CHAPTER 7

7.0 ENERGY GENERATION

7.1 Energy Demand

The proposed project will be both a tourism and residential sector based operation that will require electrical energy to power all the proposed equipments and ancillaries. Both sectors will target mainly tourism visitors as well as retired full time and part time residential inhabitants. This tourism operation is comprised of different type hotel rooms and villa units. Other facilities will include the amenities around the development. On the whole, these facilities at full operation will require an overall constant, adequate and reliable source of energy.

The energy requirements for the proposed project are expected to be mainly for domestic and commercial purposes as described in the following:

- Domestic: Unit illumination, home appliances (refrigeration, cooking and heating), administrative uses,
- Commercial: Project's ancillaries (restaurants, bar, ect), and project illumination (security purposes).

It is difficult to calculate the required energy demand for the proposed projected from an Environmental Impact Assessment's point of view for the simple notion that there are many energy requirement variables. Nevertheless, the projected energy demand for the project can be calculated from a holistic approach encompassing both the daily and yearly kilowatt hour requirements. The energy requirements are described in table 7.1. The daily energy demand at full occupancy and operation will be about *6,097 kilowatt hours.*

Table 7.1 Project Energy Demand

Type	Facility	Quantity	Unit Equivalent	Yearly Energy Use x (10,000kwh)	Daily Demand (kwh)
1	Typical Hotel Unit	74	1.0	740,000	2,056
2	Type B Hotel Unit	32	1.0	320,000	889
3	Villa Type A	19	1.5	285,000	792
4	Villa Type B	19	1.5	285,000	792
5	Villa Type C-1	6	1.5	90,000	250
6	Villa Type C-2	9	1.5	135,000	375
7	Special Lot	6	1.5	90,000	250
8	Over Water Cabanas	14	1.5	210,000	583
9	Special Estate	1	1.5	15,000	42
10	Management	1	1.0	10,000	28
11	Others	1	1.5	15,000	42
Projected Occupancy		**90**	**1.4**	**2,195,000**	**6,097**

* Other facilities include the piers, security equipments, road side and walkways illuminations ect.

Typical hotel and villa designs were used to calculate the energy requirements for the project. As well, it is assume that the energy use includes lighting and the use of common domestic appliances. The proposed project will also require energy for its construction phase. It is anticipated that for the construction phase, minimal energy will be utilized. It is estimated that there will be a demand of about 200 kwh - 400 kwh during construction of the project. All of the energy demand will be gotten from a portable gas or diesel powered generator.

7.2 Energy Sources

Energy sources are an important component in determining the viability of the project. This important factor will be instrumental in maintaining the operation of the proposed project with the least environmental impact and at a reasonable cost. With this in mind, the following section summarizes the various sources of energy that will be used.

7.2.1 Primary Source

The project site is located about a mile east from the Placencia Peninsula and therefore equidistant from the nearest transmission line. The Stann Creek District is already connected to the Belize Electricity Limited National grid. The BEL transmission line extends from the Riversdale Community all the way to Placencia Village on the Placencia Peninsula. BEL is the sole provider of electricity throughout the country. Although there are private companies producing electricity other than BEL, all electricity is sold to BEL for re-distribution to consumers. This pre-existing situation, along with the existence of limited potentials for on-site generation (i.e., high construction and generation costs), leads to the conclusion that the developer has little choice but to resort to BEL as the main provider of electricity.

7.2.2 Secondary Source

Solar panels, wind energy and diesel generators are recommended as secondary sources of electricity but their use is limited to the residential portion of the project. These different options may be used along with BEL energy source. The various options for energy generation are compared in table 7.2. These options, however, are secondary sources of electricity which are designed to reduce the overall dependence on BEL.

