GOVERNMENT OF THE REPUBLIC OF NAMIBIA

MINISTRY OF MINES AND ENERGY

SMART GRID POLICY

FINAL DRAFT

August 2019

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Foreword

For many, an electricity grid may not seem to be much more than some poles and wires. However, the modern electricity transmission, distribution and supply grid is considerably more than meets the eye. To ensure that the demand for electricity is always matched by available supplies necessitates sophisticated coordination and control capabilities. As more intermittent sources of supply are used to meet the prevailing demand, as is the case when solar and wind resources are integrated into the national supply mix, the requirements to keep the grid both stable and fully operational increase.

Smartening the grid necessitates the successive modernisation and upgrade of electricity networks and their constituent parts. These include, amongst others, information exchange and control technologies to enable real-time decision-making capabilities across the grid. Amongst others, these necessitate communication, exchange and inter-operability standards, as well as their grid-wide implementation. Some of the basic components underpinning a smarter grid are already operational in Namibia. Examples include the optic fibre that is part of our transmission networks as well as the remote management capabilities of this network that spans throughout the country.

As Namibia reforms its electricity market towards the modified single buyer market, many additional small- and medium-scale Independent Power Producers are expected to commence operations. At the same time, we witness unprecedented developments which transform passive consumers into active electricity market participants (i.e. prosumers). These transformative developments emphasise that it is imperative that we strengthen the foundations of a smartened grid, thereby emphasising why the Smart Grid Policy is important: we must establish the regulatory provisions, protocols and rules to ensure that the electricity grid of the future delivers the services that end-users are prepared to pay for, thereby ensuring the viability and sustainability of the grid as a critical national asset.

While no-one knows what the future will bring, it remains critically important that the development of our national assets enable the continued socio-economic development of the country. Our world-class solar resource, tumbling prices for solar technologies, rapid development of electricity storage technologies, and the development of grid-supplied electricity prices all point to a future in which the electricity grid will have to be far more dynamic and provide more cost-effective services than it has in the past. The future of our electricity grid necessitates pro-active and decisive action by the Government and grid utilities, to ensure that the basis of our country's development and its industrialisation can take place. This means that our electricity grid must be smartened, to enhance the value of grid-supplied services and to ensure that competitive electricity services can be provided to end-users.

With the above in mind, it is my hope that this Smart Grid Policy provides the necessary foundation that steers the development of the country's electricity grid to smartly deliver cost-effective services for all electricity end-users in future.

…….

Thomas K. Alweendo, Member of Parliament

Minister of Mines and Energy

Acronyms and Abbreviations

CRAN	Communications Regulatory Authority of Namibia
DSM	Demand Side Management
DSO	Distribution System Operator
ECB	Electricity Control Board
EDI	Electricity Distribution Industry
EE	Energy Efficiency
ESI	Electricity Supply Industry
HPP	Harambee Prosperity Plan
IEA	International Energy Agency
IPP	Independent Power Producer
IPPP	Independent Power Producer Policy
Minister	The Minister of Mines and Energy *(unless indicated otherwise)*
MoF	Ministry of Finance
MME	Ministry of Mines and Energy
MoPE	Ministry of Public Enterprises
MSB	Modified Single Buyer (electricity market model, as approved by Cabinet in 2019)
NamPower	Namibia Power Corporation
NEF	National Energy Fund
NEI	Namibia Energy Institute
NENA	Namibian Electrical Network Asset Register
NEP	National Energy Policy
NIRP	National Integrated Resource Plan
NPC	National Planning Commission
NUST	Namibia University of Science and Technology
OMAs	Offices, Ministries and Agencies of the Government of Namibia
PPA	Power Purchase Agreement
PPP	Public Private Partnership
R&D	Research and Development
RE	Renewable Energy
REP	Renewable Energy Policy
RED	Regional Electricity Distributor
REFIT	Renewable Energy Feed-in-Tariff
SAPP	Southern African Power Pool
SCADA	Supervisory Control and Data Acquisition (grid control system)
SGWG	Smart Grid Working Group
TSO	Transmission System Operator
UNAM	University of Namibia

Glossary and Definitions

Term	Definition
distributor	A person or entity that distributes and supplies electricity to end-users.
grid defection	Termination of the grid supply contract by previously connected end-users.
prosumer	An electricity end-user who supplies part of their electrical energy needs from their own electricity generation and/or storage capabilities while remaining connected to the grid.
Regulator	The authority responsible for the regulation of the country's electricity industry (currently the Electricity Control Board).
renewable energy	Energy that is derived from resources or processes that are naturally replenished on a human timescale. Solar, wind, hydropower, bioenergy, geothermal and ocean/wave power are examples of renewable energy sources.
smart grid	An electricity network equipped with advanced control, communication, security, protection, metering, integration, automation, intelligence and related features that are deployed to optimise its overall use.
sustainable development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Executive Summary

Purpose

This Policy expresses the Government of Namibia's intent to assist licensees to modernise the country's electricity grid in order to optimally meet current and emerging demands, while enhancing its sustainability and security.

Process

In late 2018, the Ministry of Mines and Energy (MME) requested the Electricity Control Board (ECB) to manage the development of the Smart Grid Policy on its behalf. The ECB tendered, selected and appointed a specialist consulting team to draft the policy document and support stakeholder engagements.

The process that led to this Policy included two phases: Phase 1 entailed an assessment of the critical requirements for smart grids in Namibia, including an assessment of current policy and regulatory gaps, and concluded with a national stakeholder workshop. Phase 2 entailed the development of the present Policy document. It included a second national workshop where stakeholders discussed the draft Policy document and provided their inputs, which led to the finalisation of this Policy.

Definition of the Smart Grid

Recognising that many different definitions are in use, this Policy defines a smart grid as *an electricity network equipped with advanced control, communication, security, protection, metering, integration, automation, intelligence and related features that are deployed to optimise its overall use.*

Key Electricity Sector Stakeholders

The Ministry of Mines and Energy (MME) is responsible for all Namibian energy matters and is therefore the principal custodian of the Smart Grid Policy. The National Planning Commission (NPC) plans and monitors the course of national development, which includes projects in the electricity sector.

The Electricity Control Board (ECB) is the statutory regulator of the country's electricity industry. It is responsible for technical and economic regulations, which includes administering the licensing of activities and recommending the issuance of licences to the Minister of the MME.

The Communications Regulatory Authority of Namibia (CRAN) is the country's communications industry regulator. As most smart grid technologies rely on communication technologies, CRAN is expected to shape the roll-out of smart grid technologies in Namibia.

The Namibia Power Corporation (NamPower) is the country's state-owned power utility. It owns and operates the major power stations and the transmission grid, and remains active in the distribution of electricity where other distributors are unavailable.

Independent Power Producers (IPPs) are commercial operators that hold licences to generate electricity. Several IPPs are active and more are most likely to become operational in order to meet local needs.

Licensed electricity distributors supply electricity to most end-users. These include the three existing Regional Electricity Distribution companies (i.e. NORED, CENORED and Erongo RED), as well as the City of Windhoek, Oshakati Premier Electric and NamPower Distribution. Other entities, including local authorities, regional councils, farmer electricity utilities and various commercial and residential private sector owned distributors, also distribute electricity to end-users.

Electricity consumers are changing from being passive recipients to active electricity market players, owning generation and/or storage capacities to displace grid supplies or feed electricity into the grid.

