

E L E C T R I C I T Y

OVERVIEW AND CHALLENGES

Access to reliable electricity supplies is vital to improve the quality of life in Timor-Leste and to support urban and rural jobs growth and development.

During the almost two and a half decades of occupation, few attempts were made to provide reliable electricity supplies outside Dili. This neglect was compounded in 1999 when much of the basic electricity infrastructure that did exist was destroyed. As a consequence, the electricity sector in Timor-Leste today is inadequate, run down and in urgent need of reform. Only about one third of the population has access to electricity, generally for six hours per day. The central parts of Dili and Baucau have 24-hour access; however, there are still regular outages.

In the home, electricity can be used for cooking, lighting, cooling, televisions, computers, radios, telephones and refrigerators. The social benefits are enormous. For example, access to good lighting allows children to read or study until later in the day and a refrigerator allows the more hygienic storage of food.

The economic benefits resulting from electrification are also very significant. The generation of electricity and its distribution throughout Timor-Leste is necessary for the nation to make the transition from a basic level of development to a modern economy and a healthy and well educated society that is connected internally and with the world. The need for power underpins almost all development endeavours in Timor-Leste and has been identified as a national priority. The Electrification Plan is now integrated into the overall development plans for the nation to establish the long-term energy requirements Timor-Leste needs to build core infrastructure and develop vitally important industries, including the development in the southern region of a refinery, a supply base and an on-shore LNG industry.

The current system in the whole country is composed of about 58 isolated local distribution diesel powered generators that in total produce about 40 MW of electricity.

Electricidade de Timor-Leste is the national electricity agency of Timor-Leste. Funding to the sector is affected by the non-payment of power bills, with around only 40% of commercial customers in Dili paying their accounts.

Community representatives at nearly every public meeting on the draft Strategic Development Plan in 2010 raised the need for reliable, affordable and sustainable electricity.

“The women in our village want solar panels so their children can study at night.”

*Community leader, Laulara sub district,
National Consultation, 20 September 2011*

STRATEGY AND ACTIONS

Access to electricity is a basic right and the foundation for our economic future. We will take action to ensure that by 2015 everyone in Timor-Leste will have access to reliable electricity 24 hours a day. This will be achieved through investment in new power plants and upgraded transmission and distribution systems, along with the rapid expansion of renewable energy systems.

THE NATIONAL ELECTRICITY GRID

The first step towards achieving this goal is already underway. A reliable national electricity generation, transmission and distribution system is currently under construction. The National Electricity Grid is the largest ever infrastructure program in Timor-Leste. It includes:

- Hera Generating Station, generating an average speed of 7 x 17 MW for a total capacity of about 119.5 MW. The plant will include storage facilities for fuel. The station will include a substation that raises the voltage to 150 kV for the purposes of connection with the transmission system. The engines will initially run on light or heavy fuel oil and will be capable of being converted to natural gas. Three of the seven generators will be operating by November 2011. The remaining four units will become operational in early 2012.
- Betano Generating Station, generating an average speed of 8 x 17 MW for a total capacity of about 136.6 MW. The plant will include storage facilities for fuel. The station will include a substation that raises the voltage to 150 kV for the purposes of connection with the transmission system. The engines will initially run on light or heavy fuel oil and will be capable of being converted to natural gas. The plant will be operational in late 2012.
- A 150 kV transmission line of approximately 715 km forming a ring around Timor-Leste. The northern part of the power grid will be completed by November 2011 and the full grid will be completed in the middle of 2012.
- Nine substations to reduce the voltage in district capitals of Timor-Leste. These substations will allow connection to the existing lines of 20 kV distribution.

- A control centre located at the substation of Dili.

These projects are under construction and are creating many direct and indirect jobs, business opportunities and economic growth.

