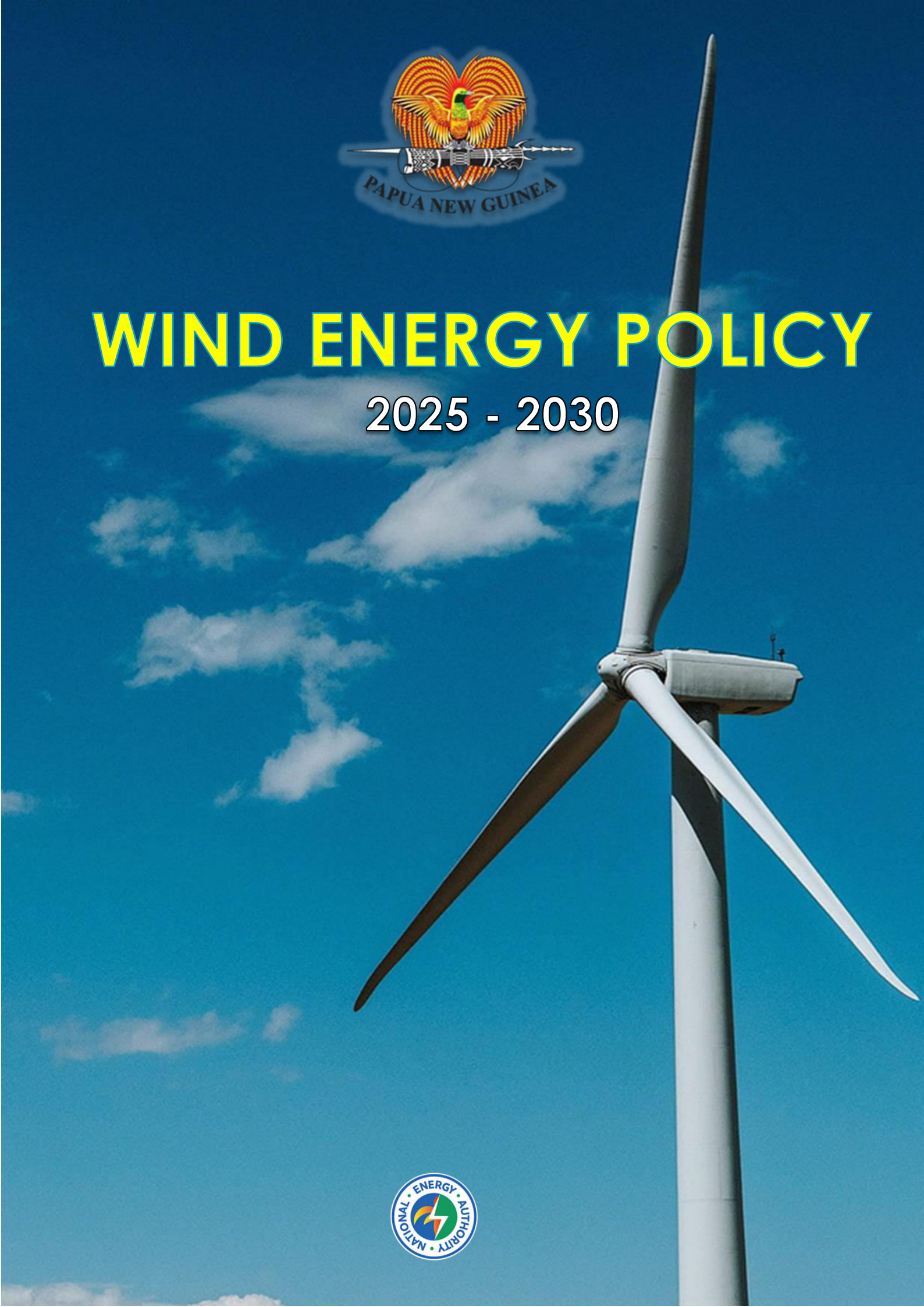
PAPUA NEW GUINEA
WIND ENERGY POLICY
2025 - 2030
NATIONAL ENERGY AUTHORITY

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CONTENT PAGE

LIST OF TABLES

LIST OF FIGURES

FOREWORD BY THE MINISTER

Hon. Peter Namea Isoaimo, MPA, MP
Minister for Energy

As Minister responsible for Energy, it gives me great pleasure and a sense of urgency to present the Geothermal Energy Policy as part of the five (5) Subsector Renewable Energy Policies. The other policies are Hydro Energy Policy, Solar Energy Policy, Wind Energy Policy, and Bioenergy Policy.

It is a culmination of collective visions, ideas and consultation from various government institutions, development partners and the private sector, and all who took part in the development of these renewable energy policies. I am grateful for their invaluable contributions. These policies represent a significant step forward in addressing the pressing energy challenges we face as a nation.

PNG is currently grappling with critical issues surrounding the energy sector and the electricity supply industry. Many communities across our nation that are connected to the main or mini electricity grids continue to experience frequent power outages and inconsistent electricity supply. This hampers economic activities and affect the quality of life of our citizens. The growing demand for electricity, driven by population growth and industrialization, necessitates immediate action to enhance our energy generation capacity and improve our energy infrastructures for adequate and effective electricity supply and distribution to our people and businesses nationwide.

I sincerely thank the Marape/Rosso Government in its wisdom to have enacted the *National Energy Authority Act* 2021 and established National Energy Authority (NEA). NEA is the regulatory body for both the energy sector and electricity supply industry, also responsible for the implementation of the National Electricity Rollout Plan (NEROP) and the National Energy Policy 2017-2027 (NEP). Furthermore, the GoPNG's Medium-Term Development Plan (MTDP) IV highlights twelve (12) Strategic Priority Areas (SPA) of which energy/electricity connectivity is one of the key deliverables for PNG of achieving the target of "middle income" country status.

GoPNG has set targets through its Connect PNG initiative to provide electricity to 70% of households nationwide by 2030 and achieve 100% electrification and household connectivity from renewable energy sources by 2050. Additionally, in line with PNG's commitment to combat climate change and reduce carbon emissions, GoPNG has set a goal to increase our energy generation from renewable sources. As such, the renewable energy policies and related regulations demonstrates the government's genuine effort and priority in rolling out a comprehensive nationwide electricity coverage which is, apart from road infrastructure and communications, the backbone for PNG's economic growth and prosperity. This policy has been meticulously crafted not only to pave the way for legislative reforms but also lay the platform to attract investment within the energy sector.

Finally, I urge all stakeholders from government agencies, private investors, development partners, NGOs, and communities around the country to collaborate in implementing these policies effectively. Together we can build a sustainable future where every Papua New Guinean has access to reliable and affordable electricity that powers their homes and businesses. Thank you and God Bless Papua New Guinea.

HON. PETER NAMEA ISOAIMO, MPA, MP
Minister for Energy

STATEMENT BY THE MANAGING DIRECTOR

Mr. Ronald Meketa
Managing Director
National Energy Authority

Energy is vital for any economy, acting as a catalyst for industrial growth, social development, and overall national progress. Papua New Guinea (PNG) has immense potential for renewable energy generation, given its abundant natural resources. However, our current energy landscape faces significant challenges that require urgent attention. Many communities still lack reliable access to electricity, power outages are frequent, and our reliance on fossil fuels threatens both our environment and economic stability.

As the Managing Director of the Authority, I am honored to announce that the NEA has successfully developed this policy as part of five specifically tailored renewable energy policies. These policies address a significant gap in our current framework and pave the way for the growth of the renewable energy sector. They will complement the regulatory guidelines that have been established, creating a more conducive environment for investment and encouraging greater participation in both the on-grid and off-grid energy spaces.

The importance of these policies cannot be overstated. They are designed not only to increase electricity supply but also to ensure that this supply is reliable, affordable and sustainable. By harnessing our abundant solar, geothermal, hydro, wind, and bioenergy resources, we can create a diversified energy portfolio that meets the growing demands of our population while safeguarding our environment for future generations.

Diversifying our energy sources through renewables will help reduce our dependence on imported fossil fuels. Each policy includes measures aimed at modernising infrastructure and integrating advanced technologies, which will allow for more consistent power delivery. Additionally, the policies outline clear pathways for investment in renewable energy projects that will significantly enhance electricity generation capacity across PNG.

These renewable energy policies and regulations, supported by the Medium-Term Development Plan IV (MTDP IV), reflect the government's commitment to rolling out comprehensive nationwide electricity coverage. This initiative is part of the Connect PNG program, which aims to improve infrastructure and communications to foster economic growth and prosperity.

The electricity grid connectivity rate in Papua New Guinea (PNG) is currently below 20%. It is essential that we address this gap and work collaboratively to achieve our ambitious goal of 70% household connectivity by 2030 and 100% by 2050. These objectives align with the Government of Papua New Guinea's Vision 2050 and the Medium-Term Development Plan IV (MTDP IV), which focus on promoting sustainable development and addressing climate change issues, as outlined in Sustainable Development Goals (SDGs) 7 and 13.

This initiative establishes a foundation for future legislative reforms aimed at attracting investment in the energy sector and promoting economic growth across all sectors of society. It is essential that we work together with local communities, private investors, development partners, and government agencies to achieve these ambitious goals.

Let us work together and move forward united in purpose as we embark on this transformative journey towards a sustainable energy future for PNG.

RONALD MEKETA
Managing Director

ACRONYMS

AI	Artificial Intelligence
BSA	Benefits Sharing Agreement
CCDA	Climate Change Development Authority
CDP	Conceptual Decommissioning Plan
CEPA	Conservation and Environment Protection Authority
DES	Decentralized Electricity Supply
DLPP	Department of Lands and Physical Planning
DMPGM	Department of Mineral Policy and Geohazards Management
EIP	Electricity Industry Policy
EIR	Environment Impact Report
EIS	Environment Impact Statement
EOI	Expression of Interest
ESI	Electricity Supply Industry
FIT	Feed-In Tariff
GHG	Green House Gas
GoPNG	Government of Papua New Guinea
HAWT	Horizontal Axis Wind Turbine
ICCC	Independent Consumer and Competition Commission
IEC	International Electrotechnical Commission
ILG	Incorporated Land Group
IPCC	Inter-governmental Panel on Climate Change
IPP	Independent Power Producer
ISO	International Organization for Standardization
ITMO	Internationally Tradable Emissions Mitigation Outcome
KCH	Kumul Consolidated Holdings
MTDP	Medium-Term Development Plan
MW	Mega Watts
NDC	Nationally Determine Contributions
NEA	National Energy Authority
NEC	National Executive Council
NEP	National Energy Policy 2017 - 2027
NGDP	National Goals and Directive Principles
NISIT	National Institute of Standards and Industrial Technology
PNG	Papua New Guinea
PPA	Power Purchase Agreement
PPL	PNG Power Limited
PPP	Public-Private Partnership
REDD+	Reducing Emissions from Deforestation and Forest Degradation
SAE	Society of Automotive Engineers
SDG	Sustainable Development Goal
SDP	Strategic Development Plan
SPA	Strategic Priority Areas
UNFCCC	United Nations Framework Convention on Climate Change
VAWT	Vertical Axis Wind Turbine

EXECUTIVE SUMMARY

The Wind Energy Policy 2025-2030 for Papua New Guinea (PNG) aims to harness the country's substantial wind energy potential to enhance energy security, reduce carbon emissions, and support sustainable economic development. This Policy establishes a comprehensive framework for the development and integration of wind energy, addressing the increasing domestic energy demand and aligning with PNG's climate goals.

This Policy captures energy development aspirations and focuses of the National Government by aligning with the National Energy Policy 2017 – 2027 (NEP), Medium Term Development Plan IV 2023-2027 (MTDP IV), Vision 2050, Development Strategic Plan 2010 – 2030 (DSP), National REED+ Strategy 2017-2027 and PNG National Determination Contributions (NDC). The primary goals of this Policy include enhancing renewable energy generation, reducing greenhouse gas emissions, and promoting socio-economic growth through the development of both onshore and offshore wind energy projects.

PNG's geographical features, such as coastal and highlands regions, offer significant wind energy potential, with wind speeds exceeding global benchmarks for viable power generation. The Policy targets the development of scalable wind farms, leveraging the consistent wind patterns across various parts of the country to contribute to a diversified renewable energy mix.

Furthermore, this Policy informs relevant stakeholders including state agencies, development partners, civil societies, private investors, and other relevant stakeholders by introducing a structured regulatory framework to facilitate wind energy project development, establishing licences and permits, proposing reforms for pricing and tariff regime, adopting standards and technologies and complying with environmental and safety standards.

The Policy supports the deployment of advanced wind technologies, including horizontal and vertical axis turbines. It also encourages the integration of hybrid systems, combining wind energy with other renewable energy sources like solar and battery storage, enhance grid stability and ensure a reliable power supply, especially in off-grid and rural areas.

The Policy also recognized environmental compliances as one of the key components of wind energy development, requiring developers' adherence to the environmental safety requirements under *Environment Act* 2000 and relevant regulations and guidelines. This Policy also highlights measures for sustainable waste management and site rehabilitation during post-decommissioning.

This Policy further emphasizes the importance of landowner engagement and fair compensation through equitable benefit-sharing mechanisms, ensuring equitable distribution of project benefits. The Policy also recognizes the investment challenges for energy project development and highlighted investment incentives such as feed-in tariffs, tax breaks, and state equity participation aimed at attracting private sector involvement and de-risking of projects.

The development and establishment of this Policy shows GoPNG's commitment towards the Paris Agreement and PNG's NDC by prioritizing wind energy as a low-carbon solution. It aims to reduce dependence on fossil fuels and lower greenhouse gas emissions, with provisions for accessing climate finance to support wind energy projects.

The National Energy Authority (NEA) will oversee the implementation of this Policy, supported by other key agencies including Department of Lands and Physical Planning, Conservation and Environment Protection Authority, Climate Change Development Authority and other relevant agencies. This includes tracking project progress, assessing compliance with regulatory standards, and measuring the impact on national electrification and climate targets.

CHAPTER 1: INTRODUCTION

1.1. INTRODUCTION TO WIND ENERGY POLICY

Wind is the movement of air caused by pressure differences in the earth's atmosphere due to uneven heating of the earth's surface by the sun. The movement of air is caused by warmer air expanding and rising, creating a pressure imbalance with the nearby cooler and compacted air, which then rushes in to fill that space. For thousands of years, humans have recognized the potential of harnessing wind to propel ships, pump water, and to saw woods.

Today, harnessing the power of the wind is known as wind energy. Wind energy is defined as the power generated by converting the kinetic (moving) energy of wind into electrical energy. This is typically done by using wind turbines, which consist of blades that capture the wind energy by spinning a rotor connected to a generator. The generator then converts the mechanical energy into electricity.

PNG recognizes the importance of diversifying its energy sources to enhance energy security, promote sustainable development, contribute towards the reduction of greenhouse gas (GHG), and meet the growing energy demands of its economy. To meet the above commitments, the government has identified wind energy as a key renewable energy source in the NEP.

The Policy is one of the energy subsector policies aimed at supporting the development of renewable energy projects in PNG to meet the national electricity access target of 70% by 2030 and 100% by 2050. This Policy recognizes the importance of PNG having structured development processes for wind energy projects and different licences required from small to large scale projects. This Policy will also inform legislative changes for effective regulations and clear monitoring processes for projects.

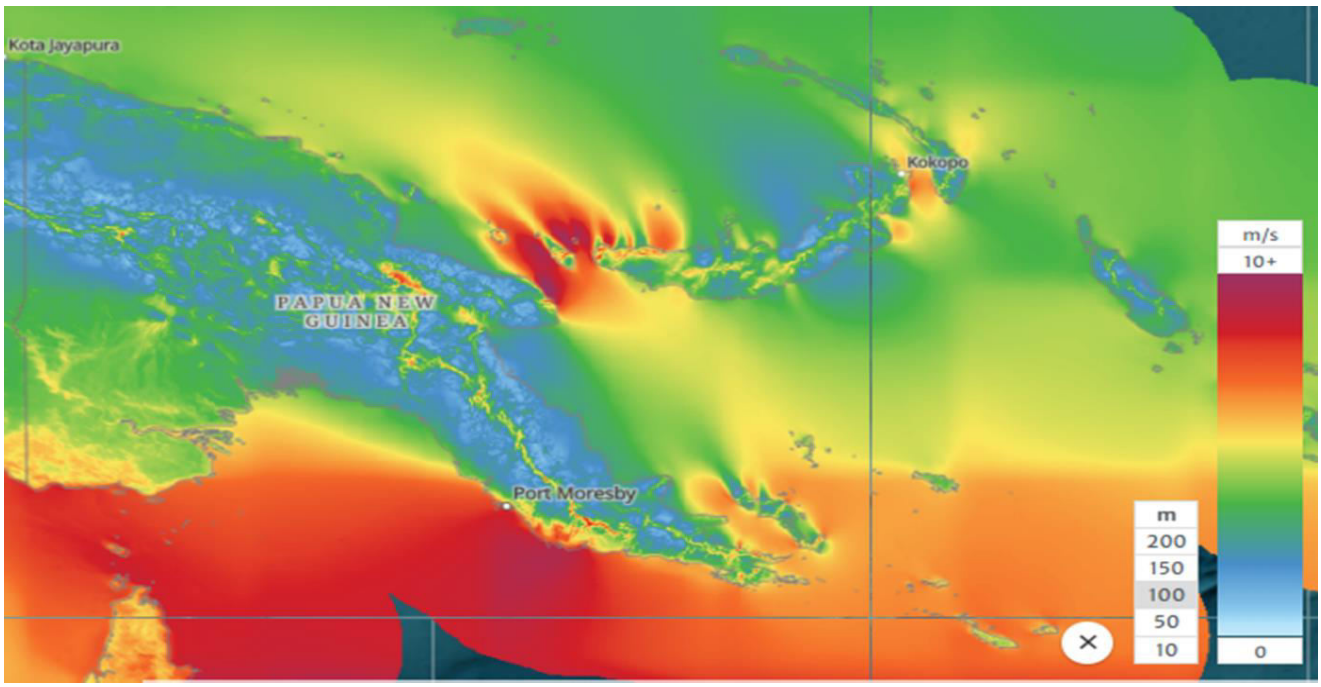
This Policy aligns with PNG's Vision 2050, PNG DSP, and MTDP IV, which aims to transform the country into a globally competitive and prosperous nation. By integrating wind energy into its energy portfolio, PNG aims to achieve economic growth, environmental sustainability, and socio-economic development in line with its long-term visions and aspirations.

Respective chapters under this Policy adopt effective measures that deal with the lack of policy guidelines, policy gaps and goals, regulatory mechanisms, compliance standards, investment incentives, tariff systems, national content, landowner participation, technical standards, environment matters, and implementation strategies, administration processes and monitoring frameworks to guide the sustainable development and growth of wind energy projects in the country.

1.2. WIND ENERGY POTENTIAL IN PAPUA NEW GUINEA

PNG has significant potential for both onshore and offshore wind energy projects for electricity generation due to its geographical characteristics and climatic conditions. The country's diverse topography, including mountainous regions and coastal areas, creates varying wind patterns that can be harnessed for electricity generation. The map below in Figure 1 shows the wind energy potential for PNG.