The Smart Grid Policy Framework

The Smart Grid Policy's vision is *for the Namibian electricity grid to optimally support local, decentralised generation and storage options as well as regional integration, and to retain and attract electricity end-users and prosumers by offering efficient, cost-effective and reliable grid services.*

Its mission is *to steer the technological development of the Namibian electricity grid towards optimally supporting decentralised generation and storage options, while offering value-added services to consumers and prosumers.*

Its objectives include *providing an enabling framework for smartening the national electricity grid; developing new commercially attractive grid value propositions for consumers and prosumers through smart grid technology investments and tariffs; improving the management, control, communication and reporting capabilities of the national grid infrastructure; facilitating activities and enabling seed investments to accelerate the coordinated development of smart grid activities; ensuring that smart grid investments optimise the cost of grid services and their viability; and fostering collaboration between grid utilities and potential smart grid beneficiaries*.

Its strategies include *providing a framework that sees utilities smarten the electricity grid; securing funding for smart grid investments; promoting research and development related to smart grids; removing barriers and promoting the development of smart grids; and introducing new and enhanced grid services that provide added value to grid-connected end-users and electricity utilities.*

Policy Statements

The Smart Grid Policy includes six core themes, which are as follows:

1. **Smart Grid Planning, Prioritisation and Coordination,** to plan, guide and coordinate smart grid developments to meet the changing requirements of grid users;
2. **Smart Grid Funding, Pilot Projects, Research and Resources,** to support activities that create new opportunities and roll out projects in the interest of accelerating smart-grid adoption and mitigating negative impacts on the cost of electricity;

3. **Smart Grid Communication, Data and Cyber-Security,** to facilitate the implementation of the required communication, data, security and interfacing regulations, standards, and procedures applicable to all licensees using smart grid technologies and applications;
4. **Empowerment of Prosumers, Consumers and Other Grid Users,** to ensure that grid users are engaged, and that relevant smart grid technologies and services add value for them;
5. **Smart Grid Asset Ownership, Licensing and Operation,** to enable and incentivise private sector participation in the development and operation of smart grid infrastructure and associated services, and to define operational authority for smart grid elements; and
6. **Smart Grid Regulatory Treatment,** to ensure that regulatory provisions, approaches and methodologies are and remain responsive to changing grid user needs and requirements, which includes the promotion of relevant smart grid investments throughout Namibia's electricity supply industry.

Implementation Framework

The Policy concludes with a high-level framework within which the Policy is to be implemented. It describes the main roles of the institutional entities responsible for Policy implementation, and it provides guidance on the legal and regulatory provisions that underpin the Government's role in smart grid developments.

The Implementation Framework includes a high-level summary of the main responsibilities relating to the mobilisation of resources required for the implementation of this Policy. It provides guidance for the monitoring and evaluation of projects that are undertaken to implement this Policy; it provides a description of the main advocacy and dissemination responsibilities associated with this Policy; and it includes an implementation action plan.

1 Introduction

This document is **Namibia's Smart Grid Policy**. It communicates the Government's intent, direction and undertakings regarding the efficient and effective development of a smarter electricity grid in Namibia.

1.1 Rationale and Structure of this Policy

1.1.1 Rationale

A smart grid refers to technologically advanced electricity transmission, distribution and supply infrastructure that optimises the coordination of connected generating plants, network infrastructure and electricity end-users. It uses modern information and communication technologies, and thereby maximises the reliability, resilience, and stability of the overall system.

In this way, a smart grid is expected to significantly enable the introduction and use of decentralised renewable energy electricity generation and electricity storage applications, while improving the efficiency of the grid through demand side measures.

Smart grids are characterised by their ability to exchange real-time information by means of two-way communication between electricity generators across transmission and distribution networks, and to and from the main energy-consuming equipment which is operated by electricity end-users.

In some ways, the smart grids of the future may well resemble the design of the Internet in that all the actors, irrespective of their roles and functions on the network, are connected to one another, and they have an 'always-on' and universal exchange mechanism at their disposal. Smart grids use digital control technologies to collect data to enable real-time optimisation of the grid, notably the individual and collective behaviour of electricity producers and consumers.

Smartening the electricity grid necessitates the successive modernisation and upgrade of contemporary networks and their constituent parts. These include, amongst others, information exchange and control applications to enable real-time decision-making capabilities which span the entire grid. This necessitates communication, exchange and inter-operability standards, as well as their successive grid-wide roll-out, in order to link supply-side assets right across to end-user appliances on the demand side.

Some of the basic components underpinning a smart grid have been developed in Namibia (e.g. optic fibre connectivity on the major transmission network and remote management of this network). However, many requirements needed to further smarten the grid are not yet in place, including regulatory provisions, network communication protocols to allow the seamless exchange of data across the grid, and the controls to link relevant network assets.

Namibia's world-class solar resource, decreasing prices for solar PV panels, the rapid development of electricity storage technologies, and contemporary grid-supplied electricity prices create an environment in which electricity end-users have an increasing incentive to defect from the grid. Such a trend is concerning for the Government and licensees as it undermines the viability of the grid, which is a national asset in that it is required for the country's development and industrialisation. Smartening the grid and enhancing the value of grid-supplied services is essential for countering the threat of grid defection, as it offers electricity end-users cost-effective services (including the supply and trade of electricity) via the grid.

1.1.2 Definition of 'Smart Grid'

The term 'smart grid' has a variety of definitions. The following three international perspectives illustrate the commonalities and differences regarding the roles and functions of smart grids.

The **International Energy Agency (IEA)** defines a smart grid as follows:

> *"A smart grid is an electricity network that uses digital and other advanced technologies to monitor and manage the transport of electricity from all generation sources to meet the varying electricity demands of end-users. Smart grids coordinate the needs and capabilities of all generators, grid operators, end-users and electricity market stakeholders to operate all parts of the system as efficiently as possible, minimising costs and environmental impacts while maximising system reliability, resilience and stability."* [1]

The **Electrical Power Research Institute** (United States of America) defines a smart grid as:

> *"one that incorporates information and communications technology into every aspect of electricity generation, delivery and consumption in order to minimize environmental impact, enhance markets, improve reliability and service, and reduce costs and improve efficiency."* [2]

The **European Regulators' Group for Electricity and Gas** defines a smart grid as:

> *"an electricity network that can cost-efficiently integrate the behaviour and actions of all users connected to it – generators, consumers and those that do both – in order to ensure economically-efficient, sustainable power systems with low losses and high levels of quality and security of supply and safety."* [3]

This Policy defines a smart grid as:

> "*an electricity network equipped with advanced control, communication, security, protection, metering, integration, automation, intelligence and related features that are deployed to optimise its overall use.*"

Establishing a smart grid necessitates major investments (many of which are made for general upgrades of the network, and not necessarily for individual or dedicated smart grid projects), and it is a lengthy process. As technologies develop, the smart grid will be subject to a continuous development process that will not foreseeably reach an end state where one could say that the grid is now 'fully smart'. It is therefore more pertinent to use the phrase 'smartening of the grid', and to see this as a process that forms a part of the continuous enhancement of operations and performance of the grid infrastructure over time. Modernising the grid is not a new concept; it has been on-going since the grid was first developed. Smartening the grid is therefore the deliberate focus on modernising the grid. **This Policy is therefore aimed at promoting and facilitating the process of modernising the grid by implementing 'smart' technologies (i.e. 'smartening the grid').**

'**Smartening the grid**' for the purposes of this Policy includes the **investment in and implementation of digital and other advanced technologies, primarily in the measurement, control, communication, and protection characteristics** of the grid. This may involve retrofitting existing

[1] International Energy Agency – Technology Roadmap Smart Grids, 2011, https://www.iea.org/publications/freepublications/publication/smartgrids_roadmap.pdf

[2] Electric Power Research Institute, USA, http://smartgrid.epri.com/Index.aspx

[3] European Regulators' Group for Electricity and Gas, Position Paper on Smart Grids, An ERGEG Public Consultation Paper, Ref: E09-EQS-30-04, 2009, www.energyregulators.eu

infrastructure with 'smart' components and/or replacing existing equipment with 'smart' alternatives.

