## Contents

1 EXECUTIVE SUMMARY ........................................................................................................ 10
1.1 WHAT IS THE MODIFIED SINGLE BUYER MODEL OR MSB? .................................. 10
1.2 WHY DOES NAMIBIA NEED THE MSB? ................................................................. 10
1.3 WHAT ARE THE KEY DESIGN FEATURES OF THE MSB? ........................................... 11
1.4 WHO CAN PARTICIPATE? ............................................................................................. 11
1.5 WHAT WILL BE THE IMPACT ON TARIFFS? ............................................................... 12
1.6 HOW WILL THE MSB IMPACT ON NAMPPOWER AND THE DISTRIBUTORS? ........... 13
1.7 HOW WILL THE MSB IMPACT ON THE ECONOMY? .................................................. 13
1.8 WHAT ARE THE RISKS? .............................................................................................. 13
1.9 NEXT STEPS ................................................................................................................ 14

2 BACKGROUND & PROJECT PURPOSE ......................................................................... 15
2.1 CURRENT ELECTRICITY MARKET STRUCTURE ....................................................... 15
2.2 PROJECT OBJECTIVE .................................................................................................. 15
2.3 KEY PROJECT OUTCOMES .......................................................................................... 15

3 DEFINITIONS .................................................................................................................. 17

4 ACRONYMS & ABBREVIATIONS ...................................................................................... 23

5 CONCEPTUAL MARKET FRAMEWORK DESIGN ............................................................. 25
5.1 STAKEHOLDER ENGAGEMENT .................................................................................. 25
5.2 SINGLE BUYER MODEL CHALLENGES ..................................................................... 25
5.3 POLICY DRIVERS ........................................................................................................ 27
5.4 BENEFITS & CONCERNS ............................................................................................ 27
5.5 MARKET DESIGN PRINCIPLES .................................................................................. 27
5.6 PROPOSED MARKET FRAMEWORK .......................................................................... 28

6 TRADING ARRANGEMENTS & MARKET PHASES .......................................................... 30
6.1 OBJECTIVE / PURPOSE .............................................................................................. 30
6.2 EXISTING SINGLE BUYER (SB) TRADING ARRANGEMENTS .................................... 30
6.3 PHASE 1A .................................................................................................................... 31
6.4 PHASE 1B .................................................................................................................... 33
6.5 PHASE 2 ....................................................................................................................... 35

7 CRITERIA FOR CONTESTABLE CUSTOMERS AND ELIGIBLE SELLERS ....................... 37
7.1 OBJECTIVE / PURPOSE .............................................................................................. 37
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.2</td>
<td>Contestable Customer Criteria</td>
<td>37</td>
</tr>
<tr>
<td>7.3</td>
<td>Eligible Seller Criteria</td>
<td>40</td>
</tr>
<tr>
<td>8</td>
<td>Summary of New Trading Arrangements &amp; Criteria</td>
<td>41</td>
</tr>
<tr>
<td>9</td>
<td>Roles and Responsibilities of the MSB</td>
<td>42</td>
</tr>
<tr>
<td>9.1</td>
<td>Objective / Purpose</td>
<td>42</td>
</tr>
<tr>
<td>9.2</td>
<td>Structure</td>
<td>42</td>
</tr>
<tr>
<td>9.3</td>
<td>Market Operations (MO)</td>
<td>42</td>
</tr>
<tr>
<td>9.4</td>
<td>Planning &amp; Procurement</td>
<td>43</td>
</tr>
<tr>
<td>9.5</td>
<td>Imports and Exports</td>
<td>44</td>
</tr>
<tr>
<td>9.6</td>
<td>The System Operations (SO)</td>
<td>44</td>
</tr>
<tr>
<td>10</td>
<td>Market Operations</td>
<td>47</td>
</tr>
<tr>
<td>10.1</td>
<td>Objective and Context</td>
<td>47</td>
</tr>
<tr>
<td>10.2</td>
<td>Trading Products and Markets</td>
<td>47</td>
</tr>
<tr>
<td>10.3</td>
<td>MSB Trading Process</td>
<td>48</td>
</tr>
<tr>
<td>10.4</td>
<td>Balancing Mechanism</td>
<td>49</td>
</tr>
<tr>
<td>10.5</td>
<td>Wheeled/Banked Energy</td>
<td>52</td>
</tr>
<tr>
<td>10.6</td>
<td>Unsold Energy</td>
<td>52</td>
</tr>
<tr>
<td>11</td>
<td>Services &amp; Charges</td>
<td>53</td>
</tr>
<tr>
<td>11.1</td>
<td>Objective and Context</td>
<td>53</td>
</tr>
<tr>
<td>11.2</td>
<td>Escapable vs. Non-escapable Charges</td>
<td>53</td>
</tr>
<tr>
<td>11.3</td>
<td>Energy Charges</td>
<td>55</td>
</tr>
<tr>
<td>11.4</td>
<td>Connection Charges</td>
<td>56</td>
</tr>
<tr>
<td>11.5</td>
<td>Use-of-System Charges</td>
<td>56</td>
</tr>
<tr>
<td>11.6</td>
<td>Network Line Loss Charges</td>
<td>59</td>
</tr>
<tr>
<td>11.7</td>
<td>Wheeling Charges</td>
<td>61</td>
</tr>
<tr>
<td>11.8</td>
<td>Balancing Charges</td>
<td>62</td>
</tr>
<tr>
<td>11.9</td>
<td>Reliability Service Charges</td>
<td>65</td>
</tr>
<tr>
<td>11.10</td>
<td>Energy Banking Charge</td>
<td>66</td>
</tr>
<tr>
<td>11.11</td>
<td>Network Capacity Reserve Charge</td>
<td>67</td>
</tr>
<tr>
<td>11.12</td>
<td>Administrative Service Charges</td>
<td>70</td>
</tr>
<tr>
<td>11.13</td>
<td>Levies</td>
<td>70</td>
</tr>
<tr>
<td>11.14</td>
<td>Value Added Tax (VAT)</td>
<td>70</td>
</tr>
<tr>
<td>12</td>
<td>Metering and Invoicing</td>
<td>71</td>
</tr>
</tbody>
</table>
12.1 Metering ............................................................................................................. 71
12.2 Eligible Seller Invoicing ................................................................................... 72
12.3 Contestable Customer Invoicing ....................................................................... 73

13 Planning Arrangements ...................................................................................... 77
13.1 Objective / Purpose ......................................................................................... 77
13.2 Legislation & Regulation .................................................................................. 77
13.3 Planning Intervals; Information Exchange ....................................................... 78
13.4 Planning Arrangement Overview ..................................................................... 78
13.5 Long Term Expansion Planning – NIRP ......................................................... 78
13.6 Annual Operational Planning .......................................................................... 79
13.7 Transmission System Planning ......................................................................... 81
13.8 Weekly Planning ............................................................................................... 82
13.9 Day-Ahead Planning ......................................................................................... 82

14 Procurement ......................................................................................................... 84
14.1 Objective / Purpose ......................................................................................... 84
14.2 Legislation & Regulation .................................................................................. 84
14.3 New Supply ....................................................................................................... 84
14.4 MSB .................................................................................................................. 84
14.5 Contestable Customers – Public Entities .......................................................... 85
14.6 Contestable Customers - Volumes .................................................................... 85
14.7 Captive Customer ............................................................................................. 85
14.8 Regional Customers .......................................................................................... 85
14.9 Traders .............................................................................................................. 86

15 Security of Supply ............................................................................................... 87
15.1 Objective / Purpose ......................................................................................... 87
15.2 Approach .......................................................................................................... 87
15.3 Energy and Capacity Adequacy ....................................................................... 88
15.4 Ancillary Services Adequacy ............................................................................ 89
15.5 The Role of the Supplier of Last Resort ............................................................ 90

16 Financial Security Requirements ......................................................................... 92
16.1 Objective / Purpose ......................................................................................... 92
16.2 Placement of Security ....................................................................................... 92
16.3 Management of Security ................................................................................... 92
Figure 13: Displaceable Vs. Non-Displaceable Energy .........................................................114
Figure 14: Displaceable Energy Vs. Maximum Potential Energy via bilateral transactions ...115
Figure 15: Profile of Customers’ Monthly Peak Demand and Consumptions for Erongo RED ..................................................................................................................................................................................117
Figure 16: Profile of Customers’ Monthly Peak Demand and Consumption for the City of Windhoek ..................................................................................................................................................................................117
Figure 17: Profile of Customers’ Monthly Peak Demand and Consumption for CENORED...118
Figure 18: Profile of Customers’ Monthly Peak Demand and Consumption for Keetmanshoop ........................................................................................................................................................................118
Figure 19: Declared Availability Distribution Curve ..................................................................120
Figure 20: Balancing Charge assessment at 50% of the energy component .........................121
Figure 21: Balancing Charge assessment at 100% of the energy component ..........................121
Figure 22: Balancing Charge assessment at 200% of the energy component ..........................122
Figure 23: Ancillary Services in Namibia ..................................................................................123
Figure 24: Approach for calculating Reliability Service Charges ...........................................124
Figure 25: Ancillary Services Costs Benchmarks ......................................................................125
Figure 26: Revenue Requirement Rebalancing for RS charges .............................................126
Figure 27: Summary of Tariff unbundling impact on different charges .................................132
Figure 28: Summary of Tariff unbundling impact on different charges after removing Under-Recovery Charge ..................................................................................................................................................133
Figure 29: RSA Marginal Cost of Production Comparison (High RE plant scenario IRP2018)134
Figure 30: Estimated delivered SAPP price scenarios .............................................................135
Figure 31: Tariff unbundling impact case study for CENORED..............................................136
Figure 32: Tariff unbundling impact case study for Erongo RED...........................................137
Figure 33: Tariff unbundling impact case study for Keetmanshoop Municipality .................138
Figure 34: Base Case Expansion Plan (Macro-economic Impact Assessment) ..........................141
Figure 35: Namibian Electricity Production as % of Total Production (SB vs. MSB) ...........142
Figure 36: Power Station Construction Costs (SB vs. MSB) ...................................................144
Figure 37: Electricity Price Path Comparison (SB vs. MSB) ....................................................145
Figure 38: ESI Avoided Costs (SB vs. MSB) ...........................................................................145
Figure 39: Impact on Economic Growth (SB vs. MSB) ..........................................................146
Figure 40: Cumulative GDP Impact (MSB) ............................................................................147
Figure 41: Changes in CPI (SB vs MSB) ................................................................. 147
Figure 42: Employment Impact (SB vs. MSB) ............................................................ 148
Figure 43: Invoicing Relationship Diagram Example 1 ........................................... 150
Figure 44: Invoicing Relationship Diagram Example 2 ........................................... 151
Figure 45: Invoicing Relationship Diagram Example 3 .......................................... 153
Figure 46: Invoicing Relationship Diagram Example 4 .......................................... 155
Figure 47: Invoicing Relationship Diagram Example 5 .......................................... 156

List of Tables

Table 1: Contestability Summary ............................................................................ 12
Table 2: Next Steps for MSB Implementation ......................................................... 14
Table 3: Definitions .................................................................................................. 17
Table 4: Phase 1a key data ..................................................................................... 31
Table 5: Phase 1b key data ..................................................................................... 33
Table 6: Phase 2 Key data ...................................................................................... 35
Table 7: Service Charges for Loads & Generators in the MSB ............................ 54
Table 8: Network congestion Scenarios ................................................................. 68
Table 9: Eligible Seller Balancing Services ............................................................ 72
Table 10: Eligible Seller Network Services ............................................................ 72
Table 11: Eligible Seller Energy Banking Services ................................................. 72
Table 12: Eligible Seller Network Capacity Reserve Services ............................. 72
Table 13: Eligible Seller Administration Services ................................................ 73
Table 14: Contestable Customer Energy Services ................................................ 73
Table 15: Contestable Customer Network Services .............................................. 74
Table 16: Wheeling Services when Distribution Losses are bundled in the tariff .... 74
Table 17: Wheeling Services when Distribution Losses are unbundled. ............... 75
Table 18: Contestable Customer Ancillary Services .............................................. 75
Table 19: Contestable Customer Administration Services .................................... 75
Table 20: Contestable Customer Levies ................................................................. 76
Table 21: Long term Expansion Planning (NIRP) Responsibilities ....................... 79
Table 22: Annual Operational Planning Responsibilities ........................................ 80
Table 23: Transmission System Planning Responsibilities ................................. 81
Table 24: Weekly Planning Responsibilities ......................................................... 82
Table 25: Day-Ahead Planning Responsibilities ................................................... 83
Table 26: Summary Results from Macro-economic Impact Assessment ............... 107
Table 27: Reliability Services Costs ..................................................................... 125
Table 28: Example of NamPower Tariff before unbundling ................................ 129
Table 29: Example of NamPower Tariff with Captive generation after unbundling .. 130
Table 30: Example of NamPower Tariff with Wheeling generation after unbundling ... 131
Table 31: Ministerial Determination on new supply capacity ............................. 140
Table 32: Electricity Comparative Pricing (SB vs. MSB) ....................................... 149
Table 33: MSB Invoicing Example 1 ................................................................... 150
Table 34: MSB Invoicing Example 2 ................................................................... 151
Table 35: Distributor 1 Invoicing Example 2 ...................................................... 152
Table 36: MSB Invoicing Example 3 ................................................................... 153
Table 37: Distributor 1 Invoicing Example 3 ...................................................... 154
Table 38: MSB Invoicing Example 4 ................................................................... 155
Table 39: Distributor Invoicing Example 4 ......................................................... 156
Table 40: MSB Invoicing Example 5 ................................................................... 157
Table 41: Distributor 1 Invoicing Example 5 ...................................................... 157
Table 42: Distributor 2 Invoicing Example 5 ...................................................... 158
1 EXECUTIVE SUMMARY

1.1 What is the Modified Single Buyer model or MSB?

The Modified Single Buyer (MSB) model, is a new market platform for the electricity industry in Namibia. It builds incrementally on the existing Single Buyer (SB) model i.e. it represents a modification of the existing market structure. The MSB draws on global best practice, but it has been designed for Namibia, with the support of all the stakeholders in the Namibian electricity industry. The MSB also gives effect to policy positions articulated in the Harambee Prosperity Plan, Energy Policy, IPP Policy and National Development Plans.

The main change to the current SB model is that the MSB will allow electricity consumers and Independent Power Producers (IPPs) to transact with each other directly for the supply of electricity. Certain customers will therefore now be able to buy a portion of their energy requirements directly from a private Generator. The MSB will also now allow for private Generators to build new generation capacity in Namibia which is specifically for export purposes – Namibia has world-class renewable energy (RE) resources and there are several companies that would like to take advantage of this opportunity.

NamPower will continue to play a critical role in the electricity sector and will build new supply, procure new supply and act as the Supplier of Last Resort. It is not recommended that NamPower or any of the existing public enterprises are unbundled or privatised, however the MSB will be a ringfenced entity within NamPower.

1.2 Why does Namibia need the MSB?

Several previous studies highlighted several challenges with the existing Single Buyer model (which was introduced in 2000), that needed to be addressed. These include, for example: the perceived conflict with NamPower as both a Generator and the only offtaker from IPPs; the slow pace of implementation and decision making; lack of competition and choice and the limited progress in reducing reliance on imports.

There has been a global shift away from the traditional operation of electricity markets i.e. from centralised generation with long transmission lines to load centres. Prices for solar photovoltaics (PV) and Wind technology keep reducing providing customers with the opportunity to produce their own energy behind their meter. The market platform needs to accommodate this combination of decentralised producers/ consumers or “prosumers”.

Thirdly, there is a policy imperative for Namibia’s electricity supply to become more self-sufficient – currently approximately half of all electricity in Namibia is imported. This has exposed the country to high prices in the past and represents a real risk in the future, given Eskom’s on-going problems. There is also economic evidence that suggests that building new plant in Namibia can stimulate the economy and increase employment. The MSB will be the enabler of economic growth activities as it will allow more IPPs to participate in the industry.
In 2018, the Ministry addressed the above-mentioned issues by making a determination on new capacity to be built by 2023 and the MSB seeks to enhance this by supporting further private investments in new capacity, which will displace further imports.

The MSB is therefore needed to overcome some of the shortcomings of the existing SB structure, as well as giving Namibians the choice and opportunity to invest in and benefit from reducing costs and new technologies. In addition to supporting customer choice, the MSB also recommends further unbundling of Tariffs and the introduction of new products and services in response to the changing technology environment.

1.3 What are the key design features of the MSB?

The main design features of the MSB are listed below:

1) New trading arrangements allow for bilateral transactions between Contestable Customers and Eligible Sellers including Generators, Exporters, Traders and in the future Importers.

2) From September 2019, Contestable Customers will be able to purchase up to 30% of their consumption from Eligible Sellers.

3) Eligible Generators selling to Contestable Customers will be able to self-dispatch.

4) The MSB is a further step by Namibia towards greater competition and choice in the electricity industry.

5) To ensure an orderly transition from the current market, a phased approach will be followed to increase the number of Contestable Customers as well as the percentage of purchases which will be contestable.

6) New products and services, such as Reliability Services, Balancing Services and Energy Banking Services will be offered by NamPower.

7) Revised Tariff structures to support these new opportunities and to allow NamPower to recover the costs associated with all of its services.

8) Changes in market operations and administration responsibilities to manage the new structure.

9) Updated regulatory instruments and rules to guide market participants.

The market design also strives to simplify the implementation of the MSB, by adopting straightforward positions on potentially complex issues. For example, Generators will be exempted from certain network service charges and will be able to fix certain charges for the duration of their contract, to ensure predictability and support project bankability. Equally, the design provides stakeholders with alternative options to implement changes required to participate in the MSB – for example, Distributors that are unable to sufficiently unbundle their tariffs, can implement a Wheeling Charge to mitigate any potential negative financial impact.

1.4 Who can participate?

In order to take advantage of the new market structure, customers need to be designated as “Contestable” and Sellers (Generators) need to be designated as “Eligible”. There are a
number of criteria that each party needs to meet in order to participate. These criteria will change over time in order to allow more customers to become Contestable. Eligible Sellers will need to comply with ECB licensing requirements and the MSB rules.

Table 1: Contestability Summary

<table>
<thead>
<tr>
<th>Phase</th>
<th>Contestable Customers</th>
<th>Contestable Purchases</th>
<th>Indicative Dates</th>
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</thead>
<tbody>
<tr>
<td>Phase 1a</td>
<td>NamPower Transmission connected customers</td>
<td>30% of total</td>
<td>Sep 2019 - Jun 2021</td>
</tr>
<tr>
<td>Phase 1b</td>
<td>NamPower Transmission connected customers, Distribution customers (1MVA and above), Distribution customers (below 1MVA) – TBC</td>
<td>30% of total, Increasing cap &gt;30% - TBC</td>
<td>Jul 2021 – Jun 2026</td>
</tr>
<tr>
<td>Phase 2</td>
<td>As above, Further customers TBC by the ECB</td>
<td>TBC by ECB</td>
<td>Jul 2026 - Ongoing</td>
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Phase 1a and 1b, will allow Bilateral Wheeling, Exports and Trading. Phase 2 will allow Imports (other than via NamPower) only once Namibia has reached ~80% self-sufficiency of supply.

NamPower will continue to own and operate various generation plant, the transmission system and parts of the distribution system. It will also manage the market and systems operations of the MSB market, subject to the respective licenses. Critically, NamPower will continue to act as the Supplier of Last Resort in the system – a service for which it will be compensated.

Smaller commercial and residential customers can continue to utilise services such as net-metering in order to benefit from generation technology cost reductions and Namibia’s RE resources.

1.5 What will be the impact on Tariffs?

The unbundling of the NamPower Tariff will not have any impact on End Consumers, who already pay for Reliability Services and Losses. However, the unbundling of tariffs will significantly reduce any potential negative impact on the utility - in particular the introduction of the Reliability Service Charge. The changes in Tariff structures will ensure that stakeholders pay appropriately for services they use, reducing cross-subsidies and the burden on those who cannot afford to invest in their own supply. In the future under the MSB, all service charges will be shown separately, including energy purchases from IPPs.

A quantitative Tariff impact assessment was carried out in order to determine how the implementation of the MSB market would affect Tariffs. The results showed that the impact is highly dependent on future supply characteristics including generation technology, cost, timing, size and location of the plant. However, high-level modelling has shown that the likely impact on the Tariff will be limited and vary in a range of ± 2% of the NamPower Tariff, depending on assumptions.
1.6 **How will the MSB impact on NamPower and the Distributors?**

As mentioned above, the unbundling of the tariff will ensure that NamPower is able to charge customers appropriately for the services they use — buying energy from IPPs will not allow customers to escape paying for Reliability and Balancing services. Limiting the Contestable Quantity of energy that can be purchased from IPPs, will also protect NamPower’s existing fixed costs which are non-escapable i.e. the MSB targets the replacement of exports and increasing self-sufficiency. The development of new services such as Energy Banking and Exports from IPPs, will also add new revenue streams for NamPower. As has been noted above, NamPower will remain the Supplier of Last Resort and will continue to procure and build new supply — the overall impact of the MSB on NamPower is therefore expected to be positive.

Distributors benefit from the opportunity to procure lower costs of supply as well as the introduction of new charges to protect their financial viability e.g. the Wheeling Charge, which is calculated to protect the Distributor’s charge on top of NamPower’s energy costs. This will provide an alternative to tariff unbundling and ensure that the Distributor continues to recover all of its costs. Several Distributors are already actively pursuing new supply options and the MSB market provides a regulated framework to support these initiatives.

1.7 **How will the MSB impact on the economy?**

Initial macro-economic modelling shows a number of significant benefits when assessing the impact of increasing local supply funded by private investment, which reduces imports. Due to increased construction of new plant, the average increase in GDP growth is expected to be approximately +0.2% per annum over the period with a net cumulative additional economic impact by 2025, of ~N$3,751m. The additional private sector investments are anticipated to create an additional ~400 jobs/annum. This excludes any potential benefit due to the development of new plant aimed at exporting power to the region. This represents a material, but currently unquantifiable benefit for Namibia.

1.8 **What are the risks?**

It is acknowledged that there are a number of risks that could arise in the transformation from a Single Buyer to a Modified Single Buyer Market. The following design features have been built into the MSB to mitigate against unforeseen or unintended consequences:

1) Adopting a measured and phased approach to opening up the market. This will allow stakeholders to evaluate and manage any issues which arise and will not commit any party to a market structure which will risk their ongoing viability.

2) Capping the amount of energy which is contestable. This will prevent stranded investments and contracts which could result in severe financial pressure on utilities.

3) Unbundling Tariffs further. This step will minimise investment distortions and reduce cross-subsidisation by making sure that customers pay for the services they use.
4) Designating MSB (in NamPower) as the Supplier of Last Resort. This will ensure that customers in Namibia will have access to reliable electricity even if a private Generator is unable to deliver power in short, medium or long term. It should be noted that the MSB is not obliged to act as the Supplier of Last Resort for: i) to regional customers receiving electricity via Exports from Namibia, ii) Namibian customers who receive electricity via Import to Namibia.

5) Captive Customers and Contestable customers who do not choose an alternative electricity producer will be able to buy all their electricity from their utility. All utility charges will remain regulated to protect customers from potential abuse.

1.9 Next Steps

The table below summarises the anticipated key next steps.

Table 2: Next Steps for MSB Implementation

<table>
<thead>
<tr>
<th>Next Steps</th>
<th>Dates</th>
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<tbody>
<tr>
<td>Submitted for Cabinet Approval</td>
<td>Approved April 2019</td>
</tr>
<tr>
<td>Market Rules Development</td>
<td>March – May 2019</td>
</tr>
<tr>
<td>Tariff Unbundling/ Reform Implemented</td>
<td>July 2019</td>
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<tr>
<td>Phase 1a MSB implementation</td>
<td>1st September 2019</td>
</tr>
<tr>
<td>Update of NIRP and MSB capacity determination</td>
<td>July 2019 – June 2020</td>
</tr>
<tr>
<td>Phase 1b MSB implementation</td>
<td>1 July 2021</td>
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2  BACKGROUND & PROJECT PURPOSE

2.1  Current Electricity Market Structure

In November 2000, the Cabinet of the Government of the Republic of Namibia (GRN) approved a model for restructuring of the Namibian Electricity Supply Industry (ESI). A key feature of the approved model was the establishment of a Single Buyer (SB) function, embedded within NamPower. This implementation of a SB was seen as the most appropriate mechanism to manage and administer electricity-trading arrangements and to contract new investments in electricity generation.

The Electricity Control Board (ECB) is the statutory regulatory authority for the electricity sector, established in terms of Electricity Act (Act 2 of 2000) repealed by (Act 4 of 2007). The ECB has the core responsibility of exercising control over the electricity supply industry (ESI); which entails regulation of generation, transmission, distribution, supply, use, import and export of electricity in Namibia. In particular Part II, sections (4)(a) and (4)(b) of the electricity Act - 2007, empowers the Regulator, subject to certain conditions, to establish an electricity market, issue licenses to persons operating in the market and to publish Market Rules and regulations to govern the market.

In 2016, the ECB decided to re-assess the suitability of an exclusive SB market model for Namibia, due to several factors, including: engagements with IPPs, the emergence of different market structures, funding requirements for new supply, significant cost reductions in photovoltaic and wind costs and the emergence of new storage technologies.

The ECB appointed New Energy Consulting to review the current SB market model in light of the emerging market forces mentioned above. This work will leverage off previous studies that were undertaken by the ECB and based on the review, Namibia will either continue with the current model – albeit more vigorously enforced – or possibly propose and adopt another model if deemed appropriate.

2.2  Project Objective

The project objective can simply be stated as:

Evaluating and proposing the most appropriate Market Structure Framework for the Electricity Supply Industry of Namibia.

2.3  Key Project Outcomes

The expected main outcome of the project was the review of the current market structure and possible design of a new market structure. The project outcomes can be more specifically listed as:

1) to draft a report documenting and summarising the work to date, reflecting current thinking and incorporating stakeholder comments,
2) to develop an appropriate market framework to meet Namibia’s future electricity sector’s needs,

3) to evaluate the impact on market participants of the proposed market design from a quantitative perspective,

4) to map out an implementation plan to provide guidance on any proposed market restructuring,

5) to prepare an executive summary of the proposed framework for submission to government,

6) to design a set of accompanying and aligned Market Rules in support of the proposed framework.

As part of the assignment, the Consultant conducted interviews with representative stakeholders from each of these groups, as well as conducting several industry-wide workshops and receiving written inputs via email. All of the inputs have been taken into account during the design of the Market Framework.
3 DEFINITIONS

There are various policy, legislative and regulatory documents that are part of the Namibian electricity market structure, each containing a variety of definitions for key terminology. As the prevailing regulatory instrument governing the roles, responsibilities and functioning of the interconnected power system, this Market Design document aligns its definitions with those in the prevailing Grid Code (the Code) and where necessary suggests changes required by the proposed changes to the market structure. Definitions are contained in the Grid Code: Preamble, which may need to be updated to reflect the new market structure as well as the roles, functions and responsibilities of the new market participants.

