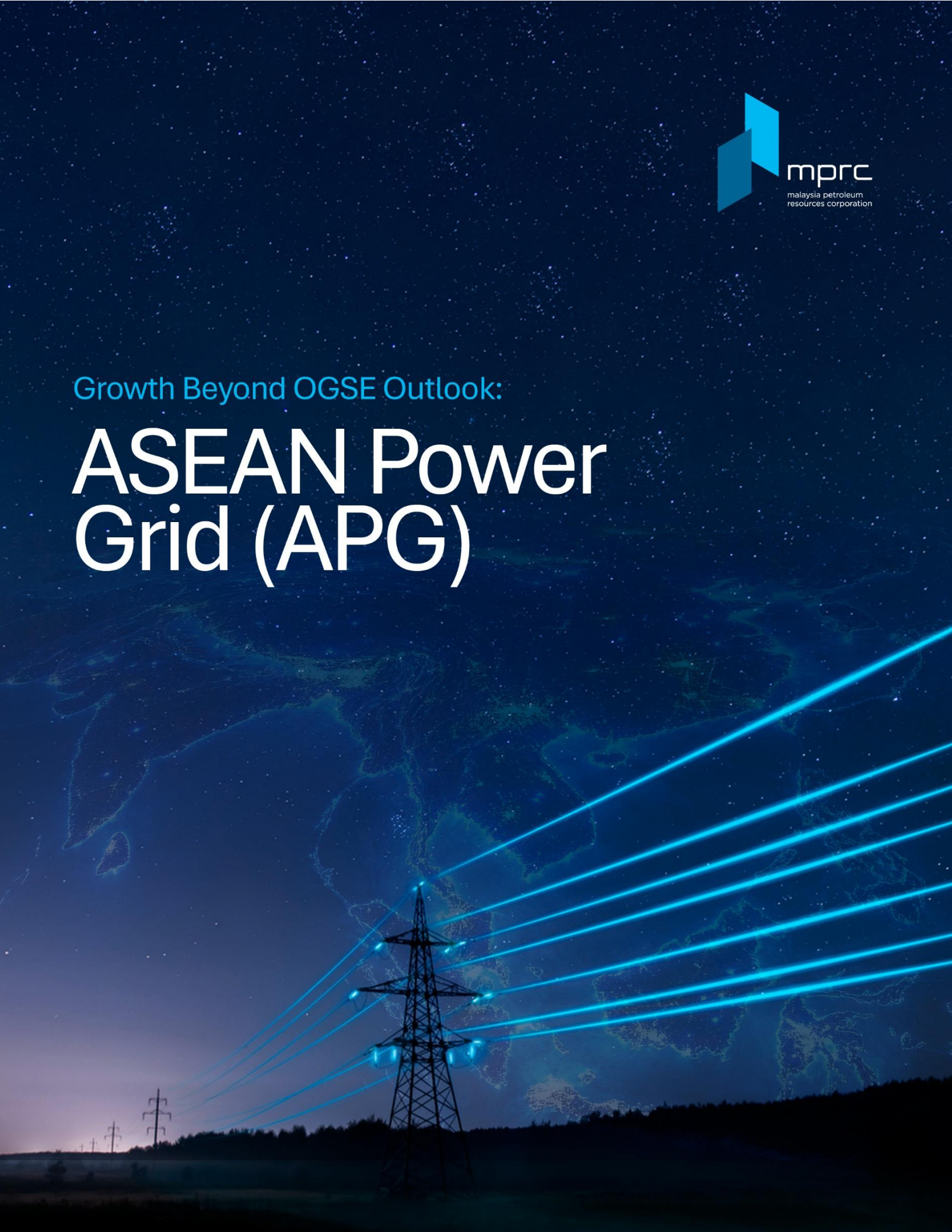
mprc
malaysia petroleum resources corporation

Growth Beyond OGSE Outlook:

ASEAN Power Grid (APG)





INTRODUCTION 03

CONTEXT SETTING 04

- Market Structures
- Current Status
- Case Studies of Regional Interconnection
- ASEAN Power Demand and Generation
- Growth Outlook to 2040
- Investment Requirements and Cost Implications for APG Development