The National Electricity Grid will provide a reliable energy supply to support the development of the south coast and further major infrastructure projects. It will also provide the flexibility to convert to the more environmentally friendly fuel source of natural gas once a domestic supply becomes available. The new power stations will have more than adequate capacity to meet all existing customer demand in Timor-Leste, plus future growth, for many years. The establishment of nine new substations will allow distribution feeders from the sub-stations to reach every corner of the country other than Oe-Cusse Ambeno and Atauro Island. Power generation at Oe-Cusse Ambeno will be subject to a standalone project. Atauro Island will be a priority for renewable energy projects.

Once the new power generation system is operational, the existing district power stations will be shut down.

The expansion of the Comoro Power Plant, now being implemented, will be able to provide a stand-by power reserve for Dili.

The National Electricity Grid project is currently being managed by Electricidade de Timor-Leste. To improve governance arrangements and ensure high level technical skills are available to the people of Timor-Leste, a new management model for Timor-Leste's electricity sector will be introduced by 2012 following consultation with the sector and based on international best practice.



NATURAL GAS

Timor-Leste has access to vast reserves of gas in the Timor Sea. The availability of natural gas for electricity generation has the potential to provide much cheaper and cleaner fuel than liquid fuels. In environmental terms, for the same amount of electricity produced, the carbon emissions from natural gas-generated electricity are considerably lower than from diesel-generated electricity.

A feasibility study will be carried out to assess the long-term prospects of attracting gas processing facilities to Timor-Leste.

RENEWABLE ENERGIES AND THE RURAL ELECTRIFICATION PROGRAM

Parallel to the construction of the National Electricity Grid, a rural electrification program will be implemented with the goal of reducing and improving the living conditions of more remote populations. This program will involve linking sites that already have diesel generators and small local networks to the nationwide network and providing renewable energy supplies to more remote areas unable to access the grid.

Renewable energy supplies have the potential to make a dramatic contribution to economic growth and help to reduce poverty levels in remote rural areas. These supplies will also contribute to Timor-Leste's climate change adaptation and climate change mitigation efforts and help us meet our obligations under international climate change conventions.

By 2020, at least half of Timor-Leste energy needs will be met from renewable energy sources.

The development of renewable energies in Timor-Leste will help drive economic growth and allow Timor-Leste to embrace new technologies that will make us a model of sustainable development.

Population growth and the needs of an expanding economy are likely to increase electricity consumption in Timor-Leste from around 160 GWh currently to 800 GWh by 2020. At least half of these energy needs will be provided by renewable energy sources. Analysis undertaken for the Strategic Development Plan has identified more than 450 MW of potential renewable energy projects spread across the following technologies:

- Hydro (wire-to-water and regulation): 252 MW
- Hydro pumping: 100 MW
- Wind: 72 MW
- Solar: 22 MW
- Biomass / Solid waste: 6 MW.

There is a range of relatively low cost and easy to install solar and wind projects that could be providing 10% of Timor-Leste energy needs by 2012. To drive, coordinate and monitor the implementation of these projects, an Office of Renewable Resources will be established. The office will have responsibility for licensing and monitoring projects, reviewing the legal framework for renewable energy projects and supporting the development of an energy efficiency plan.

The sale of carbon credits will assist the viability of renewable energy projects. The National Development Agency (see Part 5) will be responsible for ensuring the allocation of carbon credits necessary for projects to develop.

Atauro Island and Oe-Cusse Ambeno will be priority areas for renewable energy projects as, for obvious geographic reasons, they will not be able to access the national distribution network.

As noted above, the rural electrification program will target communities in isolated areas that will not be connecting to the national grid in the medium term. About 8,000 families in remote areas already have their supply of energy guaranteed through the use of renewable energy resources; however, there are still around 50,000 families who are not covered by the distribution network and who do not have renewable energy systems.

The rural electrification program will provide financial and technical support to communities to install renewable energy sources on the basis that the project will serve the whole community. In the short-term, the program will encourage rural communities to generate their own electricity production using the most appropriate renewable energy source. In the medium term, communities will be encouraged to sell any excess electricity production to the national electricity network.

Hydroelectric power

Hydroelectric power is generated by using water flows to spin turbines. It is a renewable, non-polluting form of power generation.