1.1.3 Policy Development Process

The development of the Smart Grid Policy was managed by the ECB on behalf of the MME. The process constituted two phases. The first phase entailed an assessment of regional and international policies and regulatory approaches for the development of smart grids. Guidelines and recommendations were collated in terms of how these policies and regulations could apply to Namibia. This first phase of the policy development culminated in a national stakeholder workshop, which offered ESI stakeholders an opportunity to deliberate on the findings and recommendations. The second phase entailed the development of the present policy document. The policy document was reviewed during a national stakeholder consultation process, which led to further refinements before the finalisation of the document.

1.1.4 Structure of this Policy

The subsequent content of this document is structured as follows:

- **Section 1** introduces the context in which the Smart Grid Policy is to be applied.
- **Section 2** describes the overarching policy framework used in this document.
- **Section 3** presents the main policy statements.
- **Section 4** presents the implementation framework for the Smart Grid Policy.

1.2 Context

1.2.1 National Context

Namibia's national development ambitions are guided by Vision 2030, which was adopted in 2004. Vision 2030 foresees the provision of secure and affordable energy to the country's developing economy and its people; it provides the overall long-term development goals for the country; and it subscribes to the principle of sustainable development. Specifically, Vision 2030 foresees **"a prosperous and industrialised Namibia, developed by her human resources, enjoying peace, harmony and political stability."**

The Government's medium-term goals and strategies are expressed in **National Development Plans** (NDPs), which are formulated in accordance with Vision 2030 and revised every five years.

The **National Energy Policy (NEP) of 2017** foresees an increase in local, decentralised electricity generation using renewable resources, by means of leveraging Namibia's natural resource endowments to increase energy self-sufficiency and promote the availability of affordable electricity for Namibia's economy and people.

The **National Renewable Energy Policy (REP) of 2017** advocates the thrust towards increasing the renewable energy contribution to the country's electricity mix. Variable renewable energy generation technologies, such as those used for decentralised electricity generation, have important repercussions and pose new challenges for the management and stability of the grid.

The **Independent Power Producer Policy (IPPP) of 2018** foresees significant investment in renewable energy IPPs in Namibia, in alignment with the National Integrated Resource Plan (NIRP),

and identifies the need for the grid to be able to accommodate such generation sources. It further foresees that IPPs requiring investments in smartening the grid should contribute to the cost thereof.

Smart grid infrastructure is expected to contribute to increasing the ability of the Namibian electricity grid to accommodate these local and decentralised electricity generation options, while also offering new service options to consumers who wish to generate and store their own electricity. **A smartened grid is therefore seen as a core enabler for the implementation of the NEP, REP and IPPP goals and objectives that relate to renewable energy-based electricity generation**.

1.2.2 Overview of Namibia's Electricity Sector

Over the past two decades, the country's electricity sector has undergone numerous important developments and changes. The sector has a well-developed regulatory framework that is operationalised by the Regulator (i.e. the Electricity Control Board). NamPower owns and operates approximately 11 500km of transmission network, which connects various regional markets to Namibia, and facilitates the active trade of electricity. In recent years, Namibia has seen an increase of renewable energy IPPs through direct contracting as well as the Interim Renewable Energy Feed-in Tariff (REFIT) programme. The REDs and other distributors supply electricity to end consumers.

As indigenous energy resources, renewable energy in the forms of solar, wind and biomass (specifically encroacher bush) are available in abundance. Increasingly, they find their way into the mainstream grid-bound electricity sector. In addition, numerous off-grid applications are well-suited for the increased application and use of renewables. The integration of intermittent renewable sources into the electricity grid requires on-going attention in order to manage their technical and operational peculiarities. Increased deployment of intermittent renewables is considered likely, which would contribute to the country's energy security and diversify its energy mix.

On a smaller scale, many electricity end-users are investing in their own electricity generation and storage capacities, mostly in the form of solar PV installations for commercial and residential applications. The Regulator's net metering rules enable customers to make such investments and be compensated for energy supplied to the grid, while continuing to benefit from grid-supplied services.

These developments mean that the country's electricity distribution systems will have to increasingly deal with changing flows of electricity as well as intermittent generation sources in order to remain relevant and sustainable. Smartening the grid is expected to contribute to meeting these requirements.

Furthermore, it is likely that off-grid solutions will be increasingly applied to provide access to electricity, especially in rural areas. These off-grid solutions, such as those provided by mini-grids, will benefit from smart grid technologies because they form an integral element of this particular supply infrastructure.

1.2.3 Key Stakeholders of Relevance to this Policy

Ministry of Mines and Energy (MME)

The Ministry of Mines and Energy (MME) is responsible for all energy matters in the country, and it is the custodian of the Smart Grid Policy.

The ministry's mandate, as expressed in the MME's strategic plan for 2012-2017, is as follows:

"*The Ministry of Mines and Energy was constitutionally established to take custody of Namibia's rich endowment of mineral and energy resources and create an environment in which the mineral, energy, and geological resources contribute to the country's socio-economic development.*"

The ministry's mission statement affirms that the MME is:

"*To promote, facilitate, regulate and monitor the responsible development and sustainable utilisation of Namibia's mineral, geological and energy resources; through competent staff, innovation, research, and stakeholder collaboration in a conducive environment for the benefit of all Namibians.*"

Among others, the MME is responsible for the following:

- Developing policies and undertaking planning to ensure national energy security
- Approval of licences under the Electricity Act
- Rural electrification planning, funding and implementation
- Planning for sufficient electricity generation capacity to meet demand
- Defining procurement and off-take responsibilities for new generation projects

As the ministry that carries the ultimate responsibility for the electricity sector, the MME's mandate includes overseeing the efficient development and continuation of the electricity grid. In this role, the ministry is responsible for guiding the ESI to ensure the sustainability of the national grid, which includes the successive smartening of the grid.

In relation to smart grids and their development, the MME defines the modalities and actively provides support for the planning, funding and barrier removal activities for the country's ESI.

Ministry of Finance (MoF)

The MoF allocates the MME's annual budget, and designs and implements fiscal incentives. The MoF also provides input on electricity sector subsidies and is responsible for the investment policy.

Electricity Control Board (ECB – the Regulator)

The Electricity Control Board (ECB) is the statutory regulator for the electricity sector. The ECB was established in 2000 under the Electricity Act of 2000, which was replaced by an updated Act in 2007. It is funded by the 'ECB Levy', which is imposed on electricity supply.

The Regulator currently regulates the technical and economic aspects of the electricity sector. It administers licensing of sector activities and makes recommendations to the Minister of the MME regarding the issuance of licences, while the Minister approves the licences.

In its role as regulator of the electricity sector, the Regulator is responsible for ensuring the cost-effective, efficient and sustainable development of electricity infrastructure for the benefit of the customer and the economy. This includes facilitating the smartening of the grid, and ensuring that licensees respond appropriately to a changing market where consumers increasingly become prosumers by embracing alternatives to grid-supplied electrical energy.

