
On the Path towards 2022
Rodrigues Power System
Planning
Strategy
Solution

How will the Rodrigues' Power System Evolve?

The development of the Rodrigues' power system is not an exception. Modernising the system will call for ingenuity. There is a need to *'think outside the barrel'*. Diversifying the energy sources and adopting a sustainable power system development approach are plausible answers.

CEB, in this quest, will explore all possible avenues!

ELECTRICITY DEMAND–SUPPLY IN RODRIGUES

Chapter 8

Electricity services delivery of Rodrigues' branch, as part of the CEB's assets portfolio, has been, and is still, relatively costly. So far, CEB's investments in Rodrigues have not been optimal in terms of financing the cost of operations. Due to this serious concern, while formulating this IEP, CEB has paid special attention to its Rodrigues' activities.

Unlike the consistent growth in electricity demand in Mauritius, the demand growth in Rodrigues, during the past five years, has been relatively slow. In fact, despite frequent announcements made by the local authorities regarding infrastructural developments on the island, a more or less stalemate condition has been observed. It is felt that this situation may even persist in the near future, if there are no major improvements of the local economy.

On the one hand, due to the sluggishness of the economy, CEB has not been, and is not, able to benefit from any potential economies of scale, neither in the electricity production nor in the electricity transport activities. This observation is confirmed by the lower system load factor of about 60% in Rodrigues, compared to approximately 70% in Mauritius. On the other hand, the mounting cost of operations, associated with the isolated nature of the Rodrigues' electric system, makes the financial situation of CEB's undertakings in Rodrigues extremely difficult.

However, it is recognised that there exist prospects for improvements. The Budget Speech 2013, recently delivered by the island's Chief Commissioner, explicitly goes in this direction. Section 8.1 below provides an overview of the upcoming social and infrastructural projects in Rodrigues, which most likely will influence the local electricity demand.

The inferences made in the discussion below, regarding the evolution in the electricity demand in Rodrigues, were based on information sourced and interpreted from available documents, released lately by the Rodrigues Regional Assembly (RRA).

8.1 EXPECTED CHANGES IN THE SOCIAL AND ECONOMIC ENVIRONMENT

Alongside its intrinsic dependence on Mauritius, as per general consensus, Rodrigues internally requires a revamping of its economic activities with the hope of boosting up its economic growth. It is indeed with this specific objective that the RRA has proposed, as part of its Budget 2013, the following developmental projects. These projects will most likely impact on the medium- and the long-term electricity demand in Rodrigues.

Airport Development

The authorities in Rodrigues have for some time been contemplating the extension of the current 1280 metres-long runway at Sir Gaëtan Duval Airport. It is argued that this development will enable the landing of larger airplanes, which, in turn, will:

- promote regional flights in Rodrigues;
- attract more tourists and encourage many of the prospective promoters to invest in their hotel development projects; and
- facilitate the mobility of people and resources to further promote economic development of Rodrigues.

In the Budget 2013, the RRA has therefore proposed to accelerate the process for the extension of the airport infrastructure. With this perspective, it is reasonable to assume that the development of the airport will, as a catalyst, create new demand for electricity supply.

Developments in Sea Ports

As mentioned in the Budget Speech 2013, some developments in sea-port services are expected in the coming years; these will include the construction of a new port at Pointe L'Herbe and a Marina at Baie aux Huitres. These projects, by default, will imply new demand for electricity.

Water Reforms

According to the local authorities, water supply deficiency has been a long-outstanding problem in Rodrigues. The local authorities expect that the Central Government will continue to support the development of the Water Sector in Rodrigues. Amongst the water development projects, the installation of new desalination plants in 2013 will be of interest to the CEB.

Contrary to a former desalination project, where two 1500 m^3 desalination plants would have been constructed, it is being planned for 2013 to install two desalination plants of only 500 m^3 capacity each, which most likely will require the CEB to provide electricity supply for their operations.

CEB foresees that the enhancement of the water system in Rodrigues will have a multiplying effect on the island's electricity consumption. With a higher volume of water availability, there may be a heightened interest in water-dependent electric appliances, such as washing machines and water pumps, as well as the setting up of new water-related industrial activities. These kinds of development will surely influence the electricity demand in Rodrigues.

Communications – Fibre Optic Cable to enhance ICT Development

By nature, Rodrigues is remotely located. It is believed that its remoteness, however, can be eliminated through rapid communication and connectivity. In this respect, some developments were initiated recently; for example, the construction of an ICT Academy at Camp du Roi, which is considered as a landmark achievement in the ICT Sector in Rodrigues. By itself, this project will add to the current electricity demand, as it will shortly start operation.

More importantly, it is expected that the implementation of the Fibre Optic Cable project, which was initiated in 2010 by the Ministry of Information Technology, will create new opportunities, such as attracting investments and creating employment in the field of ICT (Call Centres, Business Process Outsourcing, Disaster Recovery Centres, etc.). These developments, by their very nature, are dependent on electricity. Hence, it is reasonable to assume that demand for electricity, especially in the Commercial Sector, will tend to increase in the near future.

Social Development Programmes

As announced in the Budget Speech 2013, Government will construct three hundred low-cost houses soon. Construction of new houses means additional demand for electricity supply. It seems also that social housing development will be a recurrent concern for the local authorities.

In addition to the above, several other social projects are being planned for 2013 and the years after. These include, among others:

(a) The construction and renovation of schools and colleges;
(b) The construction of a complex for 'Sports de Combat' and renovation of sports infrastructures, such as the Malabar gymnasium and the Grande Montagne Sport Complex stadium;
(c) The renovation of cultural and community centres;
(d) The extension and renovation of the Pointe La Gueule Prison; and
(e) Improvements in health-related infrastructures.