There is potential for mini-hydro projects in Timor-Leste that do not require rivers to be dammed. Instead, these projects divert water from a river to an elevation above the power station and use the falling water to turn a turbine that drives a generator. The water then returns to the river.

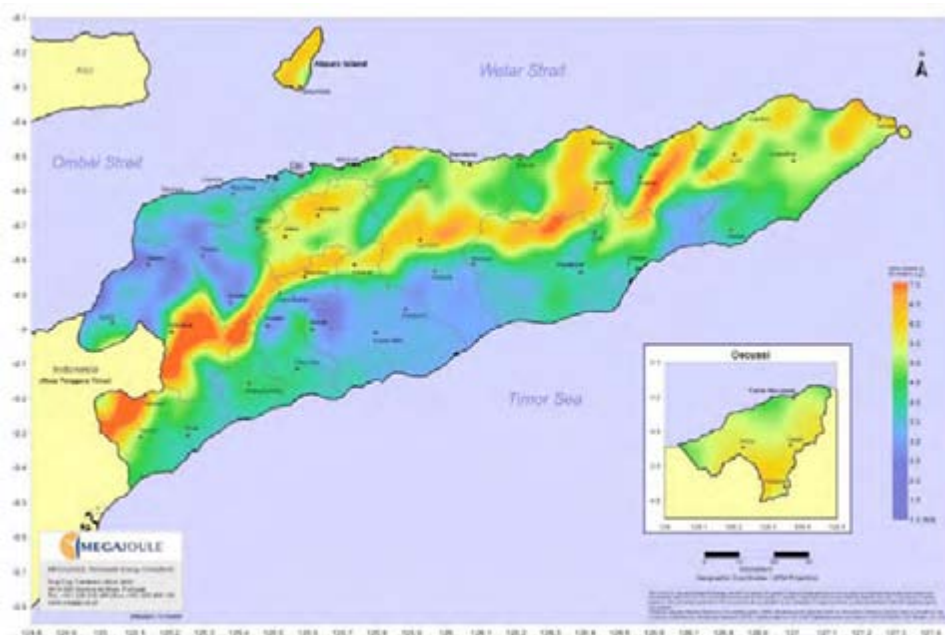
While the majority of mini-hydro projects only have access to enough water to provide power during the wet season, they are still economically worthwhile as the savings on the import of fuel will help meet the costs incurred to develop the projects. Construction activity will generate jobs and there are also potential crossover benefits for agriculture.

An analysis of potential hydroelectric sites in Timor-Leste conducted for the Strategic Development Plan identified nearly forty sites that could generate between 1.2 MW and 50 MW. Based on the results of this detailed research and analysis, feasibility studies will be conducted on potential mini-hydro sites throughout Timor-Leste.

Wind power

While lack of wind usually makes wind power unviable in tropical areas, a preliminary survey of potential sites in Timor-Leste has identified a number of areas suitable for wind turbines. The results of an analysis of wind speeds averaged across Timor-Leste are set out in figure 12.

Figure 12 Atlas of annual average wind speed



Source: Electrification Plan of Timor-Leste based on Renewable Energy, 2010

Preliminary analysis has shown that the mountainous areas east of Maliana, and southwest and east of Venilale and Quelicai, stand out as potential areas for wind powered electricity generation. Further testing at five weather stations over a 12 month period and the results of technical computer analysis have revealed Bobonaro and Lariguto as having conditions best suited to wind power. This analysis also took into account factors such as:

- The potential to be integrated into the electricity grid
- The existence of roads and ports to transport large wind turbines
- The capacity to manage the variability and unpredictability of the resource.

Other potential 'windy' areas that will be subject to further analysis are Fatumean (Cova Lima) Aituto (Ainaro) and Lebos (Bobonaro).

The Lariguto wind farm will be constructed and connected within two years to act a model wind farm development.