Table 3: Definitions

<table>
<thead>
<tr>
<th>Administrative Service Charge</th>
<th>Recovers the cost of providing customer service including metering, meter reading and billing.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ancillary Services</td>
<td>Services supplied by the System Operator and procured by the MSB, that are necessary for the reliable and secure transport of power from Generators to consumers i.e. to maintain the short-term reliability of the power system. They include, for example, the various types of reserves, black start, reactive power, voltage control, regulation and load following services, as defined in the Grid Code: System Operation Code, Section 4.</td>
</tr>
<tr>
<td>Adjusted Constrained Schedule</td>
<td>Means the Constrained Schedule adjusted for any valid Dispatch Instructions.</td>
</tr>
<tr>
<td>Balancing Charge</td>
<td>The charge used to determine the Balancing Payment to be made by a licensed producer that is out of balance</td>
</tr>
<tr>
<td>Balancing Energy</td>
<td>Has the meaning given to that term in section 11.8.2.</td>
</tr>
<tr>
<td>Balancing Mechanism</td>
<td>The method used in determining the Balancing Energy quantity and Balancing Payment.</td>
</tr>
<tr>
<td>Balancing Payment</td>
<td>Has the meaning given to that term in section 11.8.4.</td>
</tr>
<tr>
<td>Balancing Service</td>
<td>The action of providing Balancing Energy.</td>
</tr>
<tr>
<td>Banked Energy</td>
<td>Refers to the quantity of electricity (in kWh) offered to the MSB under the Energy Banking Service and that was calculated as set out in section 10.5</td>
</tr>
<tr>
<td>Bilateral Wheeling Transaction (Wheeling)</td>
<td>A transaction between a Willing Buyer and a Willing Seller of energy, in which the Buyer and Seller are not co-located and must use a 3rd party's network to transport the power from the Seller to the Buyer. In the case of the MSB market, the Seller will be registered as an Eligible Seller and the Buyer will be registered as a Contestable Customer. The networks used may be either transmission or distribution or any combination of the two.</td>
</tr>
<tr>
<td>Buyer</td>
<td>See Contestable Customer</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Call Back Option</td>
<td>An option included in an Exporter's PPA with a regional customer, that allows the MSB to increase their purchases from the Exporter - the option cannot exceed 10% of the plant minimum total output, as measured over a 12-month period, since commercial operations have started.</td>
</tr>
<tr>
<td>Captive Customer</td>
<td>Means an end consumer of electricity that buys electricity from a licensed Transmitter or Distributor and who is not allowed to buy electricity from an Eligible Seller.</td>
</tr>
<tr>
<td>Captive Generator</td>
<td>A Generator connected to a customer’s electrical equipment that supplies its power to the connected customer and not to a utility.</td>
</tr>
<tr>
<td>Connection Charge</td>
<td>The Connection Charge is the charge allocated to the customer for the capital costs of dedicated or shared assets, required to connect an End Customer to the grid, and that are not recovered via Use of System charges in the Tariff. It is payable in addition to the Tariff charges as an up-front payment or as a monthly Connection Charge where the Distributor finances the Connection Charge.</td>
</tr>
<tr>
<td>Constrained Schedule</td>
<td>The most recent binding plan, prepared by the MSB, detailing the estimated production output from each Generator and Importer for every Trading Period of a particular day taking network and System Operator constraints into account.</td>
</tr>
</tbody>
</table>
| Contestable Customer        | Means any of:  
  - Contestable End Consumer  
  - Contestable Distributor  
  - An Exporter  
  - A Trader  
<p>| Contestable Distributor     | Means a Distributor that is connected to - and purchases electricity at - a Contestable Supply Point.                                                                                                       |
| Contestable End Consumer    | Means an End Consumer that is connected to - and purchases electricity at - a Contestable Supply Point.                                                                                                     |
| Contestable Quantity        | Has the meaning given to that term in section 7.2.3                                                                                                                                                       |
| Contestable Supply Point    | Has the meaning given to that term in section 7.2.2                                                                                                                                                       |
| Control Area                | A subset of SAPP that adheres to the minimum requirements for a Control Area as defined in the SAPP Operating Guidelines. (South Africa, Namibia, Botswana, Mozambique, Swaziland and Lesotho currently operate as one Control Area. Eskom, South Africa, manages the Control Area and all Control Area services such as AGC are under their control.) |
| Customer                    | See Contestable Customer                                                                                                                                                                                  |
| Day                         | A period of 24 consecutive hours starting at 00h00 and ending at 24h00 Namibia time                                                                                                                        |
| Delivered Energy            | The active energy produced by a Generator during a specific period at a specific point, measured in kWh.                                                                                                 |</p>
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deviation Energy</td>
<td>The difference between Delivered Energy and Adjusted Constrained Schedule. Also referred to as Imbalance Energy.</td>
</tr>
<tr>
<td>Delivery Point</td>
<td>A physical point on the electrical network where energy can be delivered by a Generator or Importer.</td>
</tr>
<tr>
<td>Dispatch</td>
<td>A process that calls for a specific level of output from a Generator or consumption from an End Customer.</td>
</tr>
<tr>
<td>Dispatch Instructions</td>
<td>The instructions from Systems Operations to a market participant, to vary the MW output production or consumption at a particular location, from the level it would have operated at.</td>
</tr>
<tr>
<td>Distributor</td>
<td>A person that is licensed to own, operate and maintain a Distribution system.</td>
</tr>
<tr>
<td>Eligible Exporter</td>
<td>A person with a license to export power from Namibia, registered with the MSB, complying with Market Rules for MSB.</td>
</tr>
<tr>
<td>Eligible Importer</td>
<td>A person with a license to import power to Namibia, registered with the MSB, complying with Market Rules for MSB.</td>
</tr>
<tr>
<td>Eligible Generator</td>
<td>A person with a license to generate electricity and which is registered with the MSB and which can enter into bilateral wheeling transactions with Contestable Customers in the MSB market.</td>
</tr>
</tbody>
</table>
| Eligible Seller          | Means any of:  
  - Eligible Generator, or  
  - Eligible Trader, or  
  - Eligible Importer                                                                 |
<p>| Eligible Trader          | A person with a license to buy and sell electricity between Eligible Sellers and Contestable Customers in Namibia.                       |
| Embedded Generator       | A Generator that is connected to a Distributor’s or an End-Customer’s electrical equipment.                                             |
| End Customer             | A user of electricity that is connected to either the Transmission or Distribution systems.                                               |
| Energy Banking Charge    | The charge levied by the MSB (N$\text{c/kWh}) to end-customers for the Energy Banking service.                                             |
| Energy Banking Service   | Allows a customer with own generation to bank excess energy with the MSB and then withdraw it in a later period when the power is needed. The value of the credit is differentiated by ToU when withdrawing the energy. Effectively extends the benefits of net-metering to customers with own-generation above 500kVA. |
| Entry Charges            | Use-of-system charges payable by Generators to allow their electricity to enter the electricity network.                                  |
| Exit Charges             | Use-of-system charges payable by loads to allow their electricity to exit the electricity network.                                         |
| Exporter                 | An entity licensed to export electricity from Namibia.                                                                                    |
| Generator                | A legal entity operating a licensed Generating Unit or Power Station.                                                                       |
| Grid Code                | Grid Code refers to a document (or set of documents) that legally establishes technical and other requirements for the connection to and use of an electrical system by parties other than the |</p>
<table>
<thead>
<tr>
<th><strong>Grid Code Advisory Committee</strong></th>
<th>A panel of stakeholder representatives tasked with review of the Grid Code amendments. Will not also be responsible for the governance of the MSB market.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grid Code Participants</strong></td>
<td>Currently the following participants are included: Licensed Generators, Licensed Traders (e.g. Single Buyer), Licensed Importer, Licensed Exporter, Licensed transmitter (wires business, supply business and Metering administrator), Licensed Distributors, Licensed suppliers, and End-customers who connect directly to the high voltage network. This definition may be expanded to include End-customers who are considered contestable and are not connected to the HV network.</td>
</tr>
<tr>
<td><strong>Imbalance Energy</strong></td>
<td>The difference between hourly scheduled electricity deliveries and hourly metered deliveries. There is an imbalances penalty for deviation from Production Schedules in the MSB market.</td>
</tr>
<tr>
<td><strong>Importer</strong></td>
<td>An entity licensed to import electricity to Namibia.</td>
</tr>
<tr>
<td><strong>Levies</strong></td>
<td>Charges imposed on end-customers via the regulated electricity Tariff to recover costs not directly related to the supply of electricity services. In Namibia this includes an Electricity Control Board levy and a National Electrification Fund levy.</td>
</tr>
<tr>
<td><strong>Loss Factor</strong></td>
<td>A factor for a particular network applied as a multiplier on consumption (withdraw) to determine delivery (injection) to the same network taking losses into account.</td>
</tr>
<tr>
<td><strong>Losses/ Technical Losses</strong></td>
<td>The technical or resistive energy Losses incurred on Transmission and Distribution networks due to the characteristics of the physical equipment usually associated with dissipation.</td>
</tr>
<tr>
<td><strong>Market Operator/ Market Operations (MO)</strong></td>
<td>Is not mentioned in current Grid Code; which refers to the Single Buyer. This will be a core function of the MSB.</td>
</tr>
<tr>
<td><strong>Market Procedures</strong></td>
<td>The Market Procedures set out the processes required to carry out obligations under the Market Rules.</td>
</tr>
<tr>
<td><strong>Market Rules</strong></td>
<td>Rules which govern the operation and management of the MSB Market. The Market Rules will form a part of the Grid Code as the Market Code.</td>
</tr>
<tr>
<td><strong>Modified Single Buyer (MSB)</strong></td>
<td>In the new market structure, the “Single Buyer”, will become the “Modified Single Buyer” or “MSB”. The MSB comprises the following functions: Systems Operations support, Market Operations, Planning &amp; Procurement and Trading.</td>
</tr>
<tr>
<td><strong>MSB Participation Fee</strong></td>
<td>An amount in NAD pledged by a Contestable Customer, in order to register and participate in the MSB market.</td>
</tr>
<tr>
<td><strong>Network Congestion</strong></td>
<td>Means a shortage of network capacity resulting in the curtailment of generation supply and or customer demand.</td>
</tr>
<tr>
<td><strong>Network Operator (NO)</strong></td>
<td>The licensed developer, operator, maintainer and administrator of the Transmission system in Namibia - i.e. NamPower.</td>
</tr>
<tr>
<td><strong>Nominated Percentage</strong></td>
<td>Means the percentage of energy from each Eligible Seller to be sold to each Contestable Customer in every Trading Period.</td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Off-grid</strong></td>
<td>Referring to either a network, Generator, consumer of energy or any combination of these, which is not grid tied i.e. connected to the transmission or distribution networks.</td>
</tr>
<tr>
<td><strong>Operational Reserves</strong></td>
<td>Capacity that will be available for reliable and secure balancing of supply and demand. There shall be three categories of operating reserves: Spinning Reserve, Regulating Reserve and Quick Reserve.</td>
</tr>
<tr>
<td><strong>Point of Connection</strong></td>
<td>The electrical node in a substation where a customer’s assets are physically connected to the network operator’s assets.</td>
</tr>
<tr>
<td><strong>Production Schedule</strong></td>
<td>Refers to a plan showing the quantity of power a Production Unit intends to produce or deliver in every Trading Period of the next Day.</td>
</tr>
</tbody>
</table>
| **Production Unit**      | Means one of the following:  
• A single generating unit that forms part of a centrally-dispatched Generator  
• A single power station if it is a self-dispatched Generator  
• A single substation identified by the MSB as the point of power entry for an Importer. |
<p>| <strong>Public Entity</strong>        | As defined in the Public Procurement Act, 2015. |
| <strong>Reliability Service</strong>  | The action of procuring and providing Ancillary Services. |
| <strong>Seller</strong>               | See Eligible Seller. |
| <strong>Self-generation / Captive Generation</strong> | Customers or IPPs, that generate electricity exclusively for the customer’s own use, where the generating unit is co-located with the customer i.e. &quot;behind the meter&quot;. |
| <strong>Single Buyer (SB)</strong>    | The Single Buyer is the only entity within an electricity market that is allowed to procure on-grid energy supply from either an existing utility or IPPs. The Single Buyer will then supply energy to customers including Distributors, energy intensive users, commercial and residential customers. The Grid Code does not define the constituents of the Single Buyer, but implicitly refers to it separately from the entity licensed for trading. |
| <strong>Supplied Energy</strong>      | The active energy used by a customer and supplied by the MSB during a specific period at a specific Supply Point, measured in kWh. |
| <strong>Supplier of Last Resort</strong> | An energy supplier who must supply those End Customers who may not be able to acquire energy from any other provider - in the case of Namibia, this is the MSB. |
| <strong>Supply Point</strong>         | A physical point on the electrical network where energy can be supplied to Distributors or End-Consumers. |
| <strong>System Operator/ Systems Operations (SO)</strong> | The entity licensed to be responsible for short-term reliability of the power system, which is in charge of controlling and operating... |</p>
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>the power system and dispatching generation (or balancing the supply and demand) in real time.</td>
<td></td>
</tr>
<tr>
<td>Tariff</td>
<td>A Tariff is a combination of charging parameters applied to recover measured quantities such as consumption and capacity costs, as well as unmeasured quantities such as service costs.</td>
</tr>
<tr>
<td>Tolerance Band</td>
<td>The threshold which sets the imbalance allowance for deviations from Production Schedules in the MSB.</td>
</tr>
<tr>
<td>Trader</td>
<td>See Eligible Trader.</td>
</tr>
<tr>
<td>Trading Period</td>
<td>A 30-minute interval starting on the hour (e.g. 00:00-00:30) or 30 minutes after the hour (e.g. 00:30-01:00).</td>
</tr>
<tr>
<td>Trading Schedule</td>
<td>Refers to a plan showing the quantity of power a Trader intends to buy from each Production Unit and sell to each Contestable Supply Point in every Trading Period of the next Day.</td>
</tr>
<tr>
<td>Trading Unit</td>
<td>The business unit currently within NamPower and in future within the MSB, that is responsible for developing, executing and administering an energy trading strategy for Namibia, in the SAPP.</td>
</tr>
<tr>
<td>Transmission Company (Transco)</td>
<td>The Grid Code refers to a Transco. In the MSB market, the NamPower Network Operator is designated as the “Transco”, responsible for network systems planning and development.</td>
</tr>
<tr>
<td>Unconstrained Schedule</td>
<td>A least-cost Day-ahead plan, prepared by the MSB, detailing the estimated production output for each Generator and Importer for every Trading Period without taking network and System Operator constraints into account.</td>
</tr>
<tr>
<td>Unsold Energy</td>
<td>Energy sold and delivered by the Seller but not consumed by the Buyer due to insufficient demand.</td>
</tr>
<tr>
<td>Use of System charges</td>
<td>The regulated Tariff charged for the use of the system, which excludes Connection Charges and which includes network, reliability, Losses and/or service and administration charges. These can be levied as Transmission Use of System (TUoS) charges or Distribution Use of System (DUoS) charges. UoS charges also often contain Levies and subsidies which may be embedded or unbundled.</td>
</tr>
<tr>
<td>Wheeled Energy</td>
<td>Has the meaning given to that term in section 10.5</td>
</tr>
<tr>
<td>Wheeling Charge</td>
<td>See Section 11.7.</td>
</tr>
<tr>
<td>Willing Buyer/ Willing Seller</td>
<td>Referring to the nature of a transaction - in this case between an Eligible Seller and a Contestable Customer - where the terms of the transaction are not regulated by the ECB, but negotiated between the two willing parties. In practice the ECB will assess any bilateral transactions, which may impact on the cost of electricity for end consumers.</td>
</tr>
</tbody>
</table>
## 4 Acronyms & Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>a:</td>
<td>Annum</td>
</tr>
<tr>
<td>ABOM:</td>
<td>Agreement Between Operating Members (Of The SAPP)</td>
</tr>
<tr>
<td>ACE:</td>
<td>Area Control Error</td>
</tr>
<tr>
<td>AGC:</td>
<td>Automatic Generation Control</td>
</tr>
<tr>
<td>AS:</td>
<td>Ancillary Services</td>
</tr>
<tr>
<td>BU:</td>
<td>Business Unit</td>
</tr>
<tr>
<td>D1:</td>
<td>Distributor 1</td>
</tr>
<tr>
<td>D2:</td>
<td>Distributor 2</td>
</tr>
<tr>
<td>DAM:</td>
<td>Day Ahead Market in SAPP</td>
</tr>
<tr>
<td>DLF:</td>
<td>Distribution Loss Factors</td>
</tr>
<tr>
<td>DUoS:</td>
<td>Distribution Use of System</td>
</tr>
<tr>
<td>Dx:</td>
<td>Distribution</td>
</tr>
<tr>
<td>ECB:</td>
<td>Electricity Control Board</td>
</tr>
<tr>
<td>ESI:</td>
<td>Electricity Supply Industry</td>
</tr>
<tr>
<td>G/ Gen:</td>
<td>Generator</td>
</tr>
<tr>
<td>GCAC:</td>
<td>Grid Code Advisory Committee</td>
</tr>
<tr>
<td>GRN:</td>
<td>Government of the Republic of Namibia</td>
</tr>
<tr>
<td>GWh:</td>
<td>Gigawatt Hour</td>
</tr>
<tr>
<td>Gx:</td>
<td>Generation</td>
</tr>
<tr>
<td>HR:</td>
<td>Human Resources</td>
</tr>
<tr>
<td>HV:</td>
<td>High Voltage</td>
</tr>
<tr>
<td>Hz:</td>
<td>Hertz</td>
</tr>
<tr>
<td>IPP:</td>
<td>Independent Power Producer</td>
</tr>
<tr>
<td>IPS:</td>
<td>Interconnected Power System</td>
</tr>
<tr>
<td>kV:</td>
<td>Kilovolt</td>
</tr>
<tr>
<td>kVA:</td>
<td>Kilo-volt-ampere</td>
</tr>
<tr>
<td>kW:</td>
<td>Kilowatt</td>
</tr>
<tr>
<td>kWh:</td>
<td>Kilowatt hour</td>
</tr>
<tr>
<td>LA:</td>
<td>Local Authority</td>
</tr>
<tr>
<td>LF:</td>
<td>Loss Factor</td>
</tr>
<tr>
<td>MO:</td>
<td>Market Operator</td>
</tr>
<tr>
<td>mo:</td>
<td>Month</td>
</tr>
<tr>
<td>MSB:</td>
<td>Modified Single Buyer</td>
</tr>
<tr>
<td>MW:</td>
<td>Megawatt</td>
</tr>
<tr>
<td>MWh:</td>
<td>Megawatt Hour</td>
</tr>
<tr>
<td>NAD:</td>
<td>Namibian Dollar</td>
</tr>
<tr>
<td>NEF:</td>
<td>National Electrification Fund</td>
</tr>
<tr>
<td>NIRP:</td>
<td>National Integrated Resource Plan</td>
</tr>
<tr>
<td>NO:</td>
<td>Network Operator</td>
</tr>
<tr>
<td>NP:</td>
<td>NamPower</td>
</tr>
<tr>
<td>PCC:</td>
<td>Point of Common Coupling</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Full Form</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------</td>
</tr>
<tr>
<td>PCLF</td>
<td>Plant Capability Loss Factor</td>
</tr>
<tr>
<td>POC</td>
<td>Point of Connection</td>
</tr>
<tr>
<td>POD</td>
<td>Point of Delivery</td>
</tr>
<tr>
<td>PPA</td>
<td>Power Purchase Agreement</td>
</tr>
<tr>
<td>PSA</td>
<td>Power Supply Agreement</td>
</tr>
<tr>
<td>PV</td>
<td>Photovoltaic</td>
</tr>
<tr>
<td>RC</td>
<td>Regional Council</td>
</tr>
<tr>
<td>RED</td>
<td>Regional Electricity Distributor</td>
</tr>
<tr>
<td>RSC</td>
<td>Reliability Service Charge</td>
</tr>
<tr>
<td>SAPP</td>
<td>Southern African Power Pool</td>
</tr>
<tr>
<td>SB</td>
<td>Single Buyer</td>
</tr>
<tr>
<td>SCADA</td>
<td>Supervisory Control and Data Acquisition</td>
</tr>
<tr>
<td>SO</td>
<td>System Operator</td>
</tr>
<tr>
<td>TBC</td>
<td>To Be Confirmed</td>
</tr>
<tr>
<td>TLF</td>
<td>Transmission Loss Factor</td>
</tr>
<tr>
<td>Transco</td>
<td>Transmission Company</td>
</tr>
<tr>
<td>TS</td>
<td>Transmission System</td>
</tr>
<tr>
<td>TUoS</td>
<td>Transmission Use of System</td>
</tr>
<tr>
<td>Tx</td>
<td>Transmission</td>
</tr>
<tr>
<td>UoS</td>
<td>Use of System</td>
</tr>
<tr>
<td>USD</td>
<td>United States Dollars</td>
</tr>
<tr>
<td>VAT</td>
<td>Value Added Tax</td>
</tr>
<tr>
<td>VRE</td>
<td>Variable Renewable Energy</td>
</tr>
</tbody>
</table>
5 CONCEPTUAL MARKET FRAMEWORK DESIGN

The Detailed Market Framework Design flows from the Conceptual Market Framework Design phase of the project, which identified the following key tasks:

1) Review and summarise work done to date

2) Review the current market model (Single Buyer Model) - including but not limited to the identification of the following:
   a) challenges, risks, opportunities, drivers and restraints
   b) barriers to entry
   c) changes in technology and technical requirements
   d) planning processes
   e) economic implications and funding needs (including the role of government guarantees)
   f) legislative and regulatory arrangements
   g) Tariffs and Tariff setting mechanism
   h) industry sustainability targets

3) Compare different market models in the region, and internationally highlighting advantages and disadvantages, and international best practice

4) Incorporate key stakeholders’ views on Market Structure, based on interaction during the Inception Workstream

5.1 Stakeholder Engagement

Namibia benefits from a well-capacitated and resourced independent regulatory body – the Electricity Control Board or ECB - which is able to effectively manage the development of the sector, with the Ministry of Mines and Energy, NamPower (state utility) and the Distribution licensees.

The ECB has ensured that the development of regulation (including this Market Framework) is accompanied by effective and on-going stakeholder engagement. The Market Framework can therefore be described as resulting from the ECB’s direction, but with material input from other government stakeholders, the utility NamPower, Regional Electricity Distributors (REDs), Local Authorities, Regional Councils, consumers, IPPs and project developers.

5.2 Single Buyer Model Challenges

The Consultants were provided with a comprehensive set of industry documents to perform a review of previous work undertaken on the structure and design of the Namibian Electricity Market. The Consultants’ main comments and observations from the review were included in
the “170505 Market Structure Overview Report”. The report was also presented to industry stakeholders during May 2017. Some of main points from this review are included below for easy reference.

The most relevant documents that formed parts of the Consultants review included:

1) Vision 2030, 2004
2) National Development Plan 4, 2012
3) Harambee Prosperity Plan, 2016
4) Namibia Energy Policy, 2016 (Draft)
5) Renewable Energy Policy, 2016 (Draft)
6) IPP Investment Market Framework and Policy, 2016 (Draft)
7) MSB model in the context of NamPower Strategic Direction_04 July 2016
8) 130830 ESI Conceptual Mkt Structure
9) NP Review of Power Market Development in Namibia v3
10) 081202_ECB_SB-Report (Final Draft)

In reviewing and summarising the previous work done on the Namibian electricity market, it became clear that a number of challenges with the existing Single Buyer model existed, namely:

1) Persistently high electricity Tariffs,
2) Shortage of investment in new infrastructure and development of local resources by both the public and private sector resulting in an over reliance on imported power,
3) Some electricity import arrangements are considered expensive resulting in upward pressure on electricity prices,
4) Slow decision-making by public sector stakeholders,
5) Perpetuating the monopoly structure in the industry through the exclusive nature of the SB market model which prevented customers and IPPs from entering into sales agreements to take advantage of falling solar PV and wind prices,
6) An inherent conflict of interest between the utility’s role as a Generator and sole off-taker from IPPs,
7) The SB market model arrangement created a perception that the GRN will provide financial and other forms of support for entities wanting to sell to the SB,

1 Please note this is not a list of all the documents provided to the Consultants
8) Large Distributors are purchasing electricity from IPPs but without a proper framework.

9) The lack of clear guidance for bilateral agreements and the need for a phased approach to competition.

For further information and discussion on the benefits and challenges of the Single Buyer model in Namibia, please see the National Independent Power Producer Policy of Namibia (2017), Executive Summary on page 12.

5.3 Policy Drivers

Furthermore, a review of the guiding policy including the Harambee Prosperity Plan, the Energy Policy, the IPP Policy, the Renewable Energy Policy and the National Development Plan amongst others, all identify the need to support IPPs and consider modifications to the Single Buyer model in Namibia. In fact, the Harambee Prosperity Plan states “... the Ministry of Mines and Energy will before the end of December 2016 conclude the process of finalizing the review of the Single Buyer model that will translate in secure and affordable electricity supply in Namibia”

5.4 Benefits & Concerns

Redesigning the market model can provide benefits to stakeholders, but at the same time raises some valid concerns. These include queries regarding ensuring the security of supply and who will take on the responsibility of the Supplier of Last Resort. The new market structure will require a clear outline of the roles and responsibilities for all participants. Licensees are also naturally concerned about the sustainability of the industry and their long-term financial viability. Consumers wish to ensure that Tariffs remain affordable and that changes to the market structure benefit all customers. Finally, any change to the market will carry some risk and the implementation strategy needs to address these and provide mitigations.

5.5 Market Design Principles

The market design has incorporated the following five design principles:

1) **Fairness**: All participants should be treated fairly i.e. all market participants, including IPPs, must be allowed to operate on a level playing field and transact under the same clear and transparent Market Rules.

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2 Harambee Prosperity Plan 2016/17 – 2019/20; page 49

3 The market design acknowledges that an intended outcome of the proposed market design are affordable long-term tariffs, however this is not a design principle. It should also be noted that the design is neutral on the issue of electricity access which is dealt with in Namibia’s Electrification Policy
2) **Efficiency:** Regulated Tariffs must reflect the cost of supply and prices must be set through effective competition and choice. Processes must be transparent and fit for purpose (e.g. minimise need for data, quick decision making). Contain and manage risks.

3) **Simplicity:** Given the size of the Namibian market it is important that the market design and Market Rules are clear and easy to understand.

4) **Ease of Implementation:** The market design and rules should not impose undue cost and time burden in market participants.

5) **Low cost of market operation:** The proposed market design should not impose excessive or unreasonable costs on market participants. The benefits must outweigh the costs.

Overall, the design has had to balance market efficiency and market complexity. This has led to adopting a phased approach which starts with simple changes and allows the market to evolve to something more complex over time.

### 5.6 Proposed Market Framework

Based on numerous recommendations from: (1) previous studies, reports and benchmarks; (2) stakeholder engagements; (3) international benchmarking as well as (4) the Consultant’s own experience and expertise, the proposed Market Framework is not a radical shift away from the Single Buyer Model currently in place. Rather, it is a *Modified Single Buyer* (MSB) Model.

The main features of the proposed MSB are:

1) Enable the partial opening of the electricity market in Namibia by allowing IPPs to sell electricity to Contestable Customers via bilateral transactions (facilitate Willing Buyer/Willing Seller transactions).

2) Market will be increasingly opened to promote competition and choice in a phased and structured way to manage exposure to potential market risks.

3) Allow Eligible Generators to self-Dispatch.

4) Unbundling of existing Tariffs and the development of new products and services to facilitate bilateral transactions and wheeling of energy and to position the industry to take advantages of changing technologies. These include services and charges for: reliability balancing and Energy Banking services.

5) Allow licensed Traders to facilitate transactions between Eligible Sellers and Contestable Customers

6) Allow license holders to export and import power.

7) Allow NamPower to build new generation and transmission facilities.
8) Allow NamPower to procure power from IPPs.

9) Position NamPower to act as the Supplier of Last Resort.

10) No unbundling or privatisation of existing utilities

The detailed key characteristics of the MSB are described in the following sections.
6 TRADING ARRANGEMENTS & MARKET PHASES

6.1 Objective / Purpose

The objective of this section is to describe the trading arrangements that are allowed under the MSB i.e. who can sell to whom. This section will also propose a phased approach to implement the new trading arrangements between Buyers and Sellers. The phased approach allows stakeholders to manage the pace for increasing competition and choice in the sector, as well as managing implementation risks. The different phases are summarised below:

1) SB: Existing Trading Arrangements
2) MSB:
   a) Phase 1 (a/b): Allow bilateral trading between Eligible Sellers and Contestable Customers, Exporting and Traders
   b) Phase 2: Allow Importers to sell to Contestable Customers

6.2 Existing Single Buyer (SB) Trading Arrangements

Under the SB model (see figure below) only NamPower was allowed to buy power from Generators – with a few exceptions. These include:

1) some Embedded Generators connected to distribution licensees,
2) self or Captive Generation,
3) off-grid mini-grids.

Figure 1: Single Buyer Model Trading Arrangements
6.3 Phase 1a

Table 4: Phase 1a key data

<table>
<thead>
<tr>
<th>Date</th>
<th>Sep 2019 – June 2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contestability</td>
<td>NamPower Transmission connected customers⁴</td>
</tr>
<tr>
<td>Contestable Purchases</td>
<td>30% of total energy purchases</td>
</tr>
<tr>
<td>Eligible Sellers</td>
<td>Licensed IPPs, Exporters⁵</td>
</tr>
</tbody>
</table>

6.3.1 Bilateral Wheeling

The Namibian electricity market has already evolved to offer greater competition and opportunities for choice (at the generation level), via the introduction of IPPs, captive power generation and net-metering. Over time, efficient competitive markets are believed to produce the most efficient outcomes i.e. by offering supply choice, providing lower costs to customers and by re-allocating the risk of investment back to the investor (and away from the consumer).

The single most fundamental change in the MSB trading arrangements, is to allow bilateral transactions from Eligible Sellers to Contestable Customers⁶. The fact that IPPs can sell directly to customers, coupled with the ability to self-Dispatch, effectively addresses some of the main concerns with the SB market model i.e. that the utility has a monopoly hold over new generation capacity and sales to customers, as well as that the utility has a conflict of interest when acting as both a Generator and sole off-taker of power.

The MSB model gives Generators and Customers the opportunity to ‘by-pass’ the SB by transacting directly which means that there is no immediate pressure to move the MSB out of NamPower. It is proposed that the MSB will therefore remain a ringfenced entity within NamPower and also assumes the role of market operator, balancing agent and Supplier of Last Resort. The organisational structure of the MSB is discussed in more detail in section 9.2.

Eligible Sellers will be allowed to sell power to multiple Contestable Customers on a “Willing Buyer/ Willing Seller” basis. The volume of contestable purchases in Phase 1a is set at 30% of total customer purchases.

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⁴ Distribution customers (1MVA and above) may be allowed to engage in bilateral transactions with Eligible Sellers subject to Regulatory Approval and the Distributor having unbundled its tariffs, updated their invoicing systems and implemented an approved Wheeling Charge.

⁵ Traders may be allowed to participate subject to Regulatory Approval – they must demonstrate added value for transactions e.g. by increasing bankability.

⁶ Contestable Customers and Eligible Sellers are discussed further in Section 6.
It is worth noting that new IPPs may still sell to the Modified Single Buyer (MSB) via solicited or unsolicited processes (regulated by ECB).

See the figure below.

**Figure 2: MSB Phase 1a Trading Arrangements**

Therefore, by allowing bilateral trading in the MSB, consumers are being given the option to purchase electricity from a potentially more competitive supplier. This will support affordability by increasing competition and innovation and will also encourage the development of local power generation in Namibia. The arrangement will also reduce the need for NamPower and GRN to provide guarantees and other forms of support to private sector projects.

### 6.3.2 Exports

In Phase 1a it is also recommended that the trading arrangements are extended to allow for electricity exports (see figure above). As exports do not directly impact on Namibian consumers, the majority of issues to be addressed pertain to technical rather than financial impacts on existing licensees. Traditionally, Namibia has been seen as an Importer of power, however due to a number of factors - including excellent renewable energy resources, a stable economy and a favourable political environment - IPPs have expressed real interest in developing renewable energy plant for export to customers in the region. Namibia can view this as an opportunity to expand the economy and to stimulate investment and jobs. Another benefit of allowing exports is that
developers will be able to design bigger projects, resulting in lower cost due to economies of scale.

Eligible Exporters are considered as Contestable Customers at the border. This is to ensure that Exporters contribute appropriately to network charges, Ancillary Services, Losses and Levies.

### 6.3.3 Trading

Traders are only planned for introduction during Phase 1b, however the Regulator may allow Traders to participate in Phase 1a, subject to approval and based on their ability to specifically enhance transactions in the MSB. This may be in the form or increased bankability or risk management, for example.

### 6.3.4 Imports

NamPower will remain the single Importer in Phase 1a.

### 6.4 Phase 1b

#### Table 5: Phase 1b key data

<table>
<thead>
<tr>
<th>Date</th>
<th>July 2021 – June 2026</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contestability</td>
<td>NamPower Transmission connected customers</td>
</tr>
<tr>
<td></td>
<td>Distribution Connected customers of 1MVA and above</td>
</tr>
<tr>
<td></td>
<td>Distribution Connected customers below 1MVA as determined by the Regulator</td>
</tr>
<tr>
<td>Contestable Purchases</td>
<td>30% of total energy purchases</td>
</tr>
<tr>
<td></td>
<td>The Regulator may decide, after consultation, to increase the percentage of contestable purchases</td>
</tr>
<tr>
<td>Eligible Sellers</td>
<td>Licensed IPPs, Exporters, Traders</td>
</tr>
</tbody>
</table>

#### 6.4.1 Bilateral Wheeling

It is possible that there will be a remaining volume of Contestable Purchases, not taken up during Phase 1a. This provides the ECB with the opportunity to:

1) further increase the allowed volume of Contestable Purchases for each customer e.g. to 50%, 60%...100%, until the remaining volume has been utilised

2) change the criteria for Contestable Customers to include more Distribution customers

The ECB can use either option or a combination of both, depending on the total remaining volume of contestable purchases and demand from customers. In either instance, the total
The volume of Contestable Purchases is limited by a national cap, which is currently set at 30% of total national purchases, in order to ensure the financial viability of existing licensees and to prevent stranded assets. The ECB may, subject to consultation, also revise the national cap. There are no changes for Eligible Sellers.

Figure 3: MSB Phase 1b Trading Arrangements

Note: It is recognised that Distribution Licensees may require further time in order to adequately prepare for the introduction of Distribution connected Customers of 1MVA and above. Distribution Licensees will therefore be given until June 2021 at the latest, in order to prepare for the introduction of Contestable 1MVA connected Distribution Customers. However, Licensees that are prepared for this during Phase 1a, may apply for regulatory approval to allow for the earlier introduction of Contestable Distribution Customers. The Regulator will conduct an assessment to ensure that the following tasks have been completed:

- sufficient tariff unbundling,
- accounting system and invoicing updates,
- the introduction of an approved Wheeling Charge.

### 6.4.2 Exports

There are no changes for Exporters.
6.4.3 Trading

Traders (including brokers and aggregators) can play an important role in the market by facilitating transactions between Sellers and Buyers. In Phase 1b, Traders could conceivably therefore become Eligible Sellers and sell to: (i) the MSB, (ii) Contestable Customers or (iii) Exporters. Traders can also be considered as a Contestable Customer and could buy from: (i) the MSB, (ii) other Eligible Sellers (Generators) or (iii) Importers. See figure above.

There are several benefits that Traders can offer, including:

1) Acting as a bankable off-taker, thereby reducing the risk to lenders and investors in generation projects.
2) Aggregate the consumption of several Contestable Customers to achieve economies of scale when buying from Eligible Sellers.
3) Reduce the complexity of negotiating agreements for both Sellers or Buyers.
4) Develop customised products and services.

6.4.4 Imports

NamPower will remain the single Importer in Phase 1b.