8.2 TREND IN ELECTRICITY CONSUMPTION

Although the overall electricity demand in Rodrigues for the period 2006-2011 has grown by an average of 1.7% annually, which is far below the 7.6% annual growth rate during the comparative previous period, the compounded growth rate in the specific consumption of the main customer categories were all negative. Table 8.1 shows the evolution of the growth rate in specific consumption.

TABLE 8.1: Growth Rate in Specific Consumption of Major Categories

Customer Category	1996–2001	2001–2006	2006–2011
Residential	6.9%	3.1%	-0.6%
Commercial	6.2%	9.1%	-1.1%
Industrial	-9.1%	7.4%	-3.5%

For the period 2006-2011, the highest negative growth in specific consumption was in the Industrial Sector, where negative 3.5% was registered. This fall in the energy intensity is probably due to falling investment in industrial activities. This possible low capital injection, consequently, did not create the impetus, which is required to bolster the social and economic conditions of the island. The end-result is the inhibited growth rate of the industrial sector's electricity demand.

In the residential sector, the fall of 0.6% in the average consumption of electricity per household can be explained by a probable fall in the purchasing power of households in Rodrigues and a heightened emphasis on energy efficiency and savings. With respect to energy efficiency, the wide distribution of energy saving lamps on the island in 2009 continues to influence the residential category electricity consumption.

Given the intrinsic relationships between the different electricity consumer categories, where the propensity of one to consume influences the other, the Commercial Sector has also experienced a fall in the average electricity consumption per account. As shown in Table 8.1 above, a fall of 1.1% in the specific consumption of the commercial category was noted for the period 2006-2011. It is obvious that, because of the sluggishness of the economic activities in Rodrigues, the performance of the Commercial Sector was also gloomy.

Despite the above, the low growth in the electricity demand recorded in Rodrigues had a positive impact on the CEB's financial performance. In Rodrigues, the cost of electricity supply has been relatively higher than the average electricity selling price, as shown in Table 8.2 below. Therefore, any reduction in electricity consumption will undoubtedly lower the overall costs of sales which, obviously, can be equated to lower deficit for the CEB.

Considering the total cost of supply in 2011, the average selling price should have been as high as Rs 9.13 per kWh for CEB's operation in Rodrigues to break-even.

8.3 DEMAND FORECAST 2013-2022

Based on recent trends and the inferences made in section 8.1 above, the demand forecast for the period 2013-2022 has been prepared and is presented in this section.

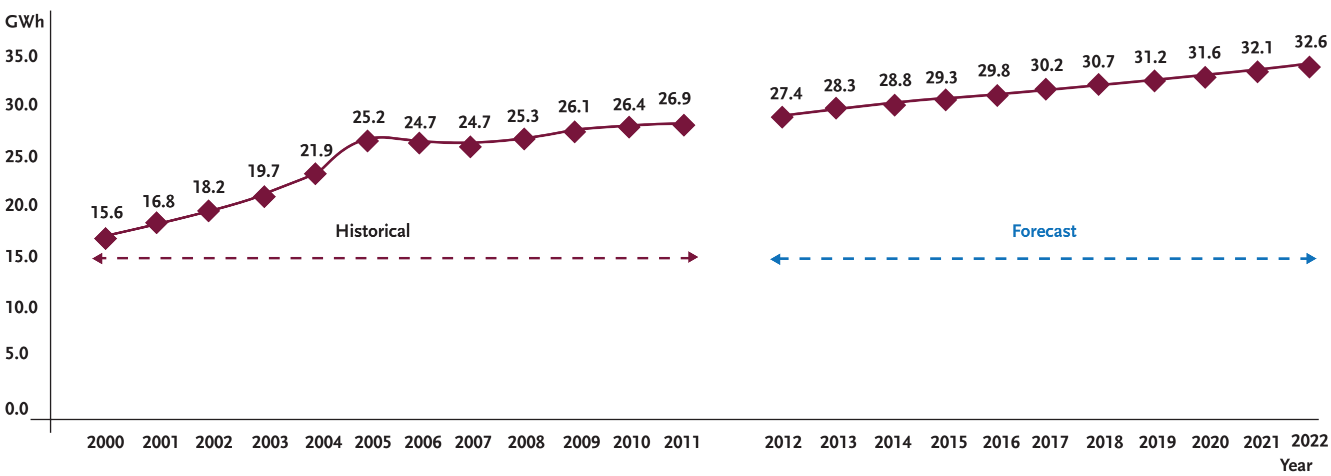
8.3.1 Energy Sales Forecast

As it can be observed in Figure 8.1 below, CEB has forecasted that the demand for electricity in Rodrigues will grow, on average, at an annual rate of 2.1% for the coming five years and at a lower rate of 1.5% for the period 2018-2022. Pending the gathering of additional data and the conduct of a comprehensive study of Rodrigues' power system, these growth rates are believed to be reasonable at this stage.

TABLE 8.2: Loss on each Unit Sold Rodrigues for the Period 2005-2011

YEAR	2005	2006	2007	2008	2009	2010	2011
Average Selling Price (Rs/kWh)	3.69	4.13	4.33	5.57	5.95	5.95	6.51
Cost of Sales (Rs/kWh)	4.26	5.74	6.38	7.50	8.45	7.21	7.52
Gross Loss (Rs/kWh)	(0.57)	(1.61)	(2.05)	(1.93)	(2.51)	(1.26)	(1.01)
Net Loss (Rs/kWh)	(1.51)	(2.41)	(2.82)	(2.89)	(3.66)	(2.44)	(2.62)

FIGURE 8.1: Annual Electricity (GWh) sales



The conducting of a comprehensive study of Rodrigues' power system has been set as a priority for 2013. Upon completion of the study, CEB will be in a better position to arrive at a more accurate long-term demand forecast for the island.