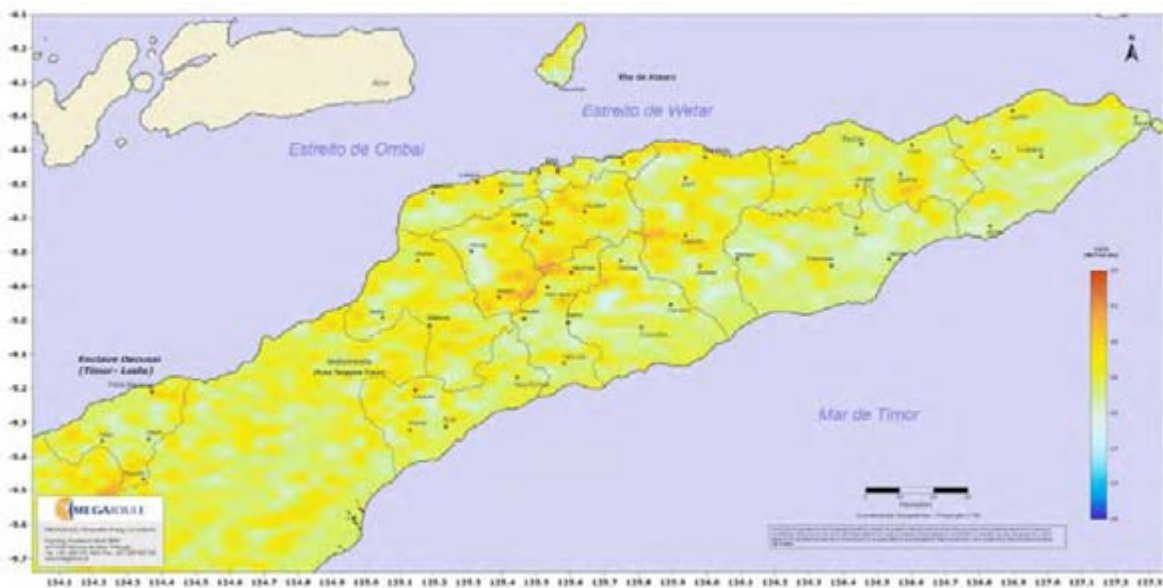
Solar power

Solar power uses heat from the sun to generate electricity using a variety of different technologies. Standalone and single household solar installations will be used to provide electricity in the very remote areas of Timor-Leste with difficult terrain where it will not be possible to access the electricity distribution system.



The figure below shows the results of a survey of rates of daily sunlight across Timor-Leste. The results suggest that the entire territory of Timor-Leste has the potential to successfully generate solar power.

Figure 13 Map of daily sunlight rates across Timor-Leste



Source: Electrification Plan of Timor-Leste based on Renewable Energy, 2010

The rates of actual daily global sunlight in terms of annual average range between 14.85 and 22.33 MJ/m² per day. These rates indicate that the entire territory of Timor-Leste has the potential to successfully generate solar power.

The results of this mapping exercise will be used to identify locations in remote areas that have optimum conditions for the development and construction of solar photovoltaic plants. Factors that will be taken into account include the local terrain, orientation, proximity to the transmission line, accessibility and the density of vegetation. As these solar energy systems are relatively simple to install, members of local communities will be trained to install and maintain them.

A program for solar lighting will be supported, which will provide approximately 100,000 families with access to electric light by 2020.

