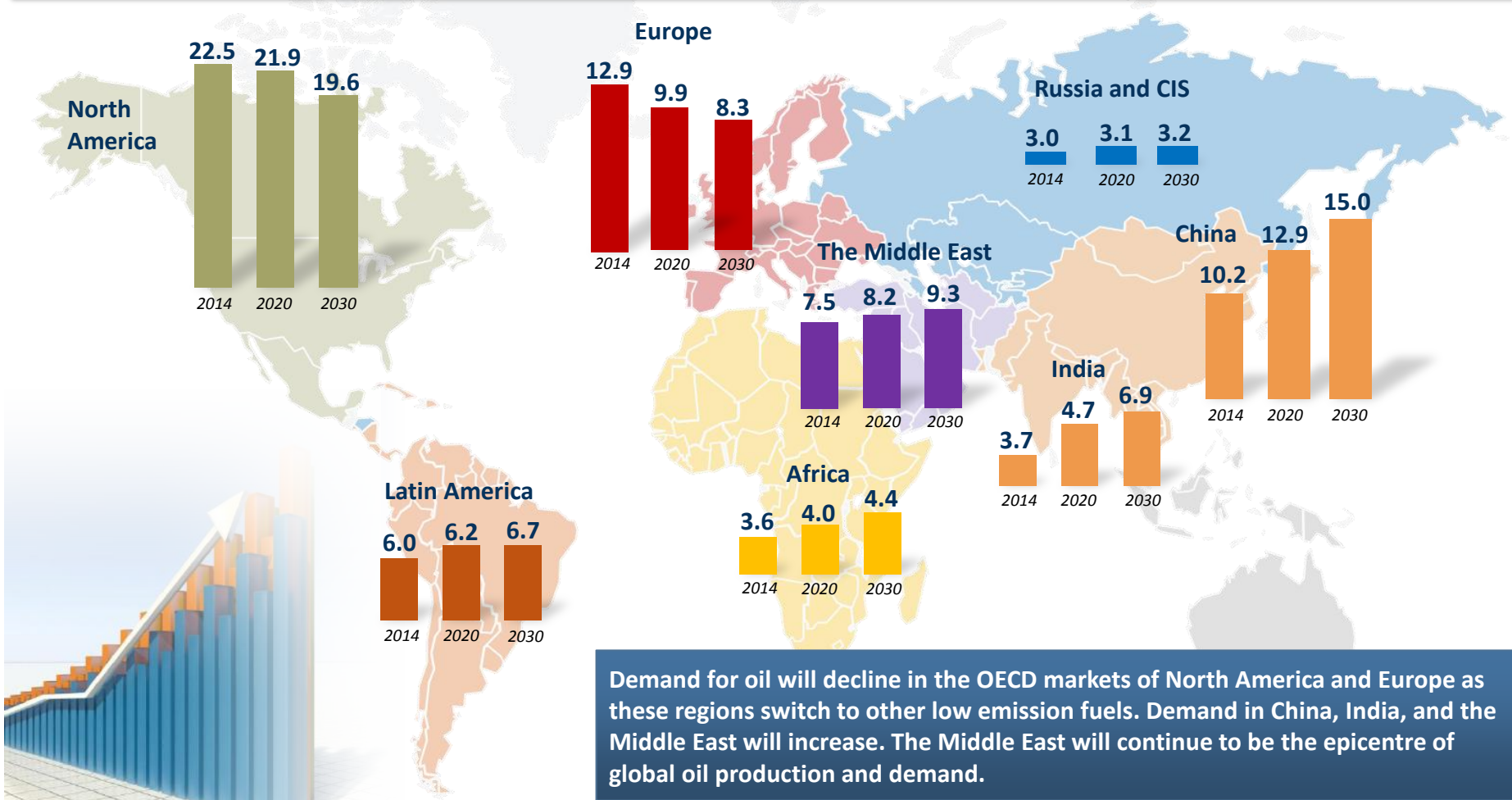
- The oil price's slump below \$40/bbl has not tempered Iran's aims to restore output once sanctions are lifted. Iran still plans to boost crude output to regain market share even as U.S. shale producers increase drilling activity in 2016.
- Advancement in technology in onshore oil and gas production is one of the major current trends in this market. Companies are working on improvements to production output, redeveloping existing oilfields, facilitating production from unconventional resources such as shale, and enhancing well management.
- Natural gas production across all major shale regions is likely to decrease for the first time as production from new wells is not large enough to offset production declines from existing, legacy wells. Most investments in the industry are dependent on the changing oil price trends.
- With the current low oil price, there has been a slowdown in newbuild rig orders. Rig owners are instead looking at repairing and upgrading their current fleet. Most investments are in maintenance and refurbishments.

Industry Outlook



Growth in Oil Demand Will Be Concentrated across The Emerging Markets of China, Latin America, and Asia-Pacific

Oil & Gas Trends: Oil Demand, Global, 2014, 2020, and 2030



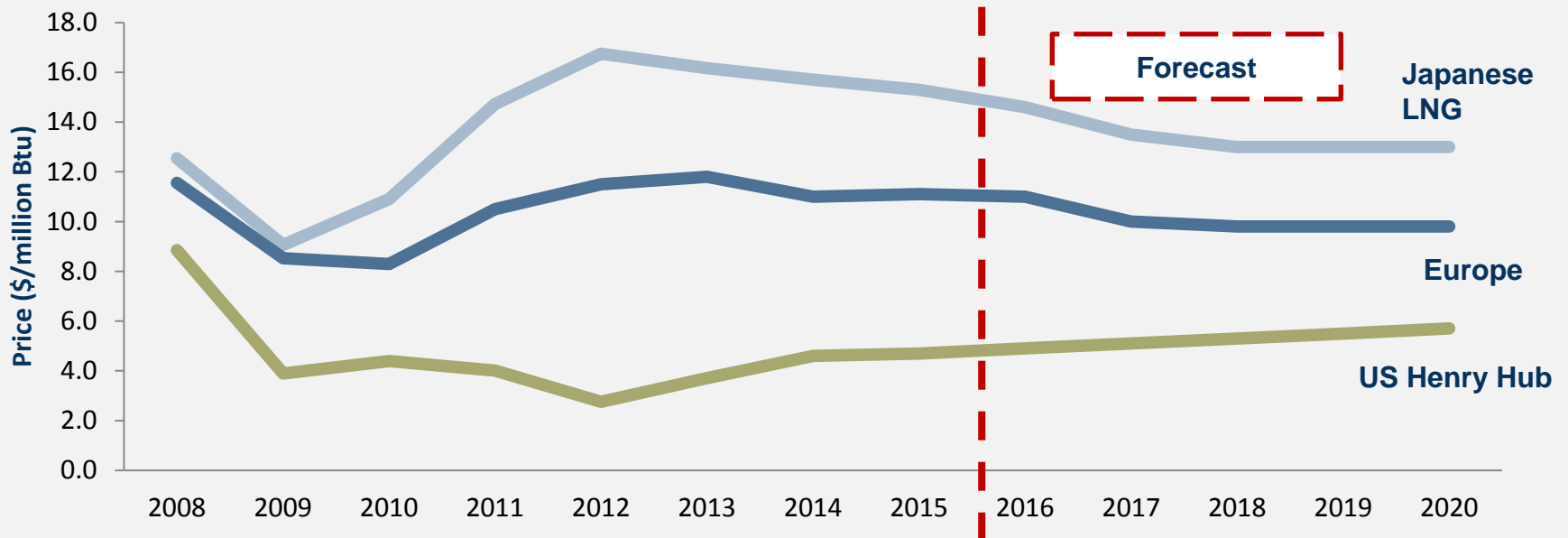
Demand for oil will decline in the OECD markets of North America and Europe as these regions switch to other low emission fuels. Demand in China, India, and the Middle East will increase. The Middle East will continue to be the epicentre of global oil production and demand.