Figure 1: Locations of wind energy potential in PNG.



Source: Global Wind Atlas, 2025

According to Figure 1, PNG has very high wind speed around the coastal areas of Southern and Momase Region. The locations in red colour indicate areas of higher wind speeds. Technical potential for fixed and floating offshore wind energy for PNG in terms of installed power capacity is around 147 megawatts (MW) within 200 kilometers of the shoreline (World Bank, 2021).

Based on International Finance Corporation report, 2021, PNG has a high wind energy potential compared to other countries in terms of coastal wind resources. PNG has many locations around the coastal areas for potential wind energy projects with wind speeds of more than 1-10 meters per second.

1.3. POLICY RATIONALE

Lack of access to reliable and affordable electricity remains one of the country's most critical barriers to economic growth and social wellbeing. The country's current electrification rate, in terms of grid connectivity, stands at around 20%. This means that over 80 per cent of PNG's population, mainly in rural areas, lack reliable access to power. More recently, there have been efforts by the Government and Development Partners to increase the accessibility rate through implementation of off-grid renewable energy projects, mainly off grid solar, mini hydro's and small isolated wind energy systems. Fifty years after independence, PNG is still plagued by chronic energy shortages and high electricity costs. Other critical issues affecting access to reliable and affordable electricity are:

- **Unreliable power:** PPL struggles to provide reliable electricity due to aging infrastructure and financial constraints.
- **High network costs**: The cost of the network is high due to the country's geography, population dispersal, and aging infrastructure.
- **Limited competition:** The electricity market is small and has limited capacity for users to pay, which limits the scope for competition thereby affecting investments in energy generation.

- **Fossil fuel reliance:** PNG's energy sector is the country's largest source of emissions, and a large portion of the grid relies on diesel fuel. Diesel fuel is more expensive and environmentally unfriendly than other alternatives, such as renewable energy resources.
- **Gaps in regulatory framework:** Recently, the Government established the NEP and enacted the *National Energy Authority Act* 2021. However, there remain gaps in the policy and regulatory framework to support the development of renewable energy sources in PNG.
- **Fragmented power grid:** PNG's power grids are fragmented and experience frequent outages. There are only three main grids with Ramu grid being the major one. However, other towns still operate standalone grids.
- **Complex land tenure system**: Approximately 97% of land in PNG is held under customary tenure, owned collectively by clans or kinship groups. Customary land is managed through unwritten customary rules and arrangements. The remaining 3% is alienated land, which is administered under the *Land Act* 1996 and other relevant laws. The complex land tenure system makes access to land for the development of renewable energy projects a challenge.
- **Lack of incentives:** There is a lack of incentives, especially fiscal incentives to attract private investments in renewable energy projects in PNG. Wind energy projects are capital intensive long pay-back periods. Fiscal incentives can reduce costs and cost recovery period for investors therefore making investments attractive.

Despite these challenges, PNG has significant renewable energy resources, including wind energy potential. This calls for policy and legislative reforms that enable a shift in addressing issues in the energy sector to allow for investments in renewable energy sources such as wind.

1.4. SCOPE OF POLICY

This Policy focuses on creating an enabling framework to promote investment in the wind energy subsector, contributing to the nation's renewable energy mix. This Policy aims to establish the platform that drives investments in harnessing wind energy potential that can contribute to achieving national electrification goals, by providing 70% of the households with access to electricity by 2030 and 100% by 2050, primarily from renewable sources. This policy addresses technical, regulatory, and socio-economic aspects, aligning with international climate commitments and national development plans to ensure sustainable and inclusive growth in PNG's energy sector.

This Policy recognizes that achieving electrification targets in PNG requires both on-grid and off-grid solutions. By supporting the development of large-scale, on-grid wind energy projects and promoting smaller, off-grid power systems in rural areas, this Policy aims to ensure that all households and businesses across the country have access to reliable, affordable, and sustainable electricity. Furthermore, this Policy encourages the integration of decentralized off-grid systems into the national grid where feasible, by facilitating a seamless transition for rural and isolated areas as the grid expands.

The implementation of this Policy will be administered by NEA, as the authority mandated to undertake policy and planning functions of the energy sector in PNG. Full implementation of this Policy requires collaboration with various State Agencies, Development Partners, Sub-National Governments and their respective Administrations, civil society, landowners, and project impact communities.

This Policy provides strategic direction for policy and legislative reforms to address technical and regulatory within the wind energy subsector. This Policy is consistent with the existing laws of PNG and aligns to various legal and policy frameworks, both at the national and

sectoral levels. However, should there be any conflict between this Policy and any existing legislation, the provisions of the legislation shall apply.

CHAPTER 2: POLICY DIRECTION

2.1. VISION

A sustainable wind energy subsector that contributes to achieving 70% of electricity coverage by 2030.

2.2. MISSION

To establish a robust policy and regulatory framework that promotes investment and sustainable development of wind energy projects.

2.3. OBJECTIVES

a) To establish effective regulatory frameworks that promote sustainable development of wind energy projects.

b) To establish mechanisms that support public and private investment in wind energy projects.

c) To contribute to achieving PNG's renewable energy targets under its enhanced Nationally Determined Contributions (NDC) while promoting Just Transition.

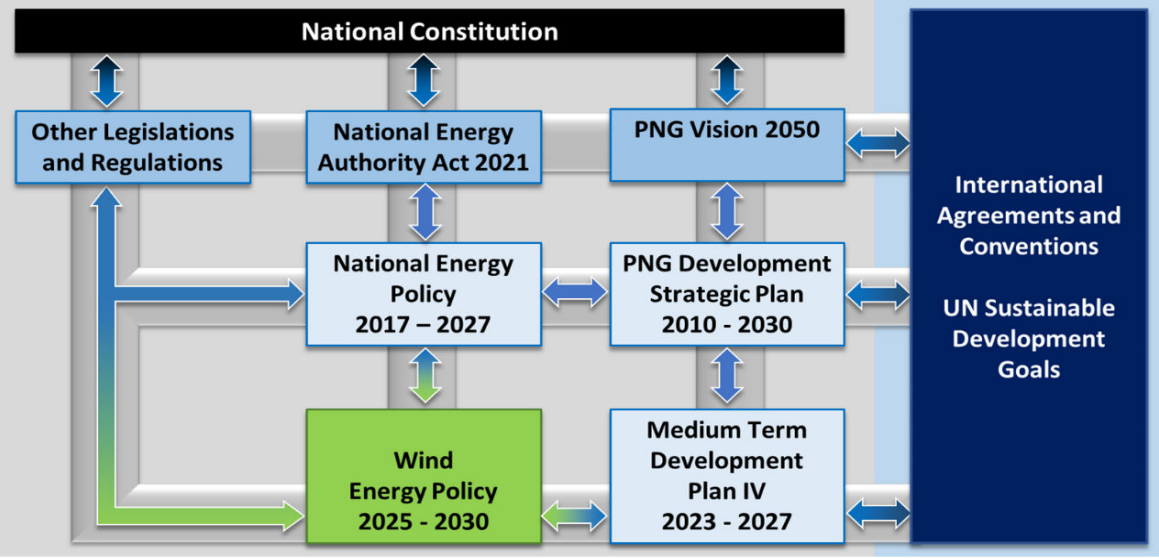
d) To contribute to PNG's energy needs by ensuring an accessible, reliable, and affordable electricity supply.

e) To promote sustainable growth and improve the socio-economic well-being of our people through partnerships.

CHAPTER 3: LEGAL AND POLICY FRAMEWORK

This Policy is aligned with the various legislations and policies as the development and regulation of wind energy projects will be undertaken under various legislations by different State agencies. The principal legislation for the Policy is the *National Energy Authority Act* 2021. This Policy is also defined under the NEP.

Figure 2: Alignment of the Wind Energy Policy 2025 – 2030.



Source: National Energy Authority, 2025

3.1. LEGAL FRAMEWORK

a) *The Constitution of the Independent State of Papua New Guinea*

This Policy takes into consideration the *Constitution of the Independent State of Papua New Guinea (*the *Constitution)* and the National Goals and Directive Principles (NGDPs) under the Constitution. The NGDPs aim for Papua New Guinea (PNG) to have an independent and mostly self-reliant economy and for Papua New Guineans to have equal opportunity to participate in and benefit from the development of our country. The NGDPs also provide for the country's natural resources and environment to be conserved and used for the collective benefit of us all and replenished for the benefit of future generations.

b) *National Energy Authority Act* 2021

The *National Energy Authority Act* 2021 is the principal legislation that establishes and mandates the NEA to undertake its various functions. NEA's functions include policy, regulatory, and project coordination and implementation in the energy and electricity supply industry. This Policy is established under Section 10(b) of the *National Energy Authority Act* 2021.

c) *Electricity Industry Act (Chapter 78)*

The *Electricity Industry Act (Chapter 78)* provides for the generation, supply, and sale of electricity. It also provides for the economic and technical regulation of the electricity supply industry. With its amendment in 2022 (*Electricity Industry (Amendment) Act* 2022), the *Electricity Industry Act (Chapter 78)* further empowers the NEA to regulate the electricity supply industry consistent with the *National Energy Authority Act* 2021.

d) *Electricity Industry (Amendment) Act* 2022

The *Electricity Industry (Amendment) Act* 2022 amended the *Electricity Industry Act (Chapter 78)*. The amendments made to the *Electricity Industry Act (Chapter 78)* among other things, further mandates the NEA as the regulator of the electricity supply industry to undertake economic and technical regulatory functions under the *Electricity Industry Act (Chapter 78)* in addition to the NEA's mandate as regulator under the *National Energy Authority Act* 2021.

e) *Environment Act* 2000

The *Environment Act* 2000 provides for the protection, conservation, and sustainable use of the environment and natural resources. The *Environment Act* 2000 also provides for the regulation of the environmental impacts of development activities. Wind energy projects will require land and sea areas for energy generation which will also be regulated under the *Environment Act* 2000.

f) Other Legislations

This Policy is consistent with all relevant laws of PNG. However, should there be any inconsistencies with this Policy and any relevant legislation, the provisions of the respective legislation shall apply.

3.2. POLICY FRAMEWORK

a) PNG Vision 2050

Vision 2050 embodies the principles of the Constitution and sets the overall direction for PNG to attain its vision of being a smart, wise, fair, and happy society. It is underpinned by seven (7) pillars. Pillar 5 on Environmental Sustainability and Climate Change targets PNG to use 100% renewable energy for power generation by 2050. This Policy aligns with the pillars and the energy goals under Vision 2050.

b) PNG Development Strategic Plan 2010 – 2030

The PNGDSP sets out the long-term development framework to promote and guide PNG onto a path of sustainable economic growth, achieving economic prosperity, and high quality of life for all Papua New Guineans.

It sets out the target that by 2030, 70% of households in PNG will have access to a reliable and affordable power supply. It targets that the total power generation capacity by 2030 will be 1970 MW, of which hydro would generate 1020 MW and other renewables including geothermal, wind, and biomass would generate in total capacity of 500 MW.

c) National Energy Policy 2017 – 2027

The National Energy Policy 2017 – 2027 (NEP) sets out the platform and direction for the development of the energy sector in PNG. It provides for the development of various subsector policies, including the Wind Energy Policy.

d) United Nations Sustainable Development Goals

The United Nations Sustainable Development Goal 7 (SDG 7) calls for “affordable, reliable, sustainable and modern energy for all” by 2030. This Policy aligns with that target by establishing a platform for the development of wind resources to contribute to achieving an affordable, reliable, and sustainable supply of energy by 2030.

This Policy also addresses SDG 13 on Climate Action and will contribute towards PNG’s effort to reduce GHG emissions within the energy sector and achieve PNG’s NDC targets under United Nations Framework Convention on Climate Change (UNFCCC) commitments.

e) Medium-Term Development IV 2023 – 2027

The Medium-Term Development Plan IV 2023-2027 (MTDP IV) is themed “National Prosperity Through growing the Economy”. The theme captures the Government’s intent

to invest in strategic priority areas to trigger greater national transformation and economic independence. Under MTDP IV, the energy (including electricity) is identified as an important sector for PNG's economy and commits to improving access to a reliable, affordable and clean energy supply to cater for more than 70% of households by 2030.

The MTDP IV identifies five (5) Strategic Priority Areas, which includes National Power Generation Investment Program. The MTDP IV further sets out various investment targets, key result areas and strategies for the energy sector. This Policy will is aligned to that by establishing the platform and sets the direction to drive investments in hydro electricity generation.

CHAPTER 4: WIND ENERGY SYSTEMS AND TECHNOLOGIES

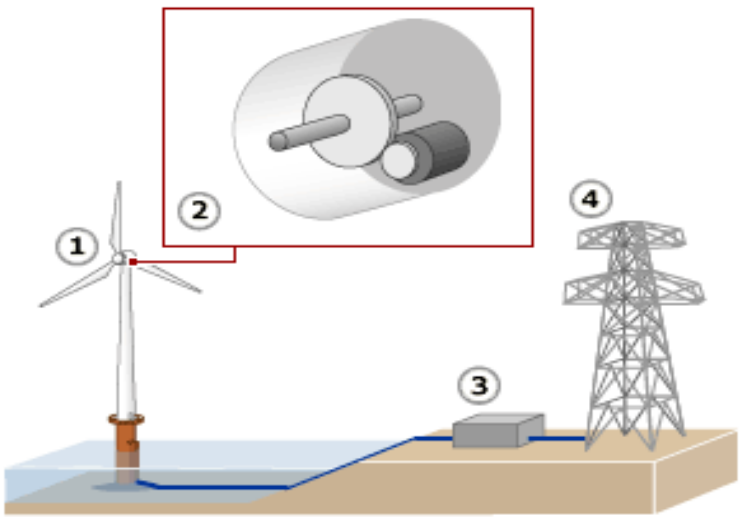
4.1. COMPONENTS OF WIND SYSTEM TECHNOLOGY

Wind power or wind energy is a form of renewable energy that harnesses wind to generate electricity. It involves wind turbines converting the turning motion of blades, pushed by moving air (kinetic energy) into electrical energy (electricity). The two (2) main wind power systems utilizing the flow of wind on the land and over the sea surface are onshore and offshore wind power systems. The technology used for the onshore or offshore wind systems to generate electricity is essentially the same, except their location, position, size, scale, and how the electricity they generate is transferred.

The components of the wind power systems include energy storage system, power conditioning system, control systems, and transmission systems. The key elements of a wind power system are the tower, blades, rotor hub, rotor shaft, nacelle, rotor brake, gearbox, generator and the transformer.

The blades capture and convert the wind's moving energy to rotational energy. The rotor hub transfers the rotational energy to the rotor shaft, which is fixed to the rotor hub. The other end of the rotor shaft is connected to the gearbox, which changes the low rotating speed from the blades to a high rotating speed for input to the generator. A transformer, usually placed at ground level, transforms the electricity from the generator to the required voltage on the grid.

Figure 3: The complete components and elements of a wind power system.



1. Wind causes blades to rotate which spins a shaft.
2. Shaft turns generator to produce electrical energy.
3. Electrical power is converted by a transformer to high-voltage supply.
4. Electricity is transmitted via the Grid

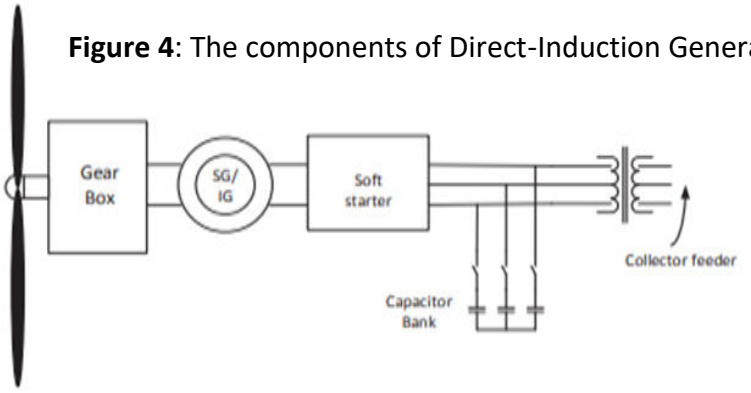
Source: Electrical Technology, 2024

4.1.1: TYPES OF WIND GENERATORS

a) Direct-Connected Induction Generator

Direct-connected Induction Generator employs stall-regulated (fixed-pitch) blades connected to a hub, which is coupled via a gearbox to a conventional squirrel-cage induction generator. Although strong and reliable, it does not efficiently capture wind energy and therefore needs extra equipment to manage power quality.

Figure 4: The components of Direct-Induction Generator.



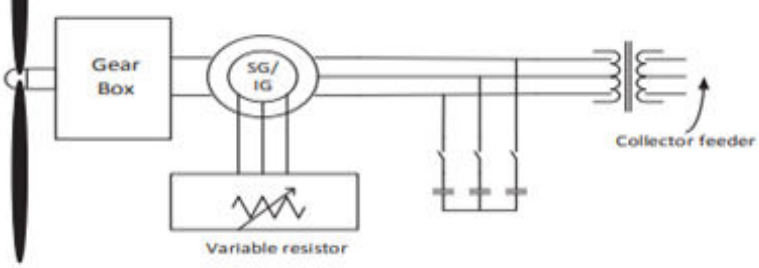
Source: Anoop. A & Shweta.M, December 2021

b) Wound-Rotor Induction Generator with External Resistance Control

These turbines have a wound rotor and use external resistors to control rotor current and blade pitch, allowing for better speed control.

The rotor circuit here has variable resistance whereas the circuit of the stator side is same as the fixed speed type induction generator.

Figure 5: Components of Wound-Rotor Induction Generator with External Resistance Control



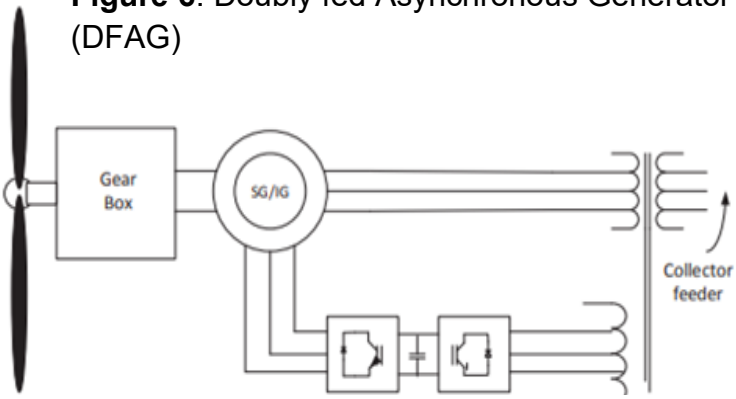
Source: Anoop. A & Shweta.M, December 2021

c) Doubly fed Asynchronous Generator (DFAG)

These turbines use a wound rotor connected to the grid through a power converter, allowing for precise control of rotor current and wider speed ranges.

These generators are the combination of both fixed and variable speed type induction generators.