6.5 Phase 2

Table 6: Phase 2 Key data

<table>
<thead>
<tr>
<th>Date</th>
<th>July 2026 – on-going</th>
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</thead>
<tbody>
<tr>
<td>Contestability</td>
<td></td>
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<tr>
<td></td>
<td>• NamPower Transmission connected customers</td>
</tr>
<tr>
<td></td>
<td>• Distribution Connected customers of 1MVA and above</td>
</tr>
<tr>
<td></td>
<td>• Further Distribution customers as determined by ECB</td>
</tr>
<tr>
<td>Contestable Purchases</td>
<td>As determined by Regulator</td>
</tr>
<tr>
<td>Eligible Sellers</td>
<td>Licensed IPPs, Exporters, Traders, Importers</td>
</tr>
</tbody>
</table>

6.5.1 Bilateral Wheeling

Total volumes for Contestable Purchases, the criteria for Contestable Customers as well as the national cap will continue to be adjusted by ECB in order to allow for the expansion of the MSB.

No changes to criteria for Eligible Sellers that wish to wheel bilaterally within Namibia.

6.5.2 Exports

No changes for Exporters.
6.5.3 Trading
No changes for Traders.

6.5.4 Imports
Whereas Phase 1 is concerned with supporting the development of new supply options within Namibia, Phase 2 allows for imports, into Namibia. The arrangements for Phase 2 are shown in figure below.

Figure 4: MSB Phase 2 Trading Arrangements

Allowing imports can be considered a further extension of the supply options available to consumers, supporting even greater levels of competition and choice. An import transaction will be viewed as a bilateral transaction between an ‘Eligible Seller at the border’ and the Contestable Customer. This transaction will attract the same charges as for any other domestic bilateral transaction.

It should be noted that a key criterion for the introduction of Importers is that Namibia has met a target of ~80% or higher self-sufficiency e.g. at least 80% of energy (GWh) supply in Namibia should be from local sources.
7 CRITERIA FOR CONTESTABLE CUSTOMERS AND ELIGIBLE SELLERS

7.1 Objective / Purpose

The section describes the criteria for defining a Contestable Customer and an Eligible Seller. It also sets out the Contestable Purchase limit which is the maximum quantity of electricity that a Contestable Customer is allowed to purchase from an Eligible Seller. The specific criteria for contestability, eligibility and quantity are defined below.

7.2 Contestable Customer Criteria

7.2.1 Contestable Customers

A Contestable Customer is permitted to purchase power directly from an Eligible Seller(s). A Contestable Customer is any one of the following:

1) A Contestable End Consumer - which means an End Consumer connected to, and that purchases electricity at a Contestable Supply Point
2) A Contestable Distributor means a Distributor connected to, and that purchases electricity at a Contestable Supply Point
3) An Exporter
4) A Trader

In addition, the MSB is allowed to purchase electrical energy and services (including the banking of energy) from any Eligible Seller subject to the MSB Market Rules.

7.2.2 Contestable Supply Points

A Contestable Customer may connect via several Supply Points to the network, each with varying voltage levels and capacities. Therefore, customers’ contestability will be measured at each Supply Point. The criteria of a Contestable Supply Point vary between the different MSB market phases in order to provide more customers with the ability to buy electricity from an alternative supplier in structured manner.

1) **Phase 1a:** The criterion of a Contestable Supply Point during this phase is:
   a) All transmission connected Supply Points.
2) **Phase 1b:** The criteria during this phase are as follow:
   a) All transmission connected Supply Points and,
   b) Any distribution connected Supply Point with a monthly measured peak demand of 1MVA or greater in any of the twelve consecutive months preceding the date of application to register a Contestable Supply Point.
   c) The Regulator may decide to lower the criteria to include distribution connected customers with a lower installed capacity (e.g. ≥750kVA). This will increase
competition and choice in the industry. However, the Regulator shall first conduct an assessment to determine the impact and readiness of the industry before lowering the criteria.

3) **Phase 2**: Same as for phase 1b.

**Supplementary Notes:**

1) All Contestable Supply Points must be approved by the Regulator and registered with the MSB before bilateral trade can be allowed at that Supply Point.

2) For the sake of clarity, once a Supply Point has been approved as a Contestable Supply Point it will remain so even if it no longer meets the criteria for a Contestable Supply Point.

3) A Contestable End-Consumer or a Contestable Distributor may apply for contestability at a Supply Point at any time (e.g. following a change in the monthly measured peak demand at that Point).

### 7.2.3 Contestable Quantity

Contestable Quantity refers to the maximum quantity of electricity a Contestable End Consumer or Contestable Distributor is allowed to purchase from an Eligible Seller. The definition of Contestable Quantity varies between Contestable Customers as well as between the MSB market structure phases as set out below:

1) **Phase 1a:**
   a) **Contestable End-Consumer**: 30% of the Contestable End-Consumer’s total annual energy purchases, in kWh, at every Contestable Supply Point measured over the twelve consecutive months preceding the date of application to register the Contestable Quantity,
   
   b) **Contestable Distributor**: 30% of the Distributor’s total annual energy purchases in kWh - excluding 30% of total annual energy purchases of End Customers with an installed capacity of ≥ 1MVA - at every Contestable Supply Point measured over the twelve consecutive months preceding the date of application to register the Contestable Quantity.
   
   c) **Exporter**: A Contestable Quantity limit will not apply to electricity exports. Certain technical limits may apply due network capacity and system operational requirements.
   
   d) **Trader**: A Contestable Quantity limit will not apply to the trading of electricity. The trading quantities are indirectly limited by the Contestable Quantity limits that apply to Contestable End-Consumers and Contestable Distributors.

2) **Phase 1b**:
   a) The Regulator shall determine the criteria to apply during Phase 1b of the MSB.
b) The determination will take into account the experiences gained and lessons learned during Phases 1a. The determination will also take into account any “unused” Contestable Quantity which may result in an upward revision (above 30%) of the percentage of contestable electricity at all Contestable Supply Points. However, the revised limit will only come into effect following a successful application and approval by the Contestable Customer.

3) **Phase 2:**

   a) Same as for Phase 1b.

**Supplementary Notes:**

1) For the sake of clarity, a Contestable End-Consumer’s or a Contestable Distributor’s registered Contestable Quantity may not be reduced.

2) A Contestable End-Consumer or a Contestable Distributor may apply for an upward revision of the Contestable Quantity following an increase in the annual energy purchases or a change in the criteria.

3) In reviewing an application for Contestable Quantity, the Regulator shall take the national contestability limit into consideration. The national cap during Phase 1 is 30% of total annual purchases in Namibia. The limit may be revised upwards during Phases 2.

**Notes on Aggregation:**

The aggregation or combining of production from several sources or purchases by several customers can serve as an important mechanism to achieve economies of scale or as a risk mitigation strategy which can assist in reaching bankability for some projects. The following shall apply in respect of aggregation in the MSB.

1) Contestability is measured at Supply Point level. This means End Customers and Distributors are not allowed to aggregate their consumption from different Supply Points in order to reach the Contestable Supply Point criteria.

2) However, Contestable Customers and Distributors are allowed to aggregate their Contestable Quantities over all approved Contestable Supply Points to determine their respective maximum Contestable Quantities.

3) Contestable Customers and Distributors are allowed to aggregate electricity purchases from an Eligible Seller at any of their Contestable Supply Points up to their respective maximum Contestable Quantities.
7.3 Eligible Seller Criteria

7.3.1 Potential Eligible Sellers

An Eligible Seller is permitted to sell power to a Contestable Customer and refers to any one of the following:

1) An Eligible Generator,
2) An Eligible Importer,
3) An Eligible Trader.

Additionally, the MSB is allowed to sell electrical energy and services to a Contestable Customer subject to any agreements between them and the MSB Market Rules.

7.3.2 Eligible Seller Criteria

All licensed Importers and Traders will be considered Eligible Sellers. In addition, the following criteria shall apply in determining whether a Generator can be considered an Eligible Generators:

1) The Generator must be grid connected,
2) The Generator’s installed generation capacity must be in excess of 500kVA,
3) The Generator must hold a valid license from the Regulator with a specific provision which will allow it to sell to a Contestable Customer.

In addition, to the above criteria, all Eligible Sellers that wish to sell electricity to Contestable Customers shall obtain the necessary approvals as set out in section 18.3.
# Summary of New Trading Arrangements & Criteria

<table>
<thead>
<tr>
<th>Phases</th>
<th>1a (1st Sep 2019 – June 2021)</th>
<th>1b (July 2021 – June 2026)</th>
<th>2 (July 2026)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contestable Purchases - National Cap</td>
<td>● 30% of total national purchases</td>
<td>● 30% of total national purchases</td>
<td>● As determined by Regulator</td>
</tr>
</tbody>
</table>
| Contestable Purchases – Customer Supply Point Cap | ● 30% of total customer purchase  
• For Distributors this volume is reduced by 30% of the purchases by ≥1MVA connected customers\(^7\) | ● As determined by Regulator | ● As determined by Regulator |
| Contestable Customers | ● Tx Connected | ● Tx connected  
• Dx connected (≥1MVA)  
• Dx connected (<1MVA) as determined by Regulator | ● Tx connected  
• Dx connected (≥1MVA)  
• Dx connected (<1MVA) as determined by Regulator |
| IPPs | ● Licensed  
• Tx or Dx connected  
• Capacity ltd by sales to Contestable Customers | ● Licensed  
• Tx or Dx connected  
• Capacity ltd by sales to Contestable Customers | ● Licensed  
• Tx or Dx connected  
• Capacity ltd by sales to Contestable Customers |
| Exporters | ● Licensed  
• No size limit | ● Licensed  
• No size limit | ● Licensed  
• No size limit |
| Traders | ● On application and approval by Regulator; Licensed\(^8\)  
• No trading volume limit | ● Licensed  
• No trading volume limit | ● Licensed  
• No trading volume limit |
| Importers | ● Not allowed | ● Not allowed | ● Licensed  
• Capacity ltd by sales to Contestable Customers |

\(^7\) This is to make provision for the introduction of the ≥1MVA connected Distribution Customers that will become Contestable in Phase 1b (July 2021)

\(^8\) ECB will assess License applications for Traders including whether the Trader will enhance project bankability and risk management of MSB transactions. Applicants must demonstrate value.
9 **Roles and Responsibilities of the MSB**

9.1 **Objective / Purpose**

The objective of this section is to describe the roles and responsibilities of the Modified Single Buyer within the market.

9.2 **Structure**

It is envisaged that the MSB will be a ringfenced function within NamPower with separate financial statements. It is further anticipated that the MSB will hold licenses for: Market Operation, Imports and Export. It will carry out the following key functions:

1) Market Operations
2) Planning & Procurement
3) SAPP Trading
4) System Operations support

An embedded systems operations function will be seconded into the MSB to streamline decision-making and facilitate information exchange.

*Figure 5: High-level overview of NamPower Organisational Structure with ringfenced MSB*

9.3 **Market Operations (MO)**

1) Develop an energy trading platform to enable Eligible Sellers to submit their Production and Trading Schedules for the following day.

2) Develop processes to manage the efficient and appropriate execution and administration of agreements concluded with Sellers and Buyers of electricity.

3) Provide accurate data to the Regulator on request.
4) Keep up to date records of each approved Contestable Supply Point including: i) location, ii) kVA, iii) kWh/annum and iv) customer details.

5) Perform meter reconciliation activities for both suppliers and customers.

6) Develop risk management policies and associated implementation procedures to ensure that risks associated with the purchase and sale of energy, capacity or other products are addressed.

7) Develop dispute resolution processes to resolve billing and other market-related disputes in a timely and predictable way as set out in agreements with offtakers and IPPs.

8) Verify supplier invoices from IPPs selling to the MSB.

9) Keep records of all relevant metering and other invoicing data for auditing and reporting purposes.

10) Maintain a complete and accurate set of accounts for all the power system transactions.

11) Hand over post-Dispatch information to SO.

12) Produce and disseminate market information in accordance with agreed procedures.

13) Conduct market surveillance.

14) Develop accounting procedures to reconcile the energy accounts and the monetary accounts related to market operations.

15) Calculate Settlement Amounts.

16) Invoice and control payments from Buyers and monitor payments made to suppliers by NamPower Treasury.

17) Administer prudential (deposit) requirements.

18) Forecast SAPP market prices.

19) Create PSA amendments to facilitate bilateral transactions for Contestable Customers.

9.4 Planning & Procurement

1) Support the negotiation and conclusion of transaction agreements necessary for the procurement of electricity from Generators within Namibia and for electricity imports.

2) Administer said agreements.

3) Act as the Buyer/ off-taker of electricity from Generators/power suppliers.

4) Procure sufficient Ancillary Services to meet the requirements specified by the System Operator in case of insufficient own resources.

5) Budgeting for MO transactions.
6) Develop risk management policies and associated implementation procedures to ensure that risks associated with the purchase and sale of energy, capacity or other products are addressed.

7) Perform long term generation planning in cooperation with SO.

8) Enter into power sales agreements with off-take customers, including exports, Contestable Customers and Traders.

9) Develop a demand forecast in each Trading Period for the day ahead.

10) Develop an Unconstrained Dispatch Schedule based on hourly demand and supply information.

11) Develop and publish a Constrained Dispatch Schedule for the day ahead, using constraint information from the SO.

**9.5 Imports and Exports**

1) Develop standardised electricity procurement and trading policies and procedures.

2) Agree trading mandate – volumes, price, timeframe, levels of authorisation.

3) Perform Trading Activities:
   a) Annual bilaterals,
   b) Monthly bilaterals and SAPP market trading,
   c) Day ahead SAPP trading,
   d) Intraday SAPP trading.

**9.6 The System Operations (SO)**

It is proposed that the System Operations function remain separate from the new MSB unit – systems operations personnel will be seconded into the MSB in order to ensure efficient operations and information exchange, as appropriate - in electricity markets, the Systems and Market Operators generally work closely and share responsibilities for a number of critical ongoing operational issues. The key responsibilities and functions of SO are: Dispatch, Coordination & Networks.

**9.6.1 Dispatch**

1) Implement real time Dispatch of available centrally Dispatch generation in accordance with real time needs.

2) Identify and communicate day ahead operating constraints to MO.

3) Define type and need for different Ancillary Services (AS).

4) If needed, request MO to procure AS.
5) Call on AS, as and when needed including controlling of the integrated power system voltages and system frequency within safe and sustainable limits.

6) In future, when Namibia becomes a separate Control Area then:
   a) Balance the system in real time,
   b) Ensure adequate operating reserves in accordance with applicable codes or rules,
   c) Perform Intra-hour Trading.

9.6.2 Co-ordination

1) Perform various planning activities in short, medium and long-term: outage management, Ancillary Services (incl. reserves) and network flows.

2) Receive pre-Dispatch information from MO.

3) Hand over relevant post-Dispatch data to MO.

4) Operate the power system in a safe, secure, efficient and sustainable way.

5) Be responsible for managing and mitigating imbalance Energy Flow (in future).

6) Serve as the operating interface to the operators of other regional transmission power systems for planning and the real-time operation of combined electrical systems.

7) Coordination with Control Area Providers especially in case of bilateral sales crossing Control Areas.

8) Develop and maintain a Grid Code.

9) Ensure and enforce compliance with Grid Code.

10) Manage exemptions to the Grid Code.

11) Ensure compliance with SAPP ABOM.

9.6.3 Networks

1) Determine network constraint requirements and communicate to transmission, generation and MO (MO to adjust unconstrained planning and Dispatch accordingly).

2) Perform line switching and line outage management as well as customer communications.

3) Optimise real and reactive power flows and voltage levels to reduce Losses whilst maintaining system security.

4) Support Connection and Operating Agreements between Network Operator and IPPs.

5) In co-operation with the Network Operator: ensure specification, configuration, calibration and monitoring of metering equipment.
6) Manage storage of - and access control to - metering data (e.g. allow MO to access account meters).

7) Record all instructions to and from Control Area Managers, producers and consumers.

8) Maintain and operate the National Control Centre as well as local/regional SCADA systems.
10 **Market Operations**

10.1 **Objective and Context**

The section describes the market operations of the MSB in more detail with a specific focus on: pre-Dispatch, Dispatch and post-Dispatch arrangements, pertaining to bilateral trading between Eligible Sellers and Contestable Customers.

10.2 **Trading Products and Markets**

A review of international competitive electricity markets shows that there are numerous products which could potentially be traded in an electricity market. These products could be grouped into four service areas namely: i) energy services, ii) capacity services, iii) Ancillary Services and iv) financial services. Below is a brief outline of the various areas and products.

1) **Energy (kWh) products are often differentiated by their time-horizons, for example:**
   a) Real time / Balancing Market
   b) Intra-Day Market (e.g. up to 1 hour before Dispatch)
   c) Spot Market (Day Ahead Market)
   d) Week-Ahead Market
   e) Month-Ahead Market
   f) Bilateral agreements between Sellers and Buyers

2) **Capacity (kW) via**
   a) Capacity market
   b) Bilateral agreements (between Sellers and Buyer)

3) **Ancillary services**
   a) Markets for reserves, voltage control, frequency control, storage, etc.
   b) Bilateral agreements (between Sellers and MSB/SO)

4) **Financial services**
   a) Futures, Options, Forwards
   b) Contracts for Differences

However, in keeping with the MSB market design principles, the following products and markets shall be available from the commencement of the market:

1) **Energy (kWh):**
   a) Balancing Market/Mechanism
b) Bilateral agreements between Eligible Sellers and Contestable Buyers

2) Capacity (kW):
   a) Eligible Sellers and Contestable Buyers will be allowed to trade capacity via their bilateral trade agreements.

3) Ancillary Services
   a) MSB will be allowed to enter into agreements to purchase Ancillary Services from licensed Sellers.

It is anticipated that more products and services will be added to the MSB over time.

**10.3 MSB Trading Process**

The main features of the MSB trading process are listed below:

1) The MSB shall inform all Eligible Sellers of planned network outages that may result in Network Congestion and impact on bilateral transactions.

2) Eligible Generators and Importers shall inform the MSB of their intention to produce or deliver electricity by submitting binding Day-ahead Production Schedules to the MSB in accordance with the MSB’s rules. Each Production Schedule shall indicate:
   a) The quantity of power (in kWh/h) to be produced or delivered in each Trading Period.
   b) The Nominated Percentage (%) of power to be allocated to each Contestable Supply Point in every Trading Period for the next Day.

3) Traders shall inform the MSB of their intention to trade electricity by submitting Day-ahead Trading Schedules to the MSB in accordance with the MSB’s rules. Each Trading Schedule shall indicate:
   a) The Nominated Percentage (%) of power to be allocated to each Contestable Supply Point from every Production Unit in every Trading Period for the next Day.

4) The MSB shall publish a day-ahead Constrained Schedule. Any differences between the submitted Production or Trading Schedules and the published Dispatch Schedule shall be dealt with in accordance with the rules for Network Congestion. See section 11.11 for more detail.

5) Eligible Generators shall self-Dispatch their plant in accordance with the MSB’s Constrained Schedule.

---

9 With the option for these to be facilitated by 3rd Party Traders
6) The MSB will collect all the relevant reconciliation data including metered values and Dispatch instructions to determine the utilisation of Balancing Services.

7) The MSB shall prepare and submit monthly invoices to the relevant parties for the use of balancing and other MSB services.

From the above description it is noted that the MSB will be a ‘one-sided market’ meaning only Eligible Sellers will be required to interact with the MSB and submit data to facilitate trade. In other words, there is no need for Contestable Customers to exchange information with the MSB.

10.4 Balancing Mechanism

10.4.1 Purpose

The purpose of the Balancing Mechanism is to facilitate physical bilateral trade by providing Balancing Services to the Sellers and the Buyers.

10.4.2 Pre-Dispatch

An Eligible Seller shall undertake the following actions before Dispatch:

1) Enter into a bilateral power sales agreement with a Contestable Customer subject to regulatory approval.

2) Meet all the requirements of the MSB including:

   a) Registration of Production Units, Contestable Supply Points and Contestable Quantities,

   b) Submission of data,

   c) Maintaining of financial guarantees.

3) Submit data, in accordance with Grid Code requirements, to the MSB including:

   a) Energy production and maintenance plans,

   b) Day-ahead Production and Trading Schedules indicating how much power will be produced in every hour of the day,

4) Specify the Nominated Percentage sales from each Production Unit / Trader to each Eligible Supply Point and Trader. A nomination can also be made to indicate the

---

10 Most market design specialist agree that a two-sided market (where load customers also participate directly in the market) produce better outcomes. It is foreseen that the market in Namibia will continue to evolve over time and that it will eventually incorporate the participation of load customers through dynamic market mechanisms.

11 Reference is made to a Balancing Mechanism rather than a Balancing Market. In a Balancing Market competitive supply offers and demand bids are called on to balance the system and set balancing prices, however during Phase 1 of the MSB balancing prices will be determined with reference to NamPower’s approved energy charge to large customers. It is anticipated that the MSB may adopt SAPP’s balancing market and prices once it is operational.
amount of power to be stored by the MSB. Note, the Nominated Percentage to be sold to Contestable Supply Points must add to a hundred percent per Production Unit.

5) Notify the MSB as soon as there is a change in the plant’s ability to meet the Constrained Dispatch Schedule.

The MSB shall undertake the following actions before plant Dispatch:

1) Ensure that all Eligible Sellers that intend to sell or trade power to Contestable Customers for the next Day have:
   a) Submitted all the data as required,
   b) Posted and maintained the required financial security amount,

2) Develop a Day-ahead demand forecast for each Trading Period.

3) Publish a Day-ahead Constrained Schedule.

4) In developing the least-cost Constrained Schedule the MSB shall take into account:
   a) Day-ahead Production Schedules submitted by Eligible Sellers,
   b) Network availability and congestion,
   c) Technical parameters and characteristics of centrally dispatched generating units and import options,
   d) Variable cost of centrally dispatched units.

10.4.3 Dispatch

The following activities are foreseen during Dispatch:

1) Eligible Sellers shall Dispatch their plant in accordance with the Constrained Schedule published by the MSB.

2) The MSB shall adjust the output from centrally dispatched units to ensure that demand and supply is balanced during all times.

3) The MSB may, under certain Emergency Conditions, instruct the Eligible Generators to increase or decrease output or to disconnect from the grid.

4) The MSB shall balance the total integrated system in real time taking into account the actual production, consumption, import and export of electricity.

10.4.4 Post-Dispatch

The following activities are foreseen Post-Dispatch:

1) Every day, the MSB shall collect and record the actual production or delivery of all Generators and Importers for each Trading Period.
2) Once a month, the MSB shall perform settlement functions including meter reconciliation and calculation of invoices for all customers including Eligible Sellers and Contestable Customers in accordance with the agreed Market Rules.

3) Disseminate relevant data to the Distributors in order for them to reconcile and settle Contestable Customers and Eligible Sellers that are connected to the Distributor’s network.

4) Review, and if needed, update MSB Financial Security requirements.

5) The MSB shall compare the Delivered Energy from every Eligible Generator against the Adjusted Constrained Schedule, adjusted for valid Dispatch Instructions.

6) Any deviations between the actual energy produced and the Adjusted Constrained Schedule shall be assessed in accordance with the Balancing Mechanism as set out below.

7) The MSB shall determine the Balancing Energy quantity utilised by every Eligible Generator in all Trading Periods as described in section 11.7.

10.4.5 Balancing under Regional Sales

Electricity Exporters from Namibia must become members of SAPP and will therefore fall under the SAPP trading rules when selling electricity to the region. To ensure alignment between the MSB and the SAPP and to avoid an Eligible Generator from paying twice for imbalances an Eligible Producer will be exempted from paying Balancing Charges by the MSB for the energy portion nominated and wheeled to an Exporter.
10.5 Wheeled/Banked Energy

The MSB shall determine the Wheeled Energy or Banked Energy quantity that will be used for meter reconciliation and invoice adjustments needed to facilitate bilateral transactions. In determining the quantity, the MSB shall take into account; the Delivered Energy from the Production Unit, the Adjusted Constrained Schedule and the Nominated Percentage (for each Supply Point or to be banked). The calculation of the Wheeled Energy quantity is shown below:

For each Trading Period:

If Delivered Energy ≤ Adjusted Constrained Schedule, then

\[
\text{Wheeled\_Energy\_A-B} = \text{Delivered\_Energy\_Production\_Unit\_A} \times \text{Nominated\_Percentage\_Supply\_Point\_B}
\]

And

\[
\text{Banked\_Energy\_Production\_Unit\_A} = \text{Delivered\_Energy\_Production\_Unit\_A} \times \text{Nominated\_Percentage\_Banked}
\]

Or,

If Delivered Energy > Adjusted Constrained Schedule, then

\[
\text{Wheeled\_Energy\_A-B} = \text{Adjusted\_Constrained\_Schedule\_Production\_Unit\_A} \times \text{Nominated\_Percentage\_Supply\_Point\_B}
\]

And

\[
\text{Banked\_Energy\_Production\_Unit\_A} = \text{Adjusted\_Constrained\_Schedule\_Production\_Unit\_A} \times \text{Nominated\_Percentage\_Banked}
\]

10.6 Unsold Energy

Unsold Energy refers to energy procured by a Contestable Customers from Eligible Sellers, but not consumed during a Trading Period.

If the under-consumption of the Contestable Customer is due to network constraints or SO/MSB instructions the differences shall be dealt with in accordance with section 11.11.

However, if the reason for under-consumption is not due to network constraints or SO/MSB instructions, the default MSB position is that the Contestable Customer will forego the Unsold Energy.

Nevertheless, the MSB will have an option, but not an obligation, to purchase Unsold Energy from the Contestable Customer at a predetermined rate (e.g. a rate linked to the Day Ahead Market for example x% of DAM). If the MSB decide to purchase Unsold Energy and to prevent discrimination, the offer to purchase must be available to all Contestable Customers that find themselves in an Unsold Energy situation.
11 SERVICES & CHARGES

11.1 Objective and Context

The ability to access and make use of the integrated transmission and distribution networks for bilateral wheeling between an Eligible Seller and a Contestable Customer, is fundamental to the operation of the MSB. Without non-discriminatory access to - and fair pricing for the use of - the integrated network, the MSB will not reach its full potential.

Furthermore, a Balancing Service is another core function of the MSB. It ensures that unforeseen production deviations from Eligible Generators are seamlessly and efficiently dealt with under a set of transparent Market Rules.

Since its establishment, the ECB has been working towards making electricity Tariffs more cost reflective. Their overarching objective has been to unbundle Tariffs to clearly differentiate between the various services offered by licensees and used by customers. These developments have helped to prepare the industry for the introduction of own-generation, net-metering and now bilateral trading. However, further unbundling of charges is needed, not only to meet the demands of the MSB, but also to reflect the need for additional services brought on by new distributed generation technologies such as solar PV, wind and energy storage.

Therefore, the push for further unbundling of services and charges should be seen as part of ongoing efforts to make the industry more effective and to prepare it to meet new challenges.

It should be noted that During Phase 1 of the MSB, wheeling will be allowed over both NamPower’s transmission network, as well as distribution networks. It is expected that many Eligible Generators will be embedded in distribution networks, which suggests that Tariff unbundling and restructuring is needed before wheeling over distribution networks can be allowed. The ECB has recently undertaken a review of distribution Tariffs, which will position the industry to support the MSB.

The discussion in this section provides further guidance to network owners and explains how Tariffs can be unbundled and structured to meet the requirements of the MSB.

11.2 Escapable vs. Non-escapable Charges

As mentioned above, further unbundling of the Tariff is required to ensure that customers pay for the services they use and are not able to escape certain energy related charges, due to either behind the meter supply or a bilateral transaction – both of which reduce their consumption from their current supplier. Specifically, consumers who enter into bilateral or behind the meter transactions with licensed Generators, are currently able to escape paying for (i) Reliability Service Charges, (ii) Losses (for Wheeled Energy ) and (iii) Levies (ECB, NEF etc.).

The fact that these charges are currently “escapable” creates two significant and undesirable outcomes. Firstly, other customers still have to pay for these services, resulting in a cross-
subsidy. Secondly, when customers are considering an offer from an IPP, they are making a comparison with the bundled NamPower Tariff which includes all of these costs – this results in an incorrect economic signal and could lead to customers making poor choices regarding energy purchases.

The diagram below shows the potential location of both Generators and customers within the Namibian system, that could be impacted by these charges. In Phase 1 of the MSB, Generators (G, G₁, G₂ etc.) can be either connected to the transmission system, connected to the distribution system or co-located/ behind the customers meter.

Figure 6: Location of Generators and Customers in Namibian ESI

By unbundling these charges from the current Tariffs, customers will pay for the services they use and will be able to make more informed decisions. The application of these “new” service charges are shown for both customers and Generators in the table below:

Table 7: Service Charges for Loads & Generators in the MSB

<table>
<thead>
<tr>
<th>Service</th>
<th>Contestable Supply Point (A) Tx Connected</th>
<th>Eligible Seller</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy from NP(MSB)</td>
<td>✓</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Less: Energy wheeled To Supply Point A</td>
<td>(✓)</td>
<td>-</td>
<td>Applicable when a Contestable Customer connected to Supply Point A, buys electricity from an Eligible Seller connected to a different Supply Point</td>
</tr>
<tr>
<td>Plus: Energy wheeled from Supply Point A</td>
<td>(✓)</td>
<td>-</td>
<td>Applicable when an Eligible Generator is connected to Supply Point A and sells power to a Contestable Customer connected to a different Supply Point</td>
</tr>
</tbody>
</table>

12 In later phases of the development of the MSB, generators can also be located outside of Namibia
<table>
<thead>
<tr>
<th>Service</th>
<th>Contestable Supply Point (A) Tx Connected</th>
<th>Eligible Seller</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balancing Service</td>
<td>-</td>
<td>✓</td>
<td>Applicable to all licensed Gx (except captive-load-connected)</td>
</tr>
<tr>
<td>Connection / Extension</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Transmission/Distribution Use of System</td>
<td>✓</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Transmission/Distribution Losses</td>
<td>✓*</td>
<td>✓</td>
<td>Non-Escapable except for Captive Generation</td>
</tr>
<tr>
<td>Wheeling Service</td>
<td>✓*</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Network Capacity Reserve Charge</td>
<td>-</td>
<td>(√)</td>
<td>Only applicable when Generator is seeking a firm wheeling path with “deemed energy” payments. Negotiated charge.</td>
</tr>
<tr>
<td>Reliability</td>
<td>✓*</td>
<td>-</td>
<td>On all energy consumed by load (including NamPower and all other licensed Generators)</td>
</tr>
<tr>
<td>Banking/ Energy Banking</td>
<td>-</td>
<td>(√)</td>
<td>Only applicable if Generator wants to bank energy</td>
</tr>
<tr>
<td>Customer service</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Point of Supply service</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Levies</td>
<td>✓*</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>VAT</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

* Non-Escapable Charges; (√) = optional charges based on demand for service

Further information on the Reliability Service Charge, Line Losses and Levies is provided below.

### 11.3 Energy Charges

Contestable Customers are able to purchase electricity from the MSB and Eligible Sellers. Energy bought shall be paid for at the relevant energy charges.

Energy charges shall apply as follow:

1) To energy procured at all Contestable Supply Points

Supplementary Note(s):

1) A Contestable Customer, that procures bilateral electricity in excess of the regulatory permitted Contestable Quantity, will be charged at standard retail rates for the excess energy. In practise this means that a Contestable Customer will pay twice for electricity purchases that exceed the Contestable Customer criteria quantity. Firstly, the
Contestable Customer will pay the Eligible Seller and secondly it will pay the MSB for energy purchases in excess of the eligible criteria.

11.4 Connection Charges

Namibia has already established a robust policy for the development and implementation of Connection Charges for customers. As a result, no changes to the current Connection Charge Policy are required to support wheeling. The only addition is that the policy should also apply to Generators that want to connect to the system. The figure below illustrates the relationships between:

1) Connection charges that are intended to recover the cost of dedicated assets,
2) Use of System Charges that are intended to recover the cost of upstream assets

![Figure 7: Connection and Use of System Charges](image-url)

Connection charges shall apply as follows:

1) Connection Charges shall apply to all Generators and Customers connecting to the transmission or distribution systems.