Note: All values in mb/d (million barrels/ day)

Source: Frost & Sullivan, BP Statistical Review of World Energy 2014, International Energy Agency 2013

Rising Energy Demand and Increase in International Trade for LNG and Piped Gas Will Impact Gas Prices in the Long Term

Oil & Gas Trends: Gas Price Trends, Global, 2008–2020

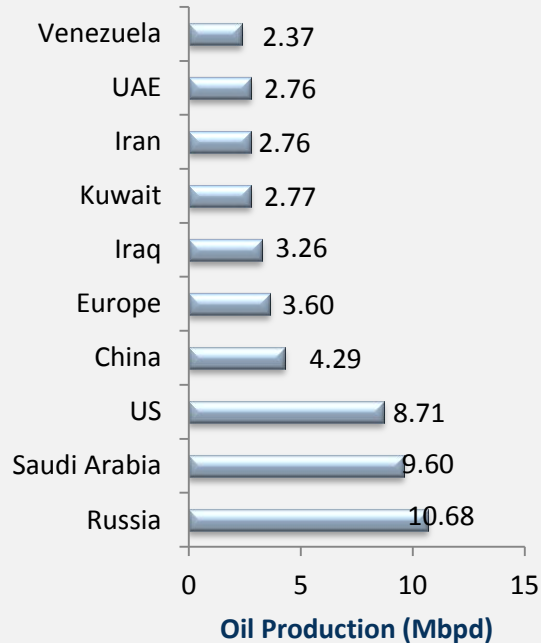


- The shale story in the United States is unlikely to be replicated in the other countries within the next 10 years. The exploration technology is kept between a small number of key US companies who need time and local support to develop shale plays across other regions. China, Latin America, and Australia are well positioned to be those next countries and regions in the long run.
- European countries are the newly opened export markets for the United States. Gas prices are forecast to decline due to a rise in cheap imported gas volumes. The United States is expected to become a net gas exporter by 2018, and with increasing volumes of gas produced, the investments in LNG infrastructure in the United States will have a direct impact on the price of gas in Europe and other US gas importing destinations.

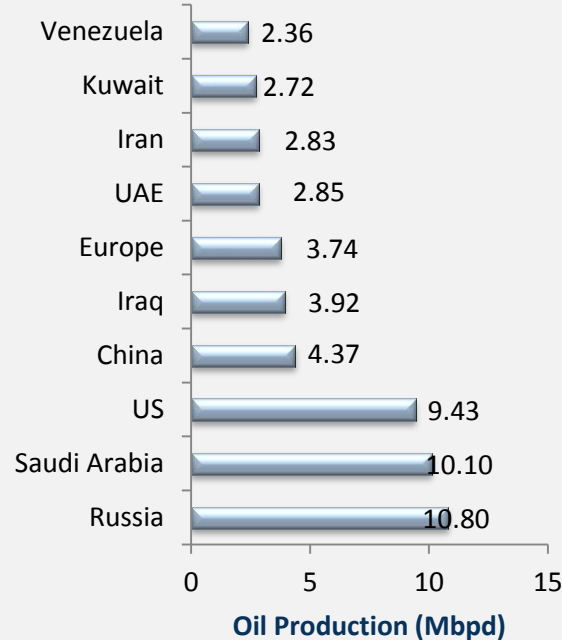
Source: BP Statistical Review of World Energy 2014, International Energy Agency 2013; Frost & Sullivan

Most Regions are Maintaining Output, Despite the Low Price, as Countries Battle to Retain Market Share

Oil & Gas Trends: Oil Production by Key Countries, Global, 2014



Oil & Gas Trends: Oil Production by Key Countries, Global, 2015



Oil & Gas Trends: Oil Production by Key Countries, Global, 2016E

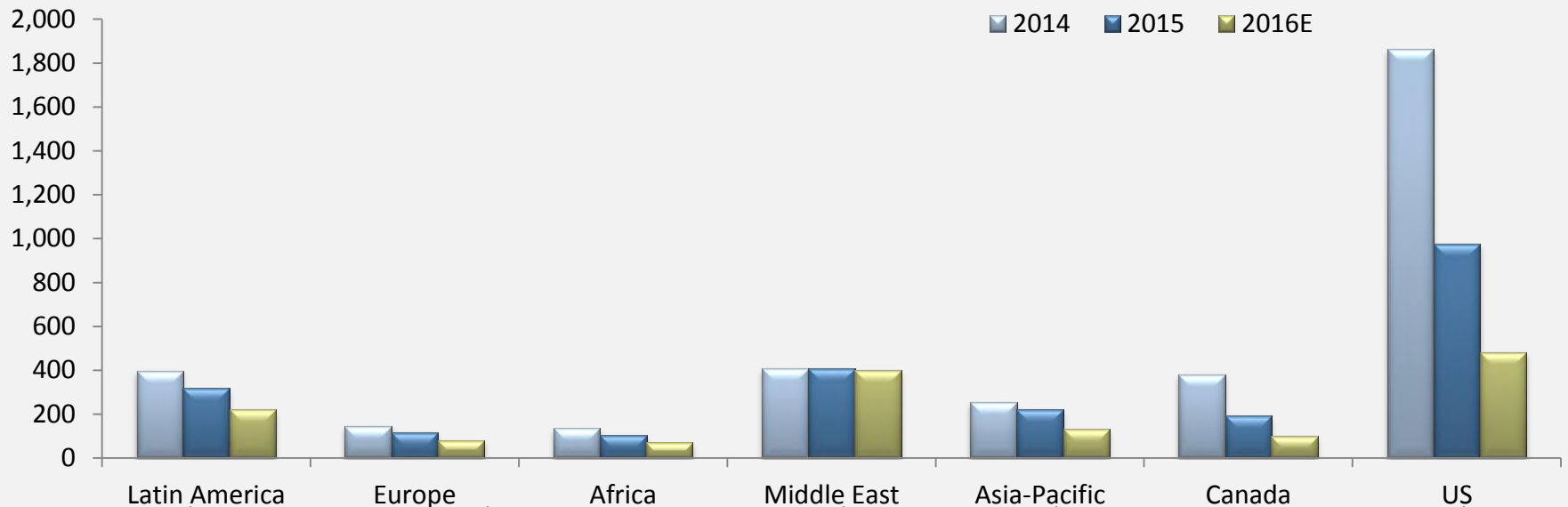


- Iranian production is forecast to increase by 0.27 million barrels per day (mbpd) in 2016, as the country gradually ramps up production.
- Iraqi oil production is also forecast to increase sharply, up 0.46 mbpd in 2016, following a 0.7 mbpd increase in 2014. Iraqi oil production costs are among the lowest in the world and reflect continued investment to rebuild infrastructure following the wars of the 2000s.
- Total global oil production was 88.8 mbpd in 2015 and is forecast to decline by 15 mbpd overall in 2016.