With regard to smart grids, the Regulator therefore provides some control over the licensees through the development of rules, standards, technical regulations, pricing methodologies, incentives, and the provision of regulatory oversight.

Namibia Power Corporation (NamPower)

The Namibia Power Corporation (NamPower) is the country's state-owned power utility. It is registered as a private limited liability company under the Companies Act, with the Government as its sole shareholder.

NamPower is responsible for generation, transmission, trading, and import and export of electricity. NamPower currently owns and operates the major power stations in the country and the transmission grid. NamPower is also involved in distribution of electricity; however, its activity in this sector is limited and the intention is for NamPower to withdraw operationally from this sector.

NamPower currently fulfils the role of modified single buyer of electricity, and it is also the country's system and market operator. As such, NamPower is the buyer of electricity under the Interim REFIT programme, as well as other IPPs. As per the modified single buyer market model, approved by Cabinet in 2019, NamPower fulfils the role of the Modified Single Buyer (MSB).

As the owner and operator of the transmission grid, NamPower is responsible for the development, implementation and operation of smart grid elements of the transmission infrastructure. In its role as Transmission System Operator (TSO), NamPower will probably play additional roles in managing and operating smart grid technologies at national level across the entire grid, which may include providing and/or managing common communication and control platforms.

Electricity Distributors

Electricity distributors are licensed to distribute and supply electricity. Most prominent among these are the three established REDs (i.e. NORED, CENORED and Erongo RED), the City of Windhoek, Oshakati Premier Electric and NamPower Distribution. Other local authorities and regional councils in the Khomas, Omaheke, Hardap and //Karas Regions also distribute electricity. In addition, several farmer electricity utilities and other privately-owned commercial/residential distributors are also active in Namibia.

As the owners and operators of the distribution grid, distributors are responsible for the procurement and operation of those smart grid components that are to be part of the distribution grid, including interfacing with grid-connected electricity end-users. Distributors may also be responsible for the development and/or management of mini-grid systems, which also include elements of the smart grid.

Independent Power Producers (IPPs)

IPPs hold licences to generate electricity and they are incorporated independently from the Government and NamPower. Several such IPPs are active in Namibia, and more are being developed.

IPPs are responsible for cooperating with the TSO to optimally manage the grid, which includes access by the TSO to certain control, measurement and communication functions of the IPPs' plants.

Electricity Consumers / Prosumers

Electricity consumers are fast developing from passive recipients of electricity towards participants in an electricity market. Many invest in their own generation and/or electricity storage capacities which they use to augment electricity supplied by the grid, and which they may also supply to the grid. Consumers are also expected to participate actively in energy efficiency and demand side

management initiatives, many of which have the potential to reduce their electricity consumption and associated costs.

Smart grid investments will benefit grid-connected electricity end-users. One specific benefit will be an increase in the grid's capacity to accommodate net metering as envisaged in the Net Metering Rules. Consumer acceptance of new grid-supplied service options is critical to their success, as is consumer participation.

Private Sector

Smart grid developments are expected to create multiple opportunities for the private sector to invest in technologies and/or provide services to electricity licensees and/or consumers. Engaging the private sector and seeking opportunities for its participation in the development of a smart(er) grid can relieve funding and resource pressures experienced by the Government and utilities.

Communications Regulatory Authority of Namibia (CRAN)

CRAN is Namibia's communications regulator. As most smart grid technologies rely on some form of communication, CRAN is expected to play a role in shaping the way that the smart grid is rolled out and may influence which technologies and specifically communication methods are employed.

Namibia Energy Institute (NEI)

The Namibia Energy Institute (NEI) is a national institute of the Government and is housed at the Namibia University of Science and Technology (NUST).

The NEI seeks to build Namibia's capacity in the field of energy, which includes energy efficiency and different energy technologies, with an aim to contribute to Namibia's industrialisation by linking energy research, technology, policy, and education to the needs of industry, in support of national socio-economic development imperatives, initiatives and programmes. The NEI achieves its mission by engaging in relevant activities at its four centres: Centre for Renewable Energy and Energy Efficiency, Centre for Electricity Supply, Centre for Petroleum (Oil and Gas), and the Centre for Nuclear Sciences.

Tertiary Education Institutions

Namibia's tertiary educational institutions have the potential to participate in the smartening of the grid by a) using opportunities for research and development offered by the trialling of smart grid technologies, and b) focusing their educational delivery on developing skill sets required for the implementation and operation of a smart grid.

National Planning Commission (NPC)

The mandate of the National Planning Commission (NPC) is to "plan and spearhead the course of national development." The NPC oversees the implementation of the Smart Grid Policy by the MME.

Namibian Standards Institution (NSI)

The NSI was established in terms of the Standards Act, 2005 (Act No. 18 of 2005) and is governed by the Namibian Standards Council (NSC). The main aspects of relevance to this Policy include:

- Managing and coordinating the implementation of the National Quality Policy

- Developing, adopting and publishing Namibian standards in compliance with World Trade Organisation requirements
- Certifying products and management systems through the Marks of Conformity

2 Policy Framework

2.1 Guiding Principles

The Smart Grid Policy is an expression of the Government's vision to modernise and upgrade the electricity grid in order to deal with current and emerging demands in a cost-effective manner. This development must improve the sustainability of the grid while mitigating negative impacts on the cost of electricity supply in Namibia, and without compromising the security of the grid. Smartening the grid should contribute to the goals expressed in the National Energy Policy, Renewable Energy Policy and the Independent Power Producer Policy, with specific regard to the increased adoption and use of local, decentralised and renewable electricity generation and electricity storage technologies, while ensuring that grid operations remain efficient and viable.

2.2 Overall Policy Direction

The overall direction of the Smart Grid Policy is **to modernise the Namibian electricity grid by enabling developments throughout the electricity sector**. This primarily includes the generation of electricity by decentralised renewable energy plants, at both utility and end-user scales, and the use of electricity storage technologies, where feasible.

2.2.1 Vision

The vision of the Smart Grid Policy is **for the Namibian electricity grid to optimally support local, decentralised generation and storage options as well as regional integration, and to retain and attract electricity end-users and prosumers by offering efficient, cost-effective and reliable grid services.**

2.2.2 Mission

The mission of the Smart Grid Policy is **to steer the technological development of the Namibian electricity grid towards optimally supporting decentralised generation and storage options, while offering value-added services to consumers and prosumers.**

2.2.3 Objectives

The objectives of the Smart Grid Policy are to:

i. provide an enabling framework for smartening the national electricity grid with the aim of increasing the capacity of the grid to accommodate decentralised generation and storage options (at both utility and end-user scales) through targeted policy interventions, an appropriate regulatory framework, and support for key smart grid technologies;

ii. develop new commercially attractive grid value propositions for consumers and prosumers (relating to energy efficiency, demand side management, renewable energy generation and electricity storage) through smart grid technology investments and tariff options;

iii. improve the management, control, communication and reporting capabilities of the national grid infrastructure in order to optimise timely and appropriate investments, and improve the cost-effectiveness and quality of supply and services delivered via the grid;

iv. facilitate activities and enable seed investments to accelerate the coordinated development of smart grid activities by electricity utilities and others;

v. ensure that smart grid investments optimise the cost of grid services and their future viability; and

vi. foster collaboration between Namibian grid utilities and potential smart grid beneficiaries.

2.3 Prerequisites

The Smart Grid Policy assumes that:

i. the Government will guide and contribute to industry-wide planning efforts and investments in smart grid technology (to complement investments by licensees and the private sector);

ii. grid licensees are willing and able to plan and implement investments in smart grid technology, and to coordinate such investments with other licensees; and

iii. electricity end-users recognise the value-addition of the services provided by a smartened grid.