11.5 Use-of-System Charges

In discussing Use of System charges, it is noted that there are a number of different network charging approaches in use across the world.

11.5.1 Transmission Use of System Charges

Essentially, all Transmission Use of System (TUoS) methodologies aim to recover the cost of the ‘upstream assets’ from customers connected to the ‘integrated network’. The key design points include:

1) Should Generators pay for the use of the transmission network?
2) How should the TUoS charges be determined and levied?
As noted earlier, there are many different TUoS charge methodologies ranging in complexities. NamPower currently uses a Flow Based Method\textsuperscript{13} to allocate upstream (or embedded) costs between the various connectees. This approach essentially allocates the charges of each transmission asset to transactions during the peak hour based on the extent of use of that facility by the transaction. This approach delivers charges to both Generators connected to the transmission (Entry Charges) and to customers connected to the transmission system (Exit Charges).

The main advantages of this approach are that:

1) It delivers charges that are aligned with network costs.
2) It delivers charges that are based on network usage.

This approach also has a number of notable disadvantages including:

1) It can be complex to define the scenarios and establish the assumptions needed to perform the flow-based calculations.
2) Charges can fluctuate considerably depending on future network developments which present private investors with a challenge in developing bankable arrangement for large projects.

In deciding which approach to use to determine wheeling charges it is important to take the following into account:

1) Generators will offset the cost of TUoS charges by increasing their selling prices. This means that customers ultimately end up paying for the full cost of the integrated network.
2) The cost of the integrated network represents a ‘sunk cost’. This is an important observation because it implies that Generators should not take these costs (represented by TUoS charges) into account when they make their decisions on where to locate their Generators. Instead, Generators should be guided by ‘Connection Charges’ (which is designed to reflect the incremental network costs of connecting a new Generator) when making locational decisions.

With the above in mind it is recommended that:

1) Generators pay cost reflective Connection Charges that are calculated in accordance with the approved Connection Charge methodology.
2) Generators do not pay TUoS charges.
3) Transmission connected Distributors and End Consumers pay for TUoS charges to recover the cost of upstream assets that form part of the integrated network.

\textsuperscript{13} There are two flow-based approaches namely: i) the Bialek tracing method and ii) the distribution factor method. NamPower employs the latter approach.
4) Exporters will be treated as End Customers, connected to an MSB identified Supply Point near the border of Namibia i.e. they will contribute to TUoS charges in order to ensure they also pay appropriately for their use of the network.

5) Regulator shall approve the structure and level of TUoS charges (e.g. demand charges and access charges).

It may be in Namibia’s interest in general - and the electricity consumers’ in particular - to stimulate the development of generation capacity for exports. There are many direct and indirect benefits that would flow from such developments including larger and more economical plant which would drive down electricity prices in Namibia and the region as well as additional job creation and economic activity including taxes for the Namibia economy.

Furthermore, on the one hand Exporters must be competitive if they wish to secure regional buyers but on the other hand Namibia’s unique geographical layout and low population density means that TUoS charges are relatively expensive. These high TUoS charges will place Namibia’s Exporters at a disadvantaged compared to other regional generators.

In order to support the development of electricity exports, the market design recognises that the Regulator may choose to discount or exempt Exporters from TUoS charges. A temporary discount or exemption on TUoS charges would effectively imply a differentiated pricing structure in favour of Exporters for the use of the network compared to other users. Therefore, Exporters would need to demonstrate additional direct and indirect benefits to local customers in order to negotiate any such incentive. Any such incentive will take into consideration the unique characteristics of the transactions and will therefore be negotiated on an ad-hoc basis between the Exporter and the Regulator, recognising that the default position is that Exporters will pay TUoS charges.

TUoS charges shall apply as follow:

1) To all transmission connected Distributors and End Customers,

2) All Exporters exporting power at transmission level unless exempted by the Regulator

3) Generators connected to the transmission system shall not pay TUoS charges.

11.5.2 Distribution Use of System Charges

Distribution licensees in Namibia follow a ‘postage stamp’ approach in determining Distribution Use of System (DUoS) charges, which are collected from customers only. Although this approach can be criticised because it does not reflect the actual use of the system, its main advantages are that it is simple to calculate and easy to implement. Despite its shortcomings it is recommended that the industry retain this approach.

This arrangement implies that an Eligible Generator, connected to the distribution system and wheeling power to a Contestable Customer, do not have to pay DUoS charges. This arrangement is also consistent with the recommended approach for transmission connected
generators as well as the current practise in that NamPower is not required to pay DUoS charges for connecting to and supplying electricity to the Distributor.

DUoS charges shall apply as follow:

1) To all distribution connected customers,
2) All Exporters exporting power at distribution level unless exempted by the Regulator
3) Generators connected to the distribution system shall not pay DUoS charges.

11.6 Network Line Loss Charges

The cost of network line Losses is currently embedded in NamPower’s bulk supply Tariff and in the Distributors’ retail Tariffs. This approach works fine in an industry where there is a single supplier of electricity but when wheeling between private entities is allowed further Tariff unbundling is recommended to ensure that parties contribute fairly towards the cost of Losses.

11.6.1 Transmission Losses

In order to send the correct electricity production and consumptions signals into the market, it is recommended that both Sellers and Buyers contribute to Losses. Furthermore, in keeping with the overall intent to make Tariffs more cost reflective, consideration should be given to differentiate transmission Loss Factors by:

1) Geographic location (area/zone of even node), and
2) Voltage level.

No immediate changes are foreseen in the way that NamPower recover network losses from transmission connected customers other than making the process more transparent by unbundling losses and showing it as a separate and non-escapable item on the invoice.

In respect of transmission connected Generators, the recommended approach is to determine Transmission Loss Factors in a way such that:

1) a Generator whose injections increase transmission Losses will experience a Transmission Loss Factor of greater than one, resulting in a Losses charge,
2) whilst a Generator whose injections reduce transmission Losses will experience a Transmission Loss Factor of less than one, resulting in a rebate.

Additional Notes:

3) It is further recommended that a (or set of) TLF(s) for a Generator is approved by the Regulator at the time of licencing and that the approved value(s) will remain until the license expires or is amended. Any differences between the approved and actual transmission losses caused by the Generators will be reconciled through the
Transmission licensee’s revenue requirement and tariff application processes. This approach will provide developers with more certainty over input costs.

4) The method for determining TLFs shall be underpinned by detailed load flow studies of average and marginal losses caused by the Generator in question.

5) In the absence of detailed studies, the default position is a TLF of one which implies that that the Generator will not pay for (or receive a rebate for) increases (or decreased) losses.

Transmission losses charges shall apply as follow:

4) To all transmission connected Distributors and End Customers,

5) All Exporters exporting power at transmission level,

6) To Eligible Generators connected to the transmission system and where the regulatory approved TLF is not equal to the value of one.

Below is a simple example of the calculation of the TLF.

Assumptions:

1) Generation of: 100MWh

2) Losses (%) or Loss Rate (%) of: 7%

3) Losses: 7MWh (100 MWh * 7%)

4) Available for sale: 93MWh (100MWh – 7MWh)

5) TLF calculation:

\[
TLF = \frac{1}{1 - \text{Loss Rate}}
\]

\[
= \frac{1}{1 - 0.07}
\]

\[
= 1.0753
\]

11.6.2 Distribution Losses

As mentioned previously, compensation for Losses on the distribution system are embedded in the current set of retail Tariffs.

Similar to the approach for transmission Losses it is recommended that losses for distribution connected End Customers take the following into consideration:

1) No immediate change in the way distribution losses are recovered from distribution connected customers.
2) Unbundling of distribution losses is preferable but not a requirement for the successful implementation of the MSB. If distribution losses are not unbundled as a separate item, it will form part of the distribution Wheeling Charges that will apply to bilateral transactions.

Embedded Generators may cause an increase or decrease in a Distributor’s network losses depending on its location, size and generation patterns. It is further recognised that calculating the impact on losses caused by Embedded Generators is not only complex and time consuming but is also subject to range of erratic assumptions resulting in uncertain outcomes. Taking these points into consideration the following is recommended in respect of Distribution Loss Factors (DLF) for Embedded Generators:

1) A DLF of one shall be assumed and approved for Embedded Generators. A DLF of one means an Embedded Generator shall not pay (or receive a rebate) for distribution losses.

2) DLF values (or set of values) other than one could be proposed by the Distributor or the Generator for approval by the Regulator but such proposals must be based on detailed load-flow and losses studies by credible and independent organisations and must include comments from Distributor and the Generator.

3) It is further recommended that the approved DLF value(s) will remain until Generator’s license expires or is amended. Any differences between the approved and actual distribution losses caused by the Embedded Generators will be reconciled through Distributor’s revenue requirement calculation and tariff application processes. This approach will provide developers with more certainty over input costs.

Distribution loss charges shall apply as follow:

1) To all distribution connected customers,

2) All Exporters exporting power at distribution level,

3) To Eligible Generators connected to the distribution system and where the regulatory approved DLF is not equal to the value of one.

11.7 Wheeling Charges

It is recognised that Distributors earn a margin on the sale of energy (kWh). The emergence of Generators that are directly connected to a customer’s equipment (behind the meter) or bilateral transactions between Eligible Sellers and Contestable Customers result in Distributors losing this margin. This will have a negative net impact on the financial viability of the Distributor.

It is expected that the unbundling and rebalancing of Tariffs will mitigate against this negative impact. However, Distributors may not necessarily be in a position to unbundle and rebalance Tariffs to the extent needed to prevent this negative impact.
The introduction of a Wheeling Charge for bilateral transactions will ensure that Distributors do not forego this margin on the sale of energy. The Wheeling Charge will vary between Distributors as well as between customer categories depending on the structure and level of retail tariffs and NamPower’s bulk supply tariff. The determination of the Time of Use differentiated Wheeling Charges (with and without distribution losses) are shown below:

Wheeling Charge including distribution losses:

\[
\text{Wheeling Charge (incl. distribution losses)}_{p,s,o} = \text{Distributor’s Energy Charge}_{p,s,o} - \text{NamPower’s Energy Charge}_{p,s,o}
\]

Wheeling Charge excluding distribution losses:

\[
\text{Wheeling Charge (excl. distribution losses)}_{p,s,o} = \text{Distributor’s Energy Charge}_{p,s,o} \times (2 - \text{DLF}) - \text{NamPower’s Energy Charge}_{p,s,o}
\]

The Wheeling Charges shall apply as follow:

1) The Wheeled Energy charge (including distribution losses) shall apply to all Wheeled Energy to a Supply Point. In other words, a Contestable Customer will pay this charge on all bilateral energy purchases.

2) The Wheeled Energy charge (excluding distribution losses) shall apply to all energy procured by an End Customer from a Generator connected to that customer’s electrical equipment (behind the meter). This will prevent the End Customer paying for distribution losses not caused.

11.8 Balancing Charges

The MSB is responsible to balance the integrated electricity system in real time. An Eligible Generator that deviates from the Adjusted Constrained Schedule will be automatically balanced by the MSB. The amount of balancing required by will be determined by the MSB and a Balancing Payment may apply\(^{14}\) taking the following rules into account.

As noted earlier Balancing Services for Eligible Generators selling to Exporters will be dealt with in accordance with the SAPP rules as well as the subsequent arrangements between NamPower and the Exporter.

11.8.1 Tolerance band

The MSB shall measure all energy deviations as the difference between the Delivered Energy less the Adjusted Constrained Schedule in every Trading Period. The MSB shall apply the

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\(^{14}\) The MSB may incur costs in balancing the system following a deviation for the Dispatch Schedule. The balancing payment by the Eligible Seller serves to compensate the MSB in procuring balancing services. The payment also encourages the Eligible Seller to adhere to the schedule.
following Tolerance Band in determining the Balancing Energy quantity that is used in determining Balancing Payment. The following tolerance limits shall apply:

1) The Lower Limit is defined as the lesser of:
   a) -0.5 MW, or
   b) -2.5% of the plant’s Adjusted Constrained Schedule

2) The Upper Limit is defined as the greater of:
   a) +0.5 MW, or
   b) +2.5% of the plant’s Adjusted Constrained Schedule.

The figure below illustrates the relationships between deviation from the Adjusted Constrained and the Tolerance Band (which is the area between the Lower Limit and the Upper Limit).

**Figure 8: Balancing Payment**

![Graph showing Balancing Payment with Lower Limit, Upper Limit, and Deviation from Dispatch Schedule](image)

### 11.8.2 Balancing Energy

The Balancing Energy quantity in every hour shall be determined as set out below:

\[
\text{Deviation Energy} = \text{Delivered Energy} - \text{Adjusted Constrained Schedule}
\]

Lower Limit = Lower of (-0.5MW or -2.5% of Adjusted Constrained Schedule)

Upper Limit = Greater of (+0.5MW or +2.5% of Adjusted Constrained Schedule)

If Deviation Energy < 0, and Deviation Energy > Lower Limit, then

Balancing Energy = 0, or
Deviation Energy < Lower Limit, then
Balancing Energy = Deviation Energy – Lower Limit

If Deviation Energy > 0, and
Deviation Energy < Upper Limit, then
Balancing Energy = 0, or
Deviation Energy > Upper Limit, then
Balancing Energy = Deviation Energy – Upper Limit

11.8.3 Balancing Charge
A Balancing Charge shall apply to determine the Balancing Payment. The Balancing Charges are:

For Balancing Energy below the Lower Limit:
Lower Balancing Charge = 100% (hundred percent) of the NamPower retail energy TOU Tariff

For Balancing Energy above the Upper Limit:
Higher Balancing Charge = No charge shall apply

The above charges have been set to encourage the Eligible Generator to submit the most likely Production Schedule. For example, if the Balancing Charge is set below 100% the Eligible Seller will be incentivised to ‘over-declare’ and ‘under-deliver’. Similarly, if the Balancing Charge is set too high the Seller will be incentivised to ‘under-declare’ and ‘over-deliver’. See Annexure 2 for a more detailed discussion with examples to test the potential behaviour of Sellers under different Balancing Charge scenarios.

The Balancing Charges shall apply as follow:

1) To all licensed Generators that are connected to the electrical equipment of:
   a. NamPower, or
   b. A Distributor in Namibia
   c. A customer in Namibia who is connected to the electrical equipment of NamPower or a Distributor in Namibia.

2) To all Importers at the approved Delivery Point for imported power.

Note:

1) MSB Balancing Charges shall not apply to Eligible Generators selling to Exporter.

2) A private Generator that obtained a Generator license under a public procurement process before 1 March 2019 and which sells all its electrical output to a public entity
may apply for exemption. Any such exemption will cease when the Generator’s license is: amended, expires or terminated.

11.8.4 Balancing Payment

A Balancing Payment shall apply to Eligible Supplier in case the Balancing Energy in any hour is not nil. The payment shall be calculated in accordance with the following formulae:

*Figure 9: Balancing Payment Calculation*

If Balancing Energy < 0:

\[
Balancing \ Payment = -(Balancing \ Energy \times Lower \ Balancing \ Charge \times Line \ Loss \ Factor)
\]

If Balancing Energy > 0:

\[
Balancing \ Payment = (Balancing \ Energy \times Lower \ Balancing \ Charge \times Line \ Loss \ Factor)
\]

11.9 Reliability Service Charges

Reliability Services (RS) facilitate the transport of electric power between Generators and loads by maintaining satisfactory conditions on the integrated system. The cost of providing RS is layered and is made up of the cost to procure, maintain and operate these services. It is important to note that RS are not a new cost to be borne by customers. In practice customers are already paying for these services but the charges are embedded, as a part of NamPower’s and the Distributor’s bundled Tariffs.

If a Contestable Customer buys power from an Eligible Generator, given the current Tariff structure, the customer will escape paying for the embedded RS charges. Therefore, it is recommended that the cost of these services is unbundled and recovered via a separate and transparent Reliability Service Charge (RSC).

The Reliability Service Charges shall apply as follow:

1) On all energy procured by a Customer and supplied by: the MSB, or Eligible Sellers or connected Captive Generators.

2) All energy exported by a licensed Exporter whether energy was procured from the MSB or Eligible Sellers

A transparent RSC on all energy delivered will prevent cross-subsidisation of RS costs, by customers who do not wheel or who are not connected to a Generator. It will also keep the RSC as low as possible by spreading the cost burden over the widest group of beneficiaries.
A detailed discussion of Ancillary Services and charges is presented in section Annexure 3: Reliability Services Definitions & Charges. The analysis show that the recommended Reliability Service Charge is 10.03 N$c/kWh for the 2018/19 financial year\textsuperscript{15}.

11.10 Energy Banking Charge

Variable Renewable Energy sources are expected to play an increasingly important role in the generation mix in Namibia. However, the absence of low-cost energy storage solutions is limiting the size of customer funded VRE plant.

NamPower should view this as an opportunity to reposition the organisation as a modern and forward-looking utility. One such initiative is to develop and implement an Energy Banking Service which can be offered to the market. The Energy Banking Service will allow Eligible Generators to store energy with the MSB. The stored energy can be withdrawn and sold to a Contestable Customer in a later period.

It is expected that this service will stimulate the development of larger VRE installations if producers know that they are able to store excess power. In the longer term this will reduce cost, improve Namibia’s generation self-sufficiency, and reduce the need for NamPower and the GRN of provide expensive financial guarantees.

In a way, the Energy Banking Service extends the benefits of net-metering to licensed Generators above 500kVA. It is foreseen that NamPower will design the Energy Banking mechanism and Tariff to reflect the cost of providing the service. The following principles are offered for consideration:

1) The value of the banked energy will be set by NamPower’s TOU energy charges for transmission connected customers.

2) The stored power can be withdrawn during any TOU period adjusted for the cost of providing the service.

3) The avoid complex accounting arrangements, all banked power must be withdrawn before the end of the financial year. Any stored power at the end of the financial year will be cancelled without compensation.

4) Stored power will be subject to network charges, Reliability Service Charges, administration charges, Levies and VAT.

5) To avoid distortions and to encourage the correct production and consumption behaviour, the Energy Banking charge shall be raised as a NAD/kWh charge on all energy banked by the Eligible Seller.

\textsuperscript{15} Based on the 2019/2020 NamPower tariff application the RSC is estimated to have increased to \textasciitilde 10.51N$c/kWh – however this charge will be published when the market is implemented in September 2019.
6) The Energy Banking charge shall be competitive compared with the latest available energy storage options.

7) NamPower may develop storage capacity, but is not obliged to do so if storage can be provided through other means e.g. SAPP Day Ahead Market.

The Energy Banking Charge shall apply as follows:

1) To an Eligible Seller on all energy banked/stored with the MSB.

11.11 Network Capacity Reserve Charge

Situations may arise which could prevent the network owner from evacuating some or all the power from the Eligible Seller or delivering the full amount of power to the Contestable Customer. Such instances will obviously have a direct impact on bilateral wheeling transactions. The effected parties, and in particular the Sellers, will argue that any economic impact due to network unavailability should be borne by the network provider.

The allocation of Network Congestion risk is potentially a complex issue which is influenced by a range of factors including:

1) Network design configuration (single radial line versus meshed network).

2) Condition of existing network assets, influenced by, for example: construction, material, maintenance, operation and age.

3) Environmental factors, including: weather (e.g. storms, wind, sand, snow, floods) and pollution from a variety of sources such as fires, dust, smog, soot.

4) Political factors such as strikes, unrest and war.

5) Delays.

6) Poor planning, design or implementation.

7) Operational reasons following system emergency conditions.

8) Economic impact on network owner, Seller and customer.

It is worth noting that the provision of electrical network services in most countries is usually provided on the condition of “best effort” service. In other words, the utility does not guarantee the availability or quality of the service. The term “best effort” service is typically defined in a non-binding manner in order not to create the potential for any claims against the utility other than if it can be proven that an interruption was caused through gross negligence on the part of the utility.

Furthermore, network performance and quality of supply arrangements are usually monitored by Regulators. Certain sanctions and corrective measure may apply when a network provider is unable to meet the performance standards set by the Regulator.

Under the MSB Market, there are several ways to mitigate against the impact from Network Congestion, including:
1) Supply interruptions affecting Sellers and customers, by default, fall under the conditions of the standard supply arrangement between the utility and the customer. These arrangements would be based on the principle of “best effort” service which means there would be no compensation to the customer for the loss of supply.

2) Deemed payments by the network owner. In this instance if the network owner is unable to evacuate the power from the Seller, it will compensate the Seller for any loss of income due to Network Congestion. The threshold of when the deemed payments will apply, and the level of payment, will be agreed between the Eligible Seller and network owner. In return for providing deemed energy payments, Eligible Sellers will be required to pay a fixed monthly negotiated network capacity reserve charge to the network owner.

3) Energy Banking could be used as a mechanism to off-set some of the impact resulting from Network Congestion. For example, if the utility is able to evacuate power from the Eligible Seller but is unable to deliver the power to the Contestable Supply Point, the utility may allow the Seller to “bank” the energy that could not be delivered. The customer will then be able to withdraw the stored energy at a later stage when it is able to do so. In this instance no storage charges will apply to either the Seller or the customer.

4) Customers that experience a Network Congestion do not have to pay network Use of System charges during times of service interruptions.

The table below summarises the different Network Congestion scenarios their outcomes and the potential mitigation measures.

Table 8: Network congestion Scenarios

<table>
<thead>
<tr>
<th>Evacuation constraint</th>
<th>Delivery constraint</th>
<th>Impact</th>
<th>Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>No</td>
<td>None</td>
<td>• None</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
<td>Seller unable to produce energy and sell to Buyer</td>
<td>• Deemed payments in exchange for network capacity reserve charge</td>
</tr>
</tbody>
</table>
| No                    | Yes                 | Seller can produce but not sell to Buyer | The Seller may select one of the following prior to submitting the Day-ahead Production Schedules:  
• The Seller could nominate an alternative Buyer for the unused power. |
Network congestion resulting in evacuation constraint and delivery constraint:

<table>
<thead>
<tr>
<th>Evacuation constraint</th>
<th>Delivery constraint</th>
<th>Impact</th>
<th>Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>• MSB shall allow the Seller to “bank” the Unsold Energy. The Seller is allowed to withdraw the ‘banked’ power at a later stage in accordance with the rules of the Energy Banking Service.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• The customer may withdraw the stored energy when it is able to do so and subject to the Energy Banking Service conditions.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Sell the unsold power to the MSB at a pre-arranged price.</td>
</tr>
</tbody>
</table>

| 4 | Yes | Yes | Seller unable to produce and sell and Buyer unable to purchase and consume | • Combinations of Options 2 or 3 |

In addition to the above arrangements it is important to point out that parties should assess the network conditions prior to entering into bilateral transactions, including:

1) The network owner must ensure through its network expansion planning studies, as well as Generator and load connection and integration studies, that it would be able to evacuate and deliver the power within the network performance criteria.

2) Sellers and Buyers who wish to wheel through the network must familiarise themselves with the condition and performance of the relevant networks prior to entering into sale and purchase agreements.

3) A premium supply or connection is available to customers that require specific quality or reliability criteria, over and above those for standard connections and which require additional network investments.

The Network Capacity Reserve Charge shall apply as follows:

1) To all Generators seeking a firm wheeling path and or deemed energy payments when network performance is impacting on evacuation or delivery of power.
11.12 Administrative Service Charges

Customer service and Customer Point of Supply charges are retail charges raised for all load customers. Customer service charges recover the cost of providing a customer service and are raised on each account. Customer Point of Supply charges cover the cost of metering, meter reading, and billing and are raised on each point of supply.

Generators that connect to the transmission system and that wish to wheel power will also require customer services and will therefore be subject to Administrative Service Charges.

A distribution connected Generator wheeling power to a customer connected to the same distribution network will not be required to pay Administrative Services charges. This is aligned with current practise in that the Distributor does not impose these charges on NamPower that connect to its system.

However, a distributed Generator that wheels power to a customer not connected to the same distribution system will be required to pay Administrative Service charges similar to what a customer of the same size would have paid.

The Administrative Service Banking Charge shall apply as follows:

1) To all transmission and distribution connected Customers including Exporters
2) To distribution and transmission connected Generators or Importers.
3) Captive Generators and Eligible Generators and Contestable Customers connected to the same Supply Point shall not pay Administrative Service charges.

11.13 Levies

Customers in Namibia are currently paying two statutory Levies namely: i) an ECB Levy and ii) a National Electricity Fund (NEF) Levy. Both Levies are raised and collected via an energy based (NAD/kWh) charge. To keep the Levies as low as possible it is important that the Levies are collected from as many customers as possible.

It follows that the implementation of the MSB should not create an opportunity to escape the payment of these Levies. Therefore, metering and billing arrangements should be designed in such way that the total payment for Levies is the same whether the Contestable Customer buys electricity from the MSB, an Eligible Seller or from on-site generation.

Electricity exported from Namibia shall attract levies, as per the prevailing legislation. The current recommendation is that Exports will attract the standard ECB Levy but will not be required to pay the NEF Levy.

11.14 Value Added Tax (VAT)

Value Added Tax shall be raised on all invoices to Eligible Sellers and Contestable Customers in accordance with prevailing legislative requirements.
12 Metering and Invoicing

Bilateral trading will require adjustments to metered values and invoices to correctly reflect the intended trades. Below is a summary of the billing process:

1) The MSB will prepare and submit monthly generation invoices to:
   a) Transmission connected licensed Generators,
   b) Distribution connected licensed Generators, and
   c) Customer connected licensed Generators,
   d) Licensed Importers.

2) The MSB will prepare and submit monthly customer invoices to:
   a) Transmission connected Distributors,
   b) Transmission connected domestic customers including Contestable Customers,
   c) Transmission connected regional customers,
   d) Licensed Exporters.

In addition, the MSB will make relevant Eligible Seller and Contestable Customer data available which will allow the Distributor to adjust invoices for distributed connected Contestable Customers who have purchased electricity Eligible Sellers or from customer connected licensed Generators.

12.1 Metering

The Transmission and Distribution Metering Codes provide detailed requirements and specifications in respect of acceptable meter arrangements for producers and customers connected to the integrated network.

The MSB has an important role in making sure that energy is produced at the lowest possible cost and that the system operates safely and reliably. To fulfil these and other important functions, it is essential that the MSB has full access to accurate and reliable metering data. This data is critical for the MSB to establish a full 360° view of the industry. Any gaps will undermine economic efficiency and threaten the security of supply.

Given the increasingly important role that distributed generation is expected to play in the future, the MSB will also require access to metering data from all licensed Generators including:

1) Transmission connected licensed Generators,
2) Distribution connected licensed Generators,
3) Customer connected licensed Generators.
12.2 Eligible Seller Invoicing

The MSB will invoice Eligible Sellers for the following services:

12.2.1 Balancing Services

Table 9: Eligible Seller Balancing Services

<table>
<thead>
<tr>
<th>Service</th>
<th>Quantity</th>
<th>Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balancing</td>
<td>Balancing Energy in kWh (see section 11.7)</td>
<td>Balancing charge (NAD/kWh)</td>
</tr>
</tbody>
</table>

12.2.2 Network Services

Table 10: Eligible Seller Network Services

<table>
<thead>
<tr>
<th>Service</th>
<th>Quantity</th>
<th>Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection / Extension</td>
<td>Specific between the Eligible Generator or Importer and the host utility</td>
<td>Upfront payment and or Extension charge (NAD/mo)</td>
</tr>
<tr>
<td>Transmission Losses (if applicable)</td>
<td>Delivered_Energy_{p,s,o} x (TLF - 1)/TLF</td>
<td>Energy_Charge_{p,s,o} (NAD/kWh)</td>
</tr>
<tr>
<td>Distribution Losses (if applicable)</td>
<td>Delivered_Energy_{p,s,o} x (DLF - 1)/DLF</td>
<td>Energy_Charge_{p,s,o} (NAD/kWh)</td>
</tr>
</tbody>
</table>

12.2.3 Energy Banking Services

Table 11: Eligible Seller Energy Banking Services

<table>
<thead>
<tr>
<th>Service</th>
<th>Quantity</th>
<th>Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Banking Service</td>
<td>Banked_Energy</td>
<td>Energy Banking charge (NAD/kWh)</td>
</tr>
</tbody>
</table>

12.2.4 Network Capacity Reserve Charge

Table 12: Eligible Seller Network Capacity Reserve Services

<table>
<thead>
<tr>
<th>Service</th>
<th>Quantity</th>
<th>Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network Capacity Reserve</td>
<td>As agreed between Eligible Seller and utility(ies)</td>
<td>Service charge (NAD/mo)</td>
</tr>
</tbody>
</table>
12.2.5 Administration Services

Table 13: Eligible Seller Administration Services

<table>
<thead>
<tr>
<th>Service</th>
<th>Quantity</th>
<th>Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer service</td>
<td>Per customer</td>
<td>Service charge (NAD/customer/mo)</td>
</tr>
<tr>
<td>Point of Connection service</td>
<td>Per Point of Connection (PoC)</td>
<td>Point of Connection Charge (NAD/PoC/mo)</td>
</tr>
</tbody>
</table>

12.2.6 Levies

Eligible Sellers will not be required to pay either the ECB Levy or the NEF Levy. These Levies will be paid for by Customers. See section 12.3.6 for more detail.

12.2.7 VAT

Invoices to Eligible Sellers shall be subject to Value Added tax (VAT)

12.3 Contestable Customer Invoicing

The MSB will invoice Contestable Customers for the following services:

12.3.1 Energy Services

Table 14: Contestable Customer Energy Services

<table>
<thead>
<tr>
<th>Service</th>
<th>Quantity (at Supply Point)</th>
<th>Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (from MSB)</td>
<td>Supplied_Energy_\text{p,p,o} in kWh (at Supply Point)</td>
<td>Energy_Charge_\text{p,p,o} (NAD/kWh)</td>
</tr>
<tr>
<td><strong>Less</strong>: Energy metered but not bought from MSB</td>
<td>Wheeled_Energy_\text{A-B}_\text{p,p,o}\text{16}</td>
<td>Energy_Charge_\text{p,p,o} (NAD/kWh)</td>
</tr>
<tr>
<td><strong>Plus</strong>: Energy not metered but bought from MSB</td>
<td>Delivered_Energy_\text{p,p,o} from Captive Generator but not bought by the connected customer</td>
<td>Energy_Charge_\text{p,p,o} (NAD/kWh)</td>
</tr>
</tbody>
</table>

---

\text{16}  \text{Wheeled Energy from Production Unit A to Supply Point B in each of the Time of Use periods}
12.3.2 Network Services

Table 15: Contestable Customer Network Services

<table>
<thead>
<tr>
<th>Service</th>
<th>Quantity (at Contestable Supply Point)</th>
<th>Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection / Extension</td>
<td>Specific between the Eligible Generator or Importer and the host utility</td>
<td>Upfront payment ad or Extension charge (NAD/mo)</td>
</tr>
<tr>
<td>Transmission Use of System</td>
<td>Monthly peak demand in kVA/mo Access charge for reserved capacity in kVA/mo</td>
<td>NamPower’s Demand charge (NAD/kVA/mo) NamPower’s Access charge (NAD/kVA/mo)</td>
</tr>
<tr>
<td>Transmission Losses</td>
<td>Supplied_Energy_{p,s,o} x (TLF – 1)</td>
<td>NamPower’s Energy_Charge_{p,s,o} (NAD/kWh)</td>
</tr>
<tr>
<td>Distribution Use of System</td>
<td>Monthly peak demand in kVA/mo Access charge for reserved capacity in kVA/mo</td>
<td>Utility’s Demand charge (NAD/kVA/mo) Utility’s Access charge (NAD/kVA/mo)</td>
</tr>
<tr>
<td>Distribution Losses (if unbundled)</td>
<td>Supplied_Energy_{p,s,o} x (DLF – 1)</td>
<td>Distributor’s Energy_Charge_{p,s,o} (NAD/kWh)</td>
</tr>
</tbody>
</table>

12.3.3 Wheeling Services

Table 16: Wheeling Services when Distribution Losses are bundled in the tariff.