OPPORTUNITIES IN ASEAN (APG) PROJECTS 08

- Potential Scopes, Works, & Activities from APG projects
- Opportunities Specific to OGSE players'
- Upcoming APG Project Opportunities in / linked to Malaysia

CONCLUSION 14

REFERENCES 15

ACKNOWLEDGEMENT 15

INTRODUCTION

The ASEAN Power Grid (APG) represents a key enabling infrastructure for Southeast Asia's energy transition, supporting the shift from largely isolated national power systems toward a more integrated, resilient, and lower-carbon regional energy network. Originally conceived in 1997, the APG has evolved from a long-term vision into an increasingly important strategic priority. The APG is a flagship regional initiative and a strategic energy infrastructure project designed to establish cross-border electricity interconnections between the ten ASEAN Member States.

For Oil & Gas Services and Equipment (OGSE) players, the APG signals not just a utility-led development, but a broader industrial transition. As the region advances toward the ASEAN 2045: Our Shared Future vision, the grid is expected to play a central role in enabling the integration of geographically dispersed renewable energy resources into high-demand industrial centres.

The APG's primary objective is to optimise regional energy resources by enabling the-unilateral transfer or export/import of power while reducing reliance on imported fuels over time.[1] The Lao PDR–Thailand–Malaysia–Singapore Power Integration Project serves as a key "pathfinder", demonstrating the technical and commercial feasibility of multilateral electricity trade across borders.[2] The ASEAN Interconnector Masterplan Study III has identified 18 priority interconnection projects.[1] To support projected 2040 demand and integration needs, cross-border transmission capacity is expected to increase significantly from current levels (estimated at ~7.7 GW) to approximately 17.8 GW.[1] By expanding and stabilising the regional power market, the APG can support ASEAN member states in progressing toward their renewable energy and climate targets, including an aspirational 45% share of renewables in installed capacity by 2030.[2]

Malaysia's ASEAN Chairmanship in 2025, themed ASEAN Chairmanship 2025, provided additional momentum for advancing APG-related initiatives. Notable developments during this period include the Enhanced APG Memorandum of Understanding (MoU) and the ASEAN Power Grid Financing Facility (APGF), which collectively strengthen policy coordination and financing mechanisms.[3] Recent developments reflect a growing supply and demand alignment in the region, with Singapore seeking to secure future imports of low carbon electricity while Sarawak positions itself as a potential renewable energy exporter supported by its hydropower resources.[4] As implementation progresses into 2026, these initiatives are expected to translate into a growing pipeline of interconnection and grid-related projects, presenting opportunities for OGSE companies to diversify into adjacent segments such as subsea cabling, grid digitalisation, and renewable energy infrastructure.



CONTEXT SETTING

Market Structures

The power systems across ASEAN are characterised by heterogenous market structures, largely shaped by national energy policies, institutional maturity, and economic development levels. Most ASEAN member states operate under a vertically integrated, single-buyer model, where state-owned utilities control transmission and distribution, and act as the sole off-taker of electricity from generators.[5] Independent Power Producers (IPPs) participate primarily through long-term Power Purchase Agreements (PPAs), limiting competition to the generation segment. In contrast, a smaller subset of markets, most notably Singapore and the Philippines, have implemented liberalised electricity markets which promotes transparent price discovery, improved efficiency, and greater private sector participation.[6] While there is a regional emphasis on increasing private participation, it remains underdeveloped due to uncertainties regarding ownership structures, financial models, and remuneration schemes.[5] However, emerging reforms across countries such as Malaysia, Vietnam, and Thailand, particularly the introduction of direct power purchase mechanisms and third party access, indicate a gradual transition beyond traditional single-buyer models.

Current Status

The APG currently operates primarily through cross-border bilateral terms.[1] As of 2025, 9 out of 18 priority interconnection projects are operational, contributing a total interconnection capacity of 10.2 GW.[2] Active bilateral interconnections exist between several member states, including Singapore and Peninsular Malaysia, Thailand and Cambodia, and Lao PDR and Vietnam.[1] The regional grid is divided into three main sub-regions for development: Northern, Southern, and Eastern.[1]