Figure 6: Doubly fed Asynchronous Generator (DFAG)



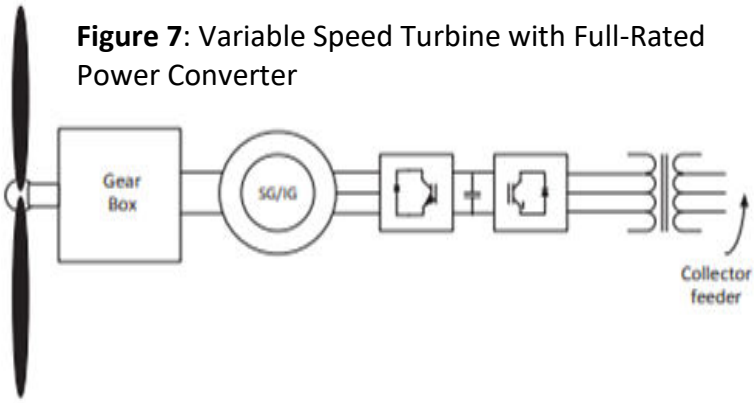
Source: Anoop. A & Shweta.M, December 2021

d) Variable Speed Turbine with Full-Rated Power Converter

These turbines have a full-rate power converter that allows them to operate at variable speeds and manage power independently from the grid.

Back-to-back frequency converter plays a vital role in this case as the generator here is directly coupled to the grid. The Variable Speed Turbine with Full-rated Power Converter offers great flexibility in power control and grid integration.

Figure 7: Variable Speed Turbine with Full-Rated Power Converter



Source: Anoop. A & Shweta.M, December 2021

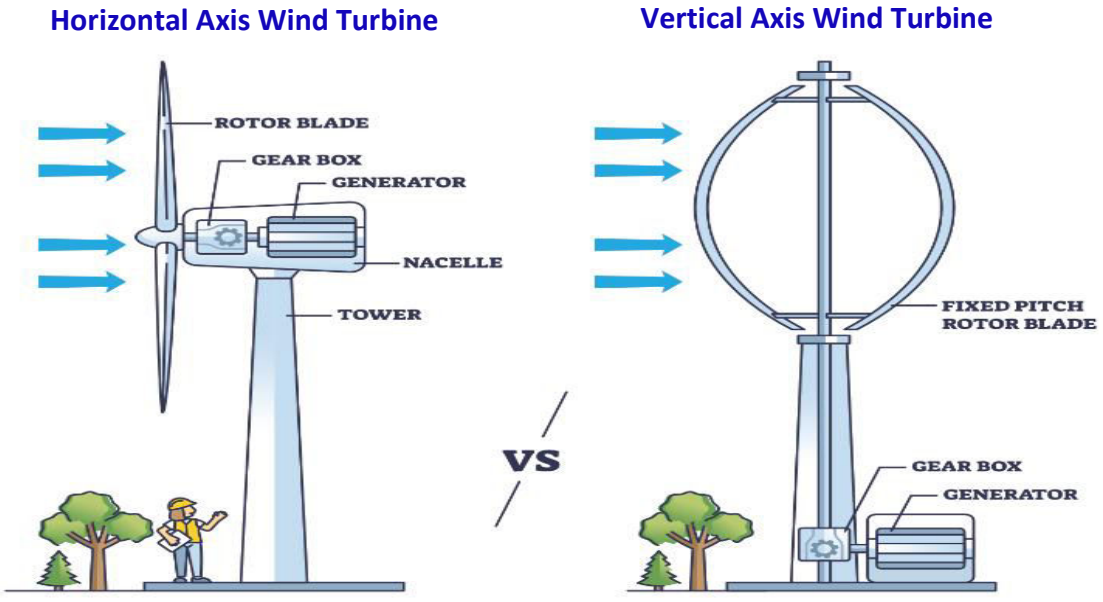
4.1.2: WIND ENERGY TURBINES

The wind energy technologies are determined by the types of wind turbines used. The wind turbines are then determined by the wind speed of the location. The wind speed of a location will allow a specific wind turbine with power class to be used. The wind power class of a wind turbine is a rating system that is used to rank the quality of a wind turbine that is applicable to the average wind speed of that location.

The two most important factors needed to obtain optimal kinetic energy from the wind are the diameter of the rotor blades and wind speeds. The higher the wind speed, the greater the wind power ratings, the greater the diameter of the blades used, the greater the area of the space swept by the blades, and the area of the blades has a direct correlation with the output of energy.

There are two main types of wind turbines used for electricity generation purposes including, Horizontal-Axis Wind Turbines (HAWT) and Vertical-Axis Wind Turbines (VAWT).

Figure 8: Types of Wind Turbines commonly used for electricity generation



Source: Greenrhub, 2024

a) Horizontal Axis Wind Turbine (HAWT)

HAWT uses the power of wind speed to rotate their blades around a horizontal axis and are mostly used for large-scale wind energy projects or for commercial use.

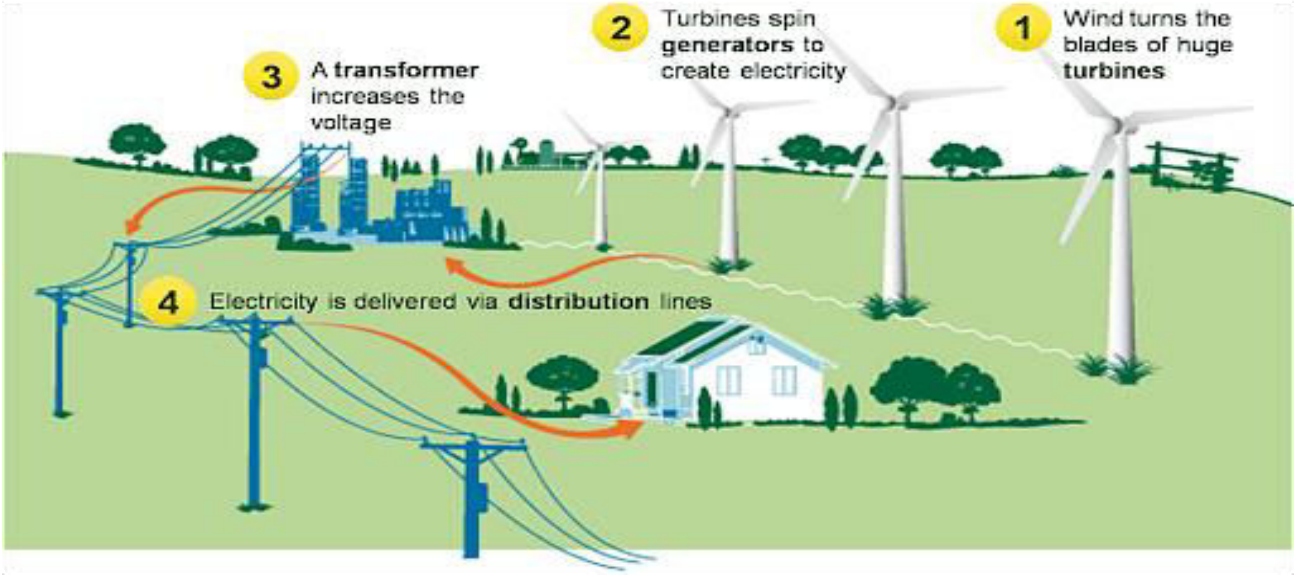
b) Vertical Axis Wind Turbine (VAWT)

The vertical turbine blades rotate around a vertical rotor instead of spinning like a fan. VAWTs are often used in areas where space is limited or wind direction changes frequently. They are adaptable and can fit in various settings. The turbines are independent of wind direction, and some can generate electricity at low wind speeds and noise levels, making them particularly suited to urban areas.

4.2. ONSHORE BASED WIND SYSTEMS

Onshore-based wind energy systems are more common and are usually erected on open land. They are built in less populated areas where buildings and obstacles do not interrupt the wind flow. Onshore wind energy systems or farms require a strategic location to optimize the amount of wind captured from all directions.

Figure 9: Onshore Based Wind Energy System



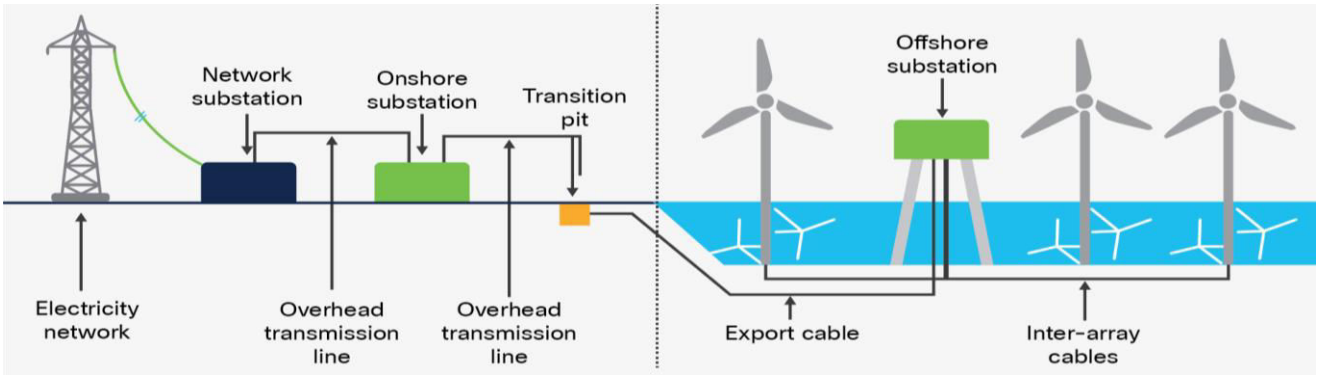
Source: PREPP, Wind Environment Notes, 2025

4.3. OFFSHORE-BASED WIND SYSTEMS

Offshore wind systems generate electricity from wind blowing across the sea. They are considered more efficient than onshore wind farms, because of the higher speed, greater consistency, and lack of physical interference from land or man-made objects. Higher wind speeds and consistency in the same direction mean offshore installations require fewer turbines to produce the same amount of energy as onshore wind farms. The offshore wind energy systems use different types of wind turbine foundations based on the dept of the sea.

However, offshore wind turbines require considerably more maintenance due to the environment they are located, mostly on open seas. The electricity transfer process takes longer and requires more equipment to distribute electricity to onshore substations.

Figure 10: Offshore Based Wind Energy System



Source: CISCO, Renewable Generation Wind Farm, 2022

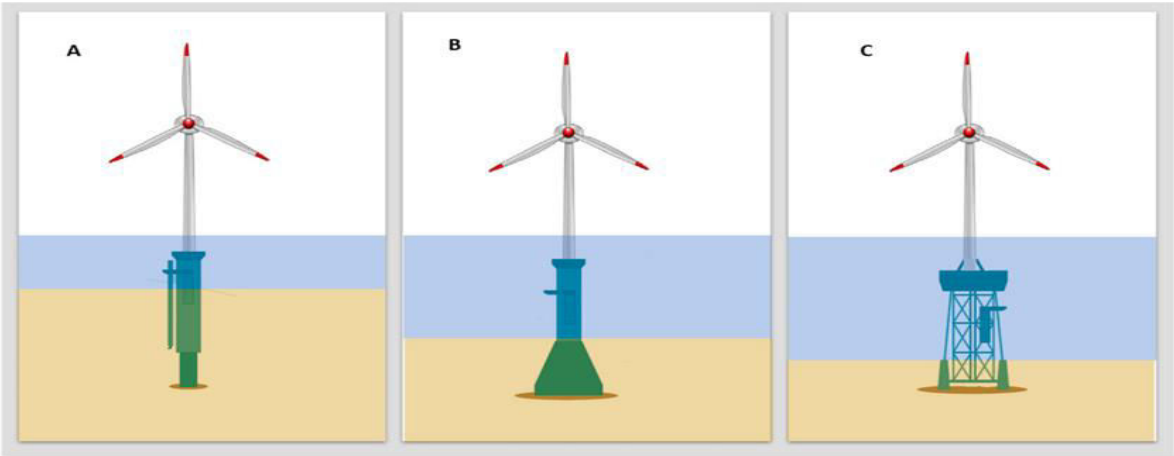
4.4. OFFSHORE WIND ENERGY TURBINE TECHNOLOGIES

A potential site for wind energy projects is identified and considered suitable if it has high and relatively consistent wind speeds and most importantly, water depths are appropriate, and the site can be connected to an electricity grid. Installation of wind turbines on the open sea requires different types of foundations for the wind turbines based on the dept of the sea. There are only two standard wind turbine foundations used for offshore wind systems, which are Fixed and Floating Wind Turbine Foundations.

4.4.1. Fixed Wind Turbine Foundations

Fixed offshore wind turbine foundations are rigidly connected to the seabed, remaining in a permanent static position. These systems feature large wind turbines typically suited at water depths up to 60 meters. Widely implemented across Europe, where the industry has advanced significantly, they are known for their stability. The firm anchoring to the seabed ensures they can endure harsh weather, including strong winds and rough seas. Their fixed positioning simplifies installation and maintenance, reducing costs and enhancing reliability, resulting in consistent power generation compared to more flexible structures.

Figure 11: Fixed – Bottom Wind Turbines. (a) Monopiles (b) Gravity-Base (c) Jacket Foundations.



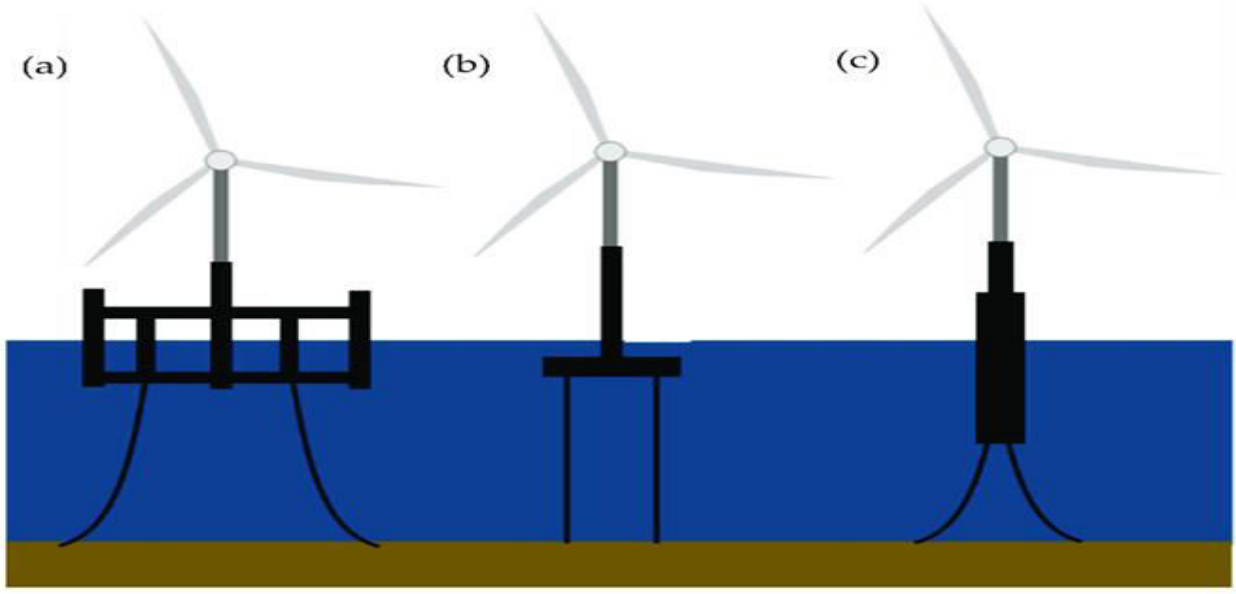
Source: Pravin.K & Santosh.B, Offshore Wind Energy harnessing, 2024

4.4.2. Floating Foundations

Floating Offshore Wind Turbines provides an innovative solution for harnessing wind energy in deep waters, where fixed turbines are not feasible. Instead of being rigidly attached to the seabed, these turbines are stabilized using mooring lines and offset anchors, making them ideal for water depths over 60 meters and areas with challenging seabed conditions. A key advantage of floating turbines is their ability to access wind resources in deep waters, unlocking vast offshore areas for energy development. Positioned farther from shore, they capitalize on stronger, more consistent winds, resulting in higher energy production.

Additionally, their distance from the coast reduces visual impact and minimizes conflicts with other marine activities.

Figure 12: The three main types of Floating offshore wind turbine structures. (a) Semi – submersible platforms (b) Tension – Leg Platforms and (c) Spar – Buoy Platforms.



Source: Thomas. M, Journal of Marine Science and Engineering, 2023

4.5. SMALL WIND SYSTEMS

Small Wind System is a power system with generation capacity of less than 1 MW. Small wind systems can be connected to the electricity grid or standalone (off-grid). This makes small wind power systems a good choice for rural areas that are not connected to the electricity grid.

Small wind power systems use wind turbines that generally have a much lower energy output than large commercial wind turbines, but their size can differ significantly. The three main classes of small wind turbines are:

4.5.1. Household-Size Wind Turbines

This category summarizes a much broader field of wind turbines depending on the very different size of 'households' and the related applications. Household-size turbines are suitable for the supply of homes, can be used for farming, small business setups and telecommunication set-ups. Household-Size Wind Turbines have rotor diameters of 2.7 - 9 meters and can generate from 2,000-20,000 kWh for sites with 5.5 m/s.

4.5.2. Mini Wind Turbines

Mini wind turbines typically have rotor diameters of 1.5 – 2.6 meters and can generate 1000 – 2000 kWh per year at sites with 5.5 m/s. They are used to power homes or for single use purposes.

4.5.3. Micro Wind Turbines

These wind turbines have a very small rotor diameter of around 1 m or less and generate about 300 kWh per year at sites with an average wind speed of 5,5 m/s. They are typically used for low power uses in remote areas for basic lighting or single use appliances.

4.6. HYBRID SYSTEMS

Hybrid renewable energy systems are becoming more appealing than stand-alone power systems, due to advances in renewable energy technologies and the high cost of conventional energy sources. A hybrid energy system combines two or more renewable energy sources to increase system efficiency, enhance reliability and supply balance. By leveraging multiple energy generation methods, these systems mitigate the intermittency of wind energy and provide a stable power supply. Hybrid systems ensure there is a consistent power supply by compensating for periods of wind availability, they are adaptable to various environmental and economic conditions and reduce the reliance on high-cost fossil fuels and lowers overall operational expenses. Some wind hybrid systems are briefly highlighted below.

4.6.1. Wind-Solar Hybrid Systems

Combining wind and solar energy capitalizes on their complementary nature. Wind energy tends to be stronger during the night or stormy weather, while solar power is most effective during the day or drier periods. Hybrid wind solar systems provide a balanced power output over 24 hours.

4.6.2. Wind-Biomass Hybrid Systems

Biomass energy provides a reliable backup to wind turbines during periods of low wind speeds. Biomass-fueled generators can be activated to ensure an uninterrupted energy supply.

4.6.3. Wind-Battery Storage Systems

Battery storage addresses the variability of wind energy by storing excess power generated during peak wind periods for use during low-wind conditions. This hybrid approach supports grid stability and power reliability.