UAE = United Arab Emirates. Source: OPEC; EIA; Frost & Sullivan

A Further 35% Decline in Operational Rigs Number is Forecast for 2016, With Rig Numbers in North America to Decline by 51%

Oil & Gas Trends: Operational Oil & Gas Rig Count Data and Forecast, Global, 2014–2016



Latin America: A decline of 31% is forecast in 2016, following a 20% drop in 2015.

Europe and Africa: Similar declines are forecast in both regions, principally in the offshore market.

Middle East: Low production costs and a desire to protect market share or to continue boosting production (Iraq and Iran) mean that the rig count is forecast to continue to be largely static.

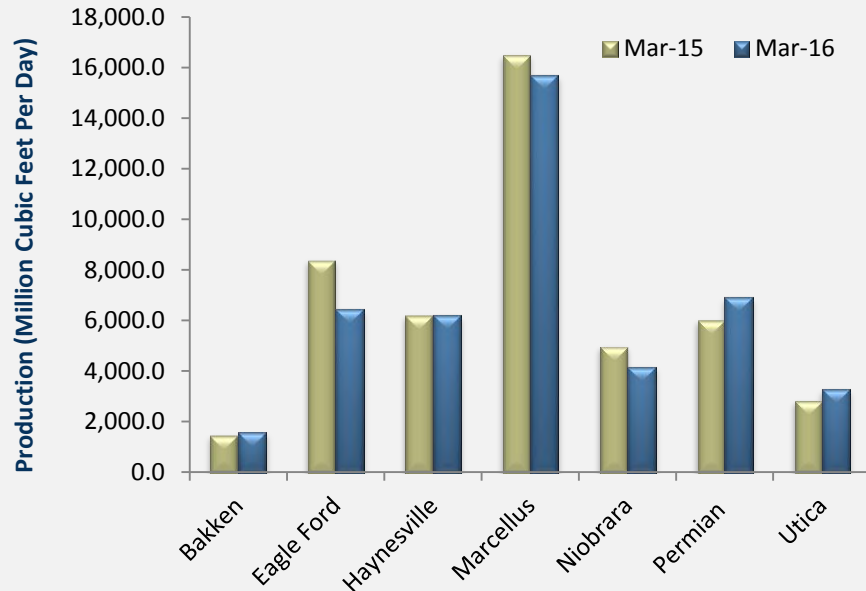
Asia-Pacific: The decline in the oil price has put a temporary halt to what had been a strong growth region. The rig count is forecast to decline by 41% in 2016.

North America: This is the hardest hit region. Investment in Canada's tar sands has totally dried up. A 48% fall in the rig count occurred in the region in 2015 and is forecast to match with 51% drop in 2016.

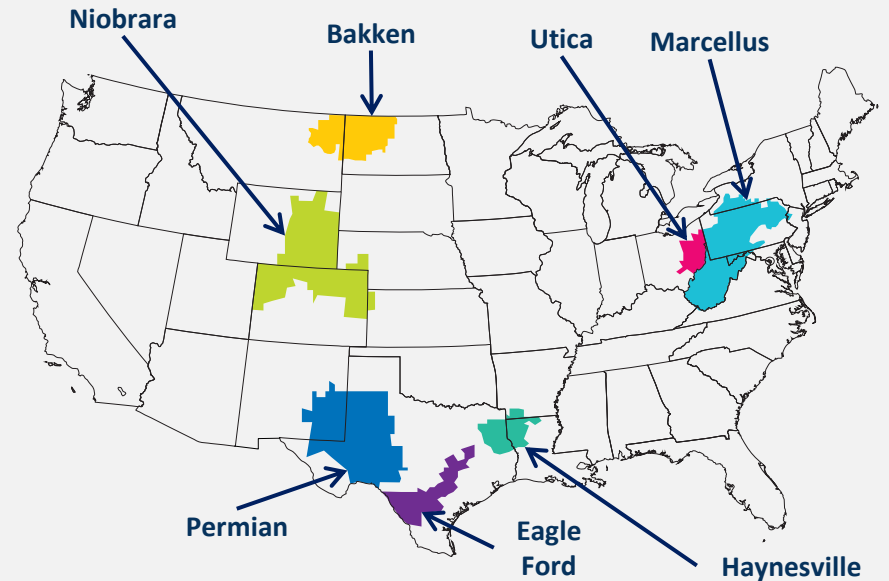
Source: Baker Hughes

Production Declines are Forecast to Accelerate, as the Impact of Lower Exploratory Drilling Starts to Build

Oil & Gas Trends: Unconventional Gas Production, US, March 2015 and March 2016



Oil & Gas Trends: Location of Key Shale Reserves, US

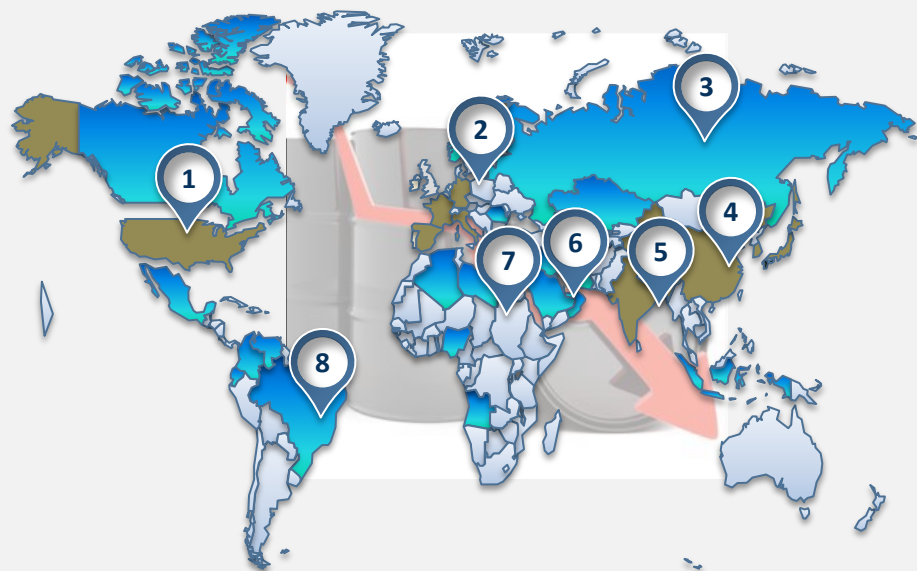


- In some cases, shale gas is extracted as a by-product of shale oil. However, the low extraction costs have kept shale gas production rates high.
- However, Frost & Sullivan expects production volume declines to accelerate markedly in 2016. Natural gas prices, already low by historical standards in 2014, are now 50% lower as of February 2016, at \$2.25 per MBTU. Prices this low make new drilling uncompetitive, ranging between a small profit and a modest loss for producers depending on the shale.
- The lack of new drilling will impact shale gas production beyond 2016, as the replacement rate gap becomes wider. However, as with shale oil, the industry is very flexible; a significant price recovery would see production re-started.