2.4 Strategies

The strategies of the Smart Grid Policy are to provide a framework within which:

i. utilities are tasked to successively smarten the electricity grid where viable;

ii. funding for smart grid investments is secured from various sources;

iii. research and development related to smart grids is actively promoted;

iv. barriers that hinder planning and investments in smart grid development are removed;

v. a regulatory framework conducive to the promotion and implementation of smart grids exists; and

vi. new and enhanced grid services that provide added value to grid-connected end-users and electricity utilities are introduced.

3 Policy Issues and Policy Statements

This section presents the main policy issues and associated policy statements. These are presented per major topic area. The sequence in which the various topic areas are addressed does not reflect their relative importance in this Policy.

3.1 Smart Grid Planning, Prioritisation and Coordination

While the introduction and development of smartened grids are advantageous, such actions are unlikely to be optimally implemented if electricity utilities are not incentivised and supported. Also, divergent technologies and a multitude of standards and approaches may result in sub-optimal results and possibly even stranded investments. For this reason, many governments internationally assist with the identification of suitable technologies, investments, planning, piloting of candidate technologies, and the funding of smart grid elements.

Planning for smartening the grid must consider developments in the use of electricity, and how this affects existing and future grid infrastructure. To illustrate: the emergence of prosumers and the associated installation of generation capacity and electricity storage changes the timing and demand of grid-supplied electricity, as will the large-scale displacement of fossil-fuelled vehicles by electric vehicles.

Smart grid technologies also play a key role in the design of mini-grids, which are intended to constitute an important part of the Government's efforts to enhance access to electricity throughout Namibia. In this context, it is noted that smart grid technologies optimise the use of generation sources, storage options and electricity consumption, to the benefit of electricity end-users. Mini-grids should therefore include relevant smart grid components which must be compatible with standards used on the main grid.

Key Issues:

1. Clear priorities must guide the coordinated activities of all stakeholders to ensure the cost-effectiveness of investments in smart grid technologies, and the avoidance of stranded assets. Focusing first on essential basic components, before on more advanced initiatives, would assist in building a smart grid from the ground up.
2. Smart grid investments must be coordinated across the ESI, which necessitates a coordinating entity in which all affected stakeholder groups are represented.
3. Smart grid investments must maximise national benefits while minimising cost impacts.
4. Smart grid investments must be efficient and effective and result in tangible end-user benefits.
5. Short- and long-term cost/viability impacts of smart grid investments must be considered.
6. Those benefitting from smart grid services must pay for it.
7. Smart grid investments must support other ESI-wide initiatives such as net metering and the implementation of the modified single buyer market framework.
8. Smart grid planning must consider consumer/prosumer ambitions and their requirements.

9. The overall design of the national smart grid initiative and overarching systems must ensure flexibility and scalability to the benefit of electricity end-users.
10. Since Namibia is part of the Southern African electricity market, smart grid technologies should be compatible with those made in other countries in the region, where appropriate.
11. The planning and design of off-grid electricity services (e.g. using mini-grids) is to include an element of smart grid technology in order to optimise generation and consumption.

Policy Objective: To plan, guide and coordinate smart grid developments in order to meet the changing requirements of grid users.

Policy Statements P1 Smart Grid Planning, Prioritisation and Coordination

Government will:

P1.a facilitate the development of a smart grid roadmap for Namibia through the establishment of a smart grid working group that represents all major affected parties;

P1.b mandate the smart grid working group to identify and rank available smart grid technologies, standards and codes relative to the implementation of other policy priorities (e.g. enhancing access to electricity, the use of renewable energy, and others);

P1.c support the Regulator with the development of an investment case framework to determine the benefit vs. cost aspects of candidate smart grid technologies in Namibia;

P1.d support the Regulator with the review and approval of licensee smart grid investments, in line with the investment case framework;

P1.e prioritise smart grid technologies that support other ESI-wide initiatives such as net metering and the implementation of the modified single buyer market framework;

P1.f prioritise smart grid technologies that introduce value-added services to grid users;

P1.g ensure that licensees' standards and technology strategies are harmonised and compatible;

P1.h ensure the establishment of a flexible and scalable national smart grid platform;

P1.i ensure that local smart grid standards and approaches align with regional approaches, where applicable, in order to ensure compatibility and optimisation;

P1.j encourage grid licensees to include relevant smart grid technologies in the development of new grid extensions, where viable;

P1.k ensure that smart grid elements are used in off-grid electricity systems, where applicable; and

P1.l request the Regulator to facilitate licensees to investigate, develop and implement a programme of activities to improve the quality and cost-effectiveness of grid-supplied services using smart grid technologies.

3.2 Smart Grid Funding, Pilot Projects, Research and Resources

On-going upgrades of the existing national electricity grid infrastructure and the implementation of smart grid applications necessitate substantial investments. If these are exclusively funded by utilities, their cost is carried by electricity end-users.

Some end-users stand to benefit more from investments in smart grid technologies than others. Those deriving specific benefits from the roll-out of a smartened grid must therefore proportionally contribute to its development through tariffs, while those not benefitting must be shielded from further increases in the price of electricity. To this end, new funding models must be considered, which may include Government funding (i.e. in the form of seed funding provided to electricity utilities, which is the practice in many countries that have embarked on smartening their national grids).

New technologies and unproven consumer acceptance pose barriers that hinder the roll-out of smart grid initiatives. These barriers can be reduced by initially focusing on research and pilot projects for select and promising candidate technologies, which may best be funded by the Government, and the results from which can be shared throughout the ESI.

Key Issues:

1. Initially, and to minimise the overall impact on electricity prices, accelerating smart grid developments will most likely require national seed funds.
2. Field testing and trialling of candidate smart grid technologies may be slow if left to electricity licensees alone, and results may not benefit all licensees.
3. Active promotion of smart grid research and development and the undertaking of pilot projects will be needed to ensure that the most appropriate initiatives can be undertaken as soon as possible.
4. The distribution and transmission grids are regarded as national assets, which the Government and utilities must actively develop to retain their value and relevance.
5. The roll-out, operation and maintenance of smart grid technologies require skills which must therefore be developed.
6. The cost of smart grid pilot projects may have significant impacts on the revenue requirements of affected licensees, and licensees may find it challenging to raise financing for such projects amid other funding priorities.
7. To ensure that best practices are shared and unnecessary expenses are minimised, licensees must share the results of individual smart grid pilot projects as well as research and development activities.
8. Cost-reflective charges for new grid-supplied services enabled by a smartened grid must be developed as and when required.

Policy Objective: To support activities that create new opportunities and roll-out projects in the interest of accelerating smart-grid adoption and mitigating negative impacts on the cost of electricity.

Policy Statements P2 Smart Grid Funding, Pilot Projects, Research and Resources

Government will:

P2.a consider providing seed funding and co-funding of licensees that undertake pilot projects, research, and/or proof-of-concept projects which involve smart grid technologies and their applications;

P2.b explore possibilities and support local initiatives to access international funding to enhance the uptake of renewable energy and storage technologies through smart grid development;

P2.c ensure that best practices and lessons learned from pilot projects are shared within the industry;

P2.d consider allocating funding in the form of grants and/or loans to fund or contribute to the roll-out of viable smart grid technologies and applications by licensees;

P2.e engage with education and training institutions to ensure that courses and/or course content aimed at smart grid developments cater for the sector's evolving needs and requirements;

P2.f support tertiary educational institutions with the leverage of pilot projects for capacity development and learning related to unlocking human resources and technologies for smart grid initiatives;

P2.g promote funding of research and development that relates directly to smart grid technologies and their implementation;

P2.h seek and support opportunities for local innovation and value addition with regard to smart grid development;

P2.i facilitate and support the development of smart grid service propositions; and

P2.j support the Regulator with the development of cost reflective tariffs for smart grid enabled services.