Table 7.2 Selection of Secondary Sources for False Caye

Criteria	Solar Power	Wind Energy	Generator
Installation Cost	High	High	Low to Medium
Operation Cost	Low	Low	High
Reliability	Dependent on available radiant energy	Dependent of wind speed	Very Reliable
Environmental Impact	Low	Low	High
Capacity	Requires battery storage for nighttime use	Requires large windmill to electrify a house	Able to work continuously

From an environmental standpoint the use of solar or wind power is preferred as it results in very low environmental pollution. Both of these sources have zero emission. However both these options cost significantly higher than a diesel generator to install and operate. Solar power is only able to operate during the day when radiant energy is available even though the electricity generated may be stored in battery cells for use at a later time. This increases the cost of this option. Wind energy is dependent on the duration of the wind as well as the wind speed. Wind energy also requires more space as the installed wind vanes occupy a large amount of space. Wind vanes usually measure a minimum of 75 feet in diameter.

The recommended source of back up electrical energy will be the use of generators, as power failure is common throughout Belize and there is a need for a continuous supply of energy over an extended period of time. The site has a good potential for both solar power and wind energy, however as noted previously, the installation cost and capacity for these to work are too high. Nevertheless, the project proponent may choose alternative energy where appropriate.

7.3 Energy Transmission Lines and Routes

As mentioned previously, the BEL transmission lines cover the Placencia Peninsula as can be seen in the Plates 1 and 2 below. With this in mind the project will acquire energy from BEL. The development will purchase electricity directly from BEL. They will then be responsible for providing electricity to all sectors of the development. Energy will be conducted to the project site via power transmission lines that will be laid underwater. Final route for the power transmission lines will need to be approved by BEL. However, the route with least impact will be followed by the proponent of the project. On the project site, much of the power lines will be laid underground. This will increase the aesthetic appeal of the community as well as reduce the risk of fallen power lines in the event of a storm. However, underground cable systems are more expensive, and have a higher maintenance cost.

Plate 7.1 Placencia Power line with transformer

Plate 7.2 Power line across the Placencia Road

The installation of the required electricity poles, power lines, down guys, transformers, etc., that are required on the Peninsula will be done either by BEL personnel who are trained in the field, or under the supervision of BEL personnel, which are standard operating procedure when this type of work is contracted out. It is also standard procedure that BEL does not approve any work which does not meet their standards, and the wiring of any site needs inspection prior to approval and connection to power supply. See figure 7.1 for the power transmission routes.

7.4 Energy Management

Just like water conservation measures, energy management will incorporate the use of conservation measures designed to reduce the energy consumption of the project. This is an important factor considering that the project will run energy from the national grid and supplemented by generators. It is therefore in the best interest of the project to institute such measures and conserve energy where applicable.

Examples include the usage of florescent bulbs, turning off lights and appliances when not in use and lowering the AC unit among others. All these 'energy conservation tips' can reduce the amount of energy consumed and save money.

7.5 Fuel Requirements

It is anticipated that the proposed project will require a minimum volume of fuel. Fuel will be primarily be used for cooking uses, generating electricity and other miscellaneous purposes. The demand will be according to the different infrastructures that require the fuel. The following sections summarize the different fuel requirements.

7.5.1 Cooking Fuel

Fuel such as butane and propane used for cooking and refrigeration if necessary will be stored using the recommended guidelines. Each facility such as hotels, restaurants and bars will store these fuels at an adequate location with the proper containment measures.

The transportation of butane and propane will be the responsibility of the supplier, who will follow the recommended guidelines for the transportation of Hazardous Materials. The supplier will also be responsible for the refilling and/or replacement of any faulty or corroded container.

7.5.2 Fuel Storage

It is anticipated that the project proponent will install diesel generators to power the site in the event of a power failure. Fuel for the generators will be stored according to the required DOE and National Fire Service storage guidelines. Fuel for the generators will be stored in a 2,500 gallon Above Storage Tank (see figure 7.2) that will be enclosed in a containment wall capable of storing 110% of the volume stored. In addition, fire extinguishers and signs will be installed for health and safety reasons.