4.6.4. Wind-Fossil Fuel Hybrid Systems

While renewable energy is the priority, fossil fuel integration remains relevant in regions transitioning to green energy. Wind energy hybridized with diesel generators or natural gas turbines is practical in remote areas or where renewables alone cannot meet demand.

In PNG, potential applications for wind-hybrid systems are particularly suited for remote and off-grid areas where they can be combined with other energy sources to ensure reliable electricity for the rural population. Also, it can be utilized for other applications such as industrial use to support agricultural operations.

4.7. GRID INTEGRATION

An integrated power system is defined as a cost-effective, sustainable, and secured power system in which renewable energy production, infrastructure, and consumption are integrated and coordinated through power services, active users, and enabling technologies. Grid

integration is essential for ensuring that decentralized wind mini grids, particularly in isolated service areas, can seamlessly connect to the central electricity grid without compromising overall system reliability and stability.

This process involves adhering to technical standards, such as synchronization of voltage and frequency, and ensuring compatibility of equipment and supply with grid codes.

Table 1 below shows key elements to be considered in any mini wind power grid development or hybrid power systems to ensure compatibility.

Table 1: Key elements of mini power grid connection

Key Elements for Grid Connection	Descriptions
Technical Standards	Mini grids should be designed and operated to meet national grid technical standards, including voltage levels, frequency stability, and synchronization. This ensures that when the mini grid connects to the central grid, the power generated can be safely and efficiently transferred.
Interconnection Equipment	Appropriate interconnection equipment, such as inverters, transformers, and protection devices, must be installed. This ensures the system to handle bidirectional power flow (where mini-grids can either feed into or draw from the centralized grid) while protecting both the mini-grid and the central grid systems from any faults.
Regulation and Load Balancing	Wind energy mini grids should incorporate automatic control systems to regulate power output in real time and balance load demand with supply. This prevents overloading and ensures consistent voltage and frequency when integrated with the grid.
Harmonization of Generation and Consumption	Mini grids should be designed to anticipate the potential shift in energy demand and supply once connected to the larger grid. This includes considerations for seasonal variations in wind patterns and ensuring generation capacity aligns with anticipated grid demand.
Utility Coordination	Continuous coordination with utility companies is critical for successful grid integration. This involves compliance with grid codes, monitoring supply, and ensuring that both the mini-grid and the centralized grid are prepared for interconnection.
Energy Storage and Backup Systems	To ensure stability, energy storage or backup systems (like battery storage) may be necessary to manage fluctuations in wind patterns. This helps balance supply and demand, particularly during grid outages.

4.8. WIND ENERGY PROJECT CLASSIFICATION

This Policy classified wind energy projects into small, medium and large scales based on the generation capacity of the project. Therefore, the generation capacity of a wind energy project will determine the application of different licences, national content, and other compliance and regulatory requirements as shown in Table 2 below.

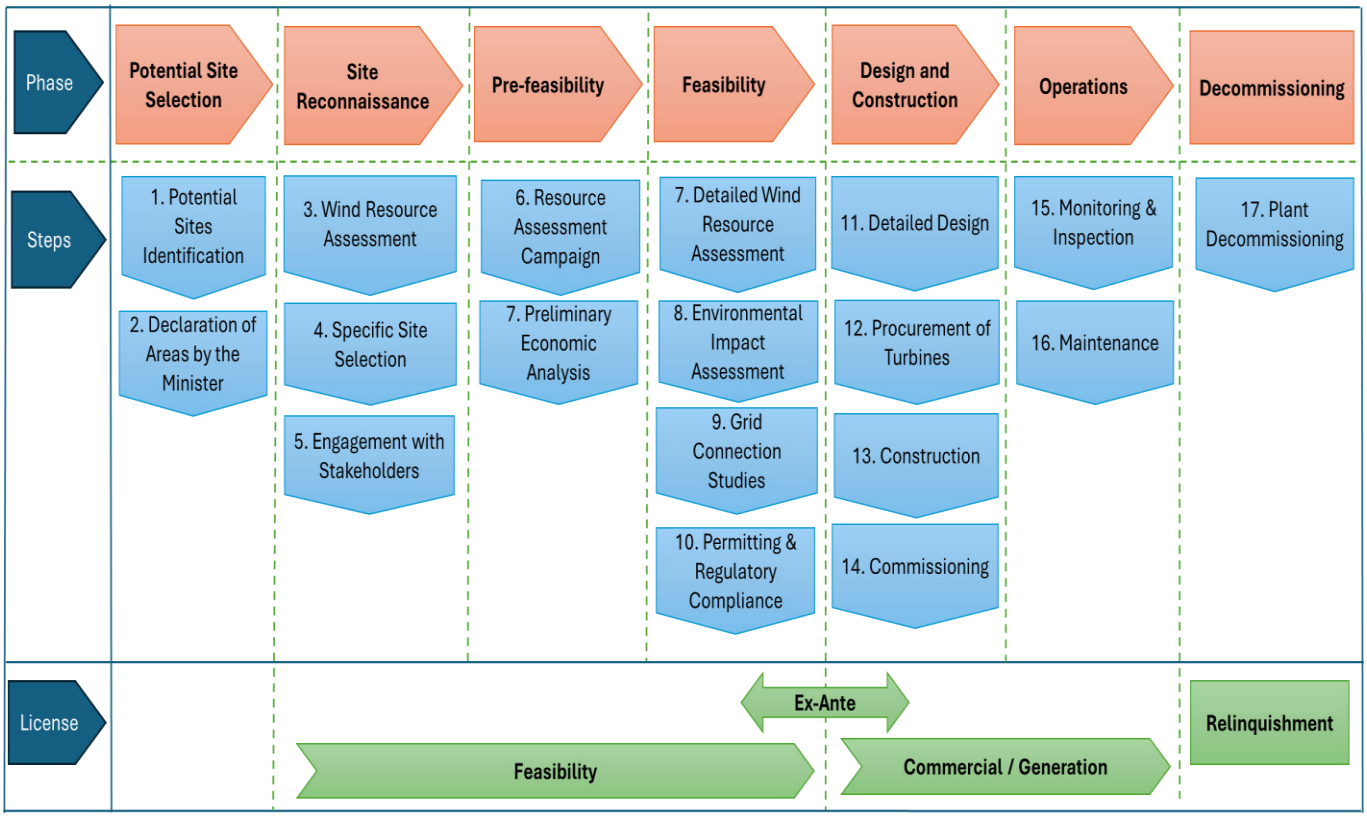
Table 2: Different categories of wind energy projects and application of different licences

Classification of wind energy project	Generation Capacity (MW)	Explanation
Large scale	≥10	A large-scale wind energy project is a project with an installed capacity of MW range from 10 MW and above.
Medium scale	<10 and >1	A medium-scale wind energy project is a project with an installed capacity of MW range from 1 MW to 10 MW.
Small scale	<1	A small-scale wind energy project is a project with an installed capacity of MW less than 1 MW.

CHAPTER 5: WIND ENERGY PROJECT DEVELOPMENT STAGES

The development phases of the medium-large scale wind energy projects involve potential site selection, site reconnaissance, pre-feasibility, feasibility, and construction. The full licensing application process is shown in the flowchart below.

Figure 13: Development phases of a wind energy project and the licensing process.



Source: National Energy Authority, 2025

5.1. POTENTIAL SITES SELECTION

Potential site selection is important for wind energy projects. Potential sites are decided based on wind speeds and environment settings which determine the wind energy project or technology to be used. Site selection also considers accessibility to basic infrastructure such as proximity to roads and power grids, which significantly influence the cost and feasibility of the projects. There are two options for site selection:

5.1.1. Site Identified by the Authority

NEA, in consultation with the relevant government agencies and landowners, will identify and select potential sites for onshore or offshore wind energy projects. The sites identified during the consultation process will then be declared by the Minister responsible for energy matters as areas suitable for the development of medium-large-scale onshore and offshore wind energy projects.

5.1.2. Site Identified by a Potential Developer

A potential developer can inform the Authority in writing of the potential sites that have not been identified by the Authority, for wind energy project development. Once notified, NEA in consultation with relevant government agencies, landowners, and the potential developer will then inform the Minister responsible for energy matters to declare the area suitable for wind energy projects.

5.2. PROJECT SITE RECONNAISSANCE AND PRE-FEASIBILITY STUDY

A potential investor or developer will undertake the initial reconnaissance of potential site. Activities to be undertaken here will include wind resource assessment, site selection within the potential site, engagement with landowners and surrounding communities.

After the initial reconnaissance, work will progress to the pre-feasibility phase with actual site selection. This phase requires site mapping and geological investigations, a preliminary layout based on available materials; preliminary selection of the main project characteristics (installed capacity, type of development, etc.); a cost estimate based on major quantities; a preliminary economic analysis of the project, the identification of possible environmental impacts; and production of a single volume report on each site.

After the preliminary study, an Inception Report is produced with recommendations to undertake detailed feasibility studies. The developer must apply for the Feasibility Study Permit if the developer proceeds to the next step, which is application for feasibility study permit.

5.3. FEASIBILITY STUDY

This involves conducting a comprehensive assessment to confirm the technical, economic, and environmental impacts of a wind energy project. The key activities include:

(a) Detailed Wind Resource Assessment to refine energy production estimates and optimize turbine layout for maximum efficiency.

(b) Environmental Impact Assessment to assess potential impacts of the project on local environment and ecosystems and develop mitigation measures/plans.

(c) Undertake socio-economic impact studies, including land access arrangements and landowner identification.

(d) Grid Connection Studies involve evaluating grid connection options and requirements to ensure seamless integration of the wind farm into the existing electricity grid without causing disruptions or constraints.

(e) Permit and Regulatory Compliance includes obtaining necessary permits and approvals from relevant authorities by demonstrating compliance with environmental regulations, land use laws, and safety standards.

The outcomes of these activities are then compiled into a final feasibility study report.

5.4. LICENCE APPLICATION, ASSESSMENT AND APPROVAL

Once the feasibility study report is finalized, it will be submitted to NEA, together with an application as a proposal for the development of a wind energy project.

The licensing and regulatory process under the *Environment Act* 2000 must be complied with. The licensing process is further discussed separately under Chapter 6. The Environment Permit will be a pre-requisite for the approval of a Generation Licence.

NEA will undertake its assessment of the application and proposal for development which will be submitted to the NEA Board for consideration and approval subject to the *National Energy Authority Act* 2021.

During the application and assessment of the application, if need be, for medium-large scale projects, various other commercial and socio-economic requirements must also be undertaken and completed. These may include:

- Settlement of National Content Issues and Compensation Agreements.
- Settlement of all Technical and Legal Issues.
- Agreement on State Equity Participation, if any.
- Determination of Tariff Rates and Power Purchase Agreements
- Other requirements may be required under the law and imposed by NEA

5.5. DETAILED DESIGN AND CONSTRUCTION

The design and construction phase involves the following:

a) Detailed design includes selection of turbine-based on-site assessment, foundation design to ensure efficiency and support for the turbine and aerodynamic design of the blades for energy efficiency.

b) Procurement includes sourcing components such as towers, nacelles, blades, and other parts.

c) The construction phase involves site preparation, turbine installation, electrical infrastructure installations such as transformers and substations, and testing and commissioning.

d) Post-construction includes operation and maintenance, planning, monitoring and performance evaluation, and compliance checks.

5.6. TESTING AND COMMISSIONING

Commissioning a wind power plant involves a series of steps to ensure that all systems and components are properly installed, tested, and verified before the plant goes into full operation.

The commissioning procedure may vary depending on the specific type and size of the power plant.

A general procedure for testing and commissioning will be established by NEA to ensure compliance with all required processes and standards, including environment and safety.

Once a wind power plant is successfully commissioned, the generation licence can be issued by NEA to the owner or operator of the wind power project.

5.7. OPERATIONS AND MAINTENANCE

The operation and maintenance phase of the project involves:

a) Operations and maintenance of the wind turbine and power plant

b) Monitoring and inspection of wind turbine performance.

c) Training and knowledge transfer to project employees.

5.8. PROJECT DECOMMISSIONING

The decommissioning phase includes planning and permitting, disassembling of the wind turbines, waste disposal or recycling, and restoration of the project site to its original condition.

a) Planning and Permitting

The developer must have a conceptual decommissioning plan to submit to the Authority when applying for a generation licence.

Two years before the project is decommissioned, the developer must submit the final decommissioning plan to the Authority. The final decommissioning plan must include strategies on how the developer will disassemble the turbines, site restoration, and waste recycling and/ or disposal.

The developer must consult relevant stakeholders responsible for waste management and environment conservation to get permits for the decommissioning of the wind energy project.

b) Disassembling

This mainly involves the removal of wind turbines which can be done by toppling or taking down by cranes and disassembling them into sections, either for recycling or disposal.

c) Recycle and Disposal

The developer must ensure sustainable disposal or recycling that complies with relevant regulations.

d) Site Restoration

After the disassembling of wind turbines, the project site must be restored, to a feasible extent, to its original condition.

CHAPTER 6: LICENSING

Establishing a licencing process for the development of Wind Energy Projects is crucial for the development and growth of the renewable energy sector in PNG. The licensing process will

ensure effective regulation through enforcement and compliance of good industry practices in the development and operations of wind energy projects.

The prescribed process will guide the licensing, development and the operation of qind energy projects.

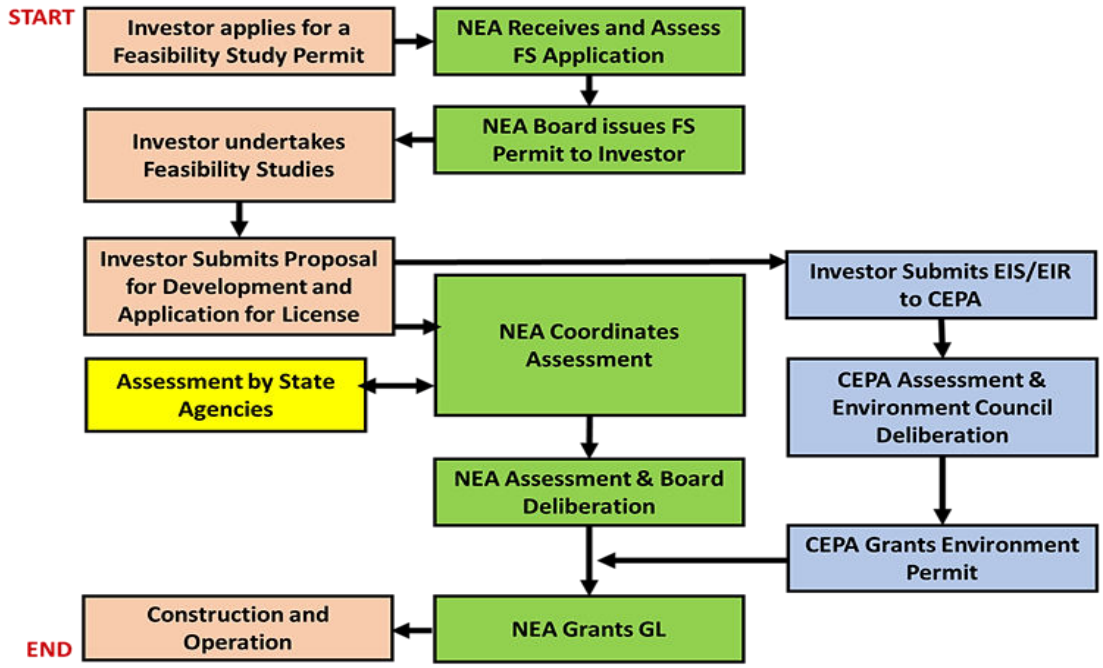
6.1. LICENSING PROCESS FOR WIND ENERGY PROJECTS

The licensing process stated here applies to medium – large scale wind energy projects. Licensing for small-scale wind energy projects, with output of less than 1MW, will be regulated under the Off-Grid Small Power System Regulation.

The electricity entities and undertakers are required under Division 1, Part IV of the *National Energy Authority Act* 2021 to have a licence to undertake either generation, transmission, distribution, or the retail of electricity. However, the *National Energy Authority Act* 2021 does not clearly define the licensing process and requirements for the development and use of wind energy resources in the country.

The process prescribed under this section therefore aims to guide the licessing process for medium – large scale wind energy projects. The licensing for wind energy projects is tied to the Project Development Stages discussed in Chapter 5.

Figure 14: Licensing process for wind energy projects.



Source: National Energy Authority, 2025

6.2. TYPES OF LICENCES

NEA will establish different licences to enforce standards and ensure compliance with requirements when developing and operating medium – large scale wind energy projects. The different licences for wind energy projects are discussed below.

6.2.1. Feasibility Study Permit

An investor or developer of a wind energy project must apply and be issued a Feasibility Study Permit by NEA to undertake feasibility studies as discussed under Chapter 5.

The requirements of the Feasibility Study Permit and related conditions will be developed by NEA through regulations. The key requirements will be the technical and financial capability to undertake and deliver the feasibility study.

The feasibility study permit will apply to any project seeking to generate electricity from 100 kW and upwards, that is for medium – large scale projects as per the classification under Table 2 in Chapter 4.8

6.2.2. Ex-Ante Licence

This Policy recognizes the challenges associated with securing finance for wind energy projects, including obtaining a guarantee from the government to support the development of wind energy projects. Investors for renewable energy projects such as wind energy projects often require a guarantee or assurance from the State to secure financing and other project logistics.

The Government, through NEA may provide an Ex-Ante Licence to an investor for a medium-large scale wind energy projects. The Ex-Ante Licence will only be provided after the requirements of the Feasibility Study Permit are met and a proposal for development with the application has been submitted to NEA.

The investor must satisfy the following conditions for the Government through NEA to grant an Ex-Ante Licence.

a) Fully completed project feasibility studies submitted to NEA.

b) Submission of a project development proposal to NEA.

c) Submission of a project financial plan or economic model to NEA.

d) Declaration of the need for Ex-Ante Licence to NEA.

6.2.3. Environment Permit

An investor or developer of a wind energy project is required by the *Environment Act* 2000 to apply for an Environment Permit. CEPA will grant the Environment Permit based on the requirements under *Environment Act* 2000.

6.2.4. Generation Licence

Any wind energy project that will generate 1 MW and upwards of electricity must apply for and be issued a generation licence by NEA to operate a wind power plant to generate and supply electricity. The requirements of the Generation licence and related conditions will be developed by NEA through regulations.

6.3. LICENSING FOR SMALL-SCALE PROJECTS

The full licensing process discussed above for medium – large wind energy projects will not apply to small scale wind energy projects. Small scale wind energy projects are defined as electricity projects with an installed capacity of less than 1 MW.

An investor or developer of a small-scale power project must apply for and be issued a Electricity Permit to generate and supply electricity. The requirements of the Electricity Permit and related conditions will be developed by NEA through regulations.

The full licensing process applies to projects with an installed capacity of more than 1 MW and may not apply to Small Wind Power Systems.

CHAPTER 7: PRICING AND ELECTRICITY MARKET

The most fundamental issue in electricity economics and welfare is the price of electricity. At what price should electricity be sold to maximize economic welfare? The structure of the economy and the energy or electricity market also determines the demand for energy or electricity. Demand and supply affect the price of energy, and price affects demand and supply.