3.3 Smart Grid Communication, Data and Cyber-Security

Most smart grid applications rely on data collection, control, and communication technologies. This includes a requirement for interfacing between technologies used on the grid. This means that a) the technologies must use compatible communication and interfacing standards, b) the data collected, especially consumer data, must be used and stored based on acceptable security and confidentiality standards, and c) the cyber-security of the grid must be assured. The definition of such standards, procedures and agreements between licensees often necessitate facilitation through a neutral agency and/or a responsible entity, such as a communications regulator.

Obtaining the necessary licences from the communications regulator and other relevant regulatory authorities may be best facilitated centrally, even though individual licensees will most likely have to apply for individual licences, if applicable. Interfacing between the electricity Regulator and other regulatory authorities will be necessary to ensure that their roles do not overlap, conflicts are avoided, and cooperation is assured.

Key Issues:

1. Many consumer-facing smart grid technologies communicate over public networks and/or collect personal data. Data collection and storage must therefore comply with privacy and data security requirements.
2. Interfacing, communication protocols, and data processing and storage formats may vary between technology providers. Standards for such interfaces, protocols, and storage and reporting formats must be coordinated sector-wide to ensure compatibility.

3. The cyber-security of the grid must be assured, and it must protect grid management and control systems from malicious interference and related acts. Many well-developed standards in this regard are available and could be adopted.
4. Integrated and/or centrally managed technologies must be able to operate autonomously to avoid collapse of the grid if centralised coordination and/or communication fail.
5. Government facilitation between the relevant regulatory authorities and industry actors is necessary to ensure that roles and responsibilities are clear and costs are minimised.
6. Communication and data costs can be substantial and must be considered in the analysis of and decision for candidate smart grid technologies.
7. Regulation and licensing of smart grid communication technologies (where applicable) will be facilitated and assisted by relevant regulatory authorities, as required.
8. Where required, relevant regulatory authorities may need to develop new regulatory capacities to effectively deal with communication, data exchange and data storage, and the security and confidentiality aspects associated with the use of smart grid technologies and applications.

Policy Objective: To facilitate the implementation of the required communication, data, security and interfacing regulations, standards, and procedures applicable to all licensees using smart grid technologies and applications.

Policy Statements P3 Smart Grid Communication, Data and Cyber-Security

Government will:

P3.a facilitate the engagement of all relevant regulatory authorities according to their mandates to address the needs arising through the introduction of smart grid technologies and their applications;

P3.b develop minimum standards to ensure the secure and confidential collection, use and storage of data generated by smart grid technologies;

P3.c encourage and support the relevant regulatory authorities to devise appropriate standards, protocols and procedures for smart grid communication;

P3.d support the Regulator with the adoption of standards for the inter-operability and compatibility of smart grid technologies and their applications for all grid licensees and users;

P3.e support the Regulator with the adoption, implementation and enforcement of the standards for the cyber-security of smart grid technologies and their applications for all grid licensees and users; and

P3.f promote the development of grid management systems that interface with and utilise smart technologies to improve the quality and scope of services provided by the electricity grid, as well as the security of supply, reducing grid-related losses and minimising their total cost.

3.4 Empowerment of Prosumers, Consumers and Other Grid Users

Many smart grid technologies create opportunities to offer value-added grid services to consumers, prosumers and other grid users, making it more attractive for them to be and remain connected to the grid. This is a critical requirement for utilities and is also important with regard to end-users who take supplies from smart grid technologies as it may reduce the risk of them defecting from the grid.

Smartening the grid offers opportunities to advance energy efficiency (EE) and demand side management (DSM) efforts. These can be aimed at reducing grid electricity costs in general (by reducing demand peaks and/or deferring investment requirements) as well as individual end-users' electricity bills (enabling the prudent use of electricity and the feed-in of electricity to the grid). Combining the smartening of the grid with EE and DSM initiatives as well as end-user education and empowerment thus creates multiple opportunities that are of benefit to both end-users and utilities.

Smartening the grid also enables more generators to use the grid. Their needs and ambitions, as facilitated by the implementation of the MSB Market Framework and Renewable Energy and IPP Policies, must be taken into account when selecting and prioritising smart grid technologies and services.

Key Issues:

1. Consumers, prosumers and other grid users must be engaged to ascertain their needs and ambitions, before and during the identification, selection and implementation of smart grid technologies.
2. Prosumers' evolving needs and ambitions must be considered as a primary criterion for selecting smart grid technologies.
3. Prosumer needs and ambitions are to be considered in designing smart grid enabled tariff and connection options.
4. Connection fees and/or service fees for added value services through smart grid technologies must be determined in consultation with licensees and consumers/prosumers.
5. The pricing of smart grid services should incentivise the use of EE technologies and participation in utility DSM programmes.
6. Prosumer and consumer willingness to invest in behind-the-meter applications to optimally benefit from smart grid technologies and applications must be explored and quantified.
7. Promoting consumer and prosumer EE and DSM participation opens opportunities to optimise smart grid investments and maximise the benefits to end-users and utilities alike.
8. Smart grid investments and services should enhance access to electricity, where feasible.

Policy Objective: To ensure that prosumers and consumers are engaged, and that relevant smart grid technologies and services add value for them.

Policy Statements P4 Empowerment of Prosumers, Consumers and Other Grid Users

Government will:

P4.a engage prosumers, consumers and other grid users to ascertain their needs and ambitions relating to grid-supplied services;

P4.b ensure that smart grid technologies and applications meet grid user needs and ambitions and add value to them;

P4.c facilitate consumer education with regard to the benefits and opportunities of smart grid technologies and related EE, DSM and other efficiency measures;

P4.d enable private sector investments in smart grid technologies and applications;

P4.e ensure that EE, DSM and other efficiency initiatives are integrated as part of the deployment of smart grid technologies and their applications, where relevant; and

P4.f support the Regulator with ensuring that licensees apply smart grid enabled end-user tariffs and offer connection options that promote EE and participation in DSM programmes, where applicable.

3.5 Smart Grid Asset Ownership, Licensing and Operation

The default position regarding the ownership of electricity network assets, as expressed in the Electricity Economic Rules of 2016, is that all network assets are the property of a licensee. There is, however, provision for a licensee to contract out the ownership and operation of certain grid assets, provided the licensee retains enough control over the network.

As smart grid technologies are diverse, and potentially complex to operate, opportunities may exist for third-parties to invest and/or operate select smart grid assets, under the aegis of the licensee. An example where private sector service providers have such relationships with licensees includes the provision and management of metering services for and on behalf of utilities.

Many smart grid technologies can interact across the whole grid (i.e. from generation, via transmission and distribution, to the supply of end-users). This requires that smart grid systems are compatible and able to communicate throughout the entire supply chain. This aspect raises the question of who controls the different functionalities of the smart grid, in other words, how the responsibilities between the national transmission system operator (TSO), distribution system operators (DSOs), and other actors are best allocated to ensure the clarity of roles, obligations and responsibilities.