Source: EIA; Frost & Sullivan

Lower Oil Prices Provide a Boost for Consumers and Manufacturers, the Big Winners, as Costs Decline

Oil & Gas Trends: Regional Winners and Losers of Lower Oil Prices, Global, 2015



■ Top Oil Exporters

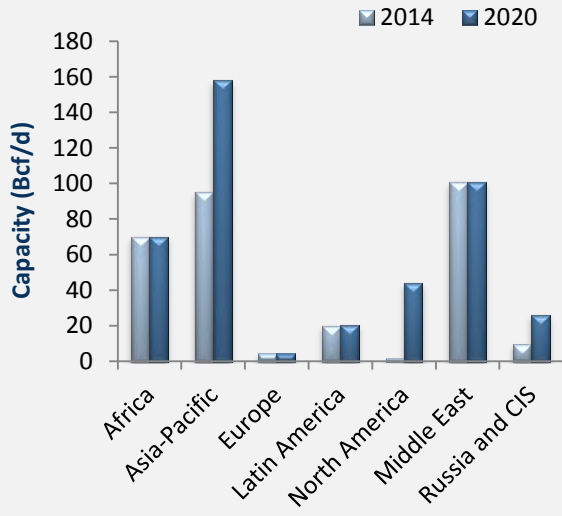
■ Top Oil Importers

- 1 North America: Positive**
The US economy gains overall as it is still a major oil importer. Canada suffers, particularly the province of Alberta, although manufacturers in Eastern Canada get a boost.
- 2 Europe: Positive**
Europe's overall economy gains, but at the cost of the North Sea producers.
- 3 Russia: Negative**
Oil and gas contribute 50% to Russia's budget and production from aging fields is slowing.
- 4 North Asia: Positive** Japan and South Korea are totally dependent on imported energy. China benefits despite domestic production as it is a significant importer.
- 5 South Asia: Positive** A majority of countries in the region are net importers. India in particular benefits, both it and Indonesia plan to reduce subsidies.
- 6 Middle East: Negative**
Saudi Arabia has huge assets reserves to rely on, but Iran is in a budget crisis.
- 7 Africa: Positive**
The region is very diverse; several major countries are badly affected, but the continent as a whole gains.
- 8 Latin America: Negative** The majority of the region is in recession due to the wider end of the commodity boom.

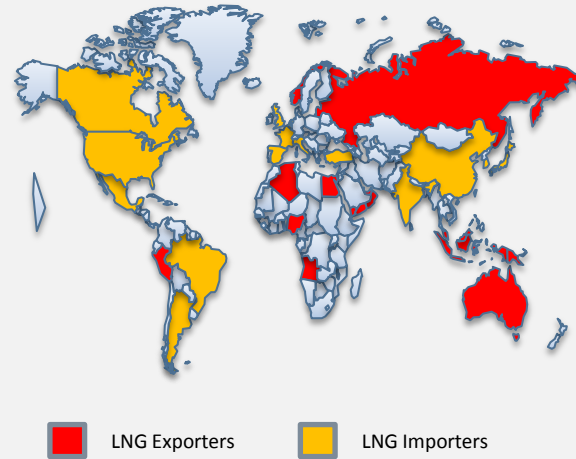
Source: Frost & Sullivan

Asia-Pacific is a Hub of Investment as Long-term Projects Continue

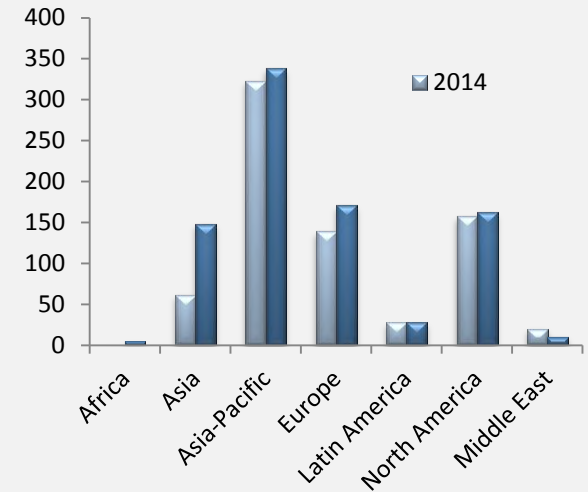
Oil & Gas Trends: LNG Liquefaction Facility by Region, Global, 2014 and 2020