<table>
<thead>
<tr>
<th>Service</th>
<th>Quantity (at Contestable Supply Point)</th>
<th>Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheeling for non-Captive Generators (if distribution losses are not unbundled)</td>
<td>Wheeled_Energy_A-B_{p,s,o}^{17}</td>
<td>Wheeling_Charge(incl losses)_{p,s,o} (NAD/kWh)</td>
</tr>
<tr>
<td>Wheeling for Captive Generators</td>
<td>Delivered_Energy_{p,s,o} from Captive Generator but not</td>
<td>Wheeling_Charge(incl losses)_{p,s,o} (NAD/kWh)</td>
</tr>
</tbody>
</table>

---

^{17} Wheeled Energy from Production Unit A to Supply Point B in each of the Time of Use periods
Table 17: Wheeling Services when Distribution Losses are unbundled.

<table>
<thead>
<tr>
<th>Service</th>
<th>Quantity (at Contestable Supply Point)</th>
<th>Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheeling for non-Captive Generators (if distribution losses are unbundled)</td>
<td>Wheeled_Energy_{A-B(p,s,o)}</td>
<td>Wheeling_Charge(excl losses)_{p,s,o} (NAD/kWh)</td>
</tr>
<tr>
<td>Wheeling for Captive Generators</td>
<td>Delivered_Energy_{p,s,o} from Captive Generator but not bought by the connected customer</td>
<td>Wheeling_Charge(excl losses)_{p,s,o} (NAD/kWh)</td>
</tr>
</tbody>
</table>

12.3.4 Reliability Services

Table 18: Contestable Customer Ancillary Services

<table>
<thead>
<tr>
<th>Service</th>
<th>Quantity</th>
<th>Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliability</td>
<td>Supplied_Energy (to a specific Supply Point) + energy bought from a Captive Generator connected to the same Supply Point.</td>
<td>Reliability charge (NAD/kWh)</td>
</tr>
</tbody>
</table>

12.3.5 Administration Services

Table 19: Contestable Customer Administration Services

<table>
<thead>
<tr>
<th>Service</th>
<th>Quantity</th>
<th>Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer service</td>
<td>Per customer</td>
<td>Service charge (NAD/customer/mo)</td>
</tr>
</tbody>
</table>

---

18 Wheeled Energy from Production Unit A to Supply Point B in each of the Time of Use periods
### 12.3.6 Levies

**Table 20: Contestable Customer Levies**

<table>
<thead>
<tr>
<th>Service</th>
<th>Quantity</th>
<th>Charge</th>
</tr>
</thead>
</table>
| ECB Levy | • Supplied\_Energy (to a specific Supply Point) + energy bought from a Captive Generator connected to the same Supply Point  
• Energy sold to the region by an Exporter | ECB Levy (NAD/kWh) |
| NEF Levy | Supplied\_Energy (to a specific Supply Point) + energy bought from a Captive Generator connected to the same Supply Point. | NEF Levy (NAD/kWh) |

### 12.3.7 VAT

Invoices to Eligible Sellers shall be subject to Value Added tax (VAT).
13 **PLANNING ARRANGEMENTS**

13.1 **Objective / Purpose**

The adoption of the MSB will result in an increasing number of market participants, all of whom will be required to comply with the information requirements, processes and timing for short, medium and long-term planning, as set out in the Namibian Grid Code. This section discusses the current planning arrangements as well as the proposed changes that will need to be implemented in the new MSB market.

13.2 **Legislation & Regulation**

The Electricity Bill (30th of November 2016), describes the following key items regarding planning:\(^{19}\):

1) The Minister of Energy (“the Minister”) is responsible for preparing, publishing and implementing the National Electricity Policy and Renewable Energy Policy, which outline key policy drivers which guide planning.

2) The Minister is also responsible for ensuring the preparation, publishing and implementation of the National Integrated Resource Plan, which may be reviewed and revised from time to time as the Minister sees fit.

3) The Minister may, in accordance with the National Electricity Policy, the Renewable Energy Policy and the National Integrated Resource Plan, make regulations as regards the manner in which, and procedures according to which, new generation capacity must be sourced and dealt with in Namibia.

4) In accordance with the above policies and plan, the Minister may determine the allocation of new generation capacity to be allocated to be connected, and how this will be allocated.

5) Amongst other items, the Minister may determine the technology types, procurement method and the offtakers of this new capacity.

It is clear from these articles in the Bill that the Minister is therefore mandated to implement any changes in planning and procurement of new generation, resulting from the MSB market. Following the promulgation of the new market structure, it is proposed that the Minister address the issues raised in this planning section in order to support the implementation of the MSB.

\(^{19}\) Part II, National Electricity Policies And Plans, Market Structure, New Generation And Advisory Forum, Section 4 & 5
13.3 Planning Intervals; Information Exchange

Planning is targeted at half-hourly, daily, weekly and monthly intervals, and is used to guide Dispatch schedules and balance supply and demand. It is anticipated that the MSB will incorporate a Market Operator (MO), which will liaise with the System Operator (SO) in the MSB on planning activities.

Eligible Sellers, consisting of Generators, Exporters, Importers and Traders will be required to declare their positions to the MSB for these intervals. The MSB market is a “one-sided” market - Contestable Customers are not required to declare their planned consumption to the MSB. However; Generators which are co-located with customers and which are licensed, must still declare their Production Schedules to the MSB. The MSB will utilise this information for planning purposes, to calculate imbalances and where appropriate will pass on this data to Distributors, to allow them to accurately calculate Reliability Service Charges\(^\text{20}\). Existing licensed REFIT or embedded IPPs, will also be required to submit Production Schedules for daily, weekly, monthly and annual planning purposes.

Information exchange protocols are as specified in Section 3 of the Namibian Grid Code: The Information Exchange Code\(^\text{21}\)

13.4 Planning Arrangement Overview

As planning arrangements are discussed in the Grid Code, this market design discusses key changes required as well as highlighting issues for new market participants.

13.5 Long Term Expansion Planning – NIRP

The National Integrated Resource Plan (NIRP) governs the long-term development of the electricity system in Namibia. The NIRP development process includes multi-stakeholder engagement and provides a long term (20 year) view of how the system will evolve.

This has significant implications for the MSB, which will require that specific capacity is now also allocated to Eligible Sellers that wish to contract with Contestable and regional customers. The NIRP is developed taking into account the overall supply/demand balance in Namibia, which will now include these transactions.

It is important to also acknowledge that there is a global trend towards distributed generation which is not adequately addressed in the current NIRP. Whilst not a direct consequence of the MSB, it is critical that this issue is addressed in long term planning. Specifically, the phenomenon of behind-the-meter generation will impact on longer term planning requirements as well as the structure of demand i.e. the shape of the daily load curve, as more customers install rooftop PV and distributed storage systems.

\(^{21}\) Information Exchange Interface, page 5
Table 21: Long term Expansion Planning (NIRP) Responsibilities

<table>
<thead>
<tr>
<th>Participant</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dept. of Energy</td>
<td>Ministry of Mines &amp; Energy is ultimately responsible for managing this process as well as deciding: which technologies to pursue; who should build; who can offtake.</td>
</tr>
<tr>
<td>Distributors</td>
<td>Contribute demand forecasts incl. step-loads; bilaterals with embedded IPPs; as eligible customers any expected bilaterals wheeling contracts; forecasts for self-generation including customer rooftop PV; distribution network development plan.</td>
</tr>
<tr>
<td>ECB</td>
<td>Reviewer of NIRP.</td>
</tr>
<tr>
<td>IPPs</td>
<td>Report production forecasts and plant technical &amp; commercial assumptions; notify MSB of bilateral trading and intended exports.</td>
</tr>
<tr>
<td>Large Customers</td>
<td>Report consumption forecasts &amp; future step loads; notify MSB of any bilateral trading.</td>
</tr>
<tr>
<td>MO</td>
<td>Collate commercial data; Conduct optimisation modelling for scheduling and Dispatch, scenarios and sensitivity modelling, trading forecasts.</td>
</tr>
<tr>
<td>NO</td>
<td>Develop local area demand forecasts, transmission network development.</td>
</tr>
<tr>
<td>NP Generators</td>
<td>Report production forecasts and plant technical &amp; commercial assumptions.</td>
</tr>
<tr>
<td>SO</td>
<td>Collate plant technical data; Develop national demand forecasts.</td>
</tr>
<tr>
<td>Trader</td>
<td>Notify MSB of intended Trading Schedules between Eligible Sellers and Contestable Customers.</td>
</tr>
</tbody>
</table>

13.6 Annual Operational Planning

The SO is required to develop an annual operational plan for the system, which includes coordinating maintenance of the grid and power stations, in accordance with the Grid Code. To enable network reliability and review available supply capacity, will require an optimised Dispatch plan to estimate how available supply will be used to meet the expected demand. The optimised plan will incorporate any technical or commercial constraints relating to specific plant in the system. The annual operational plan should also be designed to co-ordinate outages of transmission and generation for maintenance so as to ensure the ongoing ability of the system to securely meet demand.
Under the new market model, the demand forecast must incorporate information from customers engaged in bilateral transactions as well as Production Schedules from similarly engaged Eligible Sellers. Contestable Customers and Eligible Sellers will need to work with the SO to enable the development of the annual forecast and they must support appropriate on-going information exchange. The plan will also need to include forecasts for international trading from the MSB and other Importers and Exporters in the market.

Table 22: Annual Operational Planning Responsibilities

<table>
<thead>
<tr>
<th>Participant</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dept. of Energy</td>
<td>Recipient of plan.</td>
</tr>
<tr>
<td>Distributors</td>
<td>Notify SO of maintenance and planned outages; new connections of large customers and embedded IPPs.</td>
</tr>
<tr>
<td>ECB</td>
<td>Recipient of plan.</td>
</tr>
<tr>
<td>IPPs</td>
<td>Notify SO of maintenance and planned outages – 52 week rolling plan updated weekly by 15:00 every Monday (or first working day of the week); An annual maintenance / outage plan per Power Station, looking five years ahead, showing the same information as above and issued by 31 December of each year; A monthly variance report, explaining the differences between the above two reports.</td>
</tr>
<tr>
<td>Large Customers</td>
<td>Notify SO of maintenance and planned demand.</td>
</tr>
<tr>
<td>MO</td>
<td>Develop and publish optimised annual production plans. Updated over the different time including a day-ahead Constrained Schedule.</td>
</tr>
<tr>
<td>NO</td>
<td>Notify SO of maintenance and planned outages; provide local demand forecasts; report network upgrades and new connections; collate outage requests.</td>
</tr>
<tr>
<td>NP Generators</td>
<td>Notify SO of maintenance and planned outages – 52 week rolling plan updated weekly by 15:00 every Monday (or first working day of the week); An annual maintenance / outage plan per Power Station, looking five years ahead, showing the same information as above and issued by 31 December of each year; A monthly variance report, explaining the differences between the above two reports.</td>
</tr>
<tr>
<td>SO</td>
<td>Responsible for development of Annual Operational Plan.</td>
</tr>
<tr>
<td>Trader</td>
<td>Notify MSB of planned trading.</td>
</tr>
</tbody>
</table>
13.7 Transmission System Planning

The Grid Code specifies that transmission system planning be managed by the Transco – for the purposes of this document, the Network Operator is identified as the responsible party within the existing Transco. Transmission system planning is required due to a number of factors, which include: new connections; reconfiguring, decommissioning or optimising parts of the existing network; introduction of new substations or points of connection, etc.

Table 23: Transmission System Planning Responsibilities

<table>
<thead>
<tr>
<th>Participant</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dept. of Energy</td>
<td>Recipient of plan.</td>
</tr>
<tr>
<td>Distributors</td>
<td>By end October each year, supply their 5-year ahead load forecast data and an estimate for the 10 years ahead demand; responsible for development of distribution level 5yr network development plan (to be reviewed a minimum of every 3 years).</td>
</tr>
<tr>
<td>ECB</td>
<td>Recipient of plan.</td>
</tr>
<tr>
<td>IPPs</td>
<td>Recipient of plan; follow appropriate procedures in Grid code for network connections.</td>
</tr>
<tr>
<td>Large Customers</td>
<td>By end October each year, supply their 5-year ahead load forecast data and an estimate for the 10 years ahead demand.</td>
</tr>
<tr>
<td>MO</td>
<td>Reviewer of Plan.</td>
</tr>
<tr>
<td>NO</td>
<td>Responsible for producing the TS demand forecast for the next five years and updating it annually – for each point of supply; estimating the load forecast for the next 10 years; shall annually publish a five year ahead network expansion plan, indicating the major capital investments planned (but not yet necessarily approved) - this plan shall be based on all customer requests received at that time, network load forecasting, as well as NO initiated projects.</td>
</tr>
<tr>
<td>NP Generators</td>
<td>Reviewer of Plan; follow appropriate procedures in Grid code for network connections.</td>
</tr>
<tr>
<td>SO</td>
<td>Reviewer of Plan.</td>
</tr>
<tr>
<td>Trader</td>
<td>Recipient of Plan.</td>
</tr>
</tbody>
</table>
13.8 Weekly Planning

The SO is to co-ordinate the medium-term Production Schedules for the weeks ahead based on internal forecasts and any specific information received from market participants – including IPPs and Contestable Customers.

**Table 24: Weekly Planning Responsibilities**

<table>
<thead>
<tr>
<th>Participant</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dept. of Energy</td>
<td>Recipient of plan.</td>
</tr>
<tr>
<td>Distributors</td>
<td>Advise on any requirements for unplanned plant outages or delays in return to service, update demand profile.</td>
</tr>
<tr>
<td>ECB</td>
<td>Recipient of plan.</td>
</tr>
<tr>
<td>IPPs</td>
<td>Advise on any requirements for unplanned plant outages or delays in return to service; updated Production Schedule.</td>
</tr>
<tr>
<td>Large Customers</td>
<td>Provide updated demand profile.</td>
</tr>
<tr>
<td>MO</td>
<td>Provide unconstrained and constrained Production Schedule.</td>
</tr>
<tr>
<td>NO</td>
<td>Advise on any requirements for unplanned plant outages or delays in return to service.</td>
</tr>
<tr>
<td>NP Generators</td>
<td>Advise on any requirements for unplanned plant outages or delays in return to service; updated Production Schedule.</td>
</tr>
<tr>
<td>SO</td>
<td>The SO will analyse the market participant production and consumption schedules to ensure the integrity of the network; The SO will provide an indicative weekly plan, including updated outage dates and international exchanges, by 15h00 every Monday, as prescribed in the Grid Code.</td>
</tr>
<tr>
<td>Trader</td>
<td>Notify MSB of planned trading.</td>
</tr>
</tbody>
</table>

13.9 Day-ahead Planning

The SO is to co-ordinate the day-ahead Unconstrained and Constrained Schedules based on internal forecasts and any specific information received from market participants – including IPPs Importers and Traders.
Table 25: Day-Ahead Planning Responsibilities

<table>
<thead>
<tr>
<th>Participant</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dept. of Energy</td>
<td>Recipient of plan.</td>
</tr>
<tr>
<td>Distributors</td>
<td>Advise on any requirements for unplanned plant outages or delays in return to service; updated demand schedule.</td>
</tr>
<tr>
<td>ECB</td>
<td>Recipient of plan.</td>
</tr>
<tr>
<td>IPPs</td>
<td>Advise on any requirements for unplanned plant outages or delays in return to service; updated Production Schedule.</td>
</tr>
<tr>
<td>MO</td>
<td>The MO must provide the SO with the daily twenty-four (24) hours day-ahead energy schedule and daily price curve before 16:00 Central African Time each day. The energy schedule shall be made available hourly thereafter as to ensure the transfer of a new schedule owing to a reschedule by the System Operator. The System Operator shall import the energy schedule hourly, at five (5) minutes to the hour, for Dispatch.</td>
</tr>
<tr>
<td>NO</td>
<td>Advise on any requirements for unplanned plant outages or delays in return to service.</td>
</tr>
<tr>
<td>NP Generators</td>
<td>Advise on any requirements for unplanned plant outages or delays in return to service; updated Production Schedule.</td>
</tr>
<tr>
<td>SO</td>
<td>The SO shall use the estimated week-ahead production plan derived from the weekly planning process and, with the day-ahead submissions from producers, Distributors, intermediaries and Contestable Customers, establish a feasible day-ahead delivery plan that is secure and does not violate transmission constraints.</td>
</tr>
<tr>
<td>Trader</td>
<td>Traders will be required to report on their planned Trading Schedules, including the allocation of energy purchases (from Eligible Sellers) to Contestable Customers. Traders will need to specify the allocation for each Generator separately in order to facilitate accurate reconciliations.</td>
</tr>
</tbody>
</table>
14 PROCUREMENT

14.1 Objective / Purpose

The objective of this section is to clarify who is responsible for procurement in the MSB and how this will be take place.

14.2 Legislation & Regulation

As discussed under planning, the Electricity Bill (30th of November 2016), clarifies that the Minister of Energy is responsible for determining how long-term supply will be procured i.e. which technologies, when and by whom. In this respect, the NIRP is the guiding document which specifies:

1) what technology is built,
2) when it must be commissioned by.

But the NIRP does not specify who will procure the new supply or who will build the new supply.

14.3 New Supply

In the SB market, new supply was predominantly procured at a national level i.e. by NamPower, in order to satisfy total demand in Namibia. However, in the recent past, some Distributors have procured embedded supply directly and rooftop solar PV (Captive Generation) has also increased significantly.

In the MSB market, new supply can be procured by:

1) The MSB to meet national demand
2) Contestable Customers as per agreed criteria
3) End consumers for own generation purposes
4) Regional customers for export purposes
5) Traders for bilateral trading purposes

The NIRP considers national demand but does not consider procurement outside of a SB or MSB. In order to avoid either over or under building of new supply, it is important that in future the NIRP considers procurement at all of these levels. The Minister will need to determine whether the NIRP is still valid given these market changes and what capacity can now be allocated for procurement by all these new market participants.

14.4 MSB

The MSB is not responsible for the development of the NIRP, but can be instructed by the Minister to procure new supply to meet national demand. In this regard, and as the supplier-of-last resort, the MSB must inform the Minister of Energy of any impending inadequacy of
supply or oversupply, in order to ensure that the Minister can manage procurement appropriately. Long term national demand forecasts are developed by the SO in order to provide guidance on procurement. The SO will determine the Ancillary Services requirements for the system which will then be procured by the MO.

14.5 Contestable Customers – Public Entities

Contestable Customers will include REDs LAs and RCs. Procurement processes for Public Entities are currently governed by the Public Procurement Act (Act. 15 of 2015) and the Public Procurement Regulations: Public Procurement Act, 2015. It is anticipated that all procurement processes for new electricity supply for Public Entities, will be aligned with this procurement legislation and regulation. REDs are private companies and are not governed by the Public Procurement Act.

14.6 Contestable Customers - Volumes

Under the MSB, Contestable Customers will be allowed to procure supply in accordance with prevailing legislation, policies and procedures. However, there is also a responsibility on Contestable Customers to make sure they do not buy more electricity than what they consume in each Trading Period. To assist customers and the MSB, a simple definition is needed to determine how much energy may be purchased from licensed Embedded Generators and bilateral transactions.

The following definition is proposed:

1) $x\%$ of the highest monthly total energy purchased as measured over the previous 12 months.

2) This definition will:

   a. avoid the effect of seasonality,

   b. keep pace with the change in customer consumption.

14.7 Captive Customer

Captive Customers which are not Contestable Customers can procure supply from generation sources connected to their electrical facilities (behind the meter installation). The procurement of such supply is governed by the Grid Code, NRS standards and ECB regulations.

14.8 Regional Customers

Allocation of new capacity for export will be managed by Ministerial determination and/or as specified in the NIRP. It is possible that both solicited and unsolicited proposals could be made for export purposes. In order to protect Namibia’s long-term interests, the ECB must manage the implementation of the “Call-Back” option, discussed in section 17.
14.9 Traders

Traders will be able to procure energy from Eligible Sellers in accordance with the criteria discussed in section 6.
15 SECURITY OF SUPPLY

15.1 Objective / Purpose

The purpose of this section is to clarify how the MSB market design will ensure on-going security of supply particularly in generation. The concern is that the introduction of IPPs, combined with the ability to wheel power, could undermine the security of supply. This risk of inadequate supply over any planning horizon can be avoided by undertaking planning, scheduling and operating activities on a rolling basis, as well as by ensuring that appropriate adequacy criteria are employed. As the nominated Supplier of Last Resort, many of these activities will be the responsibility of the MSB in NamPower.

15.2 Approach

The generation of reliable and quality electricity requires the provision of services across several dimensions including:

1) Sufficient potential to meet the energy needs on the integrated system,
2) Sufficient capacity to meet the demand for electricity, including the need for Ancillary Services, on the integrated system, and
3) Sufficient Ancillary Services capabilities to meet the need for these services on the integrated system.

To ensure that these services are available when needed the MSB is tasked with carrying out planning and operational activities over different planning horizons including:

1) Long term plans (e.g. ranging from 1 – 20 years),
2) Annual Plans (e.g. 12-month period),
3) Weekly plans (e.g. 4-week period),
4) Daily Schedules (e.g. next 24 hours),
5) Hourly (or half-hourly) operations (real time operations from one hour to the next),
6) Sufficient potential to meet the energy needs on the integrated system.

The above approach underlines the fact that “Reliability” or the continuous supply of reliable low-cost electricity, depends on planning, implementation and operations over the short, medium and long term. This approach is depicted the figure below:
In the MSB market, system reliability remains the responsibility of the Supplier of Last Resort i.e. the MSB within NamPower. Their responsibilities can be defined over the following periods:

- **Short term** responsibilities (next 24-hours): Includes scheduling and Dispatch of supply and the calling of Ancillary Services.
- **Medium term** responsibilities (1-day up to 3 years in the future): Operations planning (maintenance and production planning).
- **Long term** responsibilities (> 3 years in the future): Generation and transmission planning.

The terms “Reliability Services” and “Ancillary Services” are often used interchangeably however, it should be noted that these are only one part of the short-term responsibilities of the MSB. Furthermore, any costs for Reliability Services will include services, functions and assets related to all of the above.

### 15.3 Energy and Capacity Adequacy

The planning for adequate energy production as well as generation and transmission capacity capability is well understood by the industry. Namibia’s NIRP is a good example of a detailed long-term plan to ensure energy and capacity adequacy.

Energy planners have always had to deal with variability and uncertainty to some extent, but the challenges that variable renewable energy (VRE) poses to the power sector are in many ways distinct. Proactive planners, in both developed and developing economies, will aim to address these challenges directly.

It is beyond the scope of this report to present a detailed discussion on the impact of high penetration levels of VRE on long-term planning processes. However, the important point to underline is that that the challenges presented by high VRE penetration can be safely addressed through proper planning methods and tools.\(^{22}\)

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15.4 Ancillary Services Adequacy

Currently Namibia falls under Eskom’s Control Area, which means Eskom provides some of Namibia’s balancing and Ancillary Service needs. Typical Control Area functions include:

1) Balance its generation, load and interchange schedules and operate sufficient generating capacity under Automatic Generation Control (AGC).

2) Reserves to deal with system contingencies.

3) Monitor Area Control Error (ACE) and be capable to reduce it to zero.

4) Telemeter, monitor and manage power flows at agreed points of interconnection (i.e. managing flows over international interconnectors).

5) Have reliable telecommunication for inter and intra area operations.

6) Provide applicable services to systems in own area.

Given the increasingly important role that VRE is playing in electricity generation in the region and the demands that this will place on Ancillary Services, it is expected that the cost of providing these services will come under the spotlight. Several utilities including Eskom are reviewing their cost structures to better understand the cost of providing these services. It is therefore reasonable to expect that Ancillary Services cost will be further unbundled resulting in a substantial increase in the prices for the various services in the near to medium term.

It follows that Namibia must take a more pro-active stance towards the procurement, provision and payment of Ancillary Services. It is assumed that NamPower will lead the development of clearly articulated Ancillary Services strategy. The first step in this process, is to clearly identify the need for Ancillary Services followed by a plan of who will provide these services and at what cost.

Linked to the above, the Grid Code defines the SO as responsible for the technical specification and execution of all short term (daily) Reliability Services. These include restoration, the balancing of supply and demand, the provision of quality voltages and the management of the real-time technical risk. The MSB will be responsible for procuring the required Ancillary Services that are economically efficient and needed to provide the required reliability. The Namibia Transmission Grid Code defines the following as Ancillary Services:

1) Operating reserves
   a) Spinning Reserve
   b) Quick Reserve
   c) Regulating Reserve
2) Black start and Islanding
3) Reactive power compensation and voltage control from units
4) Regulation and Load Following
5) Near 50Hz Resonance Control Service

International studies have pointed out that large scale penetration of VRE (e.g. >70%) indicated that planners should ensure adequate reserves to deal with decreasing levels of inertia.\textsuperscript{23} In layman’s terms this means the energy in large rotating generating machines provide ‘momentum’ which is used as a ‘first line’ mitigation (< 5 seconds) against system disturbances. In the past, this ‘service’ came as part of rotating machines and were provided for free.

Although wind Generators are rotating machinery their rotating components are not directly coupled to the system while solar PV arrangements have no rotating parts. Under normal design conditions these sources, referred to as non-synchronous power sources, are unable to provide inertia to the system. A system with very high levels of non-synchronous machines may therefore experience a lack of reserves to deal with the system disturbances immediately following an incident.

Numerous international studies have clearly pointed out that there are several ways to deal with decreasing inertia from synchronous machines including:

1) Active power control services available to some types of VRE (e.g. wind Generators can be designed to provide synthetic/pseudo inertia to the system. This means that inertia can be planned, controlled and optimised.

2) Fast frequency response options such as Energy Banking systems and demand response.

3) Regional interconnections provide access to larger network which will share the available inertia between the interconnected systems.

The above indicates that there is no natural or scientific ‘cap’ on the level of vRE in the system and that planning is needed to deal with the characteristics of new technologies. A more in-depth discussion of the roles of Ancillary Services in ensuring sufficient quality of supply is presented in Section 23.1.1.

15.5 The Role of the Supplier of Last Resort

It is recognised that in a market structure where customers are afforded freedom to choose between alternate suppliers the failure of a particular supplier to deliver can lead to interruption of supply. In the event of a supplier failure, it is important to have mechanisms in place to ensure that all customers continue to receive supply of electricity.

\textsuperscript{23} Inertia refers to the “stored rotating energy in a power system provided by synchronous and induction generation” (NERC and California ISO, 2013).
It is recommended that under the proposed MSB market structure, this obligation to supply is placed with the MSB unit. The responsibilities as Supplier of Last Resort will not apply in the following instances:

1) In the instance of IPPs exporting power to regional markets, it is important to note that the MSB will not be required to act as the Supplier of Last Resort for regional off-takers.

2) Given that the generation sources for import transactions are located outside Namibia there will be no obligation on the MSB to act as the Supplier of Last Resort in imported transactions.
16 **FINANCIAL SECURITY REQUIREMENTS**

16.1 **Objective / Purpose**

Eligible Sellers that participate in the MSB will face Balancing Charges if they deviate from the Adjusted Constrained Schedule. In order to manage the MSB’s financial exposure between the time when balancing and other services are provided, and when payment is received for these services, the MSB will expect Eligible Sellers to place and maintain a financial security (or deposit).

The purpose of this section is to provide details on the operation of the Financial Security mechanism which will be a requirement for participation of an Eligible Seller in the MSB.

16.2 **Placement of Security**

Each Eligible Seller, as security towards cost of energy imbalances and other services, shall:

1) Deposit a cash collateral, either in a securities account nominated by the MSB or,
2) Provide the MSB with a bank guarantee from a bank of good credit standing acceptable to the MSB.

The minimum-security amount required shall be equal to the average monthly settlement amount for the three most recently published settlement reports provided that the security amount shall never be less than the NAD equivalent of USD 5 000 (five thousand US Dollars).

16.3 **Management of Security**

The MSB shall ensure the following:

1) Designate a bank account for the purpose of managing security payments.
2) Adjust the amount of security required for each Seller based on the most recent settlement reports.
3) Monitor and ensure that the required security amount is maintained at all times.
4) Manage, facilitate and disqualify any Seller from entering into any further bilateral trading transactions that are in breach of the minimum security requirements.
5) Be the only entity who is authorised to approve liquidations and transfers from this account.

The MSB shall adhere to the following:

1) Any interest accruing from this account will be credited to the Eligible Seller.
2) Payment of settlement amounts shall not be made from the security account.
3) Should a draw down on the security occur, additional security shall be lodged with the MSB until the minimum-security requirements have been met before any further transactions by the Eligible Seller are allowed to proceed.
4) Eligible Sellers shall ensure that sufficient security is lodged with the MSB before trading commences.

16.4 Withdrawal of Security

The following shall apply in respect of the withdrawal of the security:

1) An Eligible Seller shall be entitled to withdraw its Financial Security if it does not intend to engage in any bilateral trades trading for a period of not less than 12-months.

2) The Seller shall provide the MSB with 7 (seven) days’ notice of its intention to withdraw the security.

3) The MSB shall deduct any outstanding monies form the security amount before the net amount is returned to the Seller.

4) Should a Seller elect to withdraw its security, any associated administrative costs shall be payable by the Seller.

5) The Seller shall, if it intends to resume bilateral trading, notify the SO of its intention to commence bilateral trading. Trading shall only commence when the Financial Security amount, as determined by SO, has been placed and all other conditions have been met.
17 **EXPORT CALL-BACK OPTION**

17.1 **Objective / Purpose**

The MSB will enable Exporters to sell electricity to regional Buyers and markets. Some stakeholders have questioned whether Namibia should allow this option. Their main concern is that IPPs might develop and then export Namibia’s least-cost generation options leaving Namibian customers with the more expensive options.

The purpose of this section is to discuss ways in which Namibia can ensure access to low cost options without preventing the electricity industry from developing an energy export orientated business which would stimulate infrastructure development, create jobs and bring benefits to the region.

17.2 **Options and Recommendations**

The outlook for power generation in Namibia has changed dramatically over the past ten years. For many years Namibia’s power generation options were restricted given the country’s limited thermal and hydro resources.

However, the significant decline in the cost of wind and solar PV generation combined with Namibia’s high levels of solar irradiation and consistent wind profiles, have opened new and exciting opportunities for the country. Namibia have also carefully and deliberately developed a stable political environment, good infrastructure and sound legal and regulatory frameworks since independence. These factors have created a favourable climate for the development of renewable options that are able to compete with more traditional energy forms.

Most experts agree that the cost of wind and solar PV generation will decline further in the coming years, increasing the chance that Namibia would be able to develop and export low cost renewable energy. In fact, by allowing and encouraging electricity exports, developers will be able to develop bigger projects which will decrease the cost of production through economies of scale.

Depending on the situation (price, location, timing, etc.), Namibia may want to access some of the power from these large and low-cost, export orientated, power generation projects. There are a few ways through which this can be achieved, including:

1) **Option 1** - Purchase all the output from the plant. Namibia can then use what it needs and export the remaining power. This approach gives Namibia maximum access and flexibility, but it will require Namibia to make long term off-take and financial commitments.