The factors that affect the investment decision are the price, profitability (return on investment), the cost of investing, and electricity demand. Setting electricity tariffs should take into consideration the factors that affect investment decisions as well as the objective of the government to set an affordable tariff rate.

The determination of a pricing mechanism is critical to encourage investment and development of wind energy projects. A pricing mechanism that promotes fair return on investment, especially for wind energy projects is important as it determines the profitability and sustainability of the project in the long term.

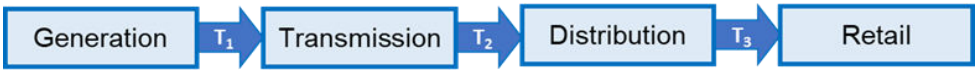
Figure 15: Relationship between Price and Sustainability of Energy Generation

Source: National Energy Authority, 2025

7.1. TARIFF SYSTEM FOR WIND ENERGY GENERATION

Currently, the tariff is charged between the different parts of the electricity value chain. That is generation, transmission, distribution, and retail. The current PNG tariff or price system defined in the NEP is as shown below:

Figure 16: Energy Value Chain and Tariff Points



Source: National Energy Policy, 2017-2027

T1, T2, and T3 are the three different points at which the tariffs are charged. T1 is the tariff agreed between the IPP and the Off-Taker. T2 is the potential tariff a transmission company would charge to the distribution company. T3 is the retail tariff charged by the distributor to the retail customers.

The focus of the tariff system under this Policy is T1, which is the tariff rate to be agreed between the IPP and the Off-Taker from the generation point to transmission. This tariff shall be agreed to between the IPP and the Off-Taker through a Power Purchase Agreement (PPA) as stipulated under Section 57 of the *National Energy Authority Act 2021*. NEA will provide oversight to ensure that any tariffs agreed under a PPA are in line with Section 56 of the *National Energy Authority Act 2021*.

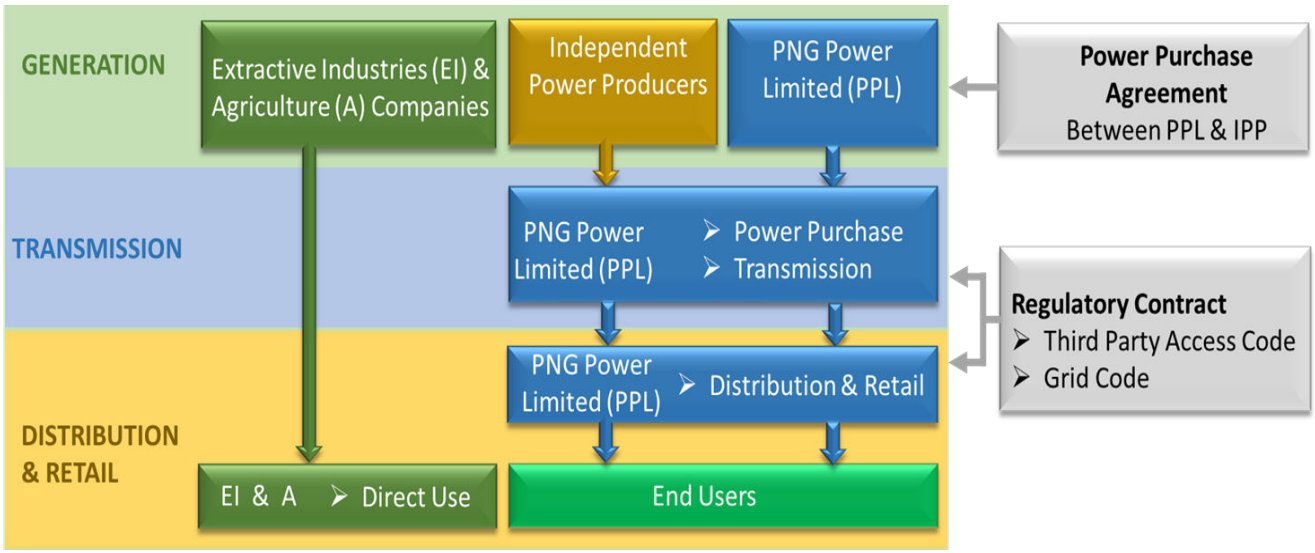
The wind is a renewable source of energy with high capital costs, including the cost of operation. Therefore, a Feed-In Tariff (FIT) may be considered under T1 to ensure that the holder of the wind energy generation licence receives a price based on generation costs and capital costs recovery.

NEA will provide oversight and establish regulations for PPAs to ensure that any tariffs agreed under a PPA are in line with Section 56 of the *National Energy Authority Act* 2021.

7.2. RESTRUCTURING THE ELECTRICITY TARIFF SYSTEM

Currently PNG Power Limited applies a uniform tariff across its entire network, from generation (except power supplied by IPPs), transmission, distribution, and retail under a Regulatory Contract. With the establishment of the NEA, the setting and regulation of the tariff will be under the On-Grid Electricity Tariff Regulation. The current tariff system is explained in Figure 10 below.

Figure 17: PNGs current Electricity Supply Industry

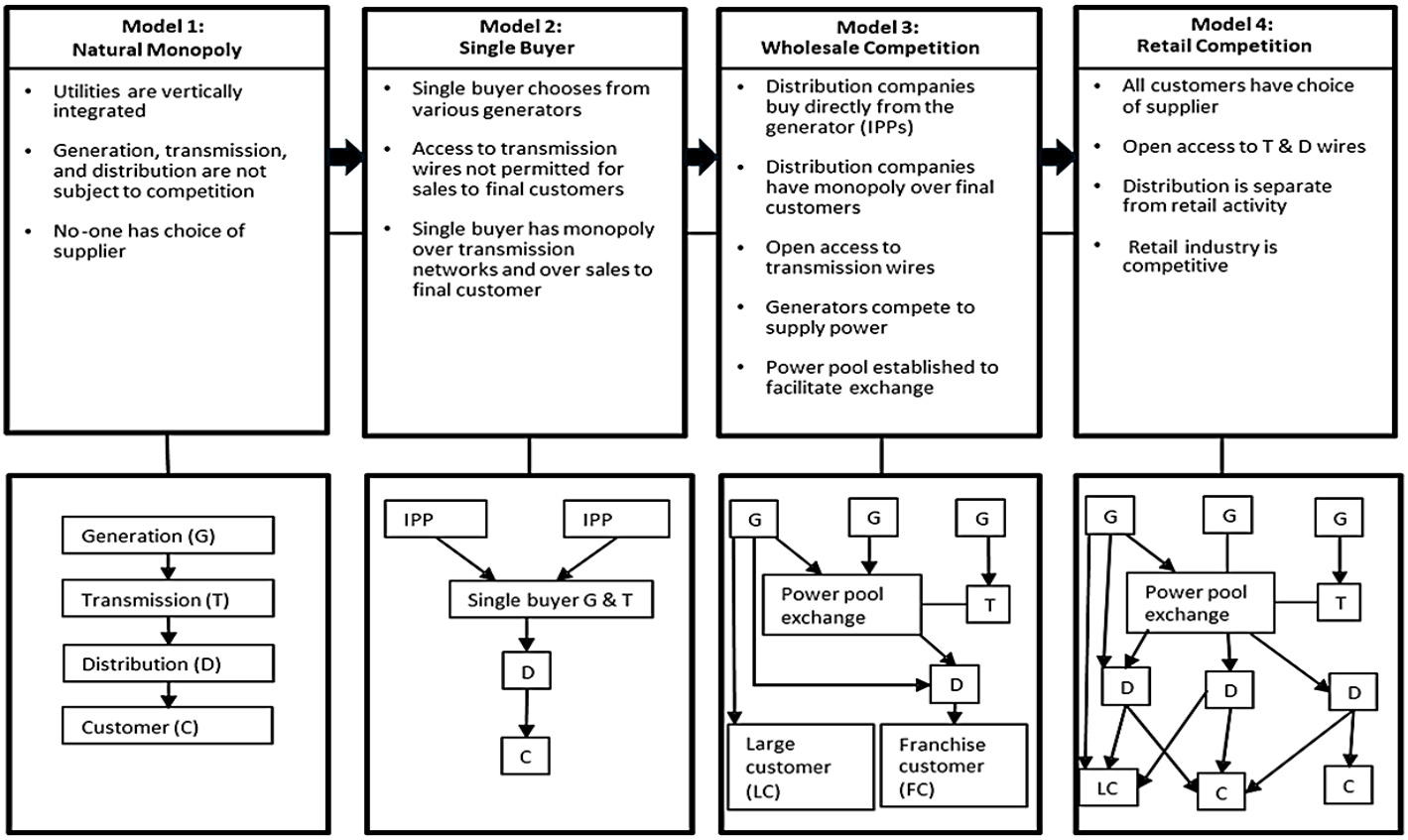


Source: National Energy Authority, 2025

Going forward, through NEA, the Government is taking steps to restructure the electricity industry. This includes the need to restructure the tariff system in accordance with Section 56 of the *National Energy Authority Act* 2021.

To restructure the tariff system, it is important to consider the different tariff systems and models that countries' electricity systems transition through. The Electricity Supply Industry (ESI) market structure is developed over time, and transitions from a monopolistic market to a competitive market with the developmental progress of a country. The pricing mechanism is therefore designed based on the market structure. Four models are widely discussed and accepted around the world. These models are distinguished by the type of competition at each stage in the supply chain rather than ownership as shown in *Figure 19* below:

Figure 18: Different Models for Integrating IPPs



Source: Gardiner and Montpelier, 2000

The current PNG ESI market structure can be best described by Model 2 in the figure above. In the long term, it is envisaged for PNG's ESI market to be at Model 4, where there is competition in the generation, transmission, distribution, and retail segments of the market. To achieve this target, the Government will have to make substantial investments in the transmission and distribution systems and encourage greater private sector participation in the generation.

The current tariff structure is determined by the regulatory contract entered between the ICCC and PPL. The regulatory contract is reviewed every 5 years. With the establishment of NEA, an On-Grid Electricity Tariff Regulation will be established which will supersede the current regulatory contract upon its expiry.

7.3. REFORMING ELECTRICITY MARKET

PPL is faced with many challenges in operating its three main grids of Port Moresby, Ramu, and Gazelle, and its other 19 Provincial Grids. PPL's critical challenge is the funding of its operations. The two key funding issues are the high levels of power theft and untimely payments of government utility bills resulting in PPL struggling to fund its operations and maintain its infrastructure and pay its IPPs.

Reform of the PNG's electricity market is crucial to achieving the government's objectives of having an electricity supply industry that has an accessible supply of electricity, that is reliable and is affordable.

The Government through NEA will work with PPL and other relevant government agencies, including development partners to reform the electricity supply industry in the medium term, and later the long term.

7.3.1. Short to Medium-Term Electricity Market Reforms

In the short to medium term, the government will focus on improving the transparency and accountability of the PPAs between the suppliers and off-takers. The government, through NEA, will develop guidelines on PPAs and provide oversight on tariff arrangements. The government will also develop an Electricity Dispatch Code for the suppliers, especially IPPs and Off-takers to maintain the supply of electricity to the demand at any given time. Such code will ensure there is a reliable power supply in the system at any given time.

The government will establish and implement a Decentralized Electricity Supply (DES) Policy with selected provincial governments. The operation of a provincial grid under the implementation of the proposed DES Policy will be cost-reflective of that provincial grid, which will be subjected to the On-Grid Tariff Regulation.

7.3.2. Long-Term Electricity Market Reform

In the long term, the government will focus on reforming the electricity market from the current single-buyer model to the wholesale competition model, where a robust regulatory framework is required for the establishment of a systems operator, market operator, and auction model for electricity generation.

One of the key factors for an effective wholesale competition model is the restructuring of the business model of the state-owned utility company. It is incumbent on the government to ensure that PPL's business model is positionally restructured to effectively operate in the wholesale competition market. PPL and Kumul Consolidated Holdings (KCH) will work in collaboration with NEA to effectively restructure PPL's business model for its operation in the wholesale competition market.

7.3.3. Off-Grid Power System

For the supply of electricity in the off-grid, the government will establish the Off-Grid Small Power System Regulation to regulate the design, installation, and operation of small power systems. The tariff regime of the small power system will be on a willing buyer–willing seller basis.

7.4. FEED-IN TARIFF

To accelerate the development of renewable energy resources, a feed-in-tariff system for electricity produced from renewable energy resources, including such portion of electricity from hybrid systems directly attributable to renewable energy resources will be introduced.

The Authority will establish a Feed-in Tariff Regulation which will determine the rules defining:

a) Eligibility for the tariff;

b) Eligible renewable energy resources for feed-in-tariff;

c) Duration of feed-in tariff power purchase agreement;

d) Principles and methodology for determining the feed-in-tariff level;

e) Adjustment of feed-in tariff based on indexation formula;

f) Priority connection to the grid for renewable energy electricity producers; and

g) Priority purchase and transmission of electricity.

7.5. PRICE REGULATION

NEA is mandated under Section 121(2)(i) *National Energy Authority* Act 2021 to regulate the sale and supply of electricity. This is to ensure accessibility, affordability, and consistency of electricity supply to consumers, while ensuring that the licence holder of a wind power plant is compensated.

NEA will establish regulations and related guidelines to ensure compliance to any pricing ang tariff structure established under Section 56 of the *National Energy Authority Act* 2021. For PPAs, NEA will provide oversight to ensure the pricing structure or tariff arrangement is transparent and complies with Section 57 of the *National Energy Authority Act* 2021.

CHAPTER 8: REGULATORY AND COMPLIANCE

8.1. REGULATION

Currently there is no specific law on wind energy projects and investments in PNG. However, as it relates to energy and harnessing of wind energy resources, the main legislation to be used to regulate the wind subsector, will be the *National Energy Authority Act* 2021, and the *Environment Act* 2000, including their related regulations.

The development of wind energy projects may involve legislation from other sectors as well. Therefore, it requires a whole Government approach to regulate the wind energy subsector. NEA, being the agency mandated to regulate the energy sector, will play the leading role in coordinating Government efforts in regulating the wind energy subsector.

Table 3: Government agencies with specific roles in the wind energy subsector**.**

Government Agency	Role
National Energy Authority	Licensing and regulation of different phases of a wind energy project. Coordinate efforts from all other Government agencies.
Conservation & Environment & Protection Authority	Licensing requirements at different phases of a wind energy project.
Department of Lands & Physical Planning	Deal with land use management and landownership issues, including compensation.
PNG Immigrations & Citizenship Authority	For visa requirements of employees of wind energy projects.
Department of Labour & Industrial Relations	Enforcement of labour laws and regulations.
PNG Customs	Deal with importation of project equipment and other goods.
Internal Revenue Commission	Enforcement of relevant Tax Laws.
National Institute of Standards & Industrial Technology	Establish or maintain relevant standards for wind energy projects.
PNG Investment Promotion Authority	Company registrations end the enforcement of company laws, including intellectual property laws.
Climate Change and Development Authority	For any registration or permits required for carbon credits generated from wind energy project activities either for domestic transaction or international transaction.

Source: National Energy Authority, 2025

8.2. HEALTH AND SAFETY

All wind energy operations in PNG must ensure the health and safety of its employees, the environment, the project infrastructure, and the surrounding communities. The developer or operator of a wind energy project must comply with all relevant legislations when establishing health and safety standards.

The licence holder of a wind energy project must comply with any other legislation that affect the health and safety of its operations and adopt these standards into their risk assessment and management safety plans during all phases of development and operations. The developer must adopt the best industry technology, practice, standards, and codes into its health and safety management regime.

8.3. COMPLIANCE AND ENFORCEMENT

Compliance with laws and regulations is usually addressed or enforced by setting out defined breaches and punitive measures for the breaches. NEA will establish regulations and guidelines under Section 121 of the *National Energy Authority Act* 2021 that spells out possible breaches if not complied with.

NEA will coordinate with other State agencies in ensuring compliance with all relevant laws through the enforcement of various regulations, codes, and guidelines, including applying penalties where required.

8.4. CONTROL MECHANISM FOR IMPORTED PRODUCTS AND EQUIPMENT

A robust control mechanism must be established to monitor and control the importation and use of wind energy products and equipment. The NEA, in collaboration with PNG Customs Service and the Independent Consumer and Competition Commission (ICCC), will establish regulatory measures to:

a) Ensure electricity products and technology adhere to internationally recognized quality standards and certification with, and mandatory product registration. PNG Customs Service to enforce these regulations through pre-importation inspections

b) Allow for random inspection and testing of products and technology at the wharf and at distribution points.

c) Establish and impose penalties for non-compliance, such as prosecution, fines, and confiscation of substandard products.

CHAPTER 9: TECHNOLOGY AND STANDARDS

9.1. TECHNOLOGY

PNG does not have specific guidelines on renewable energy technologies, nor guidelines that are specific to wind energy. This Policy recognizes the need to develop these guidelines that support appropriate applicable technologies that conforms to the renewable energy industry and international standards. The long-term aim of this Policy is to establish a regulatory framework that guides the use of appropriate technology that is supported by research and development.

Any technology applied must comply with the best international practices and standards. NEA shall work with the National Institute of Standards and Industrial Technology (NISIT) to establish specific standards and guidelines for wind technology. The project developers must be responsible for managing the risk associated with the operations of wind technologies

deployed on their projects. NEA, with relevant state agencies, will ensure compliance with any regulations and international standards for technology.

To advance the modernization and efficiency of the electricity industry, the Government, through the NEA, shall promote the digitization of the electricity sector by encouraging the development and deployment of digitally integrated technologies such as smart grids, real-time data monitoring, and advanced control systems to optimize the integration of wind energy and other renewable energy sources. Digital solutions shall be leveraged to improve grid management, enhance energy efficiency, support demand response, and ensure a resilient and adaptive electricity infrastructure for both on-grid and off-grid applications.

9.2. STANDARDS

Wind technology must meet international requirements, standards and best practices. The Government through NEA will promote standards that are compatible with wind energy technology deployment, and those that are globally certified by recognized international technology regulatory bodies including International Electrotechnical Commission (IEC) and International Organization for Standardization (ISO).

Any investor or electricity provider for a wind energy project must comply with all standards and requirements established under the *National Energy Authority Act* 2021 or any other legislation and related regulations.

9.3. ENERGY EFFICIENCY

Promoting energy efficiency in wind energy systems is a critical aspect of achieving sustainable energy goals in PNG. Energy efficiency can be realized through both supply-side and demand-side measures, with the adoption of modern technologies and best practices that adhere to international standards.

9.3.1. Supply-Side Efficiency Measures

Supply-side measures involve improving the efficiency of wind electric power generation, transmission, and distribution systems. Key technologies and strategies include:

(a) **Turbine Efficiency**: Advanced turbine designs that minimize energy losses and optimize energy output, including variable-speed turbines and low-head turbines for smaller or less consistent wind flow conditions.

(b) **Automation and Control Systems**: Installing smart sensors and control systems to monitor and optimize wind energy, reducing inefficiencies and ensuring that the power plant operates at peak performance.