Oil & Gas Trends: Key LNG Exporters and Importers, Global, 2015



Oil & Gas Trends: LNG Regasification Facility by Region, Global, 2014 and 2020

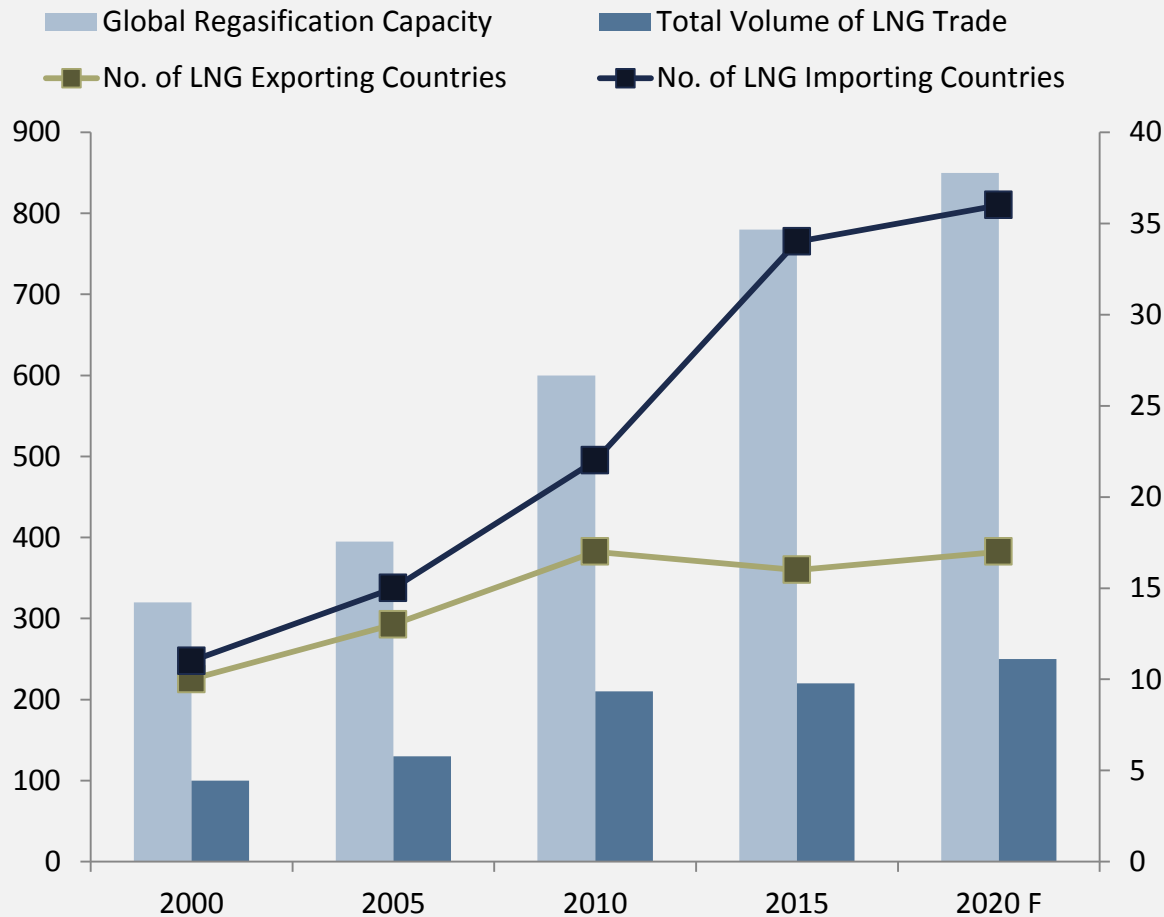


- LNG projects are usually planned for the long term and are capital intensive. Hence, much of the construction activity is continuing, despite the recent downturn in prices.
- The main focus of activity is Asia-Pacific, particularly China. Improving the gas infrastructure and boosting the use of natural gas in the power generation sector remain long-term priorities.

Bcf/d = Billion Cubic Feet per Day. Source: Frost & Sullivan








Growing LNG Infrastructure Boosting Gas Trade

Oil & Gas Trends: LNG Trade, 2000-2020



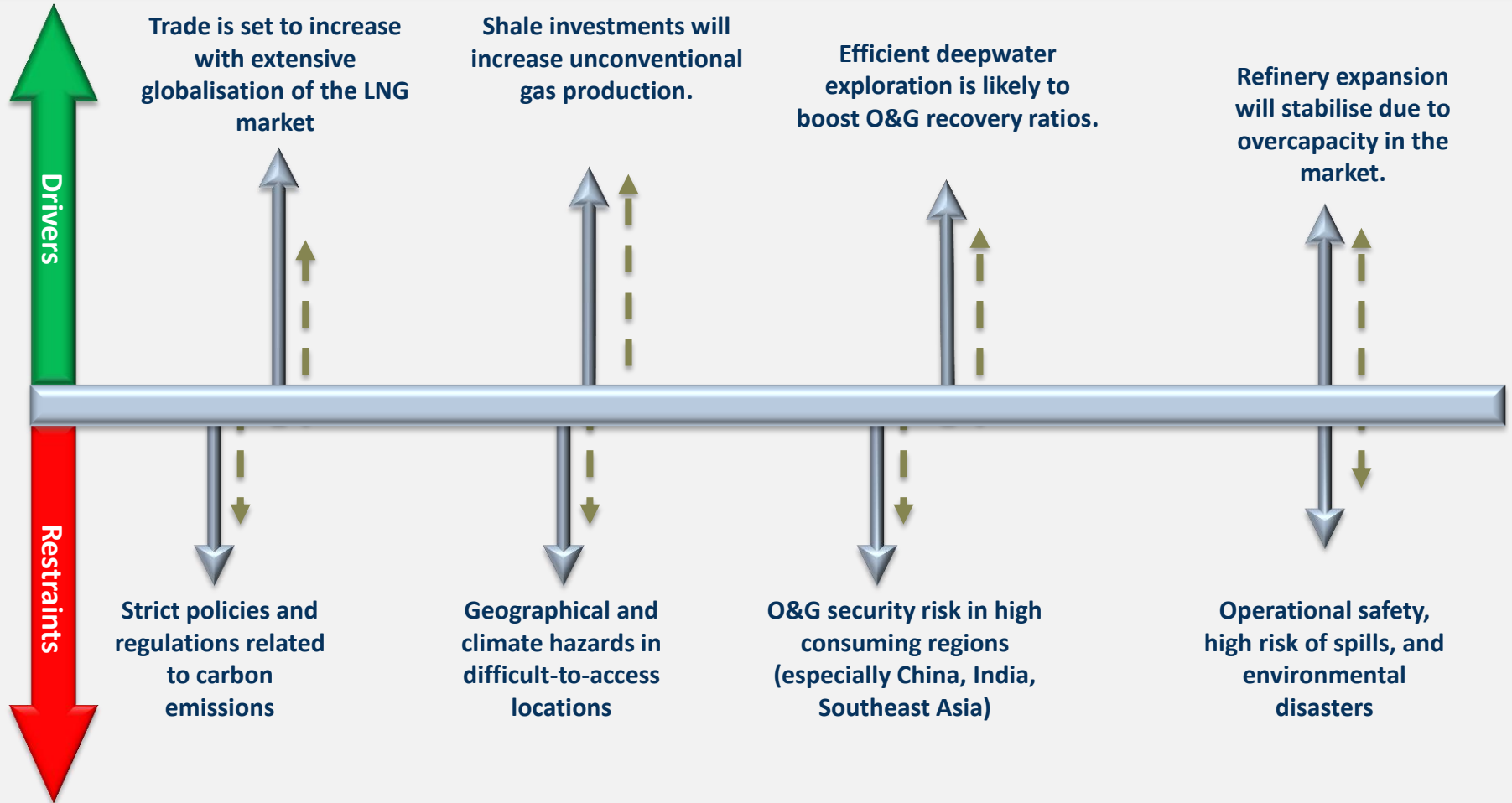
- Global LNG trade reached an historical high in 2015, with 244 MT of LNG traded across regions.
- While the number of countries exporting LNG declined, those importing LNG have increased over the last 15 years.
- The number of importers are likely to increase to 36 countries by 2020.
- Economic slowdown in China and Japan had weakened imports in the region. However, Asia-Pacific countries accounted for more than 71.7% of total imports in 2015.
- Qatar, Australia, Malaysia, Nigeria, and Indonesia were top 5 exporters while Japan and South Korea together make up almost 50% of the LNG imported globally.