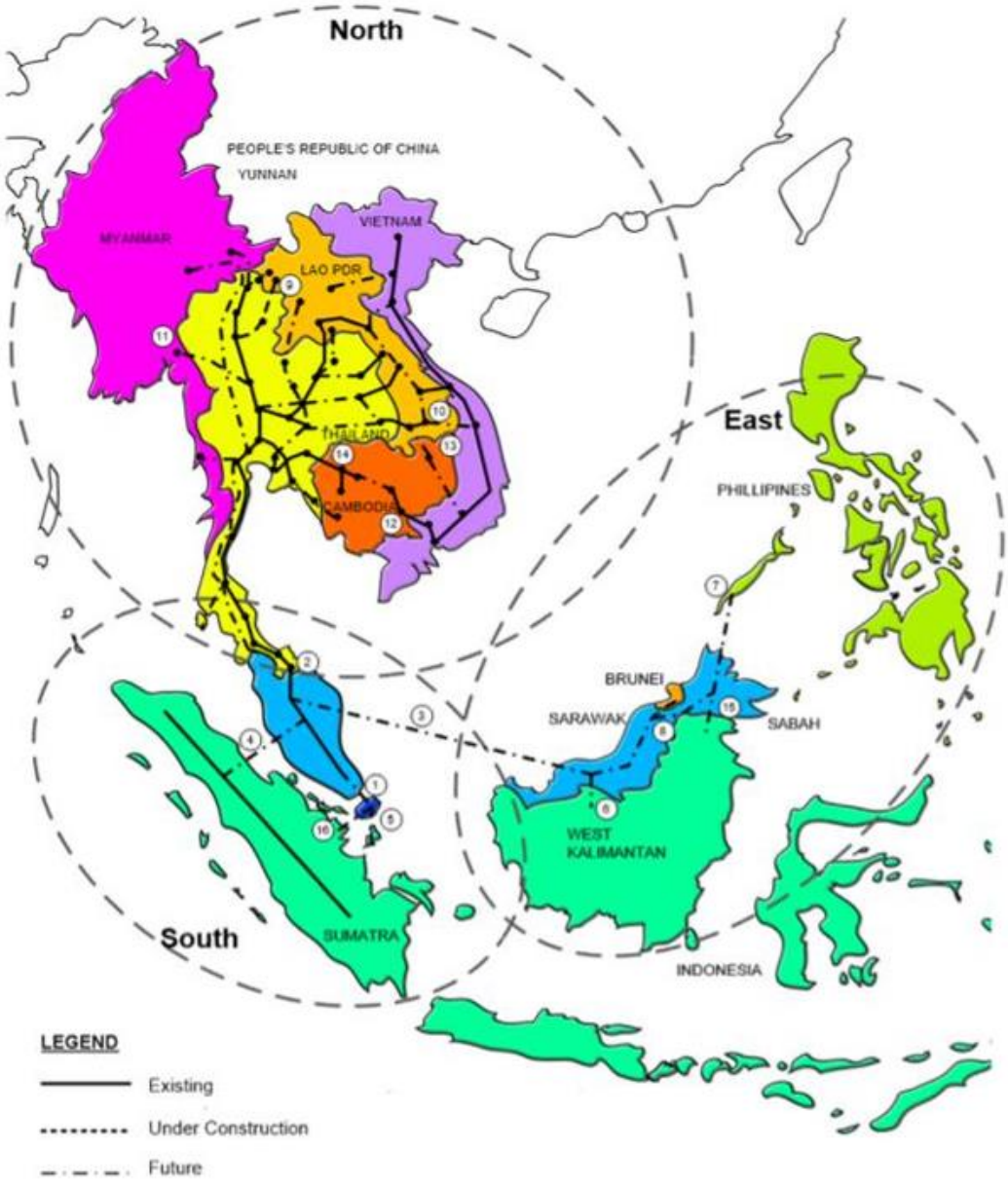


Figure 1: Three main sub-regions for development.[1]

High-voltage transmission in major systems like Thailand, Vietnam, and Indonesia typically operates at 500 kV.[1] Some national grids, such as Lao PDR, face stability issues like low system inertia because variable renewable energy (VRE) is high relative to current grid strength.[1] National-level grid strengthening is required on both sides of many interconnections to support higher levels of power transfer.[1]

Case Studies of Regional Interconnection

To realise a fully integrated APG, the region will need to transition from fragmented systems to a coordinated, market-based regional power ecosystem. Several regional electricity market models provide useful lessons for such a transition.