In Rodrigues, residential sales account for more than 50% of the total electricity sales. As the residential category will continue to have the largest number of accounts, around 88% of the CEB's customer-base in Rodrigues, and non-residential development will be mostly in proportion to the size of the local market, represented by the number of households, the above-mentioned share of more than 50% is expected to be maintained in the future.

In line with the RRA's strategic goal to consolidate Rodrigues' economy, future electricity sales, as mentioned above, will follow an upward trend. In addition to the spill-over effect of economic activities on the local households, the sales forecast has taken into account the potential growth in industrial activities geared towards exportation and the developments in the Commercial Sector focusing on tourism. Figure 8.2 below illustrates this overall view.

Over the past seven years, the Commercial Sector accounted for approximately 32% of the total electricity consumption in Rodrigues. Commercial electricity usages were mainly towards providing government services, businesses operations and tourism activities.

Commercial activities in Rodrigues seem to be closely linked to households' propensity to consume and tourism-related activities. Given this observation, it is sensible to assume that changes in the quantity of electricity consumed in the Commercial Sector will be largely dependent on these two causal factors. Unless there is a drastic change in the economic structure, the electricity consumption in the Commercial Sector will continue to move in tandem with the households and hospitality sectors' affluence.

For the period 2005-2011, electricity sales to the industrial category had been around 8% annually. As at the end of 2011, statistics showed that the number of registered industrial electricity accounts was around 230. CEB has forecasted that the current trend will be maintained for the coming years. This is based on the assumption that future industrial developments in Rodrigues will be moderate for the following reasons:

- The local market will remain tiny;
- The remoteness of the island; and
- Possible development of low-energy intensity industrial activities.

8.3.2 Peak Demand Forecast

CEB estimated that the peak electricity demand in Rodrigues will grow on average by 3.5% annually over the next five years and by 1.5% over the period 2018 to 2022. According to this trend, the peak power demand will reach 8.83 MW by the year 2022;

FIGURE 8.2: Share of Each Customer Category in Total Sales

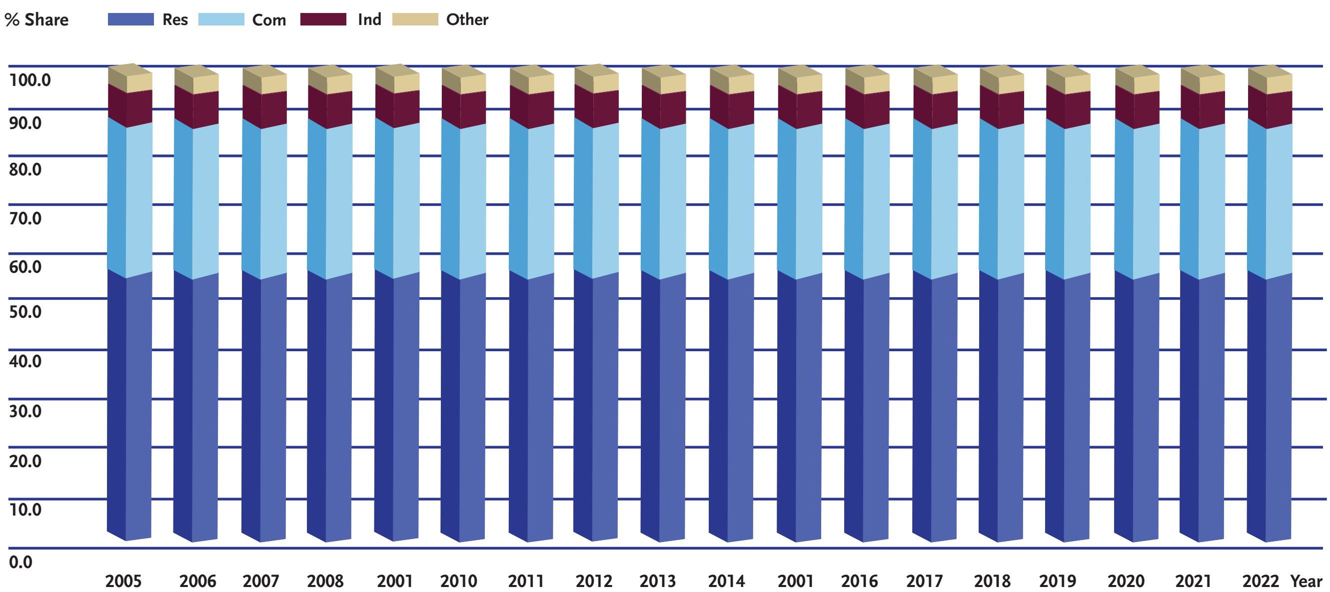
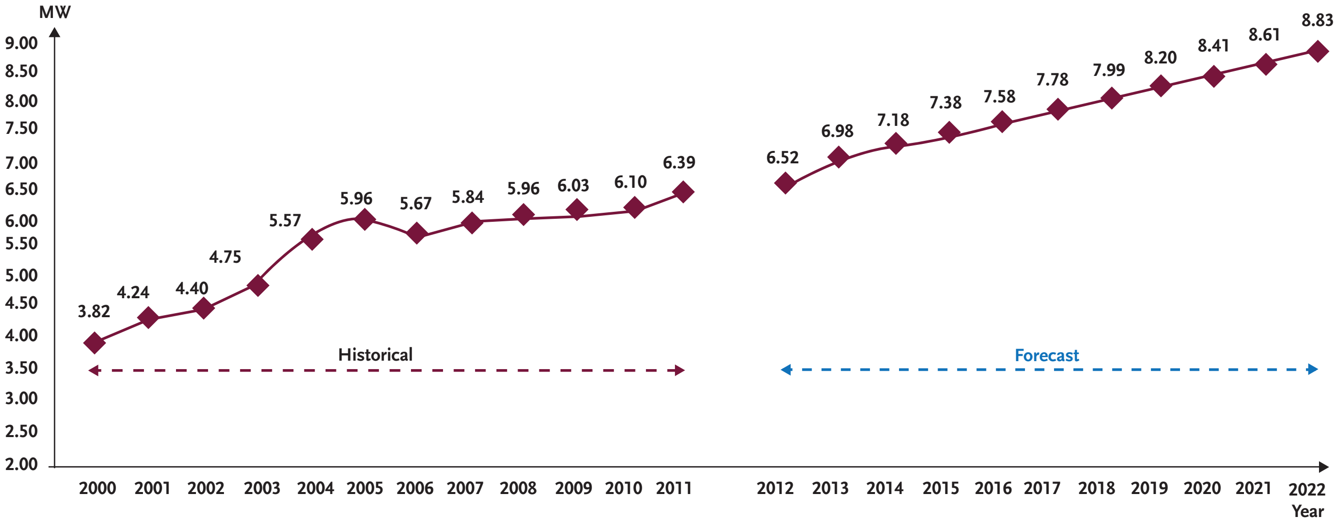