Key projects in the Global Oil and Gas Market

-  Jacobs Engineering Group Inc. was recently selected by ExxonMobil to perform engineering, procurement and construction management (EPCM) services for its Crude Flexibility Engineering and Construction Project at the ExxonMobil Refinery in Beaumont, Texas.
-  Rosneft and Statoil ASA completed drilling works as part of the Pilot Project at the PK1 layer of the North-Komsomolskoye field in Russia. During this year the companies jointly drilled 2 horizontal exploitation wells.
-  Wärtsilä has secured two contracts to supply seawater/propane-based regasification modules to South Korean shipyard Hyundai Heavy Industries (HHI). The systems will be installed on FSRU vessels owned by both Norway-based Höegh LNG and Russian energy company Gazprom.
-  Singapore's Keppel Offshore & Marine has signed an agreement to acquire the offshore rigs business of the US-based Cameron, in a transaction valued at \$100m.
-  Italian company Eni has discovered a huge gas reserve in the Zohr 1X NFW well at its Zohr Prospect in Mediterranean Sea offshore Egypt. They are likely to develop it in the next 2 years.
-  The Nigerian National Petroleum Corporation (NNPC) has cancelled its previously signed offshore processing agreements (OPAs) with the Duke Oil Company, Aiteo Energy Resources, and Sahara Energy Resources (Nig). The profitability and timeframes were not favourable enough.
-  France-based Total has agreed to divest all of its interests in the Frigg UK Pipeline (FUKA), the Shetland Island Regional Gas Export System (SIRGE) gas pipelines, and the St Fergus Gas Terminal to UK's North Sea Midstream Partners, in a transaction valued at £585m (\$905m)

Drivers and Restraints

Key Takeaway: The increasing use of digital technology to offset the impact of market restraints



 Denotes current impact
  Denotes long-term impact

Source: Frost & Sullivan analysis.

Oil and Gas Trends Impacting the Genset Demand



Falling Oil Prices Affects Gensets Sales



Due to the fall in oil prices, many projects have been cancelled. Over the past two years close to \$380 billion worth of oil and gas projects have been cancelled and \$170 billion of CAPEX spending cut between 2016 and 2020.



Major oil and gas companies such as Royal Dutch Shell, Chevron Corp. and Woodside Petroleum have postponed and even cancelled many projects. ConocoPhillips in May announced that it would cut its spending by a further \$700 million in 2016, while Exxon Mobil announced a 25% cut in its capital spending. BP cut jobs globally and especially in the North Sea.



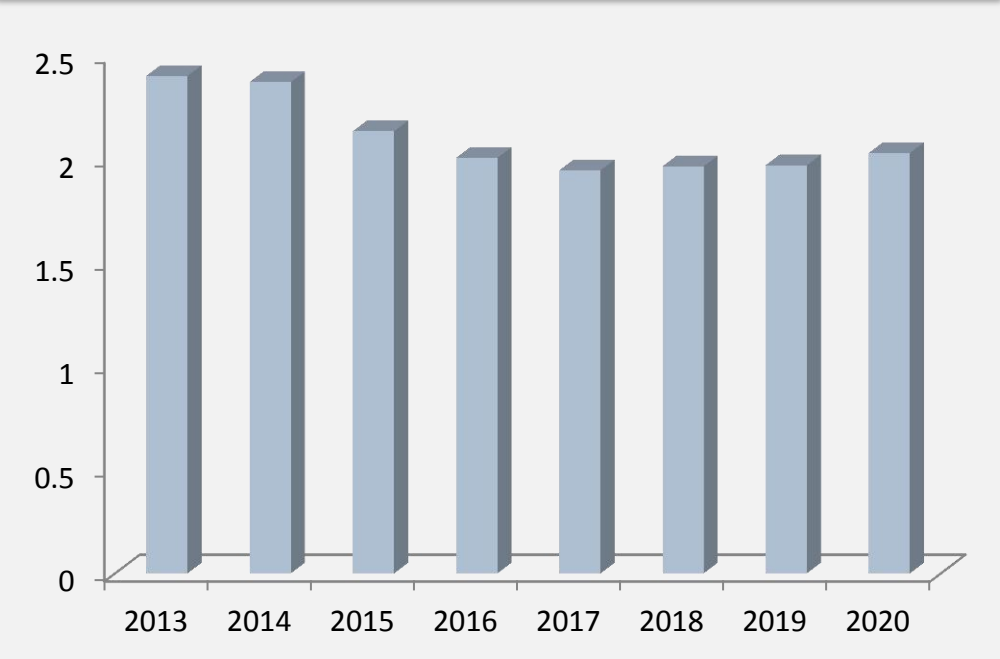
Oil and Gas companies are however investing in solutions that provide improved productivity and cost management across operational areas that include production optimisation and flow assurance.



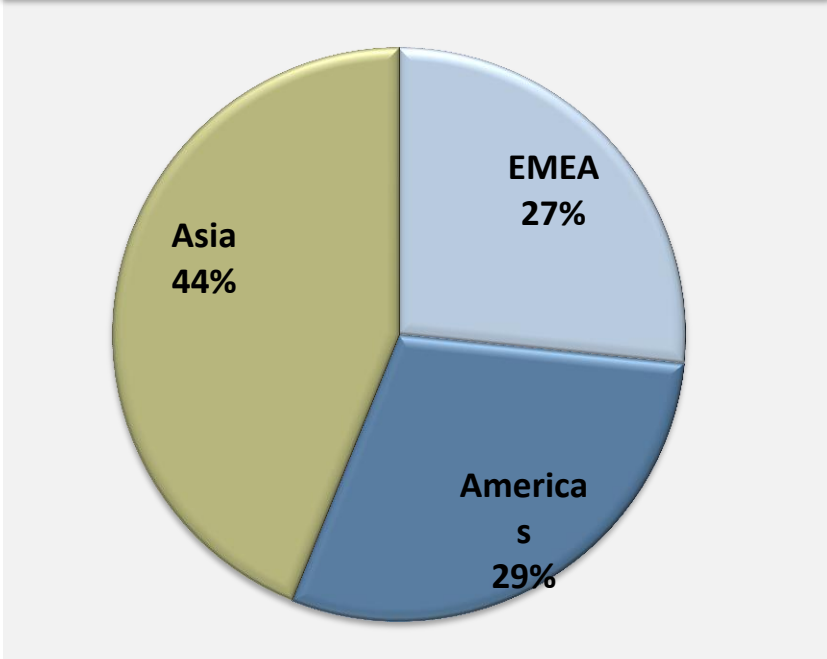
Genset packagers with a big focus on the oil and gas sector have witnessed a slump in their revenues and are now focusing on other applications such as datacenters, renewable energy support (hybrid power systems), and so on for newer opportunities.

