

Innovation imperative for companies in Energy and Natural Resources (ENR) industry



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Emerging trends and possibilities

The ENR industry is facing major challenges due to enhanced needs of asset productivity, agility, process efficiency and sustainability. Digital technologies and big data analytics capabilities provide opportunities to bring disruption in traditional business processes and significantly enhance integration and collaboration across customers, suppliers and various segments of the value chain. As per industry experts, either the companies will have to transform their business along these lines or face extinction within next 10 years.

Some of the 'mega' developments that will impact both our consumption of energy and the functioning of energy and natural resources industry are:

1. Industrial Internet of Things: Higher reliability of operations through aggregation of data from plant machinery for asset integrity management and increased machine uptime
2. Digital and analytics: Analytics of the granular data collected to draw insights. For example, analysis of production potential of oil wells
3. Cloud: Creates entire value chain wide data availability providing employees an end-to-end view of activity. For example, cloud enables collaborative production of refinery products, allowing multiple departments to plan and produce in alignment. Collaborative production increases internal/external responsiveness, agility, and reduces costs caused by lack of data transparency
4. Robotic process automation: Automation of processes may be used to reduce human involvement in challenging environments. For example, inspection of offshore rigs, piloting of drones, etc.
5. 3D technologies: Utilise additive manufacturing to create complex parts in a shorter time span as compared to conventional methods
6. Machine to Machine: Reduces requirement of human intervention through seamless integration of machines. For example, in a digital oil field, instruments monitor various parameters of an equipment's health on the well head, and accordingly adjust oil flows to ensure safe operations
7. Increased focus on sustainability and green energy:
 - a. Higher productivity in utilisation of natural resources: Oil and gas and coal deposits, which were previously considered inaccessible, are now being exploited through better technologies. For example, a NASDAQ listed energy technology and oil production company has devised a process for improving the sustainability and efficiency of recovering oil trapped in reservoirs by stimulating naturally occurring microbes. Similarly, some coal may be too deep to mine. Another energy company, a developer of underground coal gasification projects, is able to convert this coal into gas streams, which is used as feedstock or to produce low energy carbon.
 - b. Higher penetration of solar energy with declining cost of solar modules, which have become 80 per cent cheaper from 2008 to 2015¹.

1. <http://www.ibtimes.co.uk/solar-energy-be-cheapest-power-source-10-years-says-report-1489228>



How can innovation impact business performance?

The energy landscape is undergoing significant shifts due to increasing prominence of renewable energy, including wind, solar, nuclear and the emergence of shale gas in the U.S.A. The difference in energy costs from renewable sources is narrowing faster and solar power is likely to be 10 per cent cheaper than coal power prices by 2020.

The fall in crude oil prices has led to the introduction of new design, engineering and maintenance techniques in order to reduce cost of operations and improve efficiency of energy companies. As per the International Energy Agency, the global spending on upstream oil and gas exploration and production has reduced by over USD 300 billion in 2015-16. Approximately, two-thirds of this amount has been from reduction of costs rather than cancelling or shelving projects.

Global energy majors have undertaken various initiatives for improvement of their existing business performance and driving investment in new/renewable energy technologies:

- **An electric power holding company in the US:** Utilising Hybrid Energy Storage Systems (HESS) in North Carolina. The HESS utilises innovative battery technologies and fast response ultra-capacitors capable of storing and discharging energy quickly to enable storage of solar power to support peak requirements and minimise fluctuations in supply to grid².

- **A multi-national oil super-major:** Utilising drones for detailed inspection on some of its oil fields. The manned inspection on the same fields used to take seven separate two-week trips with a 12-man team that had to be flown in and accommodated on site. The drones complete the same work in two days and at about a tenth of the cost³.
- **An oil and gas multinational:** In billion dollar construction projects, companies used to order 3-5 per cent excess material, which was later sold at a steep discount. By managing the vast amounts of data available, the company is able to predict exactly what is needed and when it will be delivered, thus reducing wastage³.
- **A leading oil and gas super-major:** In order to boost production of crude oil from deep water wells, the company has developed a new type of pipe, called a steel lazy wave riser, to carry oil and gas from its deep water field for processing. The pipe bends to absorb the motion of the sea and the floating platform, which the company says boosts production at extreme depths⁴.
- **Another oil and gas super-major:** Uses a robotic device to clean and check the inside of pipelines more quickly. The improvement has helped increase the daily production rate to the highest in two years⁵.

2. <https://news.duke-energy.com/releases/duke-energy-to-put-new-battery-and-ultracapacitor-system-to-the-test-in-nc>
3. <http://www.investing.com/news/commodities-news/oil-majors-experiment-with-technology-to-weather-crisis-432690>

4. <http://www.shell.com/about-us/major-projects/stones.html>
5. <http://www.reuters.com/article/us-oil-companies-costs-insight-idUSKBN12G08N>

What will it take to be a winner?

Energy companies need to adopt a multi-pronged strategy to respond to the emerging changes. They need to aggressively focus on operational excellence through adoption of smarter technology across the asset lifecycle. They also need to facilitate development of innovation centres in their organisations to continuously research and explore application of new-age technologies in bringing disruption in their existing business and operating models.

Critical role of cyber risk management

With the exponential increase in digital capabilities, online systems and use of large volumes of data in business decision making, cyber attacks on the energy sector has increased multifold over the last three to five years. The cyber landscape is constantly changing and is growing beyond the IT cyber threats that organisational security departments have become familiar with. A new threat is emerging on direct compromise of critical production assets and Industrial Control Systems [ICS].

In the energy industry, the focus has been more on ensuring connectivities and having information compared to establishing the desired level of security environment.

Cyber attacks on critical infrastructure sector (including energy sector) have emerged as a key threat and are being considered as a national level security agenda, since advanced attacks can lead

to immediate operations, safety, environmental impact beyond the traditional impact. Similar attacks across the world have resulted in impact, which has larger implications including a dent to the country's economy.

While the industry is subjected to multiple attacks, the key attack vectors include:

- Sensitive information leakage
- Attacks on legacy systems in ICS environment (including SCADA, DCS and other control systems)
- Social engineering/spear phishing
- Malwares/viruses/worms

The need is to have a multi-pronged approach to address the risk holistically and adopt global cyber security frameworks so that the management can adequately prevent the risk from materialising and also respond to any cyber incidents in a structured manner.



Conclusion

The energy landscape is undergoing significant shifts due to increasing prominence of renewable energy including wind, solar, nuclear, and the emergence of shale gas in the U.S.A. The difference in energy costs from renewable sources is narrowing faster and solar power is likely to be 10 per cent cheaper than coal power prices by 2020.

Based on recent market developments, the energy industry is now facing major challenges due to enhanced needs of asset productivity, agility, process efficiency and sustainability.

Organisations need to aggressively pursue adoption of smarter technology across the asset lifecycle. They also need to facilitate development of innovation

centres in their organisations to continuously research and explore application of new-age technologies in bringing disruption in their existing business and operating models.

Finally, increased intensity of cyber attacks is being witnessed alongside the adoption of emerging technology (cloud, mobility, analytics, smart devices and IoT) across the industry, which are being driven to bring in efficiencies across processes. The challenge that the industry faces is that upgrade/ deployment of new technologies, if not managed well from a cyber security perspective, may lead to heightened risk exposure for organisations.



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