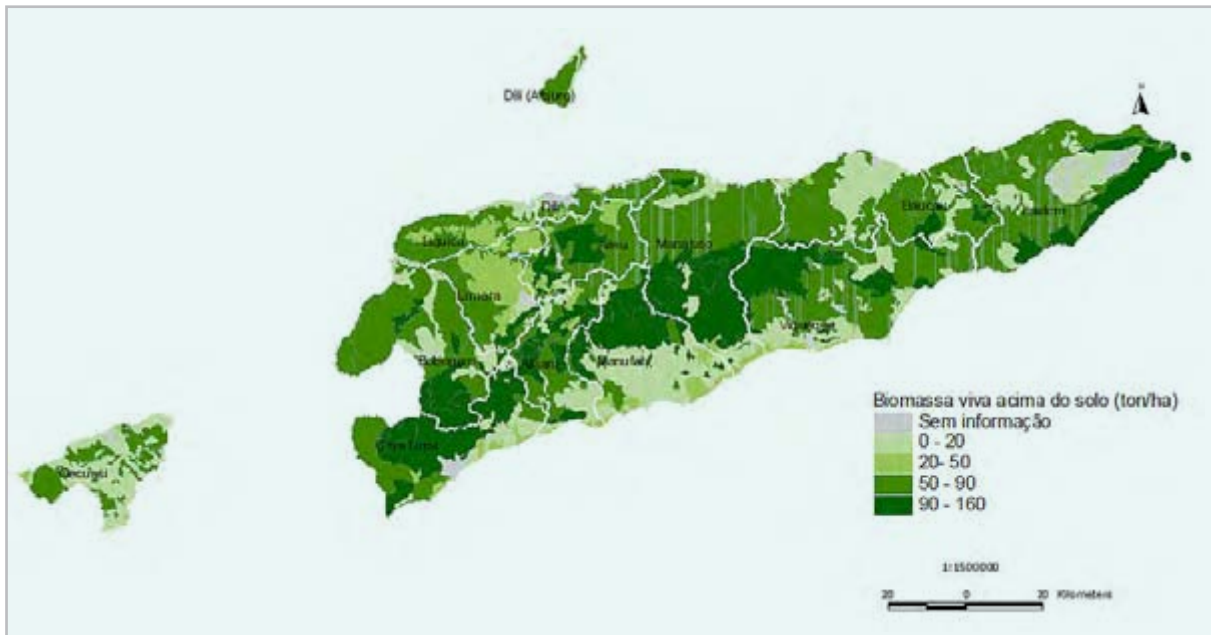
To demonstrate the potential of solar energy, a Solar Centre will be established in Dili by 2015.

Biomass energy

Biomass energy is produced by or from plant or animal waste material. For example, wood becomes a source of biomass energy when it is processed to make wood pellets as fuel for cooking. Farm waste, such as cow manure, can be processed into biomass to form biogas, which can then be bottled and used for cooking or other activities. Crops such as corn and sugarcane can produce ethanol, which can be used to fuel vehicles. Household and industrial rubbish can be processed in specially designed factories to produce electricity.

An analysis conducted for the Strategic Development Plan of the amount of biomass above ground in Timor-Leste found the highest concentration of plant biomass is associated with tropical forests in upland areas and also areas with middle and lower density forest. This analysis also evaluated the type of soil and the local geography. The results are set out in the figure below.

Figure 14 Map of biomass potential



Source: Electrification Plan of Timor-Leste based on Renewable Energy, 2010

The districts of Manatuto, Viqueque and Lautem were identified as having the most potential for the installation of new developments in biomass conversion electricity. Feasibility studies will be conducted on potential projects in these regions.

A feasibility study will also be conducted on the viability of building a thermoelectric power plant to generate electricity from Dili's household and industrial rubbish.

TARGETS

By 2015:

- Everyone in Timor-Leste will have access to reliable electricity 24 hours a day
- Two new power stations will have been constructed in Hera and Betano providing 250 MW of electricity to support social and economic development across Timor-Leste
- A new management model for Timor-Leste's electricity sector will be in place based on international best practice
- The Lariguto wind farm will be constructed as a model wind farm development
- A Solar Centre will be established in Dili to demonstrate the potential of solar energy
- Feasibility studies will have been conducted on the long-term prospects of attracting gas processing facilities to Timor-Leste; on potential mini-hydro sites throughout Timor-Leste; and on the viability of building a thermoelectric power plant to generate electricity from Dili's household and industrial rubbish

By 2020:

- At least half of Timor-Leste's energy needs will be provided by renewable energy sources
- Approximately 100,000 families will have access to solar powered electric light

By 2030:

- All households in Timor-Leste will have access to electricity either by the conventional expansion of the electricity system or through the use of renewable energy