Key Issues:

1. Third party ownership of specific grid network components may be necessary to realistically open the smart grid to private sector investments.
2. The definition of roles and responsibilities of entities interacting via smart grid technologies and applications is necessary and must include third-party service providers.
3. The functional and operational authority of the TSO and DSOs regarding the control of end-user equipment must be identified and codified. This may imply that certain core functions should not be outsourced by the licensees to ensure system integrity.
4. Third party involvement in the ownership and operation of smart grid assets must be beneficial to the licensees and grid users, including any impacts on tariffs.

5. Third party ownership of network assets and the provision of network services necessitate the definition of the legal, regulatory and service-related modalities and underpinnings, which includes their pricing.
6. To minimise costs, maximise the economies of scale and to prevent any duplication, licensees must cooperate on smart grid initiatives, where sensible.
7. The functional and operational authority of the TSO and DSOs regarding the control of end-user equipment must be addressed as part of the regulatory provisions that are developed to govern the deployment, operation, management and control of smart grid technologies.
8. The existing Grid Code Committee, Grid Operator Committee and other relevant committees and bodies should be included in the Smart Grid Working Group to ensure the coordination of relevant activities.
9. Smart grid-related procurement must comply with relevant procurement legislation as well as other laws and policies that may have a bearing on private sector participation in the development of the smart grid.
10. Smart grid technologies may create new opportunities to protect licensee revenues.

Policy Objective: To enable and incentivise private sector participation in the development and operation of smart grid infrastructure and associated services, and to define operational authority for smart grid elements.

Policy Statements P5 Smart Grid Asset Ownership, Licensing and Operation

Government will:

P5.a facilitate the development of the required legal and regulatory provisions to enable and incentivise private sector participation in the effective and efficient development and operation of smart grid infrastructure and associated services, while ensuring the integrity and viability of licensees as well as compliance with other relevant legislation and policies;

P5.b support the Regulator with the management of orderly, secure and efficient interfacing and cooperation among licensees, as well as between licensees and third-party smart grid actors, service providers and/or operators, where required; and

P5.c develop the necessary legal provisions to enable the orderly interfacing and control between all relevant network operators and grid users.

3.6 Smart Grid Regulatory Treatment

Smart grid technologies require substantial investments for implementation. If licensees make such investments from their balance sheets, grid user tariffs will be affected. In contrast, if smart grid investments are funded/co-funded from sources other than licensees, the tariff impact can be substantially reduced. It is therefore important that the Regulator treats smart grid investments in a manner that promotes investments from sources other than licensees, while keeping the impacts that these have on electricity prices in mind.

Smart grid technologies can also offer new services for electricity grid users. These must be priced to ensure their attractiveness, while allowing the recovery of relevant costs from those consumers that

are causing or benefiting from such costs (in line with the Government's policy that tariffs should be cost reflective).

Key Issues:

1. A commitment by the Government to assist with funding specific smart grid developments would reduce the need to include depreciation and a return on investment charge in the licensees' revenue requirements, which will be beneficial for the tariffs associated with smart grid services.
2. The Net Metering Rules may need to be revised to optimally accommodate smart grid technologies and associated services.
3. Smart grid investments should ultimately contribute to reducing the cost of grid electricity and/or improving the value of grid services for grid users.
4. To remain relevant and of value, grid services must be responsive to evolving grid user needs and requirements.
5. Smart grid services will only be provided if adequately monetised and must therefore be expressed in terms of end-user service charges (i.e. tariffs and/or connection charges).
6. Promoting smart grid investments may necessitate specific tariff determination methodologies, which would need to be developed.
7. Smart grid investments should be subjected to regulatory scrutiny to ensure that their benefits justify the cost, and that they contribute to future-proofing the grid.
8. Smart grid infrastructure is an integral part of the overall network assets and needs to be added to the NENA standard asset register.
9. Smart grid development must consider existing regulatory and legal instruments and its deployment may necessitate additions and/or changes to such instruments.

Policy Objective: To ensure that regulatory provisions, approaches and methodologies are and remain responsive to changing grid user needs and requirements, which includes the promotion of relevant smart grid investments throughout Namibia's ESI.

Policy Statements P6 Smart Grid Regulatory Treatment

Government will:

P6.a support the Regulator with reviewing regulatory provisions and instruments underpinning investments in the electricity sector, with a view to incentivise licensees and third-party investments in economically justifiable smart grid infrastructure;

P6.b support the review and update of relevant regulatory and legal instruments, when necessary, to facilitate smart grid development; and

P6.c support the Regulator with the development of tariffs and charges required for the introduction and roll-out of smart grid technologies and associated services.

4 Implementation Framework

This section describes the high-level framework within which the Smart Grid Policy is implemented.

4.1 Institutional Arrangements

Institution	Roles
Ministry of Mines and Energy (MME)	The MME has the primary responsibility to implement the Smart Grid Policy. It may delegate activities to other institutions active in the energy sector, provided this is clearly communicated and appropriate resources are made available for such activities.
National Planning Commission (NPC)	The NPC is, on the whole, responsible for managing and monitoring the implementation of Government policy, and therefore supervises the MME's implementation of this Policy.
Regulator (currently the ECB)	The ECB, as the electricity sector's regulatory authority, is responsible for the implementation of all activities that fall within its regulatory mandate, in compliance with the provisions of this Policy. This includes the envisaged mandates once the ECB has been transformed into the country's energy regulator.
Grid utilities (transmission, distribution and supply licensees)	Grid utilities are responsible for the development and operation of the grid, and thus for the identification, specification, procurement, implementation and management of smart grid technologies.
Communications Regulatory Authority of Namibia (CRAN)	CRAN, as the country's communications regulator, is responsible for regulating relevant communications aspects of the smart grid, as defined in its mandate.
Namibia Energy Institute (NEI)	The NEI, as a Government agency, is responsible for the implementation of activities that fall within its designated mandate, as well as additional mandates that may be added through this and other policies.
Private sector entities	Private sector entities are vendors of smart grid technologies, and potentially providers of smart grid services to end-users and/or utilities, as well as being potential owners or co-owners of select smart grid technologies.
Tertiary education and training institutions	Education and training institutions are responsible for adjusting their technical, vocational or engineering curricula to meet the needs of smart grid technologies and applications. In addition, such institutions may potentially participate in future smart grid R&D projects.

4.2 Legal and Regulatory Provisions

The Electricity Act, 2007 (Act No. 4 of 2007) provides the legal and regulatory framework for the licensing, management and operation of the Namibian grid, and is considered to be well developed and working effectively. Several regulations, rules, codes, standards and related methodologies have been developed in the past, and they provide the framework within which smart grid technologies can be deployed by licensees. As part of the development of this Policy, no major legal and regulatory barriers that could hinder smart grid investment by licensees have been identified under the Electricity Act. Barriers and gaps relating to the Communications Act must be identified once potential smart grid technologies have been identified for implementation.

The main areas where further development is required are identified in the policy statements and the Implementation Action Plan, and they include the following:

i. Technology inter-operability standards and/or codes
ii. Communication and data format/storage/security standards
iii. Modification of tariff methodologies (if required)
iv. Amended rules to regulate smart grid ownership and operation by third parties (if required)

4.3 Resource Mobilisation

The mobilisation of resources required to implement this Policy will proceed by means of a variety of channels and approaches, of which the main options and responsibilities are summarised below.