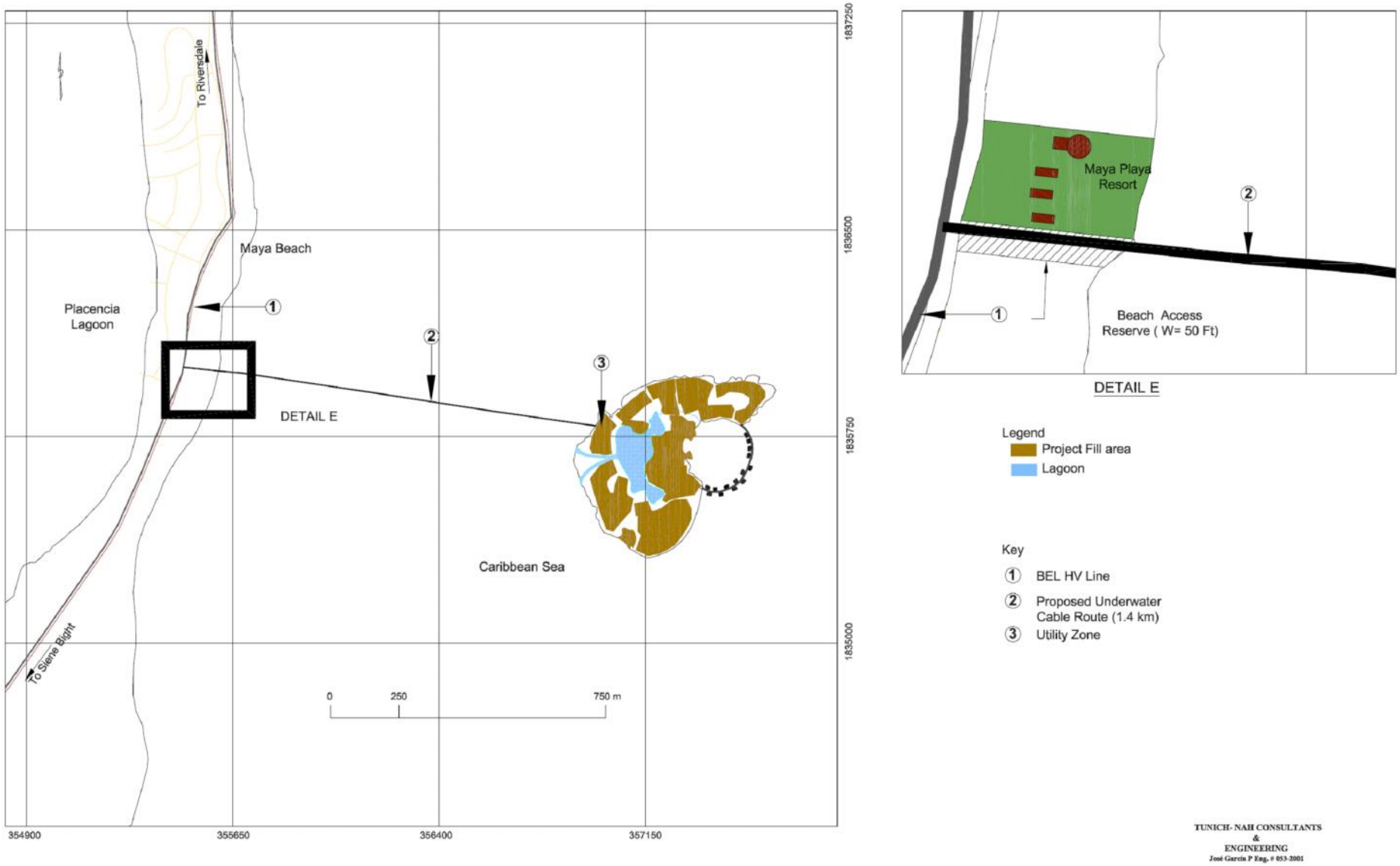

Fig. 7.1 Proposed BEL HV Line Underwater Route

Fuel for miscellaneous use will be stored in properly sealed containers or drums. It is anticipated that gasoline fuel will be primarily used for miscellaneous purposes such as cleaning machine parts ect.