2) **Option 2** - Purchase only a portion of the output. In this way Namibia can access a specified quantity of energy from the plant. The developer will then be able to export the remainder of the energy to its regional customer(s). This option reduces Namibia’s upfront commitment and exposure, but it prevents it from increasing its purchases from the plant as the needs of the system grow.
3) **Option 3 – Call Option:** This option is an enhancement of option two and allows Namibia to increase its purchases from the power plant. This is achieved through the incorporation of a ‘call -option’ in the power purchase agreement between the IPP and Namibia (represented by the MSB)\(^\text{24}\). The call option gives the MSB the right (but not an obligation) to increase its purchases from the power plant provided that:

a) The price paid by the MSB shall be equal to what the producer would have received if the power was sold to the existing regional customer(s),

b) The quantity of energy, exercised under the call option, shall not exceed 10% of the plant’s maximum total output as measured over any 12-month period since the plant achieved commercial operation, unless otherwise agreed to be the parties,

c) The parties shall adhere to the following notification conditions in respect of every notification,

i) A minimum notification period of 12 months.

ii) After 12 months, a quantity of energy equal to or less than [3%] of the plant’s maximum total output as measured over any 12-month period since the plant achieved commercial operation status, can be called, unless otherwise agreed to be the parties.

iii) After 36 months notification period a quantity of energy equal to or less than [10%] of the plant’s maximum total output as measured over any 12-month period since the plant achieved commercial operation status, can be called, unless otherwise agreed to be the parties.

iv) After 60 months notification period a quantity of energy equal to or less than [20%] of the plant’s maximum total output as measured over any 12-month period since the plant achieved commercial operation status, can be called, unless otherwise agreed to be the parties.

v) A maximum of 20% of the plants maximum total output as measured over any 12-month period since the plant achieved commercial operation status, can be called, unless otherwise agreed to be the parties.

d) A call-option is only valid if the ECB has approved it.

e) There is no limit on the number of times the MSB can exercise the call option subject to the total energy amount available under the call-option and notification periods,

\(^\text{24}\) The Call option is between the MSB and the IPP. The PPA may be between the IPP and another 3\text{rd} party.
f) Once the MSB has exercised a call-option it will remain in place until the expiry of the sales agreement between the Seller and the last remaining regional customer.

g) Neither the MSB nor the GRN shall provide the Seller with any financial guarantees, letters of credit or similar instruments if a call option is exercised.

h) The conditions for the call-option will remain as set out in this section unless otherwise agreed to by the parties.

The Call-Option is depicted below:

Figure 11: Illustration of Call-Back Option
18 Regulation and Governance

18.1 Objective / Purpose
The purpose of this section is to describe the potential changes in regulation and governance, required by the MSB market.

18.2 Regulation of the MSB
Regulation of the MSB falls within the purview of the electricity Regulator. The Regulator derives its oversight mandate from the Electricity Act - 2007 and shall fulfil this role through the licensing processes as foreseen by the Act. In particular Part II, sections (4)(a) and (4)(b) of the electricity Act - 2007, empowers the Regulator, subject to certain conditions, to establish an electricity market, issue licenses to persons operating in the market and to publish Market Rules and regulations to govern the market. It is also noted that the Electricity Bill of 30 November 2016 enables a more flexible market structure and allows the Regulator, subject to certain conditions, to issue specific licenses (separately or combined) to System Operator and Market Operator entities.

18.3 Approval and Licensing
The Regulator has developed an existing licensing regime, which is applied to current market participants. Under the MSB market structure, the Regulator may choose to amend licensing regulations for new and existing market participants. Licenses will only be granted pending a number of other approvals.

The various approvals and licenses are listed below for each of the new participants in the MSB.

18.3.1 MSB
Following the completion of the Detailed Market Design and the stakeholder participation process, the MSB Market has been approved by:\n
1) Regulator’s Board.
2) Minister of Mines & Energy.
3) Cabinet.

The MSB will require the following approvals:

1) Regulatory Approval
   a) Market Operator License,

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25 In April 2019, for implementation on 1st September 2019
b) Import License,

c) Export License.

The MSB Rules will require the approval of the Regulator.

18.3.2 Contestable Customer

A Contestable Customer will require the following approvals:

1) MSB approval
   a) The MSB will register Customer as a Contestable Customer,
      b) Will confirm that transaction volumes are within acceptable limits.

2) Utility Approval
   a) The customer has signed the revised power supply agreement which provides for unbundled Tariffs and meter-offsetting arrangements.

3) Regulator Approval
   a) Regulator will confirm that:
      i) all abovementioned approvals have been obtained,
      ii) PPA Tariffs and conditions are acceptable.
      iii) The Contestable Purchase volume is within the National and Customer Supply Point Cap limits,
      iv) The licensee’s tariffs have been sufficiently unbundled to facilitate MSB transactions (including the regulatory approval of a wheeling charge),
      v) In the case of a Distribution licensee, the project will be evaluated against the Regulator’s long-term wholesale energy tariff forecast in order to ensure that the project provides sufficient value to the Distributors retail customers over the life of the project.
      vi) The Contestable Customer has paid their MSB Participation Fee.

18.3.3 Eligible Sellers

Eligible Sellers (Generators) within Namibia, will require the following approvals:

1) System Operator approval
   a) The SO will confirm that the producer will not compromise the integrity of the national grid.

2) MSB approval
   a) The MSB will register Seller as an Eligible Producer/ Seller,
b) The MSB will confirm that Eligible Producer has met all the financial security requirements.

3) Network Operator(s)
   a) Utility will confirm that:
      i) a wheeling agreement has been entered into,
      ii) a connection agreement has been entered into,
      iii) that a Use of System agreement has been entered into.

4) Regulatory Approval
   a) Regulator will confirm that:
      i) all abovementioned approvals have been obtained,
      ii) PPA Tariffs and conditions are acceptable,
      iii) Tariffs of affected utilities have been unbundled and wheeling charges have been calculated and approved in accordance with wheeling framework,
      iv) GRN requirements have been accommodated including any ‘Call Back Option’ provisions,
      v) Power plant complies with NIRP/Ministerial determination capacity allocation,
      vi) All other licensing requirements,
      vii) Generation license has been issued.

18.3.4 Exporters

IPPs that wish to export electricity will have to meet a number of requirements including26:

1) System Operator approval
   a) SO will confirm that the producer will not compromise the integrity of the national grid.

2) MSB approval
   a) The MSB will register the Producer as an Exporter.

3) Network Operator
   a) Utility will confirm that:
      i) a wheeling agreement has been entered into,
      ii) a connection agreement has been entered into,

26 The MSB assumes that all SAPP approvals have been obtained
iii) that a Use of System agreement has been entered into.

4) Regulatory Approval
   a) Regulator will confirm that:
      i) all abovementioned approvals have been obtained,
      ii) Tariffs of affected utilities have been unbundled and wheeling charges have been calculated and approved in accordance with wheeling framework,
      iii) GRN requirements have been accommodated including any ‘Call Back Option’ provisions,
      iv) Power plant complies with NIRP capacity allocation,
      v) All other licensing requirements,
      vi) Generation and Export license have been issued.

18.3.5 Eligible Traders

Traders will require the following approvals:

1) MSB approval
   a) The MSB will register Trader as an Eligible Trader,
   b) The MSB will confirm that Eligible Trader has met all the financial security requirements.

2) Network Operator
   a) Utility will confirm that:
      i) wheeling agreements have been entered into.

3) Regulatory Approval
   a) Regulator will confirm that:
      i) all abovementioned approvals have been obtained,
      ii) PPA Tariffs and conditions are acceptable,
      iii) Tariffs of affected utilities have been unbundled and wheeling charges have been calculated and approved in accordance with wheeling framework,
      iv) GRN requirements have been accommodated including any ‘Call Back Option’ provisions,
      v) Power plant complies with NIRP capacity allocation,

27 If Importing, the Trader will require further SAPP approvals
vi) All other licensing requirements,

vii) Trading license has been issued as appropriate.

18.3.6 Imports

Any person wishing to import power must meet a number of requirements including:

1) Obtain an import license from the Regulator.

2) Register with and obtain clearance from the MSB indicating that all market requirements have been met and that there are no technical, operational or commercial objections,

3) Meet all the requirements as specified by the MSB Market Rules.

4) Pay relevant charges including balancing and wheeling.

18.4 Governance of the MSB

The MSB market is governed by a set of Market Rules. The development, amendment and enforcement of Market Rules are complex tasks that require careful consideration by various specialists in collaboration with industry and political stakeholders. This is very similar to the governance requirements in respect of the Namibian Grid Code arrangements.

In view of the above and given the integrated nature between System and Market Operator activities, it can be argued that the Grid Code Advisory Committee (GCAC) is best positioned to assume the governance roles and functions of the MSB. There are several reasons in support of this position:

1) The GCAC mandate, structures and processes already exists.

2) Avoids duplication of potentially overlapping tasks.

3) Access to similar industry skills and experiences.

4) Co-ordination between system and market operations, rules and decisions.

The Governance Code section of Namibia’s Transmission Grid Code establishes the Regulator as the administrative authority of the GCAC and clearly sets out the following:

1) The composition and appointment of the GCAC members.

2) The functioning of the GCAC.

3) The registration of Grid Code participants.

4) Grid Code amendment or exemption procedures.

5) Grid code dispute mediation, resolution and appeal mechanisms.

6) Grid Code Compliance requirements.

7) Grid Code audits.
The GCAC’s roles and responsibilities in respect of the MSB in general and the Market Rules in particular, include:

1) The GCAC will act as the guardian of the MSB Market Rules.

2) The GCAC will ensure that the Market Rules are reviewed and updated as required and ensuring that a consultative stakeholder approach is followed.

3) The GCAC will make recommendations on any proposals for exemptions from the Rules and facilitate expert technical advice for the Regulator on matters relating to the Market Rules.

4) The GCAC will be responsible for curtailing market abuse e.g. market manipulation, price positioning, transfer pricing, etc.

It is proposed that the Regulator review the composition of the GCAC to explicitly include a member to represent market operator interest as well as ensuring that one of the Generator members is from the public sector and that one is from the private sector.

18.5 Regulation of Market Entry

Over and above approvals and governance, the Regulator will also remain responsible for managing entry into the MSB Market, including registration for Contestable Customers and Eligible Sellers. The Regulator will therefore develop Market Procedures, to manage and maximise market participation. This will include guidance on the following issues:

18.5.1 Registration for MSB participation

Customers can register for the MSB, provided that:

1) They meet the Contestable Qualifying Criteria at a Supply Point, defined by the Regulator for each Market Phase.

2) They can identify the specific Eligible Seller with which they will transact.

3) They can identify the specific generating unit that will supply them.

4) The volumes specified in the transaction are within their allocated Contestable Purchase limits.

5) They pay their MSB Participation Fee.

Sellers can register for the MSB, provided that:

1) They meet the Eligibility criteria

2) They identify the specific Contestable Customer with which they will transact

3) They identify the specific generating unit that will supply the Contestable Customer

4) Submit the specified project development documentation requested by the Regulator

It should be noted that Contestable Customers can:
1) De-register from participation in the MSB market at any time.

2) Apply to the ECB to amend their registration for the purposes of identifying an alternative Eligible Seller.

It should be noted that Eligible Sellers can:

1) De-register from participation in the MSB market at any time.

18.5.2 MSB Participation Fee

An “MSB Participation Fee” must be paid by Contestable Customers in order to register and participate in the MSB market. The Participation Fee is effectively a “license fee”, charged to Contestable Customers in order to recover the Regulator’s costs associated with registration and regulation of Contestable Customers in the MSB.

The MSB Participation Fee will have the following characteristics:

1) The Fee will be calculated on the Contestable percentage (maximum 30% in Phase 1a and 1b) of a Contestable Supply Point Capacity.

2) Each Contestable Supply Point will be calculated individually.

3) The fee value per MVA is NAD 3,000 (in September 2019).

4) Fees will be payable on an annual basis and inflated with CPI.

5) Annual Fees are not refundable on de-registration from the MSB.
19 **IMPACT OF PROPOSED MSB**

19.1 **Objectives / Purpose**

Any proposed changes within the MSB market must also consider the financial and economic impact of the proposed market structure. The new market structure must maintain the overall financial viability of the market and all market participants, as well as demonstrating sufficient benefits to outweigh the assumed costs. Keeping this in mind, feedback from stakeholders was for the ECB to conduct a detailed quantitative impact assessment to test whether the new market design would result in a positive overall impact on the Namibian ESI.

Two distinct analyses have been conducted to determine (i) the Economic impact and (ii) the Tariff Impact of the MSB. The scope of work for these two studies included the following tasks:

1) Conduct a high-level ringfencing of MSB Functions & Activities.

2) Calculating indicative charges for the proposed unbundled MSB service charges including:
   a) Reliability service charge,
   b) Transmission capacity-based charges,
   c) Banking methodology & charges,
   d) Transmission Loss Factors.

3) Based on the results from the above analysis determine the high-level Tariff impact assessment on selected distribution licensees and typical or representative customers. Work closely with ECB, distribution licensees and other industry exports.

4) Determine through objective means, the appropriate percentage of contestable sales quantity during the initial phase following the introduction of the MSB.

5) Performing a macro-economic assessment of the cost and benefits of the proposed MSB. The analysis will use the ECB macro-economic model in determining the impact.

The outcome of the Tariff Impact Assessment was presented to stakeholders in November 2018 and the results have been included in Annexure 3 of this report. The macro-economic impact analysis was completed in January 2019 and the results have been included in Annexure 4 of this report.

19.2 **Tariff Unbundling Impact Results**

19.2.1 **Charge Adjustments**

A first step in the Tariff impact assessment, was the further unbundling of the NamPower Tariff to ringfence Reliability Service Costs. The conclusions from this task were:

1) The ringfenced Reliability Services Costs include:
   a. Energy Trader and Systems Operations in NamPower,
   b. Assets including Anixas and Van Eck,
   c. Ancillary Services from Eskom.
2) Unbundling impacts on both energy (variable) and network (fixed) costs BUT the overall Tariff is not impacted – this is a cost reallocation, not the addition of further costs.

3) Currently, the total cost of reliability is estimated at ~N$381m.

4) This is ~7.8% of total energy costs and equates to ~10N$c/kWh.

5) This is on par with international benchmarks.

The Tariff impact assessment also identified which Tariff charges would now be inescapable or “non-escapable” i.e. to level the playing field and to ensure customers pay for the services that they use (minimising cross-subsidisation). It was recommended that these include: (i) Reliability Service charges, (ii) Losses (for energy wheeled) and (iii) Levies (e.g. ECB or NEF).

The impact of the introduction of non-escapable charges can be summarised as:

1) Reliability Services, ECB and NEF Levies are now charged on all electricity consumed – levelling the playing field and reducing cross-subsidisation

2) The unwinding of “temporary charges” such as the “Under Recovery Charge” could cause a reduction of up to 21.69 N$c/kWh in the “Escapable” charges

**19.2.2 Impact on REDs**

The impact of the Tariff unbundling was tested on CENORED and ERONGORED as case studies. The conclusions from the case studies (calculations detailed in Annexure 3), is that REDs:

1) Will now pay reliability charge (~10N$c/kWh) on all energy consumed including embedded and Captive Generators.

2) Can pass this cost on to customers with Captive Generation (will be listed as separate line item on invoice from NamPower).

3) Has been given a more accurate indication of the energy charge that an IPP must compete with i.e. not 138N$c/kWh but closer to ~121N$c/kWh for embedded and ~112N$c/kWh for wheeled.

4) If under-recovery charges reduce over next 2-3 years, this will lead to another reduction of ~20N$c/kWh in energy charge; therefore target for IPP is probably less than ~99N$c/kWh.

5) Tariff unbundling on REDs with embedded generation was 0.03% or 0.01% increase in total energy costs.

**19.2.3 Impact on NamPower**

1) NamPower is currently losing ~10N$c/kWh on energy generated by licensed Captive Generators in terms of Reliability services costs, leading to cross-subsidisation by other consumers.

2) The MSB proposes that the identified services, functions and assets associated with Reliability, are ringfenced and removed from the bundled energy charge and levied on customers for all energy consumed.
3) NamPower’s overall Revenue Requirement remains unchanged except for relatively small cost of implementation of MSB.

4) NamPower and the ECB will need to constantly review and update Tariff charges in order to ensure accuracy and send appropriate pricing signals e.g. Time of Use.

19.2.4 Impact on Consumers

1) Consumers will no longer be able to avoid paying for Reliability and other “Non-escapable” Levies and charges.

2) REDs will pass on the cost of these services to customers with Captive generation.

3) The “avoided cost” of REDs will reduce by 5,5% initially and potentially by another ~20% in the short term.

4) This will have an impact on customers that net-meter, their ToU differentiated net-metering Tariffs will reduce proportionally in line with the licensees avoided costs.

5) Recovery of costs from a greater number of consumers will lead to lower charge levels for certain costs – if Tariffs are not unbundled, Tariff levels will need to increase to account for subsidisation.

19.2.5 Impact on Net-metering Consumers

The ECB has indicated that it will be revising the net-metering rules; however an initial assessment reflects the following impact:

1) On NamPower - there is no impact.

2) On the Distributor – an increased benefit of 16N$/c/kWh due to the reduction in the licensees avoided energy cost.

3) On the Customer – a reduction in the net-metering benefit of 16N$/c/kWh due to the reduction in the licensees avoided energy cost.

19.3 Macro-Economic Assessment Results

In assessing the macro-economic impact of the MSB, it is important to note that both the MSB and the SB provide a platform for activities which can then have either a positive or a negative impact. From a macro-economic perspective, these impacts can be measured by examining changes in indicators such as GDP, Inflation and Employment creation.

Previous macro-economic modelling experience has shown that large infrastructure programs, including the construction of new power stations and transmission lines, has a positive impact on economies due to the influx of investment and job creation. Once again, this is consistent for both the SB and the MSB. Therefore, if all assumptions are fixed, macro-economic comparisons between the SB and the MSB, should show no differences.

The utilisation of differing market structures does however address issues including: competition, choice, efficiency, cost and flexibility. The MSB promotes competition and choice
as two key differentiating design features when compared with the SB. At the heart of the MSB market structure is the belief that competition is the most efficient and effective mechanism to driving down costs. It also encourages multiple expert market participants and spreads risks and the funding burden for new plant development. As compared to the SB, it is therefore believed that the MSB provides the best possible chance of building more local supply options, for the lowest possible cost, in the shortest possible time.

The macro-economic assessment conducted therefore does not specifically contrast the SB with the MSB. Rather, it compares a market (the Base Case), in which less local plant is built with a market in which more local plant is built to displace imports (the MSB Case).

Table 26: Summary Results from Macro-economic Impact Assessment

<table>
<thead>
<tr>
<th>Economic Indicator</th>
<th>MSB vs. SB (real terms; 2019-2025)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity Price in 2025</td>
<td>MSB is 5c/kWh cheaper than the SB</td>
</tr>
<tr>
<td>Cumulative avoided costs due to difference in electricity price</td>
<td>N$1,294m in 2025</td>
</tr>
<tr>
<td>Average increase in GDP growth per annum</td>
<td>+0.20%</td>
</tr>
<tr>
<td>Cumulative benefit in GDP</td>
<td>N$3,751m</td>
</tr>
<tr>
<td>Reduction in CPI</td>
<td>-0.02%</td>
</tr>
<tr>
<td>Job creation</td>
<td>+400/annum</td>
</tr>
</tbody>
</table>

19.4 Impact on Low Income Customers

The deployment of the MSB market model could fundamentally change the way electricity is bought and sold in the future. Understandably, there is a concern that smaller power consumers and more specifically the poor, could be disadvantaged either by way of lower quality, higher Tariffs or even a slow-down in the electrification programme.

Although the MSB is not specifically created as a mechanism to provide social support it is anticipated that the efficient working of the market will bring indirect benefits to smaller users, including:

1) Harnessing the advantages of declining renewable energy costs and Namibia’s exceptional solar and wind resources to halt Tariff increases and to drive down costs,

2) The replacement of imported electricity with local generation will stimulate job creation in Namibia.
3) The development of distributed generation will create job employment opportunities at local level including rural areas.

4) Large export orientated generation projects will create true value adding job opportunities which will a positive knock-on effect including rural communities.

5) The participation of private industry in power generation projects will reduce GRN’s commitment to the generation sector this freeing up limited resources which government can deploy elsewhere to improve the lives of ordinary citizens.

In addition, to the potential indirect benefits listed above, it is worth mentioning that Namibia has developed a Social Support Tariff as a means to make electricity more affordable to those in need.
20  RISK & MITIGATION

20.1 Objective / Purpose

It is acknowledged that there are a number of risks that arise in the transformation from a Single Buyer to a Modified Single Buyer Market. It is worthwhile to reiterate that the MSB was designed to mitigate any unforeseen or unintended consequences by:

1) Adopting a measured and phased approach to opening up the market. This will allow stakeholders to evaluate and manage any issues which arise and will not commit any party to a market structure which will risk their ongoing viability.

2) Capping the amount of energy which is contestable. This will prevent stranded investments and contracts which could result in severe financial pressure on utilities.

3) Unbundling Tariffs further. This step will minimise investment distortions and reduce cross-subsidisation by making sure that customers pay for the services they use.

4) Designating MSB (in NamPower) as the Supplier of Last Resort. This will ensure that customers in Namibia will have access to reliable electricity even if a private Generator is unable to deliver power in short, medium or long term. It should be noted that the MSB is not obliged to act as the Supplier of Last Resort for: i) to regional customers receiving electricity via Exports from Namibia, ii) Namibian customers who receive electricity via Import to Namibia.

5) Captive Customers and Contestable customers who do not choose an alternative electricity producer will be able to buy all their electricity from their utility. All utility charges will remain regulated to protect customers from potential abuse.

The purpose of this section is to provide a more detailed description of the potential risks that could be encountered through the different bilateral transactions as well as strategies to mitigate against these risks.

20.2 Risks Emanating from Bilateral Transactions

20.2.1 Volume Risk

Evolving market design requires careful consideration of the potential risks that may be encountered. The immediate concern with opening the market for bilateral transactions is the financial impact on the current single supplier i.e. NamPower, who has already entered into power purchase agreements and invested significantly into generation assets with costs that need to be recovered over the long life of the power plants. Currently however, Namibia also imports ~50% of their power from South Africa and neighbouring markets - therefore there is an opportunity to displace some imported energy by phasing the implementation of new bilateral trading in Namibia, to coincide with the expiration of these import contracts.

In order to determine and mitigate the financial viability risk, the ECB and the Consultants worked with NamPower and other stakeholders to calculate the rate and threshold at which
bilateral transactions can be introduced in order to manage the potential revenue impact. The results from this assessment is summarised in section 26 under “Annexure 1: Contestable Customer Impact Assessment”. It provides the ECB with overarching limits to oversee a phased approach in growing the energy volume that are allowed to transact bilaterally in order to manage and mitigate any unintended consequences.

20.2.2 Security of Supply Risk

One of the key risks frequently raised during the stakeholder engagement process revolved around the security of supply in Namibia, particularly when NamPower is no longer the only entity responsible for the procurement and development of new generation capacity. This is a valid concern but one that has been addressed in markets that allow transactions between willing Sellers and Buyers. Section 15 “Security of Supply”, deals more specifically with identifying the relevant risks and mitigation strategies.

20.2.3 Quality of Supply Risk

As bilateral transactions increase in the market the requirements for additional Ancillary Services may also increase to deal with changing needs. The procurement of adequate Ancillary Services is addressed in Section 15. The recovery of Ancillary Services costs via a transparent Reliability Service Charge is described in Section 23.

20.2.4 Market Access Risk

There is a risk that bilateral transactions will not proceed unless IPPs are provided with open and fair access to the grid. Whilst this already forms a principle tenet of Namibia’s enabling regulatory environment, the ECB will need to closely monitor network access applications in order to ensure that this is facilitated.

A final risk which the MSB market design must address is the lack of clarity on how wheeling charges will be levied for use of both Transmission and Distribution networks, and how they will be allocated between Generators and off-takers. These detailed design documents make several recommendations to ensure that transmission and distribution licensees recover their network investment costs.

20.2.5 Protection of Captive Customers

It should be noted that Captive Customers (or Contestable Customers who do not choose an alternative supplier) will still be able to purchase electricity from their existing service provider in the same way as before. Electricity Tariffs for Captive Customers (and Contestable Customers who do buy electricity via bilateral transactions) will be subject to regulation by the ECB.

20.2.6 Cherry Picking

Some stakeholders have expressed a concern that Eligible Sellers will target the most profitable Contestable Customers first leaving Captive Customers exposed to potentially
higher Tariffs. It is anticipated that the unbundling of Tariffs and the phasing in of contestability will ensure that Cherry Picking will not disadvantage Captive Customers.

20.3 Other Potential Risks

20.3.1 Risks Emanating from Exports

There are a number of technical issues and risks related to the transport of exported power from IPPs. NamPower will firstly need to assess the capacity available for export transactions on its transmission lines in order to avoid the risk of congestion. NamPower will need to consider what level of network availability they are able to commit to in light of the agreed compensation for the wheeling of electricity. This aspect is discussed in more detail in section 11.11 under “Network Capacity Reserve Charge”.

Furthermore, in the instance of IPPs exporting power to regional markets, it is important to note that the MSB will not be required to act as the Supplier of Last Resort for regional off-takers.

If exports of large quantities of electricity are allowed, there is a risk that the country might inadvertently forego low cost electricity resources. In order to mitigate against this risk, the Government of the Republic of Namibia (GRN) may introduce a “call option” on certain export arrangements to ensure that they can be utilised for Namibia’s benefit in the future if needed. This option is discussed in more detail in section 17 under “Export Call-Back Option”.

A final risk is that allowing for exports to other markets may imply reciprocity i.e. if Namibia want to allow bilateral exports, it should be prepared to accept bilateral imports as well. This is targeted for Phase 2.

20.3.2 Risks Emanating from Trading

As the Trader will potentially act as both a bankable offtaker and a supplier, the ECB will need to carefully assess the financial viability, operational ability, procurement processes and governance of the Trader (amongst other qualities) to allow them to operate within the market.

From a technical perspective, Traders do not seek to own grid or power station infrastructure in their own right. In other words, they do not directly impact on physical electricity infrastructure or on the technical operation of the integrated system.

Although Traders in the MSB will be able to enter into bilateral transactions with multiple Sellers and Buyers, they will not be allowed to optimise real time Dispatch – this will remain the responsibility of the MSB. To ensure that the System Operator and the MSB have full visibility of the energy supplied, each Production Unit transacting with a Trader must still submit a Production Schedule. This will ensure that the MSB will be able to determine feasible least cost Dispatch schedules (including reserves) in the short term while fulfilling its mandate as the Supplier of Last Resort in the medium to long term. However, provision is made for the
MSB to allow aggregation of Production Units if it there is no threat to system operations and reliability.

The Trader must also nominate which Contestable Customers will receive the energy from each Production Unit. The Trader can manage the risk of Network Congestion or under-consumption by a Customer by utilising the options discussed in Sections 11.11 and 10.6.

20.3.3 Risks Emanating from Imports

Allowing imports into Namibia is more complicated than introducing exports as there is a direct impact on the customer base for existing licensees. Therefore, it is proposed that this be managed by allowing imports during Phase 2 of the MSB market to Contestable Customers only.

Given that the generation sources for import transactions are located outside Namibia there will be no obligation on the MSB to act as the Supplier of Last Resort in import transactions. However, the Importer and the MSB are free to negotiate suitable back-up arrangements subject to regulatory approval but such agreements are not a pre-requisite for import transactions.
21  ANNEXURE 1: CONTESTABLE CUSTOMER IMPACT ASSESSMENT

21.1 Transmission Connected Contestable Customers

Following stakeholder feedback, an impact assessment was undertaken to determine an acceptable starting point for the volume of allowable contestable purchases in Phase 1. The results of the assessment were presented to stakeholders in a workshop in November 2018.

In undertaking the study, the Consultants worked with the ECB and NamPower to develop a forward view of the most likely energy sources for Namibia over the next ten years. These sources were then classified as:

1) “Non-Displaceable”: There is a significant fixed cost (financial or contractual) associated with these sources which means there is no or little economic benefit if they are displaced.

2) “Displaceable”: These sources have low or no fixed costs (or fixed cost could be avoided). These sources could be displaced at the right price or time.

For example, imports from Zambia and Zimbabwe are currently classified as “Non-Displaceable” due to contractual commitment that expire in 2021 and 2026 respectively, at which point they will become “Displaceable”. Similarly, IPPs are seen as “Non-Displaceable” due their contractual commitments. On the other hand, imports from Eskom and SAPP have a no, or low, fixed cost commitment and are therefore seen as “Displaceable”.

Below is a summary of the “Non-Displaceable” and “Displaceable” energy sources in Namibia.

“Non-displaceable” sources include:

1) Existing Public (NamPower plant)
2) Existing Private (IPP and other REFIT)
3) Committed Private (IPP)
4) Ministerial Determinations (NamPower and IPPs)
5) Existing Firm Imports (Zambia and Zimbabwe)

“Displaceable” sources include:

1) Flexible Imports (Eskom and SAPP)
2) New Supply (tbc)

The figure below shows the various energy sources available to Namibia to 2026.
The above figure shows that the MSB can currently displace Eskom and SAPP imports and in due course could also replace the imports from Zambia (2021) and Zimbabwe (2026). The figure also shows how the “New Supply” displaces these sources over time – part of this New Supply capacity could be made available for the MSB.

The above results show that the percentage of “Displaceable” and “Non-displaceable” energy varies over time. This is due to the commissioning of committed plant e.g. plant included in ministerial determinations and the phasing out of import contracts. The figure above (on the right), shows that for the period 2019-2025, the volume of “Displaceable” energy varies...
between a minimum of 1,479GWh (2023) and 2,096 GWh in 2021. This is the equivalent of 33% - 48% of total production.

In recommending the degree of contestability it is important to consider:

1) Maximum “Displaceable” energy (avoid causing stranded investments or contracts)
2) Risk of energy demand forecast error
3) Increased unlicensed (<500kVA) generation behind the meter
4) Contestability “room” for distribution connected customers (next phases of MSB)
5) Not all transmission customers are interested in entering into MSB transactions

There are therefore several issues which may cause the level of total displaceable production, to change. The analysis shows that ~30% of total production is immediately displaceable and feedback from the Ministry of Mines & Energy has confirmed that this production volume should immediately be made contestable in the MSB market.

Figure 14: Displaceable Energy Vs. Maximum Potential Energy via bilateral transactions

The yellow area in the figure above represents the total displaceable forecast production. The allowable MSB production values are represented on the blue line, with the production values labelled above the line for each year in GWh. The ~30% limit assumes that all Contestable Customers will utilise their Contestable Quantity. In practice this may not be the case, in which case the Regulator can either increase the number of market participants or increase the Contestable Quantity above 30%.
21.2 Distribution Connected Contestable Customers

Experience from international markets who opened their electricity industries for competition and choice show that it was done in a gradual and phased manner. The following table summarises the transitional phases on three different countries.

<table>
<thead>
<tr>
<th>Market Phases</th>
<th>United Kingdom</th>
<th>Philippines</th>
<th>Australia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1</td>
<td>• 1MW and above from 1990</td>
<td>• 1MW and above from 2013</td>
<td>• 40GWh and above from 1994</td>
</tr>
<tr>
<td>Phase 2</td>
<td>• 100kW and above from 1994</td>
<td>• 750kW and above from 2016</td>
<td>• 4GWh and above from 1995</td>
</tr>
<tr>
<td>Phase 3</td>
<td>• All loads from 1998</td>
<td>• 500kW and above from 2018</td>
<td>• 750MWh and above from 1996</td>
</tr>
<tr>
<td>Phase 4</td>
<td>None</td>
<td>None</td>
<td>• 160MWh and above from 1998</td>
</tr>
<tr>
<td>Phase 5</td>
<td>None</td>
<td>None</td>
<td>• All customers from 2000</td>
</tr>
</tbody>
</table>

The above table shows:

1) The UK took eight years to allow all customers choice.

2) The Philippines took 5 years to open the market to 500kW and above customers choice. Interesting that small customers (<500kW) remain Captive Customers.

3) Australia adopted five phases over 6 years allow all customers choice.

4) Both the UK and Philippines started by giving customer of 1MW and above choice.