FIGURE 8.3: Annual Peak Demand (MW)



that is, approximately 38% higher than the peak of 6.39 MW recorded in 2011. The estimated growth rates are consistent with the recent growth in the peak demand, as shown in Figure 8.3 above.

8.4 ELECTRICITY GENERATION PLAN FOR RODRIGUES

In accordance with the market assessment, an Electricity Generation Expansion Plan, covering the period 2013-2022, has been prepared for Rodrigues, as summarised in the following sub-sections.

8.4.1 The Existing Generating System

In Rodrigues, CEB caters for the total electricity needs. Diesel engines and Wind Farms are the two main technologies used for generating electricity. The thermal power plants (diesel engines) are located at Port Mathurin and Pointe Monnier, while the Wind Farms are sited at Trèfles and Grenade.

The currently available effective plants capacities are shown in the Table 8.3.

The total installed wind farm capacity in Rodrigues is presently 1,280 kW and the total thermal effective capacity is 11,400 kW (includes the newly-commissioned generating unit at Pointe Monnier).

8.4.2 Energy Mix

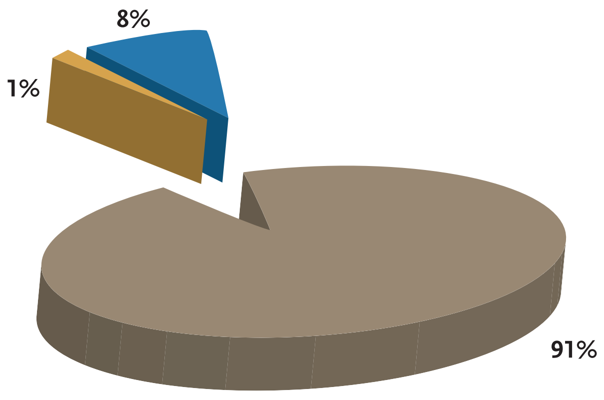
In 2011, CEB generated a total of 33 GWh of electricity to meet the island's electricity demand. Out of the 33 GWh, around 9% were generated by the Wind Farms,

TABLE 8.3: Capacities of Generating Units in Rodrigues

Power Stations	Units	CAPACITY / kW Installed	CAPACITY / kW Effective
Port Mathurin	MWM No.1	500	400
	MWM No.2	500	400
	MWM No.3	500	400
	MWM No.4	500	400
	MWM No.5	500	400
	MWM No.6	500	400
	MAN No.7	1,000	900
	MAN No.8	1,000	900
	MAN No.9	1,000	900
	SubTotal	**6,000**	5,100
Pointe Monnier	MAN No.1	1,900	1,900
	MAN No.2	1,900	1,900
	New Unit	2,500	2,500
	SubTotal	**6,300**	**6,300**
Trèfles	WTG 1	60	60
	WTG 2	60	60
	WTG 3	60	60
	SubTotal	**180**	**180**
Grenade	WTG 1	275	275
	WTG 2	275	275
	WTG 3	275	275
	WTG 4	275	275
	SubTotal	**1,100**	**1,100**
		Total Thermal	**11,400**
		Total Wind + Thermal	**12,680**

remaining was produced from diesel and heavy fuel oil. Figure 8.4 shows the share of the energy mix in 2011.

FIGURE 8.4: Energy Mix 2011 - Rodrigues



8.4.3 Capacity Planning Criteria

The updated effective generation capacities, the spinning reserve margin and the *'N minus 1'* criterion are the main determinants of the generation expansion plan.

Effective capacities

As in Mauritius, the effective plant capacities of Rodrigues are updated on an annual basis. The revised generating capacities are used, when carrying out the demand-supply balance.

Spinning Reserve

As for the power system in Mauritius, a margin of 10% is generally maintained for the spinning reserve in the Rodrigues' system.

'N minus 1' Criterion

In Rodrigues, given the small number of generating units which allows better maintenance management, CEB uses the *'N minus 1'* criterion in the demand-supply balance matrix. Under this planning approach, CEB ensures that in the event of the largest engine being out of use, mainly due to forced outage, the remaining available engines should be able to satisfy the demand.

According to records, the peak demand in Rodrigues usually occurs on the last day of December every year. With this information and to ensure preparedness in having sufficient generation capacity, CEB does not plan any engine maintenance during the month of December. By so doing, CEB is able to achieve the *'N minus 1'* criterion.