(c) **Reduction of Transmission Losses**: Ensuring high-quality transmission infrastructure to minimize energy losses during the distribution of wind electric power, particularly in remote or rural areas.

9.3.2. Demand-Side Efficiency Measures

Demand-side energy efficiency focuses on reducing the overall energy consumption of end users while maintaining or improving service quality. This can be achieved through:

(a) **Energy-efficient Appliances**: Encouraging the use of appliances and equipment that meet energy-efficiency standards, such as those certified by the International Organization for Standardization (ISO) or energy labeling programs.

(b) **Energy Storage Technologies**: Incorporating advanced energy storage systems, such as batteries, can optimize the use of electricity generated from wind power plants, ensuring that energy is available even during low wind flow periods or peak demand times, thereby improving overall system efficiency.

(c) **Smart Grid Integration**: Developing smart grids that integrate real-time monitoring and control systems to optimize the distribution and consumption of electricity, avoiding energy wastage.

9.3.3. Regulatory Support for Energy Efficiency

To promote energy efficiency, NEA will collaborate with relevant institutions to develop standards and guidelines that foster the deployment of energy-efficient technologies. The key regulatory actions are:

(a) Setting benchmarks for minimum energy performance standards (MEPS) for wind energy systems.

(b) Promoting the use of certified energy-efficient equipment in wind energy projects through incentives in compliance with recognized international standards.

(c) Requiring investors and developers to conduct energy audits and implement energy-efficiency improvement measures in their wind energy projects.

9.4. COPY RIGHTS AND INTELLECTUAL PROPERTY

The Government shall ensure the protection of intellectual property (IP) rights for local individuals and organizations that invent or develop energy technologies. Foreign energy investors operating in PNG must adhere to national IP laws, such as the *Trademarks Act (Chapter 385),* the *Copyright and Neighboring Rights Act* 2000 and the *Patents and Industrial Design Act* 2000, and other related regulations and legislations, and enter into fair agreements that recognize and compensate local inventors for the use and commercialization of their technologies.

CHAPTER 10: COMMERCIAL

There are certain commercial aspects that are crucial to the development and sustainability of renewable energy projects such as wind energy projects. The main commercial aspects are taxation, incentives, and price (tariff). Other commercial aspects that are also important in PNG include the State's equity participation and monetary benefits, especially compensation that maybe paid to landowners.

10.1. TAXATION

The developer or licence holder for a wind energy project must comply with the tax laws of PNG, including any amendments to the tax laws. Any matters concerning taxation and tax arrangements will be determined by the Department of Treasury and the Internal Revenue Commission.

The Government will ensure that tax rates for the wind energy sector are compatible, investor-friendly, and does not discriminate against any investors. The Government may consider supporting local participation in wind energy projects to utilize or benefit from any tax incentives under the PNG tax laws and related policies.

10.2. INCENTIVES

The Government may provide incentives to support the development and commercialization of wind energy projects. Any incentives provided shall be consistent with the existing laws and policies that provides such incentives. Relevant State agencies responsible for such incentives under respective laws and policies will be consulted for their views and approval.

The National Executive Council will determine any incentives to be provided under this Policy or for any renewable energy projects.

10.3. STATE EQUITY PARTICIPATION

The State has the right but is not obligated to acquire, directly or through a nominee, all or any participating interest (not exceeding 20%) in each wind energy project as stipulated under Section 83 of the *National Energy Authority Act* 2021. The State may enter into an agreement consistent with the *National Energy Authority Act* 2021 and any other relevant laws relating to the exercise of its equity entitlement.

The State may allocate its equity entitlement, consistent with the *National Energy Authority Act* 2021, to the affected Provincial Governments and landowners.

10.4. ROYALTY

Royalty is a resource rent typically applied to finite, non-renewable resources like minerals, oil, and gas. When these resources are extracted and sold to generate revenue, royalties ensure a portion of this revenue is shared with the resource-owning country. Similarly, royalty payment in PNG is usually paid to the Government who then grants a portion to the landowners in the extractive industry. It is usually a rate applied to the amount of minerals, petroleum products, and timber exported, or the amount of revenue generated from sales of these resources.

Unlike minerals or other finite, non-renewable resources, wind energy is a renewable energy resource, which is harnessed from the natural flow of air currents using mechanical wind turbines. The electricity generated is then sold to an off taker at a price (tariff). No one owns the air, therefore, the royalty concept in the extractive industry cannot be applied to wind energy projects.

Government through NEA will review Section 82 of the *National Energy Authority Act* 2021 to ensure that Royalty is not paid for wind energy projects to the State or any landowners for the natural wind resources that are harnessed to produce energy. Instead, there will be consideration for compensation for land used to establish the infrastructure for medium - large scale wind energy projects.

10.5. SUBSIDY

Capital cost subsidies are the primary mechanism for funding rural electrification programs as it contributes to reducing the cost of generators and distribution grid. The subsidies can be through government funding, grant or concessionary loans. This allows for renewable energy projects, such as wind, to be able to charge affordable tariff to recover the initial capital costs, including any difference in remaining cost of operating the system.

NEA will collaborate with relevant Government agencies to introduce regulations and schemes to support rural electrification, mostly small to medium scale community based projects.

10.6. ACCESS TO CLIMATE FINANCE

Climate finance refers to funding sourced from international, regional, and national climate-related financial mechanisms, designed to support projects that contribute to reducing greenhouse gas emissions, enhancing climate resilience, and promoting sustainable development. To accelerate the development of renewable energy projects in PNG, and align with global climate action goals, it is essential to facilitate direct access to climate finance for both public and private investment in the energy sector.

The Government, through NEA and CCDA, will work with relevant State agencies to establish transparent and efficient processes and systems that allow for public and private investors to access climate finance for renewable energy projects such as the development of wind energy projects.

CHAPTER 11: ENVIRONMENT

11.1. COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

The development and construction of wind energy projects may have a wide range of environmental impacts. These impacts can be categorized into several key areas including ecological, hydrological, geological, social, and economic. The developer or holder of a licence for a wind energy project shall comply with all requirements for environmental management under the *Environment Act* 2000.

11.2. WASTE MANAGEMENT

The developer or holder of a generation licence for a wind energy project, where required, shall submit a waste management plan to NEA and CEPA. The waste management plan must be consistent with the requirements under the *Environment Act* 2000. The waste management plan shall include:

a) storage and disposal of waste;

b) strategies for waste avoidance, reduction, or mitigation;

c) monitoring systems considering the health and safety aspects of the environment and the surrounding communities;

d) disaster management and response strategies; and

e) such other information as may be required by CEPA or NEA as prescribed under any laws in PNG.

The developer or holder of a licence for a wind energy project shall periodically update the waste management plan as and when required by CEPA and NEA. Treatment of waste must be done in accordance with the *Environment Act* 2000 and any other related standards and regulations.

11.3. REHABILITATION AND CLOSURE

A plan for ongoing rehabilitation of the environment must be developed and submitted to CEPA and NEA by the holder of a generation licence. CEPA and NEA shall ensure the holder of a generation licence complies with the rehabilitation plan.

Should the licence holder of a generation licence for a wind energy project or operator decide to shut down a wind energy project or any parts of the project, they must undertake proper closure in accordance with existing policies and laws. This may include the requirement to submit a closure plan.

CHAPTER 12: CLIMATE CHANGE

12.1. COMPLIANCE WITH CLIMATE CHANGE REQUIREMENTS

The Government through NEA in collaboration with CCDA shall ensure that a developer or holder of a licence for a wind energy project complies with:

a) The *Climate Change Management Act* 2015 and its subsequent amendments.

b) Specific provisions under the Climate Change Carbon Markets Regulations and the Nationally Determined Contributions (NDC), and any related guidelines.

c) Articles of the Paris Agreement 2015 and its subsequent Conference of Parties (COP) decisions and any other future climate change international treaties under the United Nations Framework Convention on Climate Change (UNFCCC).

d) The international UNFCCC's Inter-governmental Panel on Climate Change 2006 (IPCC-2006) Guidelines.

12.2. DOMESTIC SHARE OF CARBON CREDITS

Carbon credits serve as an incentive for private investment in renewable energy projects such as wind. By investing in wind energy projects, an investor or holder of a generation licence can earn credits for their sustainable practices as they contribute to the reduction of their carbon footprint, and support initiatives that drive global climate action.

In recognizing the ownership rights of wind energy project area landowners, a twenty percent (20%) domestic share of proceeds shall apply to every disclosed credit contained in the inventory of a medium-large scale wind energy project. This emission reduction or emission avoidance credits shall be obtained from the entire operations, including any activity related to the project and or within the project licensed area. This 20% will be managed as part of the other project benefits to landowners.

12.3. JUST TRANSITION PATHWAYS

The development of wind energy projects will contribute to reducing GHG emissions. This Policy aims to support PNG's decarbonization efforts by reducing dependency on fossil fuels and lowering greenhouse gas emissions. This will be achieved through strategies such as developing wind energy projects, integrating hybrid energy systems, and improving energy efficiency in both supply and demand. The Policy encourages carbon accounting, monitoring, and the adoption of low-carbon technologies and clean development practices. To encourage decarbonization, the Government may consider providing tax breaks, facilitate climate finance, and consider the feed-in tariff, where required.

12.4. PROMOTING DECARBONIZATION

The development of wind energy projects will contribute to reducing greenhouse gas (GHG) emissions. This Policy aims to support PNG's decarbonization efforts by reducing dependency on fossil fuels and lowering greenhouse gas emissions. This will be achieved through strategies such as developing wind energy projects, integrating hybrid energy systems, and improving energy efficiency in both supply and demand.

NEA, in collaboration with CCDA, will ensure there is carbon accounting, monitoring, and the adoption of low-carbon development practices. To incentivize decarbonization, the Government may consider providing tax breaks, facilitate climate finance, and consider feed-in tariff, where applicable.

CHAPTER 13: LAND AND LANDOWNER MOBILIZATION

13.1. ACCESS TO LAND

Access to land or offshore areas for wind energy project shall be facilitated or acquired under the *Land Act* 1996 by the developer or licence holder of a wind energy project.

Wind energy projects may be established in offshore areas. Therefore, any access to offshore areas will be treated in the same manner under the *Land Act* 1996 or any other law regulating ownership of offshore areas, subject to legal rights of ownership, access and usage.

For customary land or offshore areas, it must be ensured that the customary landowners and persons having an interest in the area are properly consulted and their free prior informed consent is obtained before the acquisition process is executed or any development takes place. If required, the holder of a licence must enter into a land access agreement with the landowners before entering the land or offshore area to undertake feasibility study, project development, or electricity generation.

Any damages or inconvenience caused to the land, the environment, or landowners shall be subject to compensation under a compensation agreement.

Small power systems and community-based projects may not require land access and compensation agreements. For any medium–large scale projects that have landowner support to waiver any land access agreement or compensation, must inform and register that consent or agreement with NEA.

13.2. LANDOWNER IDENTIFICATION

During the feasibility stage and before undertaking any project development, the developer or holder of a licence must undertake landowner identification and social mapping studies of the area proposed to be impacted by the wind energy project.
The scope and method for social mapping or landholder identification study will be determined under the *National Energy Authority Act* 2021 or through related regulations.

13.3. SOCIAL IMPACT ASSESSMENT

The developer or holder of a licence must conduct social impact assessment and related studies as part of the feasibility studies. The process for the identification, analysis, assessment, management, and monitoring of the potential social impacts of a project, both positive and negative, will be determined by the NEA in collaboration with relevant Government agencies.

13.4. LANDOWNER PARTICIPATION

The Government will ensure that landowners participate and benefit from the development and operation of wind energy projects. If there are benefits and opportunities for landowners.

Landowners will participate through recognized ILG groups or associations agreed to by the landowners.

13.5. LAND BOUNDARY DEMARCATION AND RECORD KEEPING

Proper land boundary demarcation and the timely recording of land information are critical to the successful development of wind energy projects. Clear land boundaries help avoid disputes, ensure transparent land transactions, and safeguard both landowner rights and investor confidence. All established land administration processes under the *Land Act* 1996 must be complied with to ensure proper land management for wind energy projects.

For customary land involving more than one landowner, there must be a clear demarcation of land boundaries, which would involve formal surveys conducted by registered surveyors and active participation from customary landowners to ensure traditional boundaries are respected.

CHAPTER 14: NATIONAL CONTENT

National content refers to the activities and benefits, including community assistance, that can be provided to landowners and impacted communities of the specific resource project area, such as wind energy project. If required, national content will be discussed and agreed to in a National Content Forum in accordance with Section 80 of the *National Energy Authority Act* 2021, with the outcome captured in a benefit-sharing agreement or such other arrangements on benefits sharing.

NEA, in consultations with relevant Government agencies, will develop guideline or specific policies to properly define and guide national content in renewable energy projects.

14.1. APPLICATION OF NATIONAL CONTENT

The national content provisions under this Policy only applies to medium–large scale wind energy projects that have a generation capacity of more than 1 MW, which may have a bigger impact on the environment and society.

The application of national content for any wind energy project is determined as provided in the table below.

Table 4: Application of national content for wind energy Projects

Classification	Generation Capacity (MW)	Type of Wind Systems	Application of National Content	Comments
Large Scale Wind Energy Projects	≥10	Onshore	Yes	National content shall apply. Regulation will determine types of benefits.
		Offshore	Yes & No	National content may apply or not. Regulation will determine application and types of benefits.
Medium Scale Wind Energy Scale	<10 and >1	Onshore	Yes & No	National content may apply or not. Regulation will determine application and types of benefits.
		Offshore	Yes & No	National content may apply or not. Regulation will determine application and types of benefits.
Small Scale Wind Energy Project	≤ 1			Development of small-scale wind energy projects will be in accordance with the off-grid small power system regulation.

14.2. NATIONAL CONTENT FORUM

Before the commencement of construction for a medium–large scale wind energy project, the Minister may call a National Content Forum for all stakeholders as stipulated under Section 80 of the *National Energy Authority Act* 2021.

14.3. EMPLOYMENT AND TRAINING

The developer or licence holder for a medium–large scale wind energy project shall provide employment and training in accordance with the labour laws of PNG. Where required, they shall submit an Employment and Training Plan consistent with Section 84 of the *National Energy Authority Act* 2021.

The developer or licence holder for a wind energy project shall submit an annual report to the Managing Director of NEA on the implementation of the Employment and Training Plan.

14.4. BUSINESS DEVELOPMENT

The developer or licence holder for a medium–large scale wind energy project must provide business development and spin-off opportunities to landowners and Papua New Guineans consistent with Section 85 of the *National Energy Authority Act* 2021. The business development opportunities may be in the form of sub-contracts, transport services, security services, construction, building maintenance, office supplies, and other opportunities that may be agreed to in any agreement on business spin-off activities.

The developer or licence holder for wind energy project, where required, shall submit a Business Development Plan if there are any business opportunities that will be provided to the landowners. The developer must submit an annual report on the implementation of the Business Development Plan to the Managing Director of NEA.

14.5. COMMUNITY DEVELOPMENT ASSISTANCE

The developer or licence holder for a medium–large scale wind energy project must consider providing community development assistance to the affected communities and landowners consistent with Section 86 of *the National Energy Authority Act* 2021.

Community development assistance, where necessary, can be part of National Content obligations or corporate social responsibility to any impacted communities.

14.6. COMPENSATION

The developer of holder of a licence for a medium - large scale wind energy project may be required to pay compensation, in respect of his entry into or occupation of the land, which is the subject of the licence, to the landowners of the land for all loss or damage suffered or foreseen to be suffered by them. Compensation under this Policy is subject to Section 135 of the *National Energy Authority Act* 2021. The compensation to which landowners are entitled to include compensation for:

(a) being deprived of the possession or use of the natural surface of the land; and

(b) damage to the natural surface of the land; and

(c) severance of land or any part thereof from other land held by the landholder; and

(d) any loss or restriction of a right of way; and

(e) the loss of, or damage to, improvements; and

(f) in the case of land under cultivation, loss of earnings; and

(g) disruption of agricultural activities on the land; and

(h) social disruption or displacement.

The rates for compensation shall be determined with reference to the values or rates as determined by the Valuer-General and such values or rates shall only be used as a reference, base rate, or minimum rate.

The NEA will coordinate any meetings and discussions on compensation and facilitate the compensation agreement. NEA will establish regulations and guidelines that guide the process for compensation agreements.

Should the licence holder and landowners not agree to the compensation rates, the Minister may determine the rates. The determination by the Minister shall be final and captured in the

compensation agreement. Furthermore, if there is a dispute regarding landownership, compensation payments shall be withheld and managed by the Managing Director of NEA until such a time the dispute is settled.

Any compensation agreement reached for a wind energy project shall be kept in the Register established under Section 79 of the *National Energy Authority Act* 2021 as part of a respective wind energy project license.

14.7. RESETTLEMENT

If required, the developer of a wind energy project will be required to submit a Resettlement Plan during the application for a licence. The resettlement plan shall contain the developer's plan on how to resettle landowners whose villages or settlements will be affected by the development of a wind energy project.

NEA will coordinate with relevant Government agencies to review and approve the resettlement plan. The developer shall implement the approved resettlement plan and provide reports to NEA annually. NEA, with support from relevant Government agencies, will monitor the implementation of the resettlement plan.

The details and structure of a resettlement plan will be determined by NEA in collaboration with other Government agencies.

14.8. BENEFITS MANAGEMENT

The National Goals and Directive Principles under the Constitution calls for equal sharing of wealth for all Papua New Guineans. It is the Policy of the Government through any resource project development, for benefits to flow to Sub-National Governments and landowners of project areas. The Government intends that any wind energy project must bring benefits to the Government and the landowners and impacted communities.

If there are benefits for medium - large scale wind energy projects, the impacted landowners and impacted communities will be required to have a benefit-sharing agreement with any developer or licence holder of any wind energy project to ensure that the benefits are shared amongst the intended beneficiaries.

The Government through NEA will ensure that appropriate mechanisms are established to manage benefits for the landowners and impacted communities in the long term, this may include holding accounts, trust arrangements, and investment funds. The distribution and management of benefits shall be discussed and agreed to in a National Content Forum.

14.9. WOMEN IN ENERGY

The role of women in renewable energy development and operations must be given importance through a gender inclusive approach promoting gender equality and women rights.

Some issues and constraints related to renewable energy project success are gender specific and stem from gender disparities and traditional roles and responsibilities. As part of the social and landowner identification studies, any wind energy project must undertake gender analysis as a methodology that seeks to understand the distinct cultural and traditional roles and tasks that women and men assume both within the family, household system and in the community.

Majority of the land in PNG is customarily owned. Most societies are patrilineal while a few are matrilineal or a mix of the two. Any processes for landowner engagement and participation under this Policy must give consideration and equal opportunities for women's participation and decision-making.

CHAPTER 15: AGREEMENTS

Any wind energy project development requires different commitments from different stakeholders. Most times, investors and developers require project development contracts with the Government or State on different commercial arrangements on fiscal and regulatory matters. Other agreements include benefit-sharing arrangements between different beneficiaries of a project, and a compensation agreement which sets the basis and areas for compensation.