The European Network of Transmission System Operators for Electricity (ENTSO-E) played a central role in transforming the electricity landscape of the European Union. Through regulatory harmonisation, cross-border transmission coordination, and the creation of integrated electricity markets, Europe moved away from isolated national monopolies towards a competitive and interconnected regional system. This integration enables efficient cross-border electricity trading and improved system reliability across multiple countries.

The Nord Pool power market is one of the earliest examples of multinational electricity exchange, initially established among the Nordic countries. It introduced transparent spot pricing and open access to transmission infrastructure, allowing electricity to be traded efficiently across borders. The market structure has supported the high penetration of hydropower and other renewable energy sources by enabling countries to balance supply and demand across the region.

Another relevant example is the Southern African Power Pool (SAPP), established by member states of the Southern African Development Community. The system evolved from largely single-buyer national electricity markets into a regional electricity trading platform. Through coordinated grid operations and cross-border power trading, SAPP enables member countries to share generation resources, improve energy security, and optimise regional electricity supply.

ASEAN Power Demand and Generation Growth Outlook to 2040

Market size projections for the ASEAN energy sector indicate a period of rapid expansion driven by industrialisation, population growth, and the energy transition. Electricity demand is expected to more than double from its 2018 level of 993 TWh to approximately 2,200 TWh by 2040.[1] The ASEAN-5 group, namely Indonesia, Malaysia Philippines, Singapore and Thailand represent the highest demand centres. Regional generation capacity is expected to double by 2040 to meet the region's demand.[1] Depending on the scenario, solar capacity is projected to reach between 61.4 GW and 438 GW by 2040, while wind capacity

is projected between 17.9 GW and 66 GW.[1] Coal capacity is projected to increase from 84.1 GW in 2020 to between 186 GW and 295 GW by 2040.[1] Gas capacity is projected to increase by 40% to 78% during the same period.[1] Recognising that coal currently provides over 43% of the region's electricity generation, ASEAN Centre for Energy's (ACE) plan focuses on a gradual phase-down rather than an immediate exit.

Investment Requirements and Cost Implications for APG Development

The Net Present Value (NPV) of total system costs (including build and production costs) across the region is projected to be between $764 billion and $771 billion USD over the study horizon to 2040.[1] Building the ASEAN Power Grid (APG) to support these targets will require interconnection capacity of up to 33,487 MW by 2040, with associated build costs ranging from $0.67 billion to $16.23 billion USD depending on RE penetration levels.[1]



OPPORTUNITIES IN ASEAN POWER GRID (APG) PROJECTS

Potential Scopes, Works & Activities from APG Projects

Successful delivery of APG interconnection projects demands rigorous planning across multiple jurisdictions and grid environments. The scopes, work packages, and activities outlined below represent the essential components of project execution, drawing on best practices from comparable international HVDC interconnector programmes.

Work Package	Key Activities/Scope Highlights
Feasibility & Development	• Concept studies • Feasibility and environmental impact assessments • Route survey and selection (including subsea and land-based optimisation) • Grid connection studies • Stakeholder consultations and permitting

Design & Engineering	• Detailed engineering design (civil, structural, mechanical, electrical, instrumentation) • Front End Engineering Design (FEED) • Value engineering and optimization • Geotechnical and geophysical analysis (especially for submarine cables or pipelines) • System integration; interface management between national grids or operators
Procurement	• Sourcing and acquisition of long-lead equipment (HVDC/HVAC cables, converter stations, transformers, switchyards); • Material and component sourcing (onshore/offshore) • Contracting for key sub-contractors
Construction & Installation	• Site preparation and enabling works (landfall sites, substations, access roads) • Civil works (foundations, buildings, cable corridors) • Cable manufacturing and transportation (including subsea cable loading and logistics) • Cable laying and jointing (onshore and offshore) • Substation and converter station construction • Mechanical, Electrical, and Instrumentation (ME&I) installation works • Pipeline installation (where applicable)
Testing & Commissioning	• Factory Acceptance Testing (FAT) for main equipment • Site Acceptance Testing (SAT) • System integration testing (both grids) • Pre-commissioning and commissioning activities • Grid synchronization and energization

Operations & Maintenance Preparation	• Operations readiness assurance • Handover documentation and training • Maintenance strategy planning • Asset Integrity management • Environmental monitoring and compliance reviews
Ancillary Activities	• Marine survey and support management (for offshore sections) • Health, Safety, Security & Environment (HSSE/HSE) management throughout • Digitalization/integration for monitoring and control • Cross-border regulatory coordination and commercial agreements

Table 1: Potential scopes and works from APG projects.