The Global Genset Market was Worth \$2.13 billion in 2015 and Expected to Decline at a CAGR of 1% to Reach \$2.03 billion in 2020

Oil & Gas Trends: Global O&G Genset Market, Revenue Forecast, 2013-2020



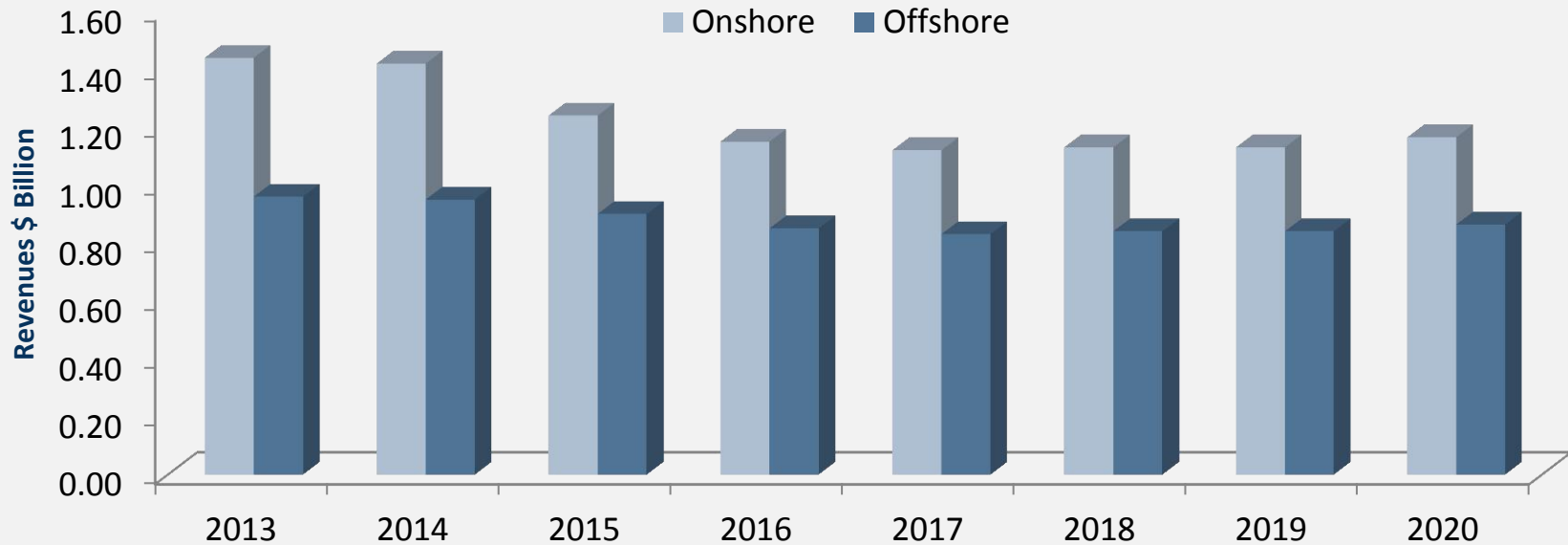
Oil & Gas Trends: Revenue Split by Region 2020



- Shell and BP cut capex significantly in 2015; however, both companies are focused on boosting the replacement rate of their current reserves.
- The genset market for oil and gas will start stabilizing in 2018 and witness slight growth post 2018.

E&P Drilling Activities and Rig Development are Supported by Increased Onshore Genset Revenue

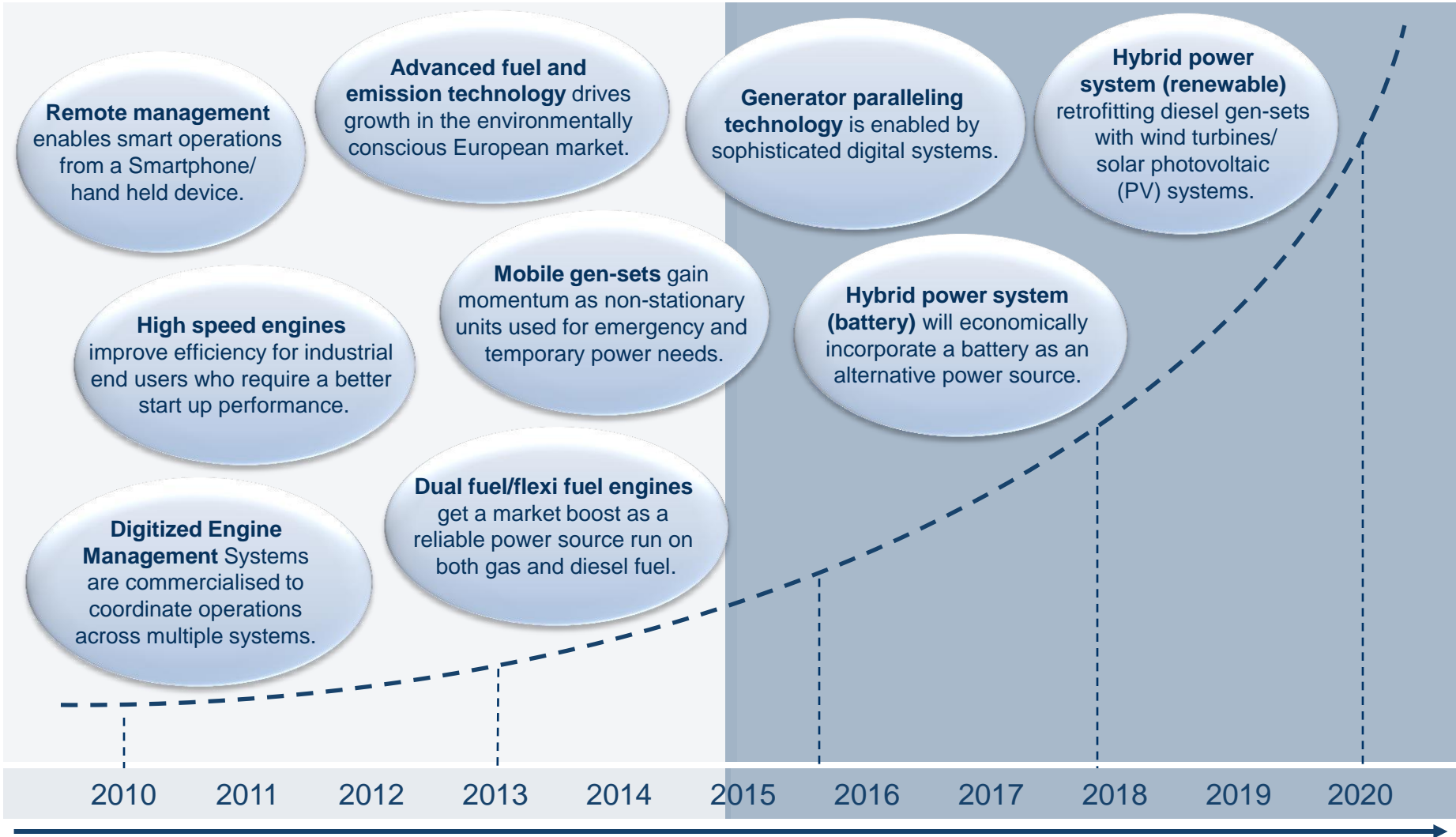
Oil & Gas Trends: Global Genset Market, Revenue Forecast, 2013-2020



- Low O&G prices and improvement in energy demand will lead to further investments in the upstream O&G sector. A significant development in the upstream sector has been multiple mergers and acquisitions in the last two years.
- The upstream E&P sector will continue to witness modest growth as investments in shale exploration continue to rise. Most notable were Rosneft's acquisition of TNK-BP, CNOOC's acquisition of Nexen, and SapuraKencana's acquisition of Seadrill.