For energy projects, an important agreement is the Power Purchase Agreement (PPA) between the producer and off-taker of the energy. The PPA sets the terms of the commercial arrangements for the supply of electricity, especially on tariff arrangements.

15.1. PROJECT DEVELOPMENT CONTRACT

The State through NEA, upon approval by the National Executive Council (NEC), may enter into any agreement consistent with relevant laws of PNG relating to the development of a medium–large scale wind energy project. The agreement may contain provisions relating to:

(a) the circumstances or the manner in which the Minister or Managing Director or a Departmental Head shall exercise any discretion conferred by any law dictating that discretion.

(b) the Government's obligations to support the development of a wind energy project.

(c) sharing of benefits.

(d) the acquisition of an equity interest by the State either directly or indirectly in a wind energy project.

(e) the settlement of disputes arising out of, or relating to the agreement or the administration of any law, including provisions relating to the settlement of any such dispute; and

(f) any other matter connected therewith as the parties to the agreement may be considered necessary.

In the event there is a conflict between the provisions of any agreement entered into under this Policy and any other law, the provisions of the respective laws shall apply.

15.2. BENEFIT SHARING AGREEMENT

If there are any benefits from wind energy projects to landowners or subnational governments, these benefits shall be captured in a Benefit Sharing Agreement (BSA). The BSA will determine the benefits and how these benefits are distributed and administered. The BSA will be agreed to by the stakeholders in a National Content Forum. Parties to a National Content Forum includes, the licence holder of a wind energy project, the National Government, host Sub-National Governments, and the landowners. The BSA shall only be for medium–large scale wind energy projects.

NEA will develop a mechanism for benefits distribution and management to ensure that any benefits emanating from wind energy projects are sustainably managed and used for the benefit of all landowners and impacted communities.

15.3. COMPENSATION AGREEMENT

Wind energy projects and related activities have the potential to disrupt the environment and cause inconvenience the livelihoods of the landowners. Hence, any developer or licence holder is required to pay compensation to the landowners and impacted communities.
The licence holder and landowners must enter into a Compensation Agreement before the developer enters onto or occupies the land to develop a wind energy project. The compensation agreement will capture compensation as discussed under Section 14.6 of this Policy.

15.4. POWER PURCHASE AGREEMENT

The Power Purchase Agreement (PPA) is the main contractual agreement between energy buyers and sellers. The licence holder of a wind energy generation licence and the Off-Taker, which will be mainly PNG Power Limited, shall enter a PPA on the details of power purchase and other arrangements.

NEA shall establish the regulations and related guidelines as stipulated under the *National Energy Authority Act* 2021. NEA will provide an oversight of the PPAs to ensure the pricing structure or tariff arrangements comply with section 56 of the *National Energy Authority Act* 2021.

A PPA will not be required for the licence holder of a wind energy generation licence who generates electricity for private consumption (auto producer), instead, a permit will be granted by NEA.

15.5. OTHER AGREEMENTS

Wind energy project stakeholders and parties may enter into any other agreement or understanding concerning matters relating to a wind energy project. However, such an agreement must be subject to and comply with the relevant laws of PNG.

CHAPTER 16: DISPUTE RESOLUTION

16.1. DISPUTE RESOLUTION MECHANISM

Disputes refer to all disagreements that arise between various stakeholders concerning a wind energy project that cannot be sorted out amicably within a reasonable time. Should such disputes arise, NEA shall initiate a dispute resolution process to settle the disputes.

The Government through NEA will establish regulations and guidelines, including a dispute resolution mechanism, to administer and resolve any disputes.

16.2. ARBITRATION

If parties continue to disagree and cannot settle the disputes, the parties may refer the disputes to an independent third party for arbitration under the *Arbitration Act* 1951. Further disputes may be referred to the PNG Courts under the Alternate Dispute Resolution process.

CHAPTER 17: INFORMATION AND REPORTING REQUIREMENTS

17.1. ACCESS TO INFORMATION

The Government, through the NEA and other relevant agencies, under respective legislation shall require any investor or developer operating a wind energy project to provide all information concerning the project. The request for information shall be through official correspondence signed by the Managing Director for NEA.

All information provided will be kept confidential and used for intended purposes only. Failure to provide information by any investor or company shall be subject to respective legislative processes for penalties.

17.2. REPORTING REQUIREMENTS

All investors and developers of wind energy projects shall be required to provide reports to NEA or any of the Government agencies, whose roles are defined under this policy. Reporting requirements will be enforced under various legislations, especially Section 51 and Section 122 of the *National Energy Authority Act* 2021. Other agencies may also enforce respective reporting requirements, such as the relevant *Environment Act* 2000 provision and other relevant legislation.

CHAPTER 18: POLICY IMPLEMENTATION

Policy implementation is comprised of two parts. The first part discussed the administration of this Policy, and the second part is the actual strategies for implementing this Policy in delivering wind energy projects to achieve the targets and objectives of this Policy.

18.1. POLICY ADMINISTRATION

The Government solely decides on the formulation and implementation of this Policy for public purposes. The Policy will come into effect commencing from the date of its publication and will remain in force until superseded or modified by another policy. The Policy will be reviewed as and when required.

The NEA as the mandated agency under the *National Energy Authority Act* 2021, will administer this Policy in collaboration with relevant State agencies, development partners, and other stakeholders.

18.2. POLICY IMPLEMENTATION STRATEGIES

The implementation strategies focus on the approaches to implementing this Policy. The strategies are based on addressing external factors that are likely to affect renewable energy growth in the future and internal capabilities.

Figure 19: Wind Energy Policy Implementation Strategies

Source: National Energy Authority, 2025

18.2.1. Legislative Reforms

The National Government, through NEA, with the support from relevant State agencies, will review the existing legislation and regulatory framework and initiate legislative reforms to support the development and operation of wind energy projects in PNG.
Legislative Reforms will include, but not limited to:

- Provide a clear definition of wind energy projects or system.
- Define the licensing process of wind energy projects.
- Establishing industry-specific regulations and mechanisms for enforcing compliance.
- Establishing provisions for sharing information and reporting.
- Establishing a tariff system with related regulations.
- Clearly define benefits and sustainable management of the benefits.
- Create linkage to other legislations for regulatory purposes.
- Developing a legislative framework that supports partnerships and collaboration; and
- Driving other legislative reforms that will give effect to the implementation of this Policy.

18.2.2. Partnerships

Establishing partnerships is important for the development and operation of wind energy projects to address social, environmental, financial, and economic issues, and to ensure the effective delivery and operation of wind energy projects. Partnerships and engagement should be at multiple or different levels and different phases of wind energy project development and operations. Key stakeholders, among others, for effective partnerships are:

a) Provincial Government (PG), Local Level Government (LLG), and District Development Authority (DDA)

The PGs and LLG's are established under the *Organic Law on Provincial Governments and Local-level Governments* 1998 (OLPLLG). The purpose of establishing PGs and LLGs was to promote equal opportunity and participation in the government at all levels.

DDAs, established under the *District Development Authority Act* 2014, are statutory authorities in PNG that are responsible for managing and spending funds on local service

infrastructure and delivery, including providing administrative support to LLGs at the district level.

Subnational Governments (PGs and LLGs) will play an important role in the implementation of this Policy to support the development of wind energy and other renewable energy projects. The subnational governments will provide leadership to support NEA and any investor in land and landowner mobilization, including addressing disputes and conflicts.

Subnational Governments can also invest in wind energy projects, or through PPP arrangements to generate and supply electricity within the provinces and districts.

NEA will build partnership and work collaboratively with the subnational Governments.

b) Development Partners

Development Partners (DP) continues to play an important role in the energy sector in PNG by providing technical support, infrastructure development and investing in rural electrification programs. The implementation of this Policy will require close collaboration with development partners to continue to implement energy programs and to further improve the policy and regulatory framework for the energy sector.

NEA will continue to collaborate with DPs in the implementation of this Policy.

c) Private Investors

Private investors play a key role in the development of renewable energy projects such as wind. PNG needs investments in the renewable energy sector such as wind energy projects, which are capital intensive with a lot of risks. Private investors bring in financial resources and take risks to invest in renewable energy projects.

The Government recognizes the role of private investors PNG's energy sector through the deployment of finance and technology in renewable energy development. This provides the direction to create an enabling environment that supports and promotes private investments in wind energy projects.

d) Landowners & Impacted Communities

Most of the land in PNG is customarily owned, either individually or communal. Landowners are considered an important partner under this Policy for any wind energy project development. Therefore, the Government through NEA, and any developer of a wind energy project, will work closely with landowners to ensure landowners participate and benefit from any project development benefits.

Consideration will also be given to impacted communities of medium-large scale wind energy projects.

e) Civil Society and Non-Government Organizations (NGO)

The Civil Society Organizations and NGO's play an important role in the development of renewable energy. They can empower communities in energy transition to develop renewable energy projects, such as community wind energy projects, and sourcing finance for projects. Civil society organizations and NGOs can also empower communities through capacity building, decision making, and ensuring a Just Transition.

Through various platforms, the Government will support civil society organization and NGO's that support Government's goals and targets in the energy sector.

f) Academia and Research Institutions

Academic and research institutions are important partners in the energy transition as they are responsible for research and providing the source of knowledge on new technology and development. Institutions have research and technical expertise that can support the implementation of this Policy, especially in the deployment of technology for small power systems for rural communities.

NEA will establish partnerships with the academia and research institutions to support the implementation of this Policy and provides technical support to development of renewable energy projects.

g) Financial Institutions

Financial institutions, both domestic and international, are considered important partners as they are responsible for providing the much-needed private capital for renewable energy projects such as wind energy project development.

The Government through NEA aims to create linkages with financial institutions to support the development of wind energy projects, especially the small – medium scale projects.

18.2.3. Community Engagement

Wind energy projects are usually located and established in both urban and rural areas. In PNG, land is owned by communities including ownership but not the user rights, as wind is intangible and blows from all directions. These rights are usually affected through the development of wind power projects. Therefore, there must be community engagement strategies and partnerships with local communities to address issues and ensure the delivery and sustainability of wind energy projects.

Community engagement approaches must enhance community participation and empowerment through inclusive engagement, collaboration, and transparent decision-making. There must be capacity-building programs, local employment initiatives, and benefit-sharing mechanisms that contribute to community development.

18.2.4. Increasing Private Investment

This Policy is aimed at driving private investments in wind energy projects. Often Governments, in trying to address growing electricity demand, undertake wind power projects that take time to complete or are abandoned. This is because medium-large scale wind energy projects are capital-intensive and require technical expertise.

The Government's role through this Policy aims to create an enabling environment that allows for private investment in wind energy projects. The Government can then participate through Public Private Partnership arrangements.

18.2.5. Public-Private Partnership

To achieve a successful development and implementation of wind energy projects, the Government recognizes the importance of fostering collaboration between the public and private sectors. The establishment of clear Public Private Partnership (PPP) arrangements is crucial to mobilizing private capital, technology, and expertise while leveraging public resources and regulatory frameworks to accelerate project development**.**

The objectives of PPP in wind energy development focuses on attracting private investments by creating transparent and stable conditions, leveraging public resources for private sector involvement, and ensuring project sustainability through long-term collaboration. Key elements of these arrangements include a formal contractual framework that outlines roles and responsibilities. Various PPP models such as Build-Operate-Transfer (BOT), Joint Ventures,

and incentives for private participation, including tax breaks and guaranteed revenue streams through Power Purchase Agreements (PPAs).

Institutional support for implementing PPPs will primarily be provided by NEA, which will oversee project bidding and contract negotiations, while the Public-Private Partnership Centre will offer technical assistance and advisory services. Robust risk management strategies will be established, detailing risk allocation and dispute resolution mechanisms to address potential conflicts. Furthermore, NEA will implement a comprehensive monitoring framework for performance assessment and conduct periodic reviews to ensure that projects meet financial and environmental objectives, allowing for necessary adjustments to the PPP framework as needed.

18.2.6. Incentives

Medium–large scale wind energy projects require a long and complex development phase as they are capital-intensive and require a lot of planning and design work. This has made privately funded wind power projects less competitive than other power sources.

The Government will therefore consider incentives to drive private investments in wind energy development. These incentives may include:

- A Feed-In-Tariff system.
- Tax concessions and tax holidays.
- Zero-rate or reduce tax and import duties on materials and equipment for wind power projects.
- Subsidies for small and hybrid wind energy systems.
- Undertake PPP arrangements.

18.2.7. Electricity Market Reforms

The current electricity market in PNG is dominated by PPL, which controls most of the generation, transmission, distribution and retail of electricity in the major cities, towns, and a few districts. There are only a few IPPs that also participate in the generation of electricity. PPL is currently faced with a lot of problems in ensuring a reliable, affordable, and consistent power supply. PPL is also faced with high maintenance cost of aging infrastructure and power purchase from IPPs.

This calls for a holistic approach to reforming the electricity market in PNG. In the medium to long term, the Government through NEA will work with PPL and relevant Government agencies to reform the electricity market. Some of the key reforms are:

(a) Unbundling of the electricity market to open a market for the generation, transmission, distribution, and retail of electricity;

(b) Decentralise unprofitable mini-grids in provincial towns by allowing private investments or public-private partnerships to generate, transmit, and distribute electricity;

(c) Provide incentives to support private sector investments in renewable energy generation;

(d) Establish regulations and guidelines to ensure a competitive, affordable, and cost-effective tariff system; and

(e) Consider a new business model for PPL that would ensure cost recovery and viability going forward in its operations.

18.2.8. Human Capacity Development

Human capital encompasses the collective skills, knowledge, and experiences within a workforce, derived from both formal education and informal learning from work experiences. The growth and development of an economy and society are also reliant on the energy sector, which then depends significantly on the actual renewable energy investments, such as wind energy projects. Which are driven by human capital development. Any increase in human capital investment always leads to significant improvements in the wind energy project capabilities and improvements in the social well-being of the host communities and the country.

The transformation of the energy sector, particularly the ongoing transition towards clean and renewable energy sources, is heavily influenced by the rapid deployment of technologies. Therefore, any strategy for human capital development in wind energy projects must enhance human capacity development in technology advancement. There is a burgeoning demand for a workforce that is not only technically proficient but also creative and adaptable to new challenges. This demand extends to the need for specialists in digital technologies, underscoring the importance of educational investments in relevant courses, degree programs, as well as the micro-credentials that are gaining popularity in recent years as an alternative to the traditional higher education.

Additionally, technological shift requires human capital with expertise in new policy and regulatory frameworks. Furthermore, skills in sustainability and environmental management are becoming crucial as these areas increasingly intersect with the energy sector's transformation.

18.2.9. Framework for Robust Monitoring and Reporting

Monitoring and reporting are an important strategy to ensure effective implementation of this Policy. Continuous monitoring will be undertaken by NEA in accordance with the monitoring and evaluation framework discussed under Chapter 20 of this Policy.

Annual reports will also be provided to the Government on the implementation of this Policy in achieving the objectives of the Policy against the long-term targets for the energy sector.

18.2.10. Research and Development

The energy sector in PNG is evolving rapidly, driven by increasing demand for electricity and advancements in technology. Recognizing the vast potential of PNG to harness its natural resources to contribute significantly to the nation's energy mix, this Policy emphasizes the importance of research and development to foster innovation and efficiency in the electricity industry. Specific regulations and standards will be developed in alignment with the *National Energy Authority Act* 2021, ensuring a framework that supports sustainable energy growth, enhanced technical capacity and adaptation to technology.

CHAPTER 19: RISKS

Energy generation from wind energy systems is one of the effective ways to address climate change, mitigate energy security risks, and promote environmental conservation as the source of energy is clean and renewable.

However, the process involved in developing a wind energy project has certain risks that affect decisions at different stages, often affecting project development and commercialization. There are also regulatory and policy risks that have impact on project decisions and development.

Under this Policy, the risks are classified into two main categories and further discussed, with proposed strategies for addressing and mitigating the risks. The first category is risks related to the implementation of this Policy and the second category is the risks associated with a wind energy project.

19.1. POLICY IMPLEMENTATION RISKS

The Policy risks may affect the implementation of this Policy. These risks are identified and discussed below:

19.1.1. Overlapping institutional arrangements

Different laws and regulations under different institutions can result in overlapping institutional arrangements and jurisdictional conflicts. This is a norm in governments that must be addressed, not just in PNG, but across different jurisdictions.

State agencies in PNG have worked together to permit and regulate resource projects, Wind Energy is no different with NEA now established, it can coordinate all Government efforts and collaborate with relevant Government agencies to license and regulate wind energy projects.

19.1.2. Resistance from stakeholders

Most policies usually receive resistance from the local communities, industry, landowners, and civil societies at large. This is mainly due to a lack of policy direction in addressing concerns around socio-economic issues, especially land, environment, and benefits to landowners.

This Policy provides clear guidance and references on land, landowner participation, creating an attractive investment environment and national content. This is in line with the National Government's policies to ensure meaningful landowner participation and benefit distribution.

19.1.3. Lack of resources

Policy implementation is usually affected by a lack of resources, especially financial, human, and technical resources.

The key agencies responsible for licensing and regulating wind energy projects are statutory bodies established under relevant statutory laws to ensure resources are available to effectively deliver on their mandated tasks. NEA will coordinate the implementation of this Policy. Furthermore, NEA, being a statutory body, will be self-funded through collection of levies which will support the organization to fully implement this Policy.

19.1.4. Lack of capacity for policy implementation and effective regulation

Wind energy potential in PNG remains largely undeveloped and is yet to be fully explored and understood. This raises the challenge of adequate capacity in terms of knowledge, skills, and experience in implementing the Policy and ensuring effective regulation.

NEA is mandated to regulate and have capacity to implement this Policy.

19.2. WIND ENERGY PROJECT RISKS

Project risks are the potential risks that may be associated with the development and operations of a wind energy project. These risks are identified in Table 4 below.