Based on the above results and following discussions with Namibian stakeholders it is recommended that all Distribution connected customers of 1MVA and above, become Contestable from Phase 1b.

The following figures show the number of distribution connected customers with a maximum demand of 1MVA and above for Erongo RED, City of Windhoek, Cenored and Keetmanshoop. The customer data is arranged to show the maximum demand in descending order. The figures also show the cumulative percentage energy sales.
Figure 15: Profile of Customers’ Monthly Peak Demand and Consumptions for Erongo RED

The results for Erongo RED shows that:

1) There are approximately 11 customers with a monthly peak demand of 1MVA and above,

2) The sales to these customers represent approximately 20% of Erongo’s total sales.

Figure 16: Profile of Customers’ Monthly Peak Demand and Consumption for the City of Windhoek

The results for City of Windhoek shows that:

1) There are approximately 15 customers with a monthly peak demand of 1MVA and above,

2) The sales to these customers represent approximately 15% of City of Windhoek’s total sales.
The results for CENORED shows that:

1) There is maybe one customer with a monthly peak demand of 1MVA and above,

2) The sales to this customer represent approximately 1% of CENORED’s total sales.

The results for Keetmanshoop shows that:

1) There are no customers with a monthly peak demand of 1MVA and above,

In summary the results show that:

1) There are not more than 30 distributed end-customers with a monthly peak demand of 1MVA and above in Namibia.
2) The sales to these customers represent roughly 230GWh per year which is nearly 8% of NamPower’s total annual sales.
22 **ANNEXURE 2: ASSESSMENT OF BALANCING CHARGES**

The consultant ran a number of ‘trading scenarios’ to test the suitability of the Balancing Charge. One of the scenarios assumed that a 10MW solar PV Generator must decide what capacity to declare to the MSB. It was further assumed that the expected output of the plant would be 5MW for a particular hour. Furthermore, the output from the plant could vary between 0 and 10MW following a typical ‘normal distribution curve’ profile away from the expected 5MW output as shown below.

*Figure 19: Declared Availability Distribution Curve*

![Declared Availability Distribution Curve](image)

The Generator wishes to declare an availability to the MSB that will maximise the plant’s revenue potential taking Balancing Charges into account. The three figures below summarise the results from the analysis. For reference, the blue line shows the expected revenue at various declared availabilities. The red line identifies the declared availability that will maximise profit potential. The grey line shows the profit potential at a declared availability of 5MW.

1) The first figure assumed a Balancing Charge of 50% of energy component of the bulk supply Tariff. Because the profit maximisation point of 6.7MW is more than 5MW it suggest that the Seller is incentivised to ‘over-declare’ and ‘under-deliver’. This is not a good outcome for the MSB that it responsible to schedule Generators for least cost Dispatch.

2) The figure in the middle assumed a Balancing Charge of 100%. It shows the profit maximisation point of 5.2MW is very close to the expected output of 5MW. The outcome therefore balances risk and rewards. The slight difference is caused by the Tolerance Band.
3) The third figure assumed a Balancing Charge of 200% of the energy component of the BST. It shows that profit maximisation would occur at a Declared availability of 4.6MW which is below the expected output of 5MW. There is therefore an incentive on the Seller to ‘under-declare’ and to ‘over deliver’ in order to avoid the steep Balancing Charge. The figure also shows that the Seller could lose money by declaring a high availability.

Figure 20: Balancing Charge assessment at 50% of the energy component

Figure 21: Balancing Charge assessment at 100% of the energy component
The above results confirm that a Balancing Charge which is the same as NamPower’s retail energy charge encourages correct ‘bidding behaviour’.

In future, the MSB may decide to adjust the above charges to encourage more accurate Production Schedules. Any adjustments to the MSB Market Rules shall be made in accordance with the relevant governance procedures.
23 **ANNEXURE 3: RELIABILITY SERVICES DEFINITIONS & CHARGES**

Following a request by stakeholders for a Tariff Impact Assessment, the Consultants worked with NamPower and the ECB to first define system Reliability Services (RS) and how these costs would be recovered, via the Reliability Service Charge (RSC).

### 23.1.1 Ancillary Services

Ancillary Services form a significant portion of the costs of RS. Ancillary services (AS) are defined as those functions that help grid operators maintain the reliability of the electricity system over very short periods of time up to one day. AS provide the flexibility needed to respond to variations in supply and demand. These services help to maintaining frequency and voltage and restore the system after an incident.

The Namibian Grid Code currently defines Ancillary Services as follows:

*Figure 23: Ancillary Services in Namibia*

![Diagram of Ancillary Services in Namibia](image)

Namibia currently falls under RSA’s Control Area for frequency control and operating reserves. However, Namibia is responsible for local Ancillary Services including: voltage control, restoration, resonance control, planning reserves, etc. NamPower currently procure frequency control and operating reserves from Eskom, however these have not been explicitly listed as charges in their agreement – it is understood that Eskom are currently in the process of redesigning their Ancillary Services strategy and that these will be probably be charged for separately in the future.

### 23.1.2 Approach for Determining Reliability Service Costs in Namibia

RS costs and charges can be defined via either a “top-down” or a “bottom-up” approach, as shown in the figure below:
Figure 24: Approach for calculating Reliability Service Charges

1. “Bottom-up” approach for determining Reliability Service (RS) charges:

   - Define services (which ones)
   - Quantify services (how much)
   - Identify suppliers (who)
   - Cost services (availability & usage)
   - Determine RS charges

2. “Top-down” approach for determining Reliability Service (RS) charges:

   - Identify RS related functions & assets
   - Determine costs of RS functions & assets
   - Determine RS charges
   - Rebalance NP capacity & energy charges

The Consultant followed a “top-down” approach for the initial estimate of Reliability Service charges for Namibia. NamPower have been tasked with developing a more detailed “bottom-up” assessment of RS in Namibia, which will be undertaken as a part of the implementation process of the MSB.

During the initial estimate, the following functions were identified as playing a key role in the provision of system reliability (Ancillary Services) and system security (“Supplier of Last Resort”):

- System Operations
- Single Buyer (Energy Trading)

The following generation assets were identified as providing Namibia with dedicated Ancillary Services (primary role is not to provide energy):

- Anixas power station (used for reserves and system restoration)
- Van Eck power station (used for reserves, voltage control and resonance control)

The following services were identified as forming part of Ancillary Services costs:

- Eskom’s ancillary service charge to NamPower for acting as the Control Area Manager and the provision of Ancillary Services

23.1.3 Benchmarking Ancillary Services Costs

As mentioned above, Eskom does not currently separate out its charges for AS, therefore the Consultants have benchmarked AS costs globally, in order to determine an initial estimate for these services. The figures below show the size of the wholesale market vs ancillary service market in Germany and the UK:
Figure 25: Ancillary Services Costs Benchmarks

Source: UK and German Ancillary Service Market trends - Bloomberg New Energy Finance – 13 April 2017

From the figure above, one can observe that:

1) Ancillary services costs represent 4-7% of the total wholesale market costs

2) The average wholesale market price in UK during 2016 was 42.7GBP/MWh implying an ancillary service charge of 0.54NAD/kWh (assuming 7% and 18.4 NAD/GBP)

As Eskom are only supplying a portion of Namibia’s required AS, the Consultants have assumed that 2% of Eskom’s total costs are for AS i.e. ~N$37m.

23.1.4 Reliability Services Costs and Revenue Requirement Rebalancing

In order to calculate the RS costs, the following NamPower costs have been ringfenced:

Table 27: Reliability Services Costs

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (N$m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Buyer (Trader)/ System Operator</td>
<td>120</td>
</tr>
<tr>
<td>Anixas/ van Eck</td>
<td>217</td>
</tr>
<tr>
<td>AS from Eskom</td>
<td>37</td>
</tr>
<tr>
<td>MSB Implementation Costs</td>
<td>7</td>
</tr>
<tr>
<td>TOTAL</td>
<td>381</td>
</tr>
<tr>
<td>% of Total Energy</td>
<td>7.8%</td>
</tr>
<tr>
<td>N$C/kWh</td>
<td>10.03</td>
</tr>
</tbody>
</table>

The costs for the Single Buyer/ System Operator are currently recovered via a fixed charge for Transmission. These will therefore need to be removed from the fixed charge, as the costs for
van Eck, Anixas and Eskom AS will need to be removed from the current Generation charge – this implies a revenue requirement rebalancing as shown in the figure below:

Figure 26: Revenue Requirement Rebalancing for RS charges

The figure shows the residual generation and transmission charges that will be recovered following the removal of the identified functions, assets and services from Generation and Transmission, and added to Reliability Service charge.

As shown in the table above, this leads to an initial RS cost estimate of N$381m, which is ~7.8% of total energy costs and an estimated charge of ~10.03N$c/kWh.

In the MSB, RS charges will become “non-escapable” along with Losses charges (for Wheeled Energy) and Levies (ECB, NEF etc.) - this will minimise cross-subsidisation and ensure customers pay for services they use. Non-escapable charges will be applied to all electricity consumed by customer including electricity purchases from NamPower and purchases from all licensed non-NamPower Generators, including Embedded Generators.29

28 These are only the fixed costs for van Eck and Anixas and exclude all variable costs for these plant

29 Further examples of the impact of non-escapable charges are shown in Annexure 3
24  **ANNEXURE 4: IMPLEMENTATION PLAN**

The objectives and responsibilities of the MSB have been discussed with key stakeholders during public consultation workshops. The key objectives and milestones for the implementation of the MSB are listed below, at a high level. Each stakeholder is responsible for the development of detailed implementation plans, to reach the milestones and objectives listed below.

### 24.1 Objectives & Key Milestones

<table>
<thead>
<tr>
<th>Area</th>
<th>Objective/ Milestone</th>
<th>Date</th>
<th>Current Status at Feb 2019</th>
<th>Responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tariffs</td>
<td>Reliability Service Charge Development</td>
<td>Jan 2019</td>
<td>Completed</td>
<td>ECB/ NP</td>
</tr>
<tr>
<td>MSB unit in NamPower</td>
<td>Ringfencing of Costs for MSB Unit</td>
<td>Jan 2019</td>
<td>Completed</td>
<td>ECB/ NP</td>
</tr>
<tr>
<td>Tariffs</td>
<td>Tariff Impact Assessment</td>
<td>Jan 2019</td>
<td>Completed</td>
<td>ECB/ NP</td>
</tr>
<tr>
<td>MSB Market Structure</td>
<td>Macro-economic Impact Assessment</td>
<td>Jan 2019</td>
<td>Completed</td>
<td>ECB</td>
</tr>
<tr>
<td>Tariffs</td>
<td>Energy Storage/ Banking Charge Development</td>
<td>February 19</td>
<td>Completed</td>
<td>ECB/ NP</td>
</tr>
<tr>
<td>Tariffs</td>
<td>Time of Use Periods Update</td>
<td>Feb 2019</td>
<td>Completed</td>
<td>ECB/ NP</td>
</tr>
<tr>
<td>Tariffs</td>
<td>Transmission Loss Charges Development</td>
<td>Feb 2019</td>
<td>Completed</td>
<td>ECB/ NP</td>
</tr>
<tr>
<td>MSB Market Structure</td>
<td>Acceptance of MSB Design by ECB Board</td>
<td>March 2019</td>
<td>Completed</td>
<td>ECB</td>
</tr>
<tr>
<td>MSB Market Structure</td>
<td>Acceptance of MSB Design by Minister of MME</td>
<td>March 2019</td>
<td>Completed</td>
<td>ECB</td>
</tr>
<tr>
<td>Tariffs</td>
<td>NP Tariff Model Update</td>
<td>March 2019</td>
<td>TBC</td>
<td>ECB/ NP</td>
</tr>
<tr>
<td>MSB Market Structure</td>
<td>MSB Rules Development</td>
<td>May 2019</td>
<td>TBC</td>
<td>ECB</td>
</tr>
<tr>
<td>MSB unit in NamPower</td>
<td>Ancillary Services Strategy Development</td>
<td>Jun 2019</td>
<td>TBC</td>
<td>NP</td>
</tr>
<tr>
<td>----------------------</td>
<td>----------------------------------------</td>
<td>----------</td>
<td>-----</td>
<td>----</td>
</tr>
<tr>
<td>Tariffs</td>
<td>Distribution Loss Charges Development</td>
<td>June 2019</td>
<td>TBC</td>
<td>ECB/Distributors</td>
</tr>
<tr>
<td>MSB unit in NamPower</td>
<td>MSB Implementation Strategy and Plan (HR, systems, processes etc.)</td>
<td>Jun 2019 – Jul 2020</td>
<td>TBC</td>
<td>NP</td>
</tr>
<tr>
<td>Tariffs</td>
<td>Tariff Unbundling Implementation</td>
<td>Jun 2019</td>
<td>TBC</td>
<td>ECB/NP</td>
</tr>
<tr>
<td>Regulation</td>
<td>Grid Code Update</td>
<td>Jul 2019</td>
<td>TBC</td>
<td>ECB</td>
</tr>
<tr>
<td>Regulation</td>
<td>Licensing updates</td>
<td>Jul 2019</td>
<td>TBC</td>
<td>ECB</td>
</tr>
<tr>
<td>MSB Market Structure</td>
<td>Phase 1a Implementation</td>
<td>1st September 2019</td>
<td>TBC</td>
<td>ALL</td>
</tr>
<tr>
<td>Planning</td>
<td>Ministerial Determination for MSB Capacity/ NIRP update</td>
<td>Jun 2020</td>
<td>TBC</td>
<td>MME</td>
</tr>
<tr>
<td>Regulation</td>
<td>Operationalisation of GCAC</td>
<td>Jun 2020</td>
<td>TBC</td>
<td>ECB</td>
</tr>
<tr>
<td>MSB Market Structure</td>
<td>Promulgation of MSB by GRN</td>
<td>June 2020</td>
<td>TBC</td>
<td>MME</td>
</tr>
<tr>
<td>MSB Market Structure</td>
<td>Phase 1b Implementation</td>
<td>July 2021</td>
<td>TBC</td>
<td>ALL</td>
</tr>
</tbody>
</table>
25  **ANNEXURE 5: TARIFF IMPACT ASSESSMENT**

25.1 Tariff Unbundling for NamPower Customers

In order to demonstrate the impact of Tariff unbundling on NamPower customers, the following example has been developed for customers that either (i) install a Captive power plant or (ii) enter into a bilateral wheeling transaction. The Table below shows the current charges paid by a NamPower transmission connected customer, split between “Escapable” and “Non-escapable” charges.

Table 28: Example of NamPower Tariff before unbundling

<table>
<thead>
<tr>
<th>Charges</th>
<th>Before Unbundling (N$/kWh)</th>
<th>Non-Escapable</th>
<th>Escapable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service/Network</td>
<td>41.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy</td>
<td></td>
<td>128.13</td>
<td></td>
</tr>
<tr>
<td>Losses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reliability</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECB/NEF Levies</td>
<td></td>
<td>3.63</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>41.03</td>
<td>131.76</td>
</tr>
<tr>
<td>Grand Total</td>
<td></td>
<td></td>
<td>172.79</td>
</tr>
</tbody>
</table>

As can be seen in the table above, there are currently total escapable energy charges of ~131.8 N$/kWh – Reliability and Losses from wheeling are still bundled in the energy charge. This is therefore the effective rate that distributed generation is currently competing with.

---

30 Fixed service and network charges are shown in c/kWh terms in order to demonstrate the changes.
Table 29: Example of NamPower Tariff with Captive generation after unbundling

<table>
<thead>
<tr>
<th>Charges</th>
<th>Before Unbundling (N$/kWh)</th>
<th>After Unbundling - Captive Generation (N$/kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-Escapable</td>
<td>Escapable</td>
</tr>
<tr>
<td>Service/Network</td>
<td>41.03</td>
<td>37.85</td>
</tr>
<tr>
<td>Energy</td>
<td>128.13</td>
<td>112.16</td>
</tr>
<tr>
<td>Losses</td>
<td></td>
<td>9.29</td>
</tr>
<tr>
<td>Reliability</td>
<td></td>
<td>10.03</td>
</tr>
<tr>
<td>ECB/NEF Levies</td>
<td>3.63</td>
<td>3.63</td>
</tr>
<tr>
<td>Total</td>
<td>41.03</td>
<td>131.76</td>
</tr>
<tr>
<td>Grand Total</td>
<td>172.79</td>
<td>172.97</td>
</tr>
</tbody>
</table>

For customers considering Captive generation transactions, the following can be observed:

1) ~3.18N$/c/kWh has been removed from the fixed Service/Network charge and added to the Reliability charge – this is for the costs for Systems Operations and the Trading Unit (MSB).

2) The fixed costs for van Eck and Anixas as well as the costs for Eskom AS, have been unbundled from the Energy charge and added to the reliability Charge – this will be shown as a separate line item on the invoice as a per kWh charge; will be metered and invoiced on all generation including purchases from the Captive Generator.

3) Losses have been unbundled from the Energy charge and are shown separately - ~9.29N$/c/kWh, but these are still escapable when there is a Captive/Behind the Meter Generator.

4) The cost of the implementation of the MSB has been added to the Reliability charge.

5) The ECB/NEF Levies have been unbundled and will be metered and invoiced on all generation including purchases from the Captive Generator.

6) The escapable charges have now reduced from 131.8c/kWh to 121.45c/kWh.

The following table shows the final example in which customers pursue a bilateral wheeling transaction – in this case, Losses charges also become inescapable and the total escapable charges reduce to 112.16c/kWh. The total non-escapable charges has now increased from 41.03N$/c/kWh (Service/Network charges) in the bundled Tariff, to a maximum of 60.81N$/c/kWh in the example of a wheeling transaction.
Table 30: Example of NamPower Tariff with Wheeling generation after unbundling

<table>
<thead>
<tr>
<th>Charges</th>
<th>Before Unbundling (N$/kWh)</th>
<th>After Unbundling - Captive Generation (N$/kWh)</th>
<th>After Unbundling - Wheeling (N$/kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-Escapable</td>
<td>Escapable</td>
<td>Non-Escapable</td>
</tr>
<tr>
<td>Service/Network</td>
<td>41.03</td>
<td>37.85</td>
<td>37.85</td>
</tr>
<tr>
<td>Energy</td>
<td>128.13</td>
<td>112.16</td>
<td>112.16</td>
</tr>
<tr>
<td>Losses</td>
<td></td>
<td>9.29</td>
<td>9.29</td>
</tr>
<tr>
<td>Reliability</td>
<td></td>
<td>10.03</td>
<td>10.03</td>
</tr>
<tr>
<td>ECB/NEF Levies</td>
<td>3.63</td>
<td>3.63</td>
<td>3.63</td>
</tr>
<tr>
<td>Total</td>
<td>41.03</td>
<td>131.76</td>
<td>51.52</td>
</tr>
<tr>
<td>Grand Total</td>
<td>172.79</td>
<td>172.97</td>
<td>172.97</td>
</tr>
</tbody>
</table>

The changes in the Tariff shown in this table are also summarised in the figure below. For all three examples, it is clear that the overall level of the Tariff remains consistent at N$172.97. However, the Tariff unbundling now allows consumers to pay for the services they benefit from, under circumstances in which NamPower is not the only supplier. Furthermore, consumers and IPPs, now receive a more accurate economic signal, regarding the price with which they are competing.
25.2 Further Changes to Tariff

It is worth highlighting that Tariff signals will probably become more dynamic in the future, due to several reasons. In the short term, there are components within the energy Tariff that will reduce or potentially be removed i.e. the “Under Recovery” charge and the LRMC “Charge”.

The Under-Recovery charge is a clawback mechanism, used by the regulator to allow NamPower to recover unforeseen expenses – in this case the past purchase of emergency power by NamPower. Similarly, the LRMC (Long Run Marginal Cost) charge is intended to buffer consumers from the impact of emergency power purchases in the future e.g. Namibia is currently importing power from RSA, Zambia and Zimbabwe – if any of those countries is unable to deliver power and NamPower has to purchase emergency power from the SAPP, there could be a significant cost implication. The LRMC provides the ECB with an existing source of funding to use and mitigates further Under-Recovery charges.

It is anticipated that the existing Under Recovery charge will be phased out in the next few years i.e. by 2020/2021, as NamPower will have recovered its unforeseen expenses for emergency power purchases. This will remove an additional 21.69N$/kWh from the current energy Tariff. Furthermore, the LRMC charge may also be removed in time as Namibia’s...
exposure to exports decreases and there is appropriate funding available for emergencies. This is a further 5.93N$c/kWh.

The figure below shows the further impact of removing the Under-Recovery charge. The total charge is no longer 172.97N$c/kWh, but is now 151.3N$c/kWh.

*Figure 28: Summary of Tariff unbundling impact on different charges after removing Under-Recovery Charge*

The net impact is that embedded IPPs now have to compete with 99.8N$c/kWh and wheeling IPPs with 90.5N$c/kWh. It is critical that consumers take these potential changes into account when making longer term procurement decisions. In the past, the onus was on NamPower to ensure that new supply was procured at the most competitive rate, but Contestable Customers that choose alternative supply options, will be taking on this responsibility themselves.

In the longer term, these Tariff signals will also provide consumers and IPPs with signals over which plant should be built. For example, Namibia’s current Time of Use periods include a number of peak hours (on weekdays) from 08:00 to 12:00. This combination of peak pricing during periods of potential PV production, is one of the contributing factors to the on-going installation of rooftop PV – consumers are able to displace the most expensive energy from NamPower.
However, as more PV is installed, the demand during those peak periods will reduce, reflected as changes in the load profile. NamPower has already noticed and reported this phenomenon and has suggested that they will shortly request a change in their ToU profiles from the ECB, to provide a more accurate signal to consumers and producers regarding the value of energy during those periods. The figure below represents the long-term impact on the marginal cost of power in RSA, under a scenario with a high penetration of renewables (a recent draft IRP2018 scenario).

Figure 29: RSA Marginal Cost of Production Comparison (High RE plant scenario IRP2018)

The figure shows that as RE plant increase from 2030 -2045, the marginal cost of production during the daytime, drops towards zero. Similarly, the evening peak evident in 2030, also drops lower as more wind plant are introduced (in RSA wind plan contribute some energy to the evening peak).

As the marginal cost reduces and ToU periods are adjusted, accurate pricing signals will provide both consumers and producers with a better understanding of the value of energy in each hour i.e. if a producer can no longer beat the marginal cost in an hour, they will not build their plant and the cost will reach equilibrium. Similarly, this mechanism will support the exploitation of new technologies such as battery storage. Adjusting ToU periods is therefore a critical mechanism for both the ECB and NamPower for the future viability of the sector.

In review, the Tariff unbundling as well as changes in the ToU periods will therefore provide more accurate signals for the timing, size, technology choices and location of new plant.

25.3 Tariff Impact NamPower

As demonstrated above, if Tariffs are not unbundled, NamPower will lose 128.1N$\text{c/kWh}$ to captive or embedded wheeling transactions. If the Tariffs are unbundled as proposed,
NamPower will lose 121.4N$/c/kWh to Captive Generators and 112.2N$/c/kWh to wheeling Generators. Following the removal of the Under-Recovery charge, these reduce further to 99.8N$/c/kWh for Embedded Generators and 90.5N$/c/kWh for wheeling Generators.

In order to determine whether NamPower is better off due to the Tariff unbundling, it is possible to compare these costs with NamPower’s avoided cost of purchase – in this case, the SAPP is used as a reference.

Figure 30: Estimated delivered SAPP price scenarios

The figure above shows three possible Tariff scenarios for the SAPP which reflect a low, medium and high increase on the average Tariff. If compared to the bundled scenarios, both the low and moderate SAPP price scenarios present better value for NamPower. If compared with the unbundled scenario only the SAPP Low scenario offers better value. The conclusion is therefore that unbundling the Tariff will leave NamPower better off.

25.4 Tariff Impact on CENORED, Erongo RED and Keetmanshoop Municipality

In order to test the impact of the Tariff unbundling on the REDS, LAs and RCs, the Consultants imposed the proposed changes on a recent year’s sales from NamPower to each of the Distributors. In each case, the following general assumptions were made:

1) Used actual sales data from NamPower to Distributor for 2017/18
2) For CENORED used the actual production data from the Hopsol PV plant for 2017/18
3) Bundled Tariff based on 2018/19 NamPower ToU Tariff
4) Unbundled Tariff assumes:
   a. A 5.5% reduction in ToU energy charges from NamPower
   b. A 7.1% reduction in Access & Demand charges from NamPower
c. Reliability Service charge of 10.3 N$\text{c}/\text{kWh} on all purchases

d. ECB levy of 2.03 N$\text{c}/\text{kWh} on all purchases

e. NEF levy of 1.6 N$\text{c}/\text{kWh} on all purchases

25.4.1 CENORED Case Study

- CENORED purchased 196GWh from NamPower at average Tariff of 122.2N$\text{c}/\text{kWh}
- CENORED purchased 1037MVA (demand + access) from NamPower at average Tariff of 98 N$/kVA
- CENORED purchased 12GWh directly from Hopsol

The figure below, shows the financial impact of the Tariff unbundling on CENORED.

*Figure 31: Tariff unbundling impact case study for CENORED*

The following can be observed:

1) The impact of the energy reduction is ~N$13m (122.2c/kWh*(-5.5%)*196GWh*10)
2) The impact of the capacity charge reduction is ~N$7m (98N$/kVA*(-7.1%)*1037MVA)
3) However, the Reliability Service Charge is now levied on:
   a. Energy from NamPower - ~N$19,6m (10c/kWh*196GWh*10)
   b. Energy from Hopsol - N$1,2m (10c/kWh*12GWh*10)
4) ECB and NEF Levies are also charged on:
   a. NamPower energy - N$240,000 (2c/kWh*12GWh*10)
   b. Hopsol energy – N$194,000 (1.6c/kWh*12GWh*10)
5) Energy and capacity charge decreases are offset by RS(NP) charge (there is a small variance caused by a difference in load factors)
6) The RS charge & Levies on IPP purchases increase CENORED’s costs by N$962,000 i.e. a ~0.36% increase on their initial total energy costs to NamPower

25.4.2 Erongo RED Case Study

- Erongo purchased 674GWh from NamPower at average Tariff of 116.1N$c/kWh
- Erongo purchased 2,328MVA (demand + access) from NamPower at average Tariff of 98 N$/kVA
- No purchases from IPPs were included in this case study

The figure below, shows the financial impact of the Tariff unbundling on Erongo RED

Figure 32: Tariff unbundling impact case study for Erongo RED

The following can be observed:

1) The impact of the energy reduction is ~N$34m (116.1c/kWh*(-5.5%)*674GWh*10)
2) The impact of the capacity charge reduction is ~N$7m (98N$/kVA*(-7.1%)*2,328MVA)
3) The Reliability Service Charge is levied on:
   a. Energy from NamPower - ~N$50,75m (10c/kWh*674GWh*10)
4) There are no additional ECB and NEF Levies, as there is no IPP energy:
5) Energy and capacity charge decreases are offset by RS(NP) charge (there is a small variance caused by a difference in load factors)
6) There is a net impact on Erongo RED’s costs of N$518,000 i.e. a ~0.08% increase on their initial total energy costs to NamPower – transmission connected customers that do not purchase electricity directly from IPPs are almost unaffected by Tariff unbundling
25.4.3 Keetmanshoop Case Study

- Keetmanshoop purchased 36.8GWh from NamPower at average Tariff of 117.8\(\text{N}\)c/kWh
- Keetmanshoop purchased 188MVA (demand + access) from NamPower at average Tariff of 90.6 \(\text{N}\)$/kVA

The figure below, shows the financial impact of the Tariff unbundling on Keetmanshoop Municipality

**Figure 33: Tariff unbundling impact case study for Keetmanshoop Municipality**

The following can be observed:

1) The impact of the energy reduction is \(~\text{N}\$2,4\text{m} (117.8\text{c/kWh}\ast(-5.5\%))\ast36.8\text{GWh}\ast10\)

2) The impact of the capacity charge reduction is \(~\text{N}\$1,2\text{m} (90.6\text{N}/\text{kVA}\ast(-7.1\%))\ast188\text{MVA}\)

3) The Reliability Service Charge is levied on:
   a. Energy from NamPower - \(~\text{N}\$3,7\text{m} (10\text{c/kWh}\ast36.8\text{GWh}\ast10)\)

4) There are no additional ECB and NEF Levies, as there is no IPP energy:

5) Energy and capacity charge decreases are offset by RS(NP) charge (there is a small variance caused by a difference in load factors)

6) There is a net impact on Keetmanshoop Municipality’s costs of \(\text{N}\$107,000\)
26  ANNEXURE 6: MACRO-ECONOMIC IMPACT

26.1  Introduction

Based on stakeholder feedback during public workshops, an analysis of the potential Macro-economic impact of the MSB, was undertaken by the ECB with the support of the Consultants. This section of the report details the results of the Macro-economic Impact Analysis.

26.2  The Model

The model used to conduct the impact analysis, is a dynamic, multi-year Computerised General Equilibrium (CGE) model developed by Stratecon and EMCON for the Electricity Control Board (ECB) of Namibia. The model was originally developed in 2010 and later updated in 2018. The model calculates how changes in the Electricity Supply Industry (ESI) impact on the Namibian economy. The changes in the ESI are brought about either by the construction and operation of new electricity generation plants, changes in electricity Tariffs or changes in the quantity of imported electricity.  

26.3  Impact Assessment Methodology

In assessing the macro-economic impact of the MSB, it is important to note that both the MSB and the SB provide a platform for activities which will then have either a positive or a negative impact. From a macro-economic perspective, these impacts can be measured by examining changes in indicators such as GDP, Inflation and Employment creation.

Previous macro-economic modelling experience has shown that large infrastructure programs, including the construction of new power stations and transmission lines, has a positive impact on economies due to the influx of investment and job creation. Once again, this is consistent for both the SB and the MSB. Therefore, if all assumptions are fixed, macro-economic comparisons between the SB and the MSB, should show no differences.

The utilisation of differing market structures does however address issues including: competition, choice, efficiency, cost and flexibility. The MSB promotes competition and choice as two key differentiating design features when compared with the SB. At the heart of the MSB market structure is the belief that competition is the most efficient and effective mechanism to driving down costs. It also encourages multiple expert market participants and spreads risks and the funding burden for new plant development. As compared to the SB, it is therefore believed that the MSB provides the best possible chance of building more local supply options, for the lowest possible cost, in the shortest possible time.

31  Update to the Namibian Electricity Supply Industry Computerised General Equilibrium Model, Stratecon and EMCON, May 2018
The macro-economic assessment conducted therefore does not specifically contrast the SB with the MSB. Rather, it compares a market (the Base Case), in which less local plant is built with a market in which more local plant is built to displace imports (the MSB Case).

All of the economic data assumptions utilised by Stratecon and EMCON in their 2018 modelling have been maintained – for further information on these assumptions, please see the final report by Stratecon and EMCON, “Update to the Namibian Electricity Supply Industry Computerised General Equilibrium Model”, May 2018.

The changes that were made in order to test the impact of increasing local supply over exports, are described in more detail below.