Funding Source	Envisaged Application	Main Responsibility
Government budget	All activities that cannot be funded from the sources below	MME, in consultation with NPC and MoF
National Energy Fund	Activities that fall within the legal scope and financial means of the NEF	MME
Grid licensee resources	Grid licensee financial resources will be applied to invest in smart grid assets, in line with utilities' capital plans; this includes commercial loans raised for capital projects by licensees	Grid licensees, with regulatory approval
ECB levy	Activities that fall within the Regulator's responsibilities	Regulator, with authorisation of the MME, as appropriate
Public Private Partnerships (PPPs)	Activities from which PPPs can directly benefit	MME / MoF, to facilitate the processes required to enable such funding
Private Sector	Activities from which the private sector can directly benefit	MME, to facilitate the processes required to enable such funding
Grant funding	Activities that can benefit from	MME, in consultation with

Funding Source	Envisaged Application	Main Responsibility
	grant funding	OMAs that are tasked with facilitating and administering such funding
Financial Instruments/Markets	Activities from which the private sector can directly benefit	MoF, to facilitate the processes required to enable such funding

4.4 Reporting, Monitoring and Evaluation

The implementation of this Policy will be monitored and evaluated by the National Planning Commission, focusing specifically on projects that originate from this Policy, in accordance with the NPC's mandate. Once the Policy has been approved, regular reporting by the MME to the NPC needs to be agreed to by both parties. Monitoring and evaluation should be broadly based on the Implementation Action Plan, which is an integral part of this Policy, and which may, from time to time, be expanded as part of the MME's evolving strategic and action plans.

4.5 Advocacy and Dissemination

The MME is responsible for the dissemination of this Policy, and the facilitation of all advocacy activities associated with it.

4.6 Implementation Action Plan

This section presents the detailed Implementation Action Plan and provides the key implementation activities for each of the policy areas addressed in the Smart Grid Policy. Accordingly, the Plan has the same topic sections as contained in this Policy.

Appropriate policy statements are indicated with (P.) references, and action items are indicated according to specific action item (A.) numbers. This enables convenient cross-referencing of policy statements and associated action items.[4] In some cases, action items under one policy topic may also address the requirements of other policy topics.

The Implementation Action Plan identifies target outcomes across three time periods: a short-term implementation period up to 2022, a medium implementation period up to 2027, and a long-term implementation period up to 2032. As is usual for action plans, few actions are planned to commence several years into the future, since few have such low urgency.

It is recommended that the Implementation Action Plan be reviewed at intervals not exceeding three years (i.e. in 2022, 2025 and 2028), taking the progress made and changing priorities and needs into account.

The Implementation Action Plan also identifies the entity responsible for initiating the actions for each item, as well as the entity responsible for mobilising the requisite funding. This does not imply that the identified entity must also fully execute the activity (i.e. the responsible entity may delegate

[4] Note that action item sub-numbers (e.g. A20.1) do not imply a link to policy statement sub-numbers such as P20.1, and merely implies that all 'A20' action items belong to the 'P20' Policy statements, but also means that 'A20.1' does not specifically link to 'P20.1'.

when appropriate, but retains the responsibility for initiating the activity and for achieving the outcomes). Similarly, the entity responsible for mobilisation of funding does not necessarily have to fund the activity itself, but must mobilise funding from whatever source may be available and suitable.

Entities are referred to in the following tables by their abbreviations, which are listed in the section on Acronyms and Abbreviations.

Ref No.	Action Description	Short-Term Target 2019-2022	Medium-Term Target 2019-2025	Long-Term Target 2019-2032	Responsible for Action / Funding
	P1: Smart Grid Planning, Prioritisation and Coordination				
A1.1	Establishment of a smart grid working group (SGWG); tasked with coordinating the smart grid development in the country; chaired and supported by the ECB.	SGWG established by 2020	SGWG coordinates smart grid development		ECB / ECB
A1.2	Development of a smart grid roadmap for Namibia, which includes the identification of smart grid technologies of interest, development of an investment case framework for use by utilities and the Regulator, and application of the investment case framework to determine priority ranking of candidate smart grid technologies.	Roadmap developed and approved by 2021	On-going implementation of the roadmap		ECB / ECB
A1.3	Implementation of the smart grid roadmap by the licensees and other actors identified in the roadmap; coordinated by the SGWG.	On-going implementation of the roadmap	On-going implementation of the roadmap		SGWG / Various
	P2: Smart Grid Funding, Pilot Projects, Research and Resources				
A2.1	Provide seed funding for smart grid pilot and proof-of-concept projects.	Seed funding provided after completion of the smart grid roadmap	Seed funding provided where necessary	Seed funding no longer needed	MME / MME
A2.2	Provide loan and/or grant funding from the NEF, aimed at priority smart grid investments by licensees.	Funding provided after completion of roadmap	On-going funding for priority projects		MME / MME
A2.3	Engage with tertiary education and training institutions to a) develop curricula aimed at smart grid skill requirements and b) seek cooperation on smart grid research, development and pilot projects to augment licensee human resources.	Curricula items identified and integrated by 2022	On-going cooperation on R&D projects		SGWG / (Licensees, MME)
A2.3	Develop smart grid services for consumers/prosumers and introduce these services in the market, in line with the smart grid roadmap.	Develop and approve smart grid service and pricing by 2021	Implement and improve services	Continue to adjust and improve services	(SGWG, Licensees, ECB) / (Licensees, ECB)

Ref No.	Action Description	Short-Term Target 2019-2022	Medium-Term Target 2019-2025	Long-Term Target 2019-2032	Responsible for Action / Funding
	P3: Smart Grid Communication, Data and Cyber-Security				
A3.1	Start a dialogue between the SGWG and CRAN regarding the communication requirements of smart grids and how these are regulated by CRAN to ensure that no conflict arises, and that CRAN's regulation poses no barriers.	CRAN requirements clarified and integrated in smart grid roadmap	On-going requirements addressed as and when these arise		(SGWG, CRAN) / ECB
A3.2	Develop standards and codes to ensure the inter-operability of smart grid technologies within and between licensees, as well as requirements for secure data management and storage.	Standards and codes developed by 2021	Oversee implementation of standards and codes		ECB / ECB
	P4: Empowerment of Prosumers, Consumers and Other Grid Users				
A4.1	Engage consumers, prosumers and other grid users as part of the development of the smart grid roadmap, and ensure that their needs and ambitions are addressed in the roadmap.	Engage with consumers and prosumers during 2020	SGWG continues to engage regularly with consumers		(ECB / SGWG) / ECB
A4.2	Develop and implement smart grid related connection and tariff options. Develop and implement complementary consumer education programmes.	Develop options during and after the roadmap development by 2022	Implement smart connection and tariff options by 2022	Improve smart connection and tariff options	(ECB / Licensees / SGWG) / (ECB / Licensees)
A4.3	Integrate smart grid and EE/DSM/efficiency initiatives for best effect.	On-going coordination			NEI / NEI
	P5: Smart Grid Asset Ownership, Licensing and Operation				
A5.1	If appropriate, develop subordinate legislation to enable private ownership of smart grid assets.	Identify the need for legislation during roadmap development by 2021	Required legislation developed and promulgated by 2023	-	ECB / ECB

Ref No.	Action Description	Short-Term Target 2019-2022	Medium-Term Target 2019-2025	Long-Term Target 2019-2032	Responsible for Action / Funding
	P6: Smart Grid Regulatory Treatment				
A6.1	Review and update regulatory methodologies that relate to smart grid investments and operational costs to promote and manage smart grid development.	Smart grid regulatory needs assessed by 2021	Regulatory methodologies developed and implemented by 2022	-	ECB / ECB
A6.2	Update the NENA asset type and category dataset to provide for smart grid assets.	Continuous updating of NENA, as and when needed			ECB / ECB