Table 5: Identification of Potential Wind Energy Project Risks

Risk	Duration or Period of Risk	Risk Rating		
		High	Medium	Low
1. Financial Risks				
1.1. Financing /Debt Service	Life of Project			
1.2. Resource Viability	Feasibility			
1.3. Transmission Access	Construction			
1.4. Credits	Life of Project			
2. **Regulatory Risks**				
2.1. Permitting	Feasibility & Construction			
2.2. Compliance	Life of Project			
2.3. Environmental	Life of Project			
3. **Market Risks**				
3.1. Entry	Operations			
3.2. Pricing	Feasibility & Operations			
3.3. Competition	Life of Project			
4. **Social Risks**				
4.1. Land Access	Feasibility & Construction			
4.2. Cultural Norms	Life of Project			
4.3. Loud noises from turbines	Life of the project			
4.4. Disturbing fishing grounds (offshore)	Life of the project			
5. **Other Risks**				
5.1. Geographic Location	Feasibility & Construction			
5.2. Political Risks	Life of Project			
5.3. Aging Turbines	Less than 20 years			
5.4. Inconsistency of weather conditions	Life of the project			
5.5. Maintenance issues	Life of the project			
5.6. Intermittency issue	Life of project			

Source: National Energy Authority, 2025

19.3. RISK MANAGEMENT AND MITIGATION FRAMEWORK

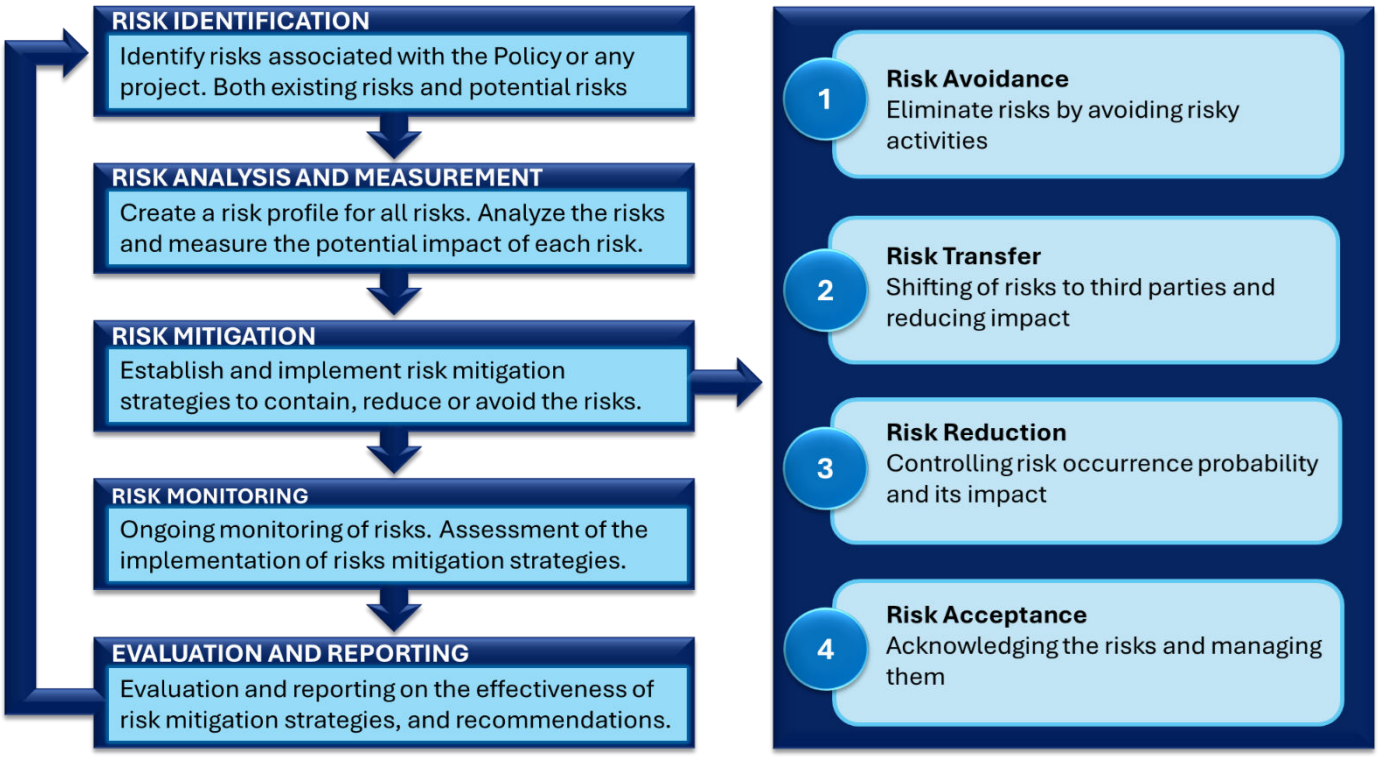
There are risks associated with developments in the energy sector, including the electricity industry. Section 19.1 and 19.2 of this Policy highlighted potential risks associated with the implementation of this Policy and development of wind energy projects respectively.

This Policy recognizes the importance of adopting effective and proper risk management and mitigation strategies to reduce risks associated with the Policy implementation and the developments of wind energy projects. Risk mitigation involves the process of identifying risks and strategizing to minimize and / or to avoid the impact of the risks.

Government, through NEA, in collaboration with other Government agencies, will manage the risks associated with implementation of this Policy. Any investor or developer must establish risk management processes and systems to mitigate project operational risks while ensuring preparation for natural risks.

A general framework for risk management and mitigation is provided below. This framework aims to guide the identification, assessment, and mitigation of risks associated with the implementation of this Policy, including the development and operation of wind energy projects.

Figure 20: Risk Management and Mitigation Framework



Source: National Energy Authority, 2025

CHAPTER 20: MONITORING & EVALUATION

20.1. MONITORING, EVALUATION AND REPORTING

The monitoring and evaluation (M&E) process is an essential tool for assessing the progress and success of this Policy. Ongoing M&E for this Policy will be pursued to identify strengths and weaknesses, identify areas where resources may be optimized, measure progress toward achieving the goals of this Policy, and achieve the desired outcomes. M&E of the implementation of this Policy aims to improve strategies and inform decision-making on the implementation of this Policy which will later inform future policies and legislative reforms.

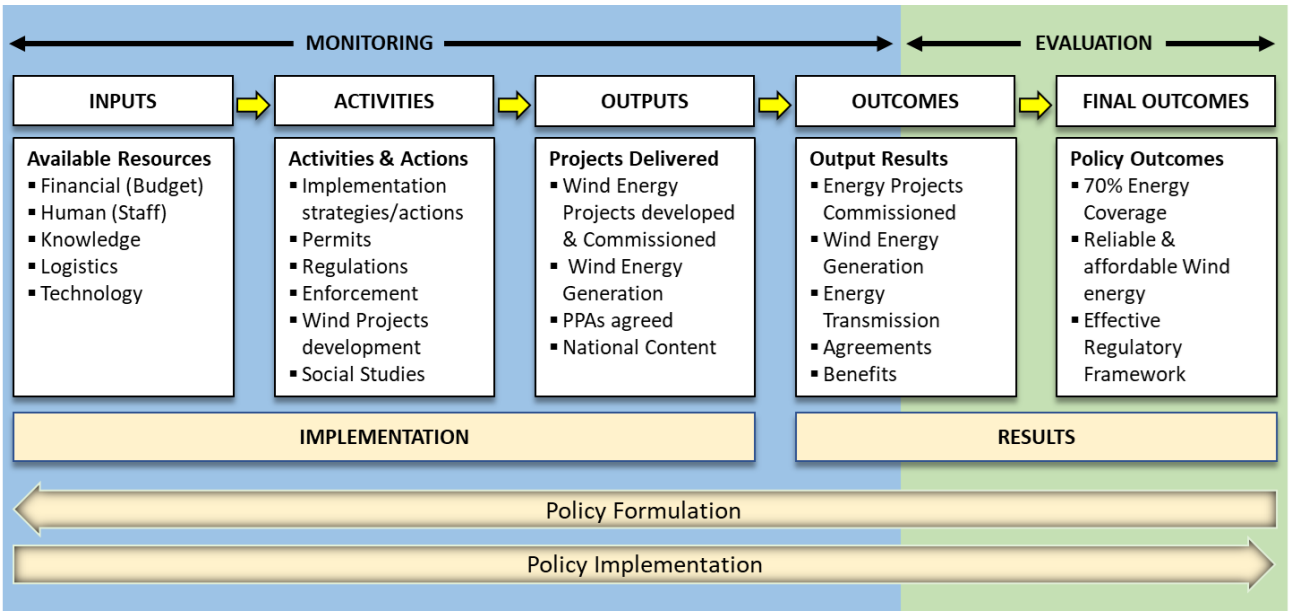
NEA is the custodian of this Policy and will be responsible for periodic and ongoing monitoring and evaluation of the implementation of this Policy in accordance with its Monitoring and Evaluation Framework. Reports and recommendations will be provided to the Managing Director for NEA, the Minister, and, if required, the National Executive Council (NEC).

20.2. FRAMEWORK FOR MONITORING AND EVALUATION

M&E is a process that requires careful consideration and planning. The M&E for this Policy is linked to the goals and expected outcomes, including the implementation and administrative arrangements under this Policy.

Monitoring the Policy starts with the input required to implement the Policy, then the activities to be undertaken to deliver on the outcomes and ends with the monitoring of the outcomes from the outputs. Evaluation will be undertaken to assess the outcomes of the Policy against the long-term outcomes and vision of the Policy.

Figure 21: Policy Results Chain for Monitoring and Evaluation



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GLOSSARY/ DEFINITIONS

TERM:	DEFINITION:
Arbitration	Is a dispute-resolution process in which the parties select a neutral third party to resolve their claims.
Build-Operate-Transfer (BOT)	The build-operate-transfer model is a popular contractual arrangement where a company teams up with a third-party provider to design, develop, and operate a specific project or service.
Customary land	Land that is owned or possessed by an automatic citizen or community of automatic citizens by virtue of rights of a proprietary or possessory kind that belong to that citizen or community and arise from and are regulated by custom. *(Source: Land Act 1996)*
Energy Efficiency	Using less energy for the same output or producing more with the same energy input, and minimising energy waste
Ex-ante licence	A preliminary or temporary licence issued to an applicant after submitting his application for a generation licence which provides guarantee to progress other requirements or steps for a project development until a generation licence is issued.
Feed-in tariff	A policy mechanism offering long-term contracts to renewable energy producers to encourage investment.
Gender analysis	The study of differences in the conditions, needs, participation rates, access to resources and development, control of assets, decision-making powers, etc., between women and men in their assigned gender roles.
Grid Codes	Define technical requirements, regulations, and behaviour for all active participants in the power system, including power generators, adjustable loads, storage, and other units.
Grid integration	The process of ensuring that power systems, like mini grids, can be connected to the central grid while maintaining system reliability.
Hybrid System	A power system that source energy from two or more different energy sources, for example, Wind-solar Hybrid System.
Intermittency	In renewable energy refers to the **unpredictability and variability of energy production** from sources like wind and solar, which depend on weather conditions and time of day.
Just Transition	Greening the economy in a way that is as fair and inclusive as possible to everyone concerned, creating decent work opportunities and leaving no one behind.
Mini grid	A mini-grid is a set of small-scale electricity generators interconnected to a distribution network that supplies electricity to a small, localized group of customers.
Minister	Minister for Energy

Off-grid	Power system not connected to or served by publicly or privately managed utilities (such as electricity, gas, or water)
Off-grid Small Power System Regulation	The Regulation provides for private and public investments in energy service products including power systems of less than one megawatt (< 1 MW).
Off-taker	means the transmission system operator or any other buyer of electricity produced by an Independent Power Producer
Projects	Any wind energy projects
Smart Grid	Are electricity network that use digital technologies, sensors and software to better match the supply and demand of electricity in real time while minimizing costs and maintaining the stability and reliability of the grid.
Wind energy	The power generated by converting the kinetic (moving) energy of wind into electrical energy.
Wind energy system	The system of components which converts the kinetic energy of the wind into electricity or mechanical power, and which comprises all necessary components, including energy storage, power conditioning, control systems, and transmission systems, where appropriate, to provide electricity or mechanical power for individual, residential, agricultural, commercial, industrial, utility, or governmental use.

ANNEXURES

Annexure 1: Supporting Agencies of the Wind Energy Policy

Organization	Role / Responsibility	Legislations & Policies
Climate Change Development Authority (CCDA)	CCDA is the Government agency mandated to coordinate and implement the country's climate change policies and programs. Its role is also to ensure PNG adapts to the impacts of climate change and to reduce its greenhouse gas emissions.	1. *Climate Change Management Act* 2015 2. *Carbon Markets Regulation* 3. PNG National Determination Contributions 2020
Department of Labour and Industrial Relations (DLIR)	DLIR is responsible for promoting labor employment opportunities at a national level to furnish employees with information on their rights through the Office of Labor Administration. DLIR also ensures harmonious industrial relations by setting and enforcing terms and conditions of employment, to promote employment opportunities.	1. *Apprenticeship and Trade Testing Act* 1986 2. *Employment Act* 1978 3. *Employment of Non-Citizens Act* 2007 4. *Employment of Non-Citizens Regulation* 2008 5. *Employment Regulation* 1980 6. *Occupational Safety, Health, and Welfare Act* 1991 7. *Workers' Compensation Act* 1978 8. *Workers' Compensation Regulation* 1983
Department of Lands and Physical Planning	The DLPP administers all alienated land (State and Freehold) in PNG and facilitates customary land (land under the ownership of the original inhabitants of PNG) issues at the discretion of the customary landowners, for social and economic development. The department also has a strong customer focus in providing a whole range of services like surveying, Physical Planning, Valuation, Incorporated Land Group registrations, Land Title registration, and Mapping requirements for all land within PNG.	1. *Compensation (Prohibition of Foreign Legal Proceedings) Act* 1995 2. *Survey Act* 1969. 3. *Land (Ownership of Freeholds) Act* 1976 4. *Land (Ownership of Freeholds) Regulation* 1977 5. *Land (Tenure Conversion) Act* 1963 6. *Land (Tenure Conversion) Regulations* 1964 7. *Land Act* 1996 8. *Land Disputes Settlement Act* 1975 9. *Land Disputes Settlement Regulation* 1975 10. *Land Groups Incorporation Act* 1974 11. *Land Groups Incorporation Regulation* 1974 12. *Land Registration Act* 1981 13. *Land Registration Regulation* 1999 14. *Land Regulation* 1999 15. *Land Titles Commission Act* 1962
Department of Provincial and Local Level Governments	The Department provides the vital link for coordination and partnership between all stakeholders to mobilize and provide the necessary support to strengthen the provincial and local level government and their administrations.	1. *Organic Law on Provincial and Local Level Governments*
Department of Treasury	The Treasury is the Government's principal **economic and financial department and maintains oversight** over the entire economy. Treasury sets fiscal policies, including tax, and deals with taxes and incentives for resource projects.	1. *Fiscal Responsibility (amended) Act* 2005 2. *Resource Contracts Fiscal Stabilisation Act* 2000 3. *Public Finance (Management) Act* 2005

Conservation and Environment Protection Authority (CEPA)	CEPA ensures that natural and physical resources are managed to sustain environmental quality human well-being and improved living standards. This Agency also ensures that all relevant policies, legislations, and regulations administered by CEPA are implemented effectively in accordance with environmental laws and regulations. CEPA issues environmental permits and regulates water usage.	1. *Conservation and Environment Authority Act* 2014 2. *Environment Act* 2000
Independent Consumer & Competition Commission (ICCC)	ICCC is PNG's principal economic regulator and consumer watchdog. Its primary role is to administer and implement the ICCC Act and other related legislation, including regulation of electricity prices at the retail point. ICCC regulates PNG Power under a regulatory contract.	1. *Independent Consumer & Competition Commission Act* 2002 2. *Prices Regulation Act* 1949 3. *Prices Regulation* 1949
Internal Revenue Commission	Responsible for all Tax matters, apart from customs duties.	1. *Income Tax Act* 1952 2. *Goods and Services Tax Act* 2003
Investment Promotion Authority	IPA's primary mandate is to promote and facilitate investments in PNG and to regulate the business industry in the country. Any business operating in PNG must register with IPA under the *Companies Act* 1997.	1. *Companies Act* 1997 2. *Companies Regulation* 1998 3. Companies Rules 4. *Investment Promotion Act* 1992 5. *Investment Promotion Regulation* 1992
National Institute of Standards and Technology	NISIT is responsible for overseeing all standardization, quality assurance, and conformity assessment activities in PNG. All new technology will have to be approved for use in the country by NISIT, including any new standards.	1. *National Institute of Standards and Industrial Technology (Amendment) Act* 1993
PNG Customs	PNG Customs is responsible for protecting PNG's borders and the economy from the insidious effects of border crimes, the production and distribution of objectionable materials, and the consequential risks and threats. PNG Customs is responsible for the clearance of all project equipment and materials.	1. Custo*ms Tariff Act* 1990 2. *Customs Act* 1951 3. *Customs Regulation* 1951
PNG Power Limited (PPL)	PPL is a fully integrated State-Owned Enterprise responsible for the generation, transmission, distribution, and retailing of electricity throughout PNG. PPL operates three (3) major electricity grids and fourteen (14) other standalone provincial systems. PPL assets comprise generation assets, 4,100 km of transmission and distribution lines nationwide encompassing industrial, commercial, Government, and domestic sectors.	1. *Electricity Commission (Privatization) Act* 2002 2. *Electricity Commission Regulation* 1966 3. *Electricity Supply (Government Power Stations) Act* 1970 4. *Electricity Supply (Government Power Stations) Regulation* 1970 5. *Electricity Industry Act* (Chapter 78)

Annexure 2: Stakeholders Involvement in Policy Consultations

As part of the Policy development process, NEA undertook various consultations with Government agencies, development partners and the public through regional consultations. Invitations were sent out to various institutions and stakeholders, including notices on media platforms for public consultations. Those as listed below, attended the consultations, policy validation or provided feedback in writing.

Government Agencies

1. Climate Change Development Authority (CCDA)
2. Conservation Environment and Protection Authority (CEPA)
3. Department of Agriculture and Livestock (DAL)
4. Department of Commerce and Industry (DCI)
5. Department of Lands and Physical Planning (DLPP)
6. Department of Mineral Policy and Geohazard Management (DMPGM)
7. Department of National Planning and Monitoring (DNPM)
8. Department of Prime Minister and NEC (PM&NEC)
9. Department of Transport
10. Department of Treasury
11. Independent Consumer and Competition Commission (ICCC)
12. Kumul Consolidated Holdings Limited (KCH)
13. Kumul Petroleum Holdings Limited (KPL)
14. Mineral Resource Authority (MRA)
15. National Weather Service (NWS)
16. Office of State Solicitor (OSS)
17. Oil Palm Industry Corporation (OPIC)
18. PNG Power Limited (PPL)
19. PNG Tourism Promotion Authority (PNGPTA)

Provincial Governments & Administrations

1. East New Britain Provincial Administrations
2. Morobe Provincial Administration
3. Madang Provincial Administration and LLG Representatives
4. Gulf Provincial Administration

Development Partners

1. Asian Development Bank (ADB)
2. World Bank
3. US Aid - PNG Electrification Program (USAID PEP)
4. Japan International Cooperation Agency (JICA)
5. International Renewable Energy Agency – PNG Coordinator (IRENA)
6. Australian Department of Foreign Affairs & Trade Economic and Social Infrastructure Program (ESIP)
7. New Zealand High Commission

Other Stakeholders

1. Media Personel
2. Energy Interest Groups0
3. Niugini Electricals
4. Lae Biscuit Company
5. Evangelical Lutheran Church of Papua New Guinea (ELCPNG)
6. Burum Kuat Hydro Dam Representatives
7. East New Britain Energy Limited
8. PAWA PNG Power Island Project
9. PNG University of National Resources and Environment (UNRE)

10. Elirana Electric Technology School
11. Newmont- Lihir
12. National Investment Holdings Limited
13. Valkan Incorporated Land Group (ILG)
14. Pawa Electric
15. East New Britain Development Corporation
16. Lihir Landowner Representatives
17. West New Britain Landowner Representatives
18. Various landowners, individuals and Public also attended the public consultations