Opportunities Specific to OGSE players'

As OGSE companies pivot toward the energy transition, their role in the ASEAN Power Grid is expected to centre on their strengths in electrical systems and EPC services, supporting power transmission infrastructure rather than engaging in electricity generation. In particular, oil and gas service providers are well placed to deliver complex marine and subsea capabilities for grid interconnection projects, especially those involving offshore or cross-border transmission. Their experience from decades of offshore O&G operations directly translates into the following key areas:

Scope	Key Activities
Marine Survey & Route Engineering	• **Geophysical and Geotechnical Surveys:** Conducting seabed mapping, soil sampling, and route characterization to optimize cable routes, avoid hazards, and ensure long-term cable integrity. • **Environmental Baseline Surveys:** Assessing marine environmental conditions, habitats, and potential risks to minimize ecological impact and comply with permitting regulations.

Subsea Cable Installation	• **Cable Route Preparation:** Pre-lay grapnel run to clear debris, route plowing/trenching, and UXO (unexploded ordnance) clearance. • **Cable Lay Operations:** Deployment of heavy-lift cable-laying vessels with dynamic positioning, capable of laying HVDC/HVAC cables on or below the seabed—sometimes in multiple, bundled circuits. • **Cable Burial & Protection:** Plowing, trenching, jetting, or rock-dumping to bury cables at required depths and protect against anchors, fishing, or shifting seabeds.
Subsea Construction & Integration	• **Crossings and Landings:** Engineering and installation of cable crossings (for pipelines or other cables) and designing shore-end cable landings with HDD (horizontal directional drilling) or microtunneling. • **Protective Structures:** Installation of mattresses, rock armor, and special joint or connection housings.
Cable Testing, Monitoring & Repair	• **Pre- and Post-Lay Inspections:** Use of ROVs, AUVs, and divers for visual inspection, depth-of-burial surveys, and cable integrity checks. • **Asset Integrity Management:** Deploying real-time monitoring technologies (e.g., distributed temperature sensing, acoustic monitoring) for ongoing health and leak detection. • **Emergency Repair Response:** Mobilizing specialized repair vessels and subsea teams for rapid cable fault location, recovery, and jointing/splicing—even in deepwater or harsh conditions.

Operational Support & Maintenance	• **Ongoing Monitoring:** Scheduled and as-needed subsea survey campaigns to detect movement, exposure, or damage. • **Intervention Services:** Precision interventions for reburial, reconnection, or upgrade of cable systems as required over asset life.

Table 2: Opportunities specific for OGSE players.

Oil and gas service providers are uniquely positioned to support APG project delivery. Their advanced marine fleets, specialised subsea tooling, and highly skilled offshore personnel translate directly into the demands of subsea cable installation and maintenance. Coupled with deep-rooted HSE expertise and proven project management capability in challenging marine environments, these companies bring an established operational backbone, encompassing logistics, emergency response, and asset management, that carries over seamlessly into the power transmission sector.

Additionally, while not universal across the sector, there are OGSE companies well-positioned to pivot into Digital Transformation & Technology Solutions. These include delivering AI-driven tools and cloud solutions for asset monitoring, optimisation, and automation, as well as Enterprise Asset Management (EAM) services leveraging digital platforms, IoT, and predictive maintenance. Further capabilities extend to data analytics, IIoT (Industrial Internet of Things) integration, and real-time monitoring, alongside IT modernisation and digital consulting to drive operations improvement.

Upcoming APG Project Opportunities in / linked to Malaysia

Malaysia stands at the heart of the ASEAN Power Grid initiative, with multiple major interconnection projects either progressing or in various stages of planning. Led by Tenaga Nasional Berhad and Sarawak Energy Berhad, these projects span both offshore subsea and onshore transmission corridors, connecting Malaysia to its regional neighbours and across its own territories. The pipeline is real, structured, and imminent representing a diversification opportunity for the Malaysia's OGSE sector.