8.4.4 Proposed Plant Addition

In February 2005, a study for extension of the Pointe Monnier Power Station was carried out. The ensuing development plan recommended a two-phase extension of the power station. Under the Phase-One, 2 units of 2.5 MW each, both operating on heavy fuel oil, would have been added. The first unit was initially planned to start operation in September 2006. The second unit was intended for commissioning in September 2007 depending on the coming into operation of the announced desalination plants. Otherwise, it would have been commissioned in September 2008 to satisfy the normal growth in demand.

Phase-Two of the project comprised 3 additional units of 2.5 MW each. Its implementation depended on the island's load growth.

Contrary to what was planned, the acquisition of the first generating unit under Phase-One was later deferred for the following reasons:

- CEB adopted the *'N minus 1'* criterion;
- Delayed decommissioning of the old MWM units at the Port Mathurin Power Station; and
- Accumulated delays in the installation of desalination plants by the local authority.

The commissioning of the first 2.5 MW engine under Phase-One was then rescheduled for the end of 2012, in anticipation of satisfying the projected increase in demand.

In accordance with the development plan, as and when the need arises, new generating units of 2.5 MW will be added. Generally, the construction time for such capacity engine(s) takes at least 14 months.

It is worth highlighting that the EIA licence for the full development (5 x 2.5 MW) of the Pointe Monnier Power Station had been already secured.

8.4.5 Proposed Retirements

With time, the MWM engines at the Port Mathurin Power Station have become less efficient, due to ageing, and increasingly problematic for the CEB to ensure strict compliance with environmental norms, especially in terms of noise level. The maintenance costs, in terms of sourcing of spare parts for these engines, are also significant. Moreover, these engines have high generation costs because they use expensive light fuel to produce electricity. Hence, their uses are limited to a minimum so as to mitigate financial impact on CEB's operation in Rodrigues. Nevertheless, CEB will keep the MWM engines in its portfolio as back-up for emergency situations. In the long run, CEB will consider their progressive retirement, as and when the need arises.

8.4.6 Demand-Supply Balance

Further to the demand forecast and the planned additions and retirements, as discussed above, the demand-supply balance, depicted in Figure 8.5 below, has been prepared while taking into account the planning criteria stated in Section 8.4.3. The demand-supply balance depicts how the CEB intends to match the 2013-2022 electricity demand in Rodrigues with the current and future generation mix.

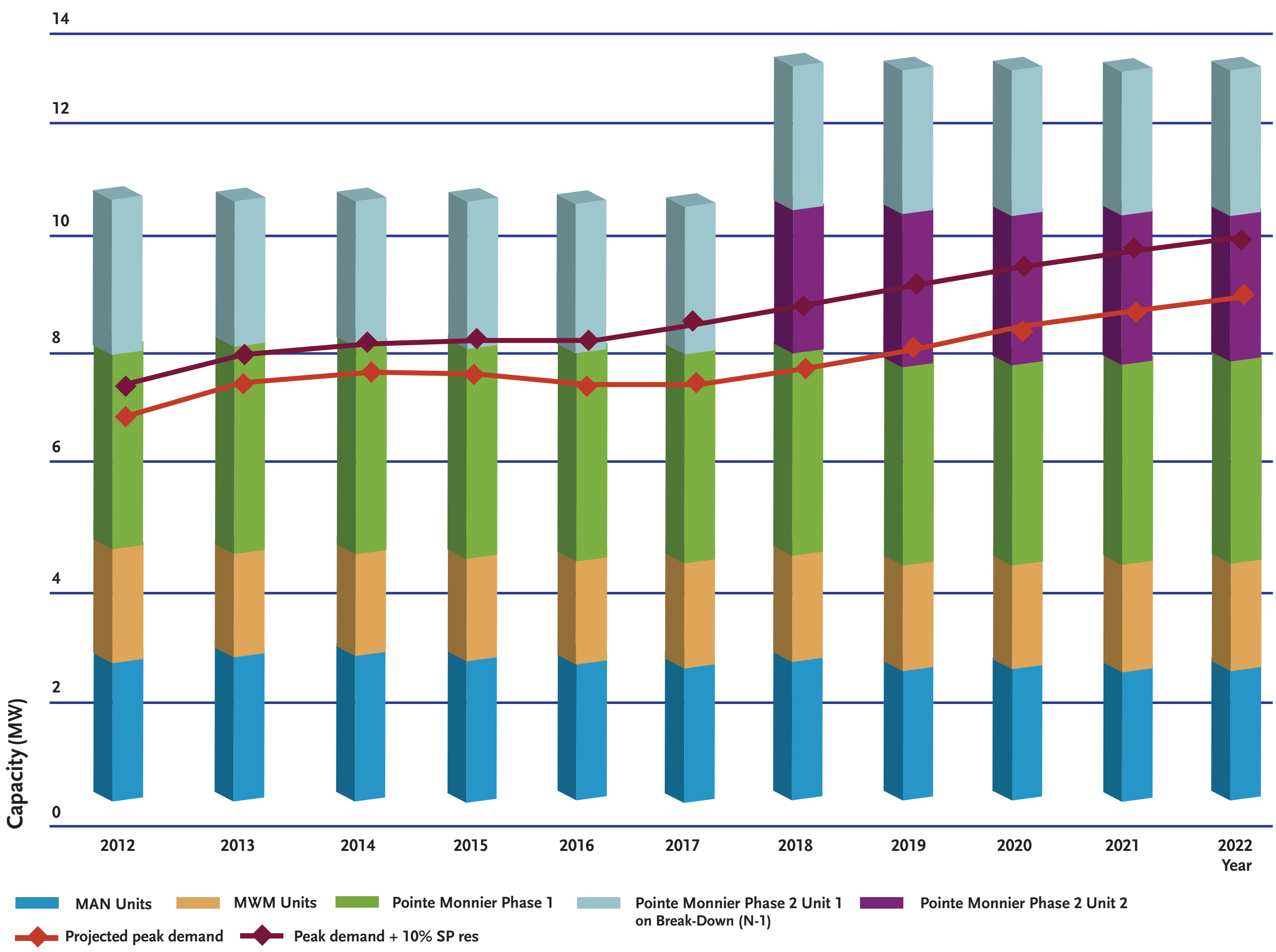
8.4.7 Planned Capacity Addition

In accordance with the demand-supply balance, whilst respecting the threshold limit for Reserve Capacity Margin, a new generating unit of 2.5 MW will be required in 2018.