### 26.3.1 Capacity Assumptions

In both cases, existing and committed plant capacity have been retained. The future capacity expansion plan (as represented by the NIRP) has also been adjusted to incorporate the latest ministerial determination dated November 2018. It should be noted that the capacity for the ministerial determination is included for both the Base Case and the MSB Case i.e. it is the same in both cases and will have no impact on the macro-economic comparison. It is included for the purpose of accuracy and in order to ensure that the potential for new MSB capacity is not overestimated. The determination is shown in the tables below:

**Table 31: Ministerial Determination on new supply capacity**

<table>
<thead>
<tr>
<th>Ministerial Determination</th>
<th>New Capacity (MW)</th>
<th>Year Commissioned</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NamPower</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wind</td>
<td>40MW</td>
<td>2023(^{32})</td>
</tr>
<tr>
<td>PV</td>
<td>20MW</td>
<td>2021</td>
</tr>
<tr>
<td>Biomass</td>
<td>40MW</td>
<td>2023</td>
</tr>
<tr>
<td>Firm HFO</td>
<td>50MW</td>
<td>2023</td>
</tr>
<tr>
<td><strong>IPP</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wind</td>
<td>50MW</td>
<td>2021</td>
</tr>
<tr>
<td>PV</td>
<td>20MW</td>
<td>2021</td>
</tr>
</tbody>
</table>

The resulting Base Case Expansion Plan is shown in the table below:

---

\(^{32}\) 2023 was the latest date by which the plant was specified to be commissioned by the Minister of Mines and Energy. The NamPower PV plant has been brought online earlier than other NamPower plant, due to its shorter lead times for development and construction. Although the ECB model does some supply optimisation, it should be noted that this supply plan has not been tested using any other modelling software.
As mentioned above, the key differentiator between the Base Case and the MSB is that the MSB allows bilaterals to displace imports over time. This has several implications, including:

1) the MSB plant reduces NamPower’s forex payments for imports
2) greater long-term price certainty as exposure to imports decreases
3) new plants are built within Namibia, resulting in increasing FDI and creation of new jobs
4) there is a reduction in the contingent liabilities on NamPower’s balance sheet and the plant do not require government guarantees.

In the MSB Case expansion plan, when import contracts from Zambia end, it is replaced by local supply options including wind and PV plant.\(^3\) To ensure sufficient flexibility in the system, SAPP Imports are retained in both cases and Eskom imports are used to balance shortfalls in supply in both cases. Therefore, Eskom supply also reduces proportionally, as MSB plant are brought online.

The MSB Case Expansion Plan table is below:

<table>
<thead>
<tr>
<th>Generation Options</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ruacana</td>
<td>347</td>
<td>347</td>
<td>347</td>
<td>347</td>
<td>347</td>
<td>347</td>
<td>347</td>
<td>347</td>
</tr>
<tr>
<td>van Eck</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Paratus/Diesel</td>
<td>22</td>
<td>22</td>
<td>22</td>
<td>22</td>
<td>22</td>
<td>22</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>Biomass</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>NP Solar PV</td>
<td>37</td>
<td>58</td>
<td>58</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>IPP PV</td>
<td>72</td>
<td>72</td>
<td>72</td>
<td>72</td>
<td>72</td>
<td>72</td>
<td>72</td>
<td>72</td>
</tr>
<tr>
<td>NP Firm HFO</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>IPP Wind</td>
<td>6</td>
<td>6</td>
<td>54</td>
<td>54</td>
<td>54</td>
<td>54</td>
<td>54</td>
<td>54</td>
</tr>
<tr>
<td>NP Wind</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>MSB PV</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>ZESCO Import 50MW</td>
<td>385</td>
<td>385</td>
<td>227</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ZESA Import Bilateral</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Eskom Import</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>SAPP imports</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>MSB Wind</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>

Total Generation Capacity: 1,479, 1,499, 1,389, 1,244, 1,279, 1,708, 1,809, 1,959

\(^3\) ZESCO (50MW) ends in 2021 and ZESA (80MW) ends in 2026.
The differences in Generator output between the MSB and Base Case output are shown in the table below:

<table>
<thead>
<tr>
<th>Year</th>
<th>MSB PV</th>
<th>MSB Wind</th>
<th>SB PV</th>
<th>SB Wind</th>
<th>Imports</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>100</td>
<td>50</td>
<td>50</td>
<td>25</td>
<td>200</td>
</tr>
<tr>
<td>2020</td>
<td>120</td>
<td>60</td>
<td>45</td>
<td>30</td>
<td>180</td>
</tr>
<tr>
<td>2021</td>
<td>130</td>
<td>65</td>
<td>40</td>
<td>35</td>
<td>165</td>
</tr>
<tr>
<td>2022</td>
<td>140</td>
<td>70</td>
<td>35</td>
<td>40</td>
<td>150</td>
</tr>
<tr>
<td>2023</td>
<td>150</td>
<td>75</td>
<td>30</td>
<td>45</td>
<td>135</td>
</tr>
</tbody>
</table>

The graph shows a significant increase in production from MSB PV and Wind, with a concurrent decrease in production from imports. When comparing their contribution to self-sufficiency, a key policy goal of Namibia, the MSB supports significantly more local production than the SB, as shown in the figure below. The figure shows that as MSB capacity is added, imports are displaced and local production grows to 78% of total production in 2025. In contrast, the SB reaches a maximum local production of 58% of total production in 2023, but then drops to 55% in 2025.

Figure 35: Namibian Electricity Production as % of Total Production (SB vs. MSB)

There is a slight difference between the reduction in Eskom imports and MSB production,
26.3.2 Generation Plant Costs

New plant are added for both the Base Case and the MSB scenario, including: Wind, PV, Biomass and HFO. The model uses inputs including fixed, costs and variable costs to calculate unit costs and to determine macro-economic impacts. For new NamPower plant, for the purposes of this modelling exercise, these inputs were taken from NamPower’s “Generation Projects Roadmap” presentation to the ECB in June 2018.

For new MSB PV plant, the unit costs are 90Nc/kWh in real 2018 terms. For new MSB wind plant, the unit costs are 93Nc/kWh in real 2018 terms. These prices are comparable with latest reported PV prices in Namibia and Wind and PV prices in RSA.

26.3.3 Cost of Imports

The modelling assumes that the MSB’s bilateral transactions displace imported energy as the contracts expire - from Zambia in 2023 and Zimbabwe 2026. Furthermore, the modelling also assumes that there is still some flexibility in the contract with Eskom and that MSB bilateral transactions will reduce this further in time. In January 2019, Eskom initially made a Tariff application to NERSA for 3 x 15% increases, over and above any of the Regulatory Clearing Account (RCA) applications made and awarded – a 4,5% RCA increase has already been approved for unforeseen expenses in the past. Electricity exports from RSA are not governed by the same regulatory Tariff setting methodology as prices in RSA, but it is unlikely that consumers in RSA will accept that exports to other countries are priced at a lower Tariff than electricity in RSA. To account for probable price increases – the modelling assumes a more moderate 9% Tariff increase for three years in 2019, 2020 and 2021.

26.4 Modelling Results

26.4.1 Power Station Construction Costs

The model allows the user to specify plant development time periods, construction time periods and operational periods. The model shifts plant construction costs, according to these specified inputs.

The figure below shows that there are more construction costs under the MSB, as imports are replaced by local supply options. In both cases, there is no assumed government funding support for the construction of new plant. It should be noted that in their May 2018 report, Stratecon/EMCON have commented that “economic growth is driven more by new electricity generation stations and the transmission network capital expenditure\(^\text{35}\)”. Therefore, it is expected that due to the greater expected construction, the MSB will stimulate greater economic growth than the SB.

\(^{35}\) Page 43 – when compared to electricity price increase applications from NamPower.
26.4.2 Electricity Price Increases

The Stratecon/EMCON reports also notes:

“There are two different electricity prices (and hence price increases) that the model deals with. One is the bulk price for electricity, which is NamPower’s output price. Some 20% of end consumption is supplied to consumers at this price, while 80% is supplied at this price to Distributors who add their own cost before arriving at their end consumer price. The second price therefore is the end consumer price, which is a blend of those 20% of consumption served by NamPower at its bulk price and the 80% served by Distributors at their distribution price.

Accordingly, there are two price increases that drive the modelling: a) the NamPower (bulk) price and b) the end consumer price. Only the end consumer price increase affects consumers and therefore influences demand. The bulk price increase is an input into the end consumer price increase.”

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36 Page 42
The price shown in the figure above, is the end consumer’s average electricity Tariff, shown in real terms. In both cases, the price reduces as local supply replaces imports. However, the impact within the MSB is greater as more local supply is introduced at an earlier date. It should be noted that the difference in the prices is mainly influenced by the assumptions made for the costs of new MSB plant vs. Eskom and other Import supply costs. Both cost assumptions could differ resulting in a larger or smaller difference. However, as noted above, this has less of a macro-economic impact than that of construction expenditure on new infrastructure projects in the electricity sector.

The difference in price in 2025 between the SB and the MSB is 5c/kWh in real terms. This represents a material cost saving to the ESI. The figure below shows that as the revenue requirements diverge, the MSB provides a cumulative benefit of N$1,294m in 2025.
26.4.3 Economic Growth

The model provides insight into three key macro-economic impacts i.e. economic growth (as measured by changes in GDP), inflation (CPI) and employment.

As expected, the MSB produces superior economic growth to the Base Case, due to the impact of the new plant build and lower overall electricity costs.

Figure 39: Impact on Economic Growth (SB vs. MSB)

For both the Base and MSB case, there is a positive impact, however the new MSB plant provide a significant boost from 2022 onwards – a 0.20% average increase in GDP from 2019-2025, increasing to 0.63% in 2025. The difference in the impact on GDP growth due to the implementation of the MSB (vs. the SB), is shown below:
The net cumulative additional impact due to the MSB (over and above the impact of the SB), is shown above – N$3,751m in 2025. The above is a conservative view. The MSB will provide a platform for developers to build plant in Namibia and to export it to the region resulting in additional positive economic impact, which has not been accounted for in this analysis.

26.4.4 CPI

The model impacts on inflation directly i.e. the primary impact of an increase or decrease in electricity prices on consumers, as well as the secondary impacts i.e. the impact on goods and services that consumers pay for.
The figure shows that the impact on inflation for both the MSB and Base case are the same between 2018 and 2021. The impact from 2022 onwards is negative in both cases i.e. inflation reduces slightly as consumer price increases are less than the forecast inflation rate\(^{37}\). Although the model forecasts a direct impact on CPI on a year per year basis, in reality it is not clear that these price reductions will be passed to the consumer immediately. Furthermore, the average impact is relatively small (~0.02\%) and will therefore probably not lead to any noticeable change.

### 26.4.5 Employment

Both cases have a positive impact on employment with large numbers of job created, however the MSB has a greater impact due to the relatively higher amount of local plant built and reduced imports.

Figure 42: Employment Impact (SB vs. MSB)

Again, this is considered a conservative view. MSB will allow development of new generation capacity which can be exported resulting in additional jobs in Namibia.

### 26.5 Macro-economic Impact Assessment Conclusion

This macro-economic impact assessment has been undertaken in order to test the effect of the transition from an SB to an MSB. Specifically, the assessment has reviewed the impact on economic growth, inflation and employment. The two main inputs into the assessment were the resulting construction costs and electricity price path, due to the MSB and compared with those from the Base Case.

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\(^{37}\) CPI is assumed to remain at 5.8\% for the modelling period.
The figure above shows that for both the Base and the MSB cases, the cost of energy in Namibia should reduce, in real terms, to 2025. This is mainly due to the increasing amount of lower cost renewable energy plant in Namibia, which displace imports. This is also reflected in the small impact on CPI, which shows that the reduction in electricity pricing supports lower than expected increases in consumer pricing when compared with the forecast inflation rate. This generally holds true for both the Base Case and MSB.

However, the major macro-economic benefits due to the MSB, are the impact on economic growth and employment. The SAM model used to make the assessment has shown that the construction of new generation and transmission infrastructure in Namibia, has a significant impact on growth – with an average growth rate of 0.22% of GDP to 2025 in comparison to the 0.14% average due to the Base Case model. The MSB local supply options, therefore materially enhances the prospect of economic growth.

There is a positive impact on employment due to the construction of plant under both the SB and MSB. However, the additional plant in the MSB model facilitate average annual employment creation of ~1628 jobs/annum vs. ~1228 jobs/annum for the Base Case.
27 ANNEXURE 7: INVOICING RELATIONSHIPS

For the sake of clarity, the invoicing relationships are described below for five example bilateral transactions:

1) Both Seller and Buyer Connected to the same Transmission network
2) Both Seller and Buyer Connected to the same Distribution network
3) Seller is Distribution connected/ Buyer is Transmission Connected
4) Seller is Transmission connected/ Buyer is Distribution Connected
5) Seller is connected to Distribution network/ Buyer is connected to a different Distribution network

27.1 Example 1

In Example 1, the Seller and Customer are both Transmission connected:

Figure 43: Invoicing Relationship Diagram Example 1

In this case the MSB is the only entity issuing invoices:

Table 33: MSB Invoicing Example 1

<table>
<thead>
<tr>
<th>Invoicing by the MSB:</th>
<th>Seller</th>
<th>T</th>
<th>Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transaction Based</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Energy use</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>b) Balancing</td>
<td>✓</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>c) Wheeling-To Rebate</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>d) Wheeling-From Add-back</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tx Network Based</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Connection/Extension</td>
<td>✓</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>b) Use of Tx system</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>c) Transmission Losses</td>
<td>✓</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>d) Capacity Reserve (optional)</td>
<td>✓</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Operations Based</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Storage (optional)</td>
<td>✓</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
b) Reliability

<table>
<thead>
<tr>
<th>Administration Based</th>
<th></th>
<th></th>
<th>✓</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Customer service</td>
<td>✓</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>b) Point of Supply</td>
<td>✓</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>c) MSB service</td>
<td>✓</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Levies</th>
<th></th>
<th></th>
<th>✓</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) ECB levy</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>b) NEF levy</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Taxes</th>
<th></th>
<th></th>
<th>✓</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) VAT</td>
<td>✓</td>
<td>-</td>
<td>✓</td>
</tr>
</tbody>
</table>

## 27.2 Example 2

In Example 1, both the Seller and Buyer are connected to the same Distribution network as shown below:

*Figure 44: Invoicing Relationship Diagram Example 2*

In this case the invoicing arrangements (who is invoicing whom and for what) are as follow:

*Table 34: MSB Invoicing Example 2*

<table>
<thead>
<tr>
<th>Invoicing by the MSB:</th>
<th>Seller</th>
<th>D1</th>
<th>Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transaction Based</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Energy use</td>
<td>-</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>b) Balancing</td>
<td>✓</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>c) Wheeling-To Rebate</td>
<td>-</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>d) Wheeling-From Add-back</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tx Network Based</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Connection/Extension</td>
<td>-</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>b) Use of Tx system</td>
<td>-</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>c) Transmission Losses</td>
<td>-</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>d) Capacity Reserve (optional)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operations Based</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Storage (optional)</td>
<td>✓</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
### Invoicing by the MSB:

<table>
<thead>
<tr>
<th></th>
<th>Seller</th>
<th>D1</th>
<th>Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) Reliability</td>
<td>-</td>
<td>✓</td>
<td>-</td>
</tr>
</tbody>
</table>

### Administration Based

<table>
<thead>
<tr>
<th></th>
<th>Seller</th>
<th>D1</th>
<th>Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Customer service</td>
<td>-</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>b) Point of Supply</td>
<td>-</td>
<td>✓</td>
<td>-</td>
</tr>
</tbody>
</table>

### Levies

<table>
<thead>
<tr>
<th></th>
<th>Seller</th>
<th>D1</th>
<th>Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) ECB levy</td>
<td>-</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>b) NEF levy</td>
<td>-</td>
<td>✓</td>
<td>-</td>
</tr>
</tbody>
</table>

### Taxes

<table>
<thead>
<tr>
<th></th>
<th>Seller</th>
<th>D1</th>
<th>Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) VAT</td>
<td>✓</td>
<td>✓</td>
<td>-</td>
</tr>
</tbody>
</table>

### Invoicing by Distributor 1 Invoicing Example 2

#### Transaction Based

<table>
<thead>
<tr>
<th></th>
<th>Seller</th>
<th>D1</th>
<th>Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Energy use</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>b) Balancing</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>c) Wheeling-To Rebate</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>d) Wheeling-From Add-back</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

#### Dx Network Based

<table>
<thead>
<tr>
<th></th>
<th>Seller</th>
<th>D1</th>
<th>Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Connection/Extension</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>b) Use of System</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>c) Distribution Losses</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>d) Wheeling charges</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>e) Capacity Reserve (optional)</td>
<td>✓</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

#### Operations Based

<table>
<thead>
<tr>
<th></th>
<th>Seller</th>
<th>D1</th>
<th>Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Storage (optional)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>b) Reliability</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
</tbody>
</table>

#### Administration Based

<table>
<thead>
<tr>
<th></th>
<th>Seller</th>
<th>D1</th>
<th>Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Customer service</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>b) Point of Supply</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
</tbody>
</table>

#### Levies

<table>
<thead>
<tr>
<th></th>
<th>Seller</th>
<th>D1</th>
<th>Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) ECB levy</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>b) NEF levy</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
</tbody>
</table>

#### Taxes

<table>
<thead>
<tr>
<th></th>
<th>Seller</th>
<th>D1</th>
<th>Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) VAT</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
</tbody>
</table>
27.3 Example 3

In Example 3, the Seller is Distribution connected but the Customer is Transmission connected:

Figure 45: Invoicing Relationship Diagram Example 3

In this case the Invoicing charges are allocated as follows:

Table 36: MSB Invoicing Example 3

<table>
<thead>
<tr>
<th>Invoicing by the MSB:</th>
<th>Seller</th>
<th>D1</th>
<th>T</th>
<th>Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transaction Based</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Energy use</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>b) Balancing</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>c) Wheeling-To Rebate</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>d) Wheeling-From Add-back</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Tx Network Based</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Connection/Extension</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>b) Use of Tx system</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>c) Transmission Losses</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>d) Capacity Reserve (optional)</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Operations Based</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Storage (optional)</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>b) Reliability</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Administration Based</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Customer service</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>b) Point of Supply</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Levies</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) ECB levy</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>b) NEF levy</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Taxes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 37: Distributor 1 Invoicing Example 3

<table>
<thead>
<tr>
<th>Invoicing by Distributor 1:</th>
<th>Seller</th>
<th>D1</th>
<th>T</th>
<th>Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transaction Based</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Energy use</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>b) Balancing</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>c) Wheeling-To Rebate</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>d) Wheeling-From Add-back</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Dx Network Based</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Connection/Extension</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>b) Use of Dx system</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>c) Dx Losses</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>d) Wheeling charges</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e) Capacity Reserve (optional)</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Operations Based</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Storage (optional)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>b) Reliability</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Administration Based</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Customer service</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>b) Point of Supply</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Levies</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) ECB levy</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>b) NEF levy</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Taxes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) VAT</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

27.4 Example 4

In Example 4, the Customer is Distribution connected but the Seller is Transmission connected:
In this case the Invoicing charges are allocated as follows:

**Table 38: MSB Invoicing Example 4**

<table>
<thead>
<tr>
<th>Invoicing by the MSB:</th>
<th>Seller</th>
<th>T</th>
<th>D1</th>
<th>Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transaction Based</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Energy use</td>
<td>-</td>
<td>-</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>b) Balancing</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>c) Wheeling-To Rebate</td>
<td>-</td>
<td>-</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>d) Wheeling-From Add-back</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tx Network Based</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Connection/Extension</td>
<td>✓</td>
<td>-</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>b) Use of Tx system</td>
<td>-</td>
<td>-</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>c) Transmission Losses</td>
<td>✓</td>
<td>-</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>d) Capacity Reserve (optional)</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Operations Based</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Storage (optional)</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>b) Reliability</td>
<td>-</td>
<td>-</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td><strong>Administration Based</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Customer service</td>
<td>✓</td>
<td>-</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>b) Point of Supply</td>
<td>✓</td>
<td>-</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td><strong>Levies</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) ECB levy</td>
<td>-</td>
<td>-</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>b) NEF levy</td>
<td>-</td>
<td>-</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td><strong>Taxes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) VAT</td>
<td>✓</td>
<td>-</td>
<td>✓</td>
<td>-</td>
</tr>
</tbody>
</table>
Table 39: Distributor Invoicing Example 4

<table>
<thead>
<tr>
<th>Invoicing by Distributor 1:</th>
<th>Seller</th>
<th>T</th>
<th>D1</th>
<th>Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transaction Based</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Energy use</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>b) Balancing</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>c) Wheeling Rebate</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>d) Wheeling-From Add-back</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dx Network Based</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Connection/Extension</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>b) Use of Dx system</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>c) Dx Losses</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>d) Capacity Reserve (optional)</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td><strong>Operations Based</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Storage (optional)</td>
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27.5 Example 5

In Example 5, the Seller is Distribution connected and the Customer is connected to a different Distribution network:

*Figure 47: Invoicing Relationship Diagram Example 5*
There are now three Invoicing entities: MSB, D1 and D2.

### Table 40: MSB Invoicing Example 5

<table>
<thead>
<tr>
<th>Invoicing by the MSB:</th>
<th>Seller</th>
<th>D1</th>
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<th>D2</th>
<th>Customer</th>
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### Table 41: Distributor 1 Invoicing Example 5

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Table 42: Distributor 2 Invoicing Example 5
28 ANNEXURE 8: SECURITY OF SUPPLY PLANNING

28.1 Annual Operational Planning

28.1.1 Predict annual demand

The SO shall estimate the annual demand levels and profiles to support the annual operational plan. This will be based on data supplied by customers, coupled with the SO's independent estimate based on recorded history data. The SO shall establish accurate databases of weather corrected demand.

28.1.2 Co-ordinate outage plan

The SO shall co-ordinate and establish the overall plant outage plan. This will be based on the advice of the planned outages of Production Units for maintenance as well as the requirements for transmission outages. The SO will co-ordinate outage plans according to the processes and procedures defined in the Grid Code.

28.1.3 Estimate production plan

The SO shall estimate the annual production plan to evaluate network security and identify potential capacity shortfalls. The annual production plan is based on the expected demand and available capacity, the outage plan and any operational guidance on system reliability requirements. This will enable the transfers into and out of the network to be estimated for the cardinal demand points, i.e. the key turning points of the demand curve such as peaks and troughs and also the appraisal of capacity margins.

It should be noted that this production plan is for the use of the SO to manage the electricity system and when published will not include detailed Generator level plans - the plan will not create any expectations or commitments on the behaviour of any of the Market Participants.

28.1.4 Check network reliability

Based on the estimated production plan the SO will study and review the network reliability for key points in the demand profile during the year to identify any potential active constraints or insecurities. The network capacity shall be based on data provided by the Network Operator. It will provide advanced warning of any impending operational problems and difficult outage periods. It will particularly take account of the changing demand profile and patterns of availability resulting from outages of generation and transmission for maintenance.

28.1.5 Check supply margins

The SO will review the balance between the supply and demand to establish the margin through the year taking account of the demand profile and the production outage plan.
28.1.6 Revise annual plan
The SO will review these proposed plans taking into account data from IPPs and Contestable Customers and will propose variations to planned outages to establish a viable production and outage plan. NamPower Generators, IPPs and the network operator are obliged to amend outage plans in accordance with SO requirements. This is ensured through the licence terms determined by the ECB, the prevailing Grid Code and established network operations standards.

28.1.7 Publish annual operational plan
Following the development of the annual operational plan, all Generators in the MSB market and the network operator will be advised of the details of the plan to enable them to review their own production plans and any constraints that may affect their commercial operation. It is likely that many of the eligible IPPs, operating in the MSB will be Renewable Energy plant, some of whom will enter into “take-or-pay” commercial contracts with offtakers. This does not release them from their requirement to support SO’s annual planning. Whilst RE IPP’s will not be penalised for deviations from annual planning Production Schedules, they will be penalised (imbalances mechanism) for any deviations (beyond the tolerance limit), on their daily Production Schedules.

28.1.8 Confirm outage plan
The outage plan will be a rolling 52 week forecast which is updated and published on a weekly basis. The SO will advise on the feasible outage plan that enables the network reliability and supply margins to be maintained. Transmission outage data will be made generally available, but detailed data on production will be restricted to the recipients’ Production Units, with other data restricted to aggregated values. The ECB may review the proposed plan to identify any issues relating the operations of the MSB market.

28.1.9 Develop System
The SO will provide an important input to the discussion on the expansion of the grid. It will involve identifying the need for reinforcement based on experiences in managing constraints and monitoring system performance.

The SO is also required to advise on the minimum technical design and operational requirements for the connection to the system of directly connected generating installations, distribution systems, directly connected consumers’ equipment and inter-connector circuits.

To facilitate the evaluation of trading conditions and new entry into the market a statement describing the overall supply/demand position should be issued annually together with network details and areas of opportunity and it is proposed this should be part of the system development process.
28.2 Weekly Schedules

The SO will perform the following activities for the co-ordination of estimation of weekly schedules:

28.2.1 Predict weekly demand

The SO will update the estimates of system demand for the week ahead. This will be based on any new data provided by large customers, including contestables, together with the SO’s own estimate based on recent historic demand records. The results will be released to the MSB as part of the SO 'requirements' including reserve and ancillary service needs as well as Losses. The data will be used to support the MSB weekly indicative price scheduling study. Where the 'market' derived demand forecast is different from the SO estimate, then the difference is added to the reserve requirement as “Collateral Capacity”.

28.2.2 Update available capacity

The SO will review the capacity available to meet the expected demand for the week ahead. Participants will provide the SO with data related to revisions to outages or delays in return to service as well as any new contracts for international energy exchange – this is critical once the MSB moves to include imports/exports and 3rd party Traders.

28.2.3 Estimate weekly production

The SO will estimate the weekly production plan based on the latest demand data and expected production availability and the annual plan data. This activity will establish a more detailed view of the planned use of the system for the coming week to enable any potential operational difficulties to be identified. It will estimate the production plan based on the latest information available and updating the annual plan.

The SO will perform the following sub-activities:

- **Update supply demand profile** – the SO will update the week ahead demand profile based on the latest recorded results.

- **Update study capacity data** – the SO will update the generation capacity data based on latest recorded actual values and any changes to the planned outage programme.

- **Estimate hydro provision** – the SO will update the data used to model hydro generation (from Ruacana) based on the latest hydrological conditions.

- **Determine study reserve provision and distribution** – the SO will refine the reserve requirement data entered into the study and its distribution around the network to confirm availability.

- **Run weekly production simulation** – the SO will perform studies to simulate operation for the week ahead to review how demand could be met. Various scenarios will be run
to test sensitivity to demand levels and lower generation or transmission availability delays in return to service following maintenance.

- **Extract weekly study data** – the SO will extract data from the annual simulation as a basic data set for the weekly simulation study.

- **Estimate weekly margins** – the SO will use the results of the weekly simulation to estimate the likely margins of capacity over demand levels through the period.

- **Estimate cardinal nodal injections** – the SO will process the results of the weekly simulation to establish the generation likely to be running at peak periods and its output for use in network studies. The SO will also study light load periods to ensure that generation inflexibly does not restrict the ability to regulate down if the load drops below the expected levels.

### 28.2.4 Revise weekly plan

Based on the analysis of system security and capacity margins, the SO will advise the relevant participants and network operator of any impending problems and develop a plan showing the type of changes necessary to secure the system. This would include periods of margin shortfall and restrictions on production in areas when transmission constraints may become active.

### 28.2.5 Establish reserve and ancillary requirements

Based on the analysis of expected performance and capacity margins the SO will determine the requirements for the provision of system reserve and advise the MSB. The distribution of reserve should be considered as well as the optimisation of its provision. The ability to retain the regulating capacity to reduce output during trough periods should also be considered. The requirements will be set initially based on current practice for:

- Instantaneous reserve based on covering the loss of a large unit;
- Regulating reserve based on the need to cover prediction error and generation Dispatch error in any one hour;
- Ten-minute reserve based on covering the range of variation possible in any 24hr period, and
- Collateral capacity to ensure that sufficient capacity is scheduled to meet the realised demand.

### 28.2.6 Issue weekly plan advice

The SO will advise all market participants of any expected system problems that may restrict their commercial operation and the expected provision to meet system reserve needs. The network operator will be advised of expected network utilisation and any critical security dependencies.
28.3 Daily Operations

28.3.1 Real Time Dispatch

The SO is required to assure that electricity is delivered and transmitted at a stable frequency and voltage. This will be effected by producing a dynamic Constrained Schedule and dispatching generation in real-time to maintain system balance and relieve any transmission congestion. It will involve the call off of Ancillary Services and the management of balancing using Automatic Generation Control systems (AGC) and manual Dispatch.

28.3.2 Maintain short-term demand forecast

The MSB shall provide the SO with data from which the SO will forecast the day-ahead demand profile including transmission Losses. These initial notifications are binding unless the SO agrees a subsequent change. They are designed to enable the SO to check for consistency with independent forecasts.

28.3.3 Predict short-term demand

The SO will maintain an independent forecast of day-ahead demand that will take account of data from Contestable Customers and other energy-intensive users as well as recent history and weather influences. The Grid Code does not currently specify when this must take place, but it is suggested that this forecast shall be provided to the MSB by 10h00 every day, and shall include specification of transmission loss volumes as well as any inadvertent flow obligations stemming from arrangements with regional Control Areas. The SO should be incentivised to maintain an accurate load forecast as this affects the required level of collateral capacity and the overall cost of production.

28.3.4 Receive data from MSB on Unconstrained Schedule

The SO will receive the data from the MSB related to the final physical transfers of Market Participants, per metering point as a result of bilateral trading. This data will be released by the MSB to the SO by 16:00 every day. These initial notifications are binding unless the SO agrees to subsequent changes.

28.3.5 Collate production plans

The SO will collate production plan data from the Unconstrained Schedule and perform a preliminary appraisal of network security.

28.3.6 Collate data for Constrained Schedule

The SO will collate all the necessary technical data required to evaluate security of the production plan produced above and the provision of system reserve.
28.3.7 Evaluate network security

The SO will evaluate network security using the day-ahead schedule and any revisions to network status as advised by the NO. The SO shall provide the MSB with any changes to the standing network constraint data, which the MSB will use to produce an unverified Constrained Schedule.

The MSB will advise the Generators, NO, Distributors, and Contestable Customers of any constraints that may affect their planned commercial operation and require changes to their production. Any active constraints will be fed forward to the Dispatch phase.

The sub-activities associated with evaluating network security are described below:

- **Update study network data** – the SO will study network status and parameters will be updated based on data supplied by the NO.
- **Run network study** – the SO will run network security studies based on the updated network status and nodal injections with an agreed set of contingencies.
- **Identify network limitations** – the SO will process results to identify any active constraints or potential network insecurities.
- **Identify constrained generation** – the SO will analyse the results of the study to appraise where generation may need to be constrained on or off to manage flows within defined export/import capacities of affected zones of the network. The MSB will be advised of the required count trades so that the Constrained Schedule can be produced.

28.3.8 Receive data from MSB on Constrained Schedule

The SO will receive the data from the MSB related to the final physical transfers of Market Participants, per Reconciliation Node, as a result of bilateral trading and as constrained by the SO. This data will be released by the MSB to the SO by 16:00 the day-ahead. These initial notifications are binding unless subsequent changes are agreed by the SO through short-term bilateral trades and real time balancing.

28.4 Hourly Activities

28.4.1 Short Term Bilateral Trades

Short term bilateral trading (Day Ahead or Intra-day Markets) are not envisaged as part of the current MSB market structure; however this is a potential option to be incorporated into the market design in the future. Currently market participants can trade on the existing SAPP markets.

The incorporation of short term trading will have implications on the information exchange requirements between market participants, which will need to be considered. The current
market design also relies on a central Balancing Mechanism – any short term trading will need to take this into account during implementation.

28.4.2 Systems Operations
The SO shall be responsible for the following on-going system operations activities:

- dynamic Dispatch
- balancing the system
- publishing of operational data
- co-ordination of imports/exports
- systems monitoring
- reviewing SO data, balancing data, Ancillary Services data for collation (to be sent to MSB for settlements)

28.5 Emergency & Contingency Planning
The SO shall develop and maintain contingency plans to manage system contingencies and emergencies in conjunction with market participants. These will include issues such as:

- Under-frequency load shedding
- Meeting disaster management requirements including the necessary minimum load requirements
- Forced outages at all points of interface
- Supply restoration