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Navigating Indonesia's Energy Future Through Digitalisation



A Strategic Imperative for Operations and Engineering Personnel

Indonesia, a cornerstone of Southeast Asia's energy landscape, stands at a critical juncture. The nation's oil and gas sector, vital to its economic stability, faces a dual challenge: meeting the escalating energy demands of a rapidly developing economy while simultaneously addressing the global imperative for a transition to more sustainable energy sources. This white paper examines the complexities of Indonesia's energy transition, the hidden challenges within its energy infrastructure, and the transformative power of digitalisation in navigating this evolving landscape.



Visualising the Energy Transition in Indonesia

Indonesia's energy transition is not a simple switch from fossil fuels to renewables. It's a multifaceted challenge, demanding a carefully orchestrated strategy that balances economic growth, energy security, and environmental sustainability. The nation's commitment to reducing greenhouse gas emissions, as outlined in its Nationally Determined Contribution (NDC) under the Paris Agreement, necessitates a significant shift in its energy mix.

Key aspects of this transition include:

- **Increased Renewable Energy Integration:** Harnessing Indonesia's vast potential for solar, hydro, geothermal, and biomass energy. For instance, Indonesia has significant geothermal potential, holding 40% of the world's geothermal resources.
- **Energy Efficiency Improvements:** Reducing energy intensity across industries and promoting energy conservation.
- **Decarbonisation of Fossil Fuels:** Implementing technologies like carbon capture, utilisation, and storage (CCUS) to mitigate emissions from existing oil and gas operations. BP is involved in a significant CCUS project in Tangguh, demonstrating a commitment to decarbonising gas production.
- **Development of Green Technologies:** Investing in hydrogen, biofuels, and other alternative energy sources.

This transition requires a long-term vision, strategic planning, and substantial investment. It also necessitates a deep understanding of the current energy landscape and the challenges that lie ahead. According to the Handbook of Energy & Economic Statistics of Indonesia 2023, the primary energy mix is still dominated by coal (39.69%), followed by petroleum (29.91%), natural gas (17.11%), and renewables (13.29%) [ESDM].

These statistics highlight the dominance of fossil fuels and the need for a greater shift towards renewables.



Illuminating Hidden Complexities: Indonesia's Energy Challenges

Beneath the surface of Indonesia's energy sector lie a complex web of challenges that can hinder the progress of the energy transition. These challenges, often interconnected, require innovative solutions and a holistic approach.

- **Infrastructure Limitations:** Ageing infrastructure, inadequate grid connectivity, and logistical bottlenecks can impede the efficient distribution of energy, particularly in remote areas. This can also hinder the integration of new renewable energy sources.
- **Data Silos and Lack of Integration:** Fragmented data systems and a lack of interoperability between different stakeholders can create inefficiencies, hinder decision-making, and limit the ability to optimise operations.
- **Operational Inefficiencies:** Traditional operational practices, manual processes, and a lack of real-time visibility can lead to increased costs, reduced productivity, and higher emissions.
- **Skills Gap:** A shortage of skilled personnel with expertise in digital technologies, renewable energy systems, and advanced data analytics can impede the adoption of new solutions.
- **Investment and Financing:** Securing the necessary investment to fund the energy transition, including the development of renewable energy projects and the modernisation of infrastructure, can be a significant hurdle. The Indonesia Energy Transition Outlook 2025 emphasizes that financing is a key challenge for renewable energy projects.

These challenges highlight the need for a paradigm shift in how Indonesia's energy sector operates. Digitalisation offers a powerful pathway to address these complexities and accelerate the energy transition.



Digitalisation in Practice: Transforming the Oil and Gas Sector

Digitalisation is no longer a futuristic concept; it is a present-day imperative for the oil and gas industry in Indonesia. By leveraging cutting-edge technologies, companies can enhance efficiency, improve productivity, reduce costs, and minimise their environmental footprint.

Key areas where digitalisation is making a significant impact:

- **Remote Monitoring and Control:** Internet of Things (IoT) sensors, drones, and satellite imagery enable real-time monitoring of assets and operations, even in remote or challenging environments. For example, companies are now providing AI technologies to Pertamina for asset inspection and maintenance, including drone-based analysis for detecting anomalies and structural damage on offshore platforms.
- **Predictive Maintenance:** Advanced analytics and machine learning algorithms can analyse operational data to predict equipment failures before they occur, enabling preventative maintenance and minimising costly disruptions.
- **Digital Twins:** Virtual replicas of physical assets and systems allow for simulation, optimisation, and scenario planning, leading to improved design, enhanced performance, and reduced risks.
- **Big Data Analytics:** The ability to collect, store, and analyse vast amounts of data from various sources provides valuable insights into operational performance, market trends, and potential risks. This empowers data-driven decision-making and enables companies to optimise their strategies. Studies have indicated that big data analytics can boost operational efficiency in the oil and gas industry by up to 25%.
- **Automation and Robotics:** Automation technologies, including robotics and artificial intelligence (AI), can streamline processes, reduce manual labour, improve accuracy, and enhance safety in hazardous environments.
- **Supply Chain Optimisation:** Digital platforms and blockchain technology can improve transparency, efficiency, and traceability across the supply chain, reducing costs and minimising disruptions.
- **Enhanced Collaboration:** Cloud-based platforms and digital collaboration tools facilitate seamless communication and knowledge sharing between different teams, departments, and stakeholders.

The Path Forward: Embracing Digital Transformation

Digitalisation is not merely about adopting new technologies; it's about embracing a new way of working. It requires a holistic approach that encompasses organisational change, process optimisation, and a commitment to continuous improvement.

For operations and engineering personnel in Indonesia's oil and gas sector, this means:

- **Developing Digital Skills:** Acquiring expertise in areas such as data analytics, AI, IoT, and cloud computing.
- **Embracing a Data-Driven Culture:** Fostering a mindset that values data and uses it to inform decision-making.
- **Collaborating Across Silos:** Breaking down organisational barriers and promoting collaboration between different departments and stakeholders.
- **Championing Innovation:** Encouraging experimentation, embracing new ideas, and driving the adoption of digital solutions.

By embracing digital transformation, Indonesia's oil and gas industry can not only overcome the challenges of the energy transition but also unlock new opportunities for growth, sustainability, and long-term success.

References

- Handbook of Energy & Economic Statistics of Indonesia 2023 - ESDM
- Indonesia Energy Transition Outlook 2025 - IESR



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