With the revised effective capacity, which includes the last generating unit of 2.5 MW commissioned in 2012, CEB will be able to meet short- and medium-term demand, unless new developments emerge. By tracking the market, CEB will anticipate potential changes and, accordingly, plan for the addition of a new 2.5 MW generating unit before 2018, if the need arises.

Within the scope of this integrated plan, consideration will also be given to the re-development of the Trèfles site, where currently three 60 kW Wind Turbine Generators (WGTs) are installed. By 2022, these WTGs will already reach the end of their service lives. This proposed re-development project will contribute to increase the energy generation from renewable sources.

FIGURE 8.5: Demand-Supply Balance - Rodrigues



8.4.8 Energy Generation Estimates

Energy generation estimates, which are essential for budget purpose, are worked out as follows:

*Energy Used-On-Works** Assumption

Compared to around 4% of energy used-on-works in Mauritius, power plants' auxiliaries in Rodrigues consume, on average, 8% of the total energy generated annually. The relatively higher energy used-on-works is mainly due to the heating of heavy fuel using electrical means, as opposed to the steam system being used in Mauritius.

Network Loss Assumption

In 2011, network energy losses in Rodrigues were estimated to be around 12.4%. Based on observed trend, it has been estimated that the energy losses will reach around 10% by the end of the planning horizon.

Reduction of energy losses in Rodrigues will be subject to close analysis in the comprehensive study, which CEB intends to finalise in early 2013. Upon completion of the study, the losses' estimates shall be reviewed accordingly.

Gross Generation Estimates

The similar bottom-up approach, as applied for Mauritius and described in Appendix B3, has been used to estimate the gross energy generation for Rodrigues for the planning period. The gross energy generation is equal to the sum of the energy sales forecast, the network losses' estimate and the power plants auxiliaries' consumptions.

The estimated energy to be generated by the different power plants is calculated, following the analysis of load duration curves, and considering the approximately 3 GWh energy produced by the existing Wind Farms.

8.5 RODRIGUES' ELECTRICAL NETWORK EXPANSION PLAN

The Island of Rodrigues has a relatively smaller power system, with no interconnection with the mainland, Mauritius. In the following sub-sections, a snapshot of the electric network expansion plan, which will ensure safe and dependable supply in Rodrigues over the next 10 years, is presented.

8.5.1 Rodrigues' Distribution Network

The Rodrigues power system consists of a 22 kV distribution network energized by two thermal power plants and two small-sized wind farms, as shown in Figure 8.6 on the next page.

There are five 22 kV feeders, namely the Cotton Bay, Oyster Bay, Malartic, Port Mathurin and Ti Reserve feeders, which are extended in radial configuration from the two thermal power plants located at Port Mathurin and Pointe Monnier. The two Wind Farms, located at Trèfles and Grenade, are connected to the Cotton Bay 22 kV feeder.

There are presently about 155 distribution transformers, with a total installed capacity of 14.26 MVA. The total length of the 22 kV distribution network is approximately 150 km, consisting mainly of 25 mm^2 and 50 mm^2 overhead conductors. Table 8.4 below gives a break-down of the network's length by feeders.

TABLE 8.4: Distribution Network Break–Down by Feeders

Station	Feeder	Total Length (km)
Pointe Monnier	Malartic	47
	Oyster Bay	34
Port Mathurin	Cotton Bay	45
	Ti Reserve	16
	Port Mathurin	8