Project	Capacity	Target Completion	Project Lead	Terrain	Status
Singapore 2nd Link Pasir Gudang – Pasir Ris	2000MW	2029	TNB	Offshore	Tender for Feasibility study is ongoing. Contract award expected in 2026. Feasibility Study will take 12-15 months to complete. Tendering activity for work packages likely to take place in 2027.
Sarawak – Singapore	1000MW	2032	SEB	Offshore	Feasibility studies and commercial negotiations ongoing. Final investment decision, route selection, and regulatory approvals are still in progress.
Thailand –MY expansion	1000MW 1000MW	2031 2038	TNB	Onshore	Planned.
Vietnam-Laos-Cambodia	400MW 1000MW	2034 2046	-	Onshore	Planned. Consortium being formed currently PTSC, TNB, Sembcorp.
Sarawak – Peninsular Malaysia (Sampadi, Kuching – Tg. Sedili, Johor)	1000MW 2000MW	2036 2045	TNB SEB	Offshore	Planned. Consortium formation planned for 2026.
Peninsular Malaysia - Sumatera	1000MW	2039	TNB	Offshore	Planned.
Philippines – Sabah	500MW	TBC	Sabah Electricity	Offshore	Planned.
Sarawak –Brunei (SB) **&** **Sarawak – Sabah (SS)**	TBC 30 – 50MW	TBC 2026	SEB SEB	Onshore	SB Planned. SS Completed and energised in Jan 2026.

Table 3: Upcoming APG projects in/linked to Malaysia.

CONCLUSION

The development of the ASEAN Power Grid (APG) presents significant opportunities for Oil & Gas Services and Equipment (OGSE) companies to diversify and expand into the regional energy transition landscape. As ASEAN scales up cross-border electricity interconnections, renewable generation, and grid modernisation, OGSE players can leverage their existing technical capabilities in engineering, project management, fabrication, offshore construction, and large-scale infrastructure development. These capabilities are highly transferable to emerging opportunities across the APG value chain, including transmission infrastructure development, substation engineering, grid digitalisation, and renewable energy integration. By repositioning their expertise towards power and grid-related projects, OGSE companies can play a meaningful role in supporting the region's transition towards a more integrated, resilient, and low-carbon power system.

In this context, the Growth Beyond OGSE (GBO) initiative under the Malaysia Petroleum Resources Corporation (MPRC) serves as a strategic platform to support Malaysian OGSE companies in capturing new opportunities beyond the traditional oil and gas sector. The initiative facilitates capability development, strategic partnerships, and market access for OGSE players seeking to participate in adjacent and emerging sectors such as renewable energy, power infrastructure, and energy transition technologies. MPRC welcomes industry players to engage and collaborate under the GBO initiative and encourages companies to reach out to explore potential opportunities, partnerships, and support mechanisms available. Additionally, MPRC also provides facilitation for OGSE companies interested in forming partnerships via the Strategic Partnership Support Programme (SPSP). By aligning industry capabilities with the evolving regional energy landscape, the GBO initiative positions Malaysian OGSE companies to remain competitive, resilient, and well-positioned to participate in the development of the ASEAN Power Grid and broader energy transition initiatives.

REFERENCES

[1] ASEAN Interconnection Masterplan Study (AIMS) III Report, ASEAN Centre of Energy (ACE)

[2] ASEAN Plan of Action for Energy Cooperation (APAEC) 2026-2030, ASEAN Centre of Energy (ACE)

[3] ASEAN Power Grid Updates 2025, ASEAN Centre of Energy (ACE)

[4] Singapore power plan buoys Sarawak's green energy ambitions, Nikkei Asia

[5] Driving regional collaboration to realise the ASEAN Power Grid vision, International Energy Agency (IEA)

[6] ASEAN's clean power pathways: 2024 insights, Ember

ACKNOWLEDGEMENT

MPRC would like to express its sincere appreciation to Ir. Mohd Junaizee bin Mohd Noor, Head of Business Strategy & Performance, Grid Division, Tenaga Nasional Berhad (TNB), for his invaluable support and guidance in the preparation of this article on the ASEAN Power Grid (APG). His willingness to provide detailed clarifications, share insightful perspectives, and contribute relevant information has significantly enhanced the accuracy and depth of this publication. MPRC greatly appreciates his time, expertise, and continuous support throughout the development of this article.