Source: Rigzone, Baker Hughes, Frost & Sullivan

Market Development and Technology Roadmap



Estimated timeline for mainstream commercialisation

Source: Frost & Sullivan

Technology Trends

- Technological advancements have resulted in the increased popularity of gas gen-sets. Examples of key technology advancements include the optimisation of engine speed, integrated approaches to generator paralleling, and bi-fuel—or combined diesel and gas fuel—operations.
- Power densities and transient performance can be improved by increasing the operating speed of gas-fired engines.
- Using these speed-optimised, spark-ignited gas engines, original equipment manufacturers (OEMs) are connecting smaller gas gen-sets together and combining their output in an integrated approach to set up larger plants with generator paralleling.
- Also, bi-fuel or dual fuel engines combine both power density and capital cost benefits.
- These engines have longer operation times as they start up on diesel fuel, but as loads are increased, natural gas is introduced to the combustion air while diesel fuel is reduced.
- In a dual fuel engine, if the natural gas supply is interrupted for any reason or if there is a fault in the bi-fuel delivery system, the controls automatically revert to 100% diesel without interruption of power generation. Typically, such engines operate on a ratio of 25% diesel and 75% natural gas.
- Another growing interest within the gas gen-sets segment is the popularity of mobile gen-sets. These units are primarily used for backup and standby demand during power interruptions.

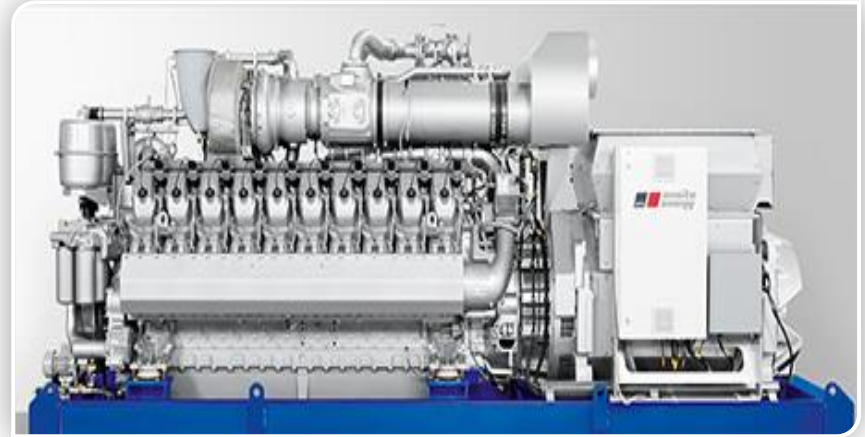


Image Source: FG Wilson Source: Frost & Sullivan

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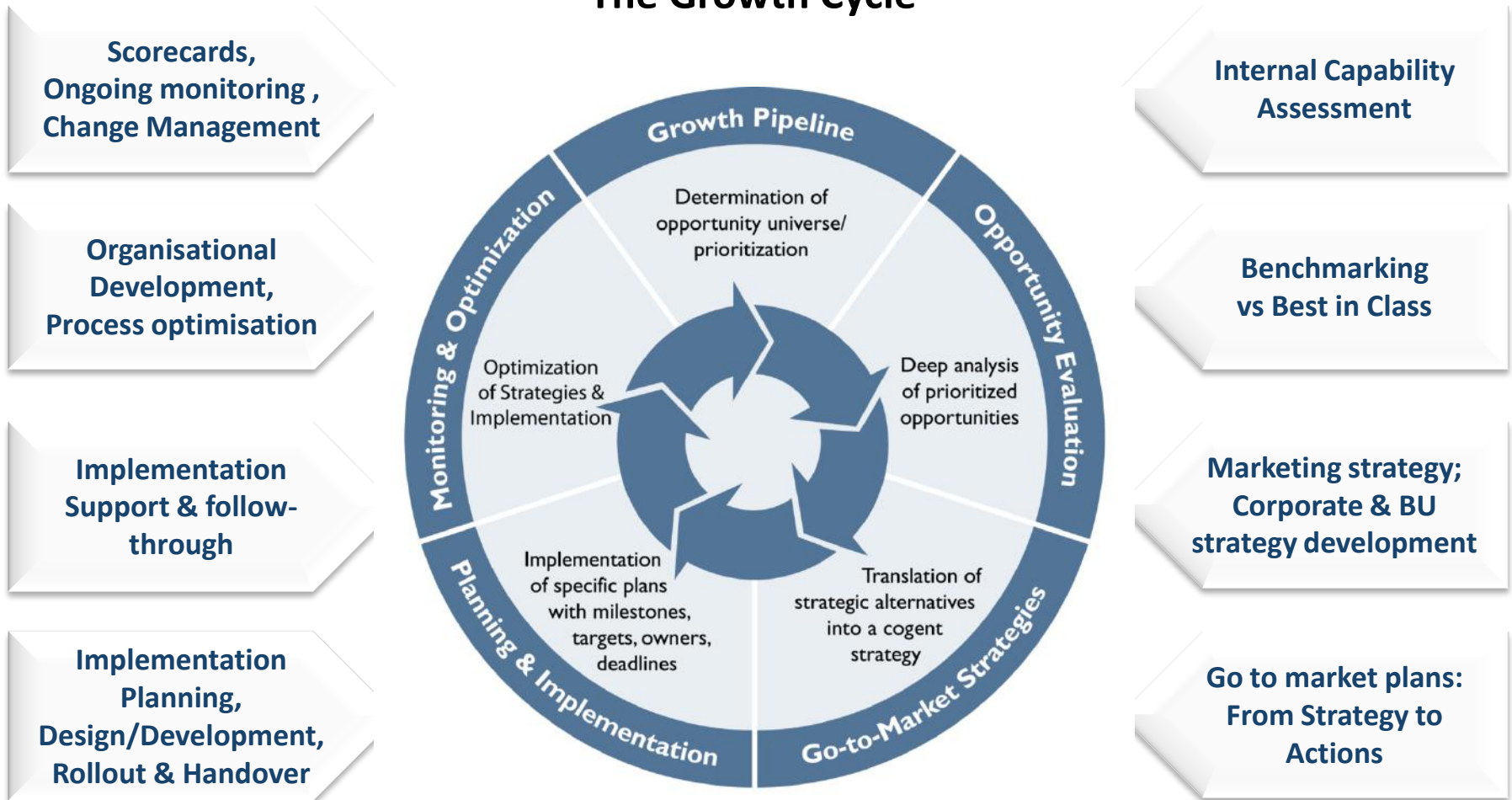
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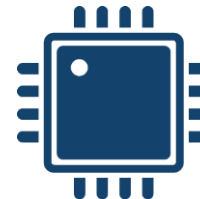
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