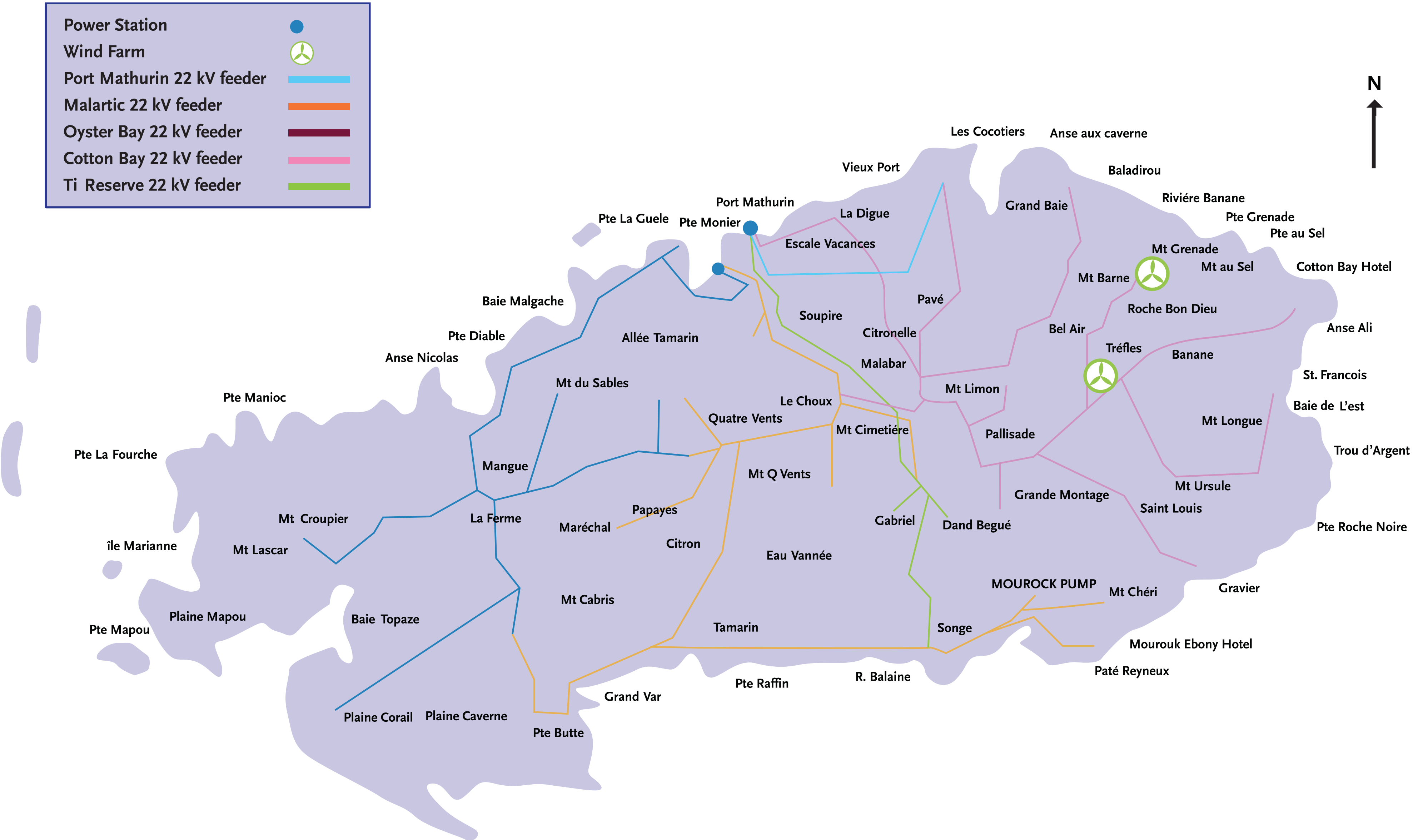
8.5.2 Network Losses

The network losses in Rodrigues were reported to be around 12.4% for the year 2011. It is mainly attributed to lightly-loaded distribution transformers (below 50%), long 22 kV distribution feeders having small cross-sectional area and long low-voltage distribution feeders (around 1 km). In order to reduce network losses, CEB will endeavour to:

- Replace under-loaded transformers by adequately sized transformers so as to achieve an efficient transformer loading condition;
- Reconfigure the low-voltage distribution feeder in order to reduce the average length to around 0.5 km;
- Upgrade the 22 kV distribution lines to 100 mm^2 bare conductors or 95 mm^2 insulated twisted cables;
- Install capacitor banks to optimise reactive power flow; and
- Construct a switching station at Petite Réserve.

* *See glossary*

FIGURE 8.6: 22 kV Network and Power Stations in Rodrigues



8.5.3 Distribution Network Expansion Plan

With the upgrading of the 22 kV feeders to minimize losses, as discussed in Section 8.5.2, the 22 kV distribution system will have sufficient spare capacity to satisfy power delivery during the period 2013-2022.

All new 22 kV distribution lines to be constructed will need to be of either 100 mm^2 bare conductors or 95 mm^2 insulated twisted cables.

8.5.4 Renewable Energy (RE) Integration

The Island of Rodrigues is endowed with wind power potential. The Grenade area was identified as a prominent site for the installation of Wind Turbine Generators (WTGs). The prime objective of installing WTGs in Rodrigues is to reduce its dependency on costly heavy fuel oil, which is transported from Mauritius to Rodrigues.

CEB has developed dynamic models of the Rodrigues' power system so as to study the impact of wind power integration on the system frequency and voltage profile. With the present level of wind power integration amounting to 1,280 kW, CEB had to curtail the power output from the Grenade Wind Farm during low system demand condition so as to maintain the system frequency deviation within the range of ±0.5 Hz.

Prospects for further RE Integration

With the commissioning of the new 2.5 MW generating unit, which is equipped with modern control systems at the Pointe Monnier Power Station, in 2012, it is anticipated that the system's response will be enhanced and that the frequency variation about the nominal value of 50 Hz will be reduced.

Once it is confirmed that the system's response has been enhanced, CEB will plan to equip the other two 1.9 MW Pointe Monnier units with similar control system.

Following these enhancement measures, CEB expects to relax the curtailment of the power output from the Grenade Wind Farm during low system demand.

In addition to the above, CEB will undertake further studies to assess the implications of integrating more RE technologies into the Rodrigues' power system. This will include, among others, exploring the possibility of higher integration of RE with/without storage batteries.

Besides adverse impact on the system frequency, the integration of wind power also leads to voltage rise and fluctuation along the distribution feeders to which the wind farms are interconnected. As per the regulatory requirement, CEB needs to maintain the voltage at the customers' terminals within ±6% of the nominal value of 230 V.

Simulation results show that the maximum wind power that can be interconnected on the 22 kV Cotton Bay feeder is 1,350 kW. Today, there is a total wind turbine capacity of 1,280 kW installed at the Trèfles and Grenade Wind Farms, which are connected to the 22 kV Cotton Bay feeder. Assuming another 275 kW wind turbine generator (similar to the Grenade Wind Farm) is added, the limit of 1,350 kW will be exceeded. As such, it will not be possible to interconnect an additional wind turbine generator to the 22 kV Cotton Bay feeder.