7.5.3 Fuel Management

The fuel will be transported by a fuelling barge to the site. It will be pumped into the barge at the fuel depot and taken to the project site where it will be discharged into the tank. Proper flexible pumping equipment will be used to facilitate the process. The handling of the fuel will follow the standard MARPOL protocol for the transportation, loading and unloading of fuel at sea.

The fuel supply will be managed by False Caye with the assistance of a designated Fuel Supplier. The installation of the AST tanks will follow the environmental clearance process, which requires the application of operation, and follow up inspections by relevant authorities, including DOE and the National Fire Service (NFS). The transportation of fuel will be the responsibility of the supplier and False Caye, who will follow recommended guidelines for the transportation of Hazardous Materials.

The accidental spill of fuel will be avoided as much as possible. An Oil Spill and Fire Contingency Plan will be developed to address all issues pertaining to spills, leaks and fires both on the island and at sea. The plan will contain mitigation measures (booms, kits), clean up processes as well as the required training for safety and health. Additional information is explained further in this document.

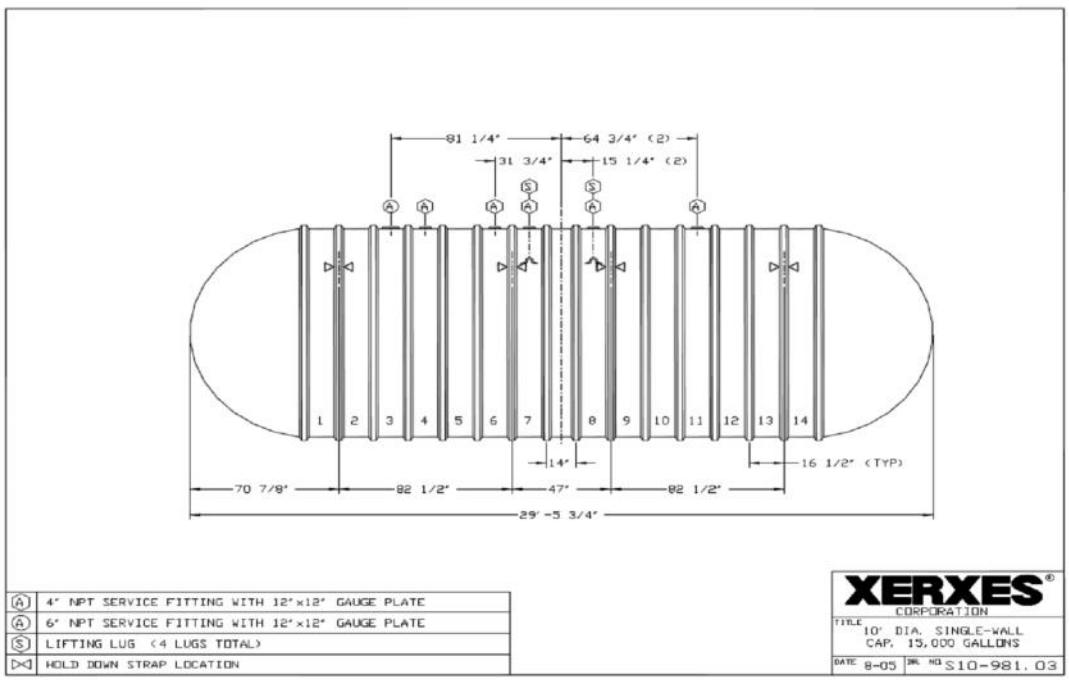

Fig. 7.2 Above Storage Tank for Diesel Fuel