Considering the above constraint, any new wind turbine generator, greater than 70 kW, will have to be interconnected to another 22 kV distribution feeder. This will ensure system security in the event of sudden loss of wind power generation, which may be due to the tripping of the distribution feeder to which the wind turbine generators are interconnected.

In addition, contrary to a setup where all the wind turbine generators are connected to one single distribution feeder, the resulting generation-demand mismatch will be less when the interconnection of the WTGs are made to more than one feeder. Furthermore, in case of a potential disturbance, it will be easier for the power system to recover.

As an alternative, the extension of the Port Mathurin 22 kV feeder towards the Grenade Wind Farm site will be studied in order to accommodate new wind turbine generators. This option will be further investigated in the comprehensive study, which will be conducted early 2013.

RE technologies of smaller capacities are being implemented in Rodrigues under the SSDG Project for an initial quota of 100 kW. The project is for RE installations having capacity not exceeding 50 kW. Given that SSDGs have small capacities and are dispersed throughout the island, they have consequently less impact, in terms of power output variation, on the system frequency and voltage, as compared to wind farms.

8.6 ENVIRONMENTAL CONSIDERATION IN MANAGING RODRIGUES SYSTEM

The development of a power system is mainly triggered by economic development, which in turn may have a direct or indirect impact on the environment. Today, electric utilities cannot develop their power systems, without considering the impact on the environment. In other words, power system development cannot be made in isolation.

During the recent years, CEB has given a particular attention to the environmental aspect of its development. The concern for the environment is an integral part of its power generation and system planning. Like for the *Maurice Ile Durable* project, CEB will also participate in the making of the Rodrigues *Ile Ecologique et Durable* project. From this viewpoint, as elaborated below, CEB has already been contributing to the sustainable development of the Rodrigues' power system.

8.6.1 Current Environmental Issues in Relation to Power Generation

As mentioned above, electricity demand in Rodrigues is met through the operations of two thermal power plants, using HFO and diesel, and two Wind Farms. Given the impact of its thermal power plants on the environment, CEB has already put in place measures to monitor the emissions, noise levels and the wastes that they generate.

The Pointe Monnier Thermal Power Station, for instance, prior to its inception, acquired the mandatory EIA licence. It was obtained following the conduct of a fully-fledged Environmental Impact Assessment (EIA) that stated CEB's obligations to ensure compliance with the national environmental standards.

With regard to the Port Mathurin Thermal Power Station, which has six old and less efficient MWM engines, CEB is planning to retire them progressively so as to comply with environmental regulation, especially noise level, in the future.

CEB has also been contributing to the sustainable development of Rodrigues by facilitating and introducing Renewable Energy (RE) generation technologies in the generation mix. The Wind Farms at Grenade and Trèfles, which represent around 10% of the CEB's generation capacity today, are evidence of CEB's commitment to environmental protection, while ensuring reliable electricity supply in Rodrigues.

Furthermore, as mentioned earlier, with the support of the Government, CEB extended the SSDG project to Rodrigues in December 2010, for an allotted quota of 100 kW, in order to promote further the penetration of RE technologies.

8.6.2 Environmental Monitoring

CEB recognises that, with the expansion of its power generation activities in Rodrigues, it will need to increase its involvement in the protection of the local environment. In this respect, it has already decided to establish a proper Environmental Monitoring Plan for Rodrigues. The main areas of monitoring will include air emissions, effluent discharges and noise levels from the two existing thermal power stations.

Accordingly, the Pointe Monnier Power Station has been equipped with a hand-held flue gas analyser to measure air emissions from the stack. Moreover, the service of the University of Mauritius was retained to conduct monitoring of stack emissions at the Port Mathurin Power Station.

To ensure that the noise level is within the prescribed limits, CEB has also made a commitment to regularly carry out noise level monitoring in the surrounding areas of its power stations.

Furthermore, the analysis of the effluent generated from each thermal power plant will be conducted on an annual basis. Where necessary, the services of accredited laboratories will be solicited to conduct other regulatory analyses.

To strengthen its commitments, CEB is also contemplating the development of a Waste Management Plan (WMP) for the thermal power plant in Rodrigues. The plan will aim at fostering the CEB's environmental stewardship.

8.6.3 Achieving Sustainable Power Generation Development in Rodrigues

CEB envisions that Rodrigues' objectives for sustainable development can be partly met by maximizing RE potential. One main driver to accelerate the penetration of RE technologies in Rodrigues is a workable financial mechanism. The MID funding, for example, can bridge the incentive gaps in order to support the positive evolution of renewable technologies in Rodrigues.

8.7 DEMAND-SIDE MANAGEMENT (DSM) PROGRAMME FOR RODRIGUES

Based on the demand forecast prepared for this IEP, CEB believes that by managing effectively electricity demand in Rodrigues it can modestly reduce its operational and financial risks. With this expectation, the Demand-Side Management (DSM) Programme, which is currently being devised for Mauritius, will be extended to Rodrigues. DSM initiatives may include promoting the use of solar water heaters, efficient appliances and energy efficient lamps. The DSM strategy will not only contribute to improving the costs of operation of the CEB, but may equally result in lower electricity bills for the CEB's customers in Rodrigues.

8.8 RODRIGUES SHORT-TERM ACTION PLAN

As part of its action-plan, CEB will conduct a comprehensive study of the Rodrigues' power system early in 2013. The objectives of the study are to conduct a thorough assessment of the market and update the demand forecast accordingly, propose measures to reduce the cost of supply and the overall electricity losses, which are estimated to be as high as 12% today, evaluate implementable Demand-Side Management initiatives and determine to what extent the capacity of RE Technologies can be increased in the generation mix.