CHAPTER 9

ENERGY GENERATION

9.1 Energy Demand

The proposed project sites will consist of two phases as previously described and basically involves the developmental drilling and production phases. Both phases will target the company's goals and objectives. Once in operation, the sites will require an overall constant supply of energy to power the equipment and its auxiliaries. The daily energy demand during the developmental drilling phase will be higher than the operational demand. The energy requirements for the San Marcos and Spanish Lookout well sites are expected to be mainly for semi-industrial purposes.

9.2 Energy Supply Source

The energy source is an important factor when considering the type of activity. BNE will exercise caution in selecting its acquired source for each stage. This includes incorporating the appropriate safety measures and the implementation of strict operational codes. The following sections summarize the energy demands for the different phases and are similar to the activities carried out by the different operating Mike Usher wells.

9.2.1 Drilling Phase

The Spanish Lookout Area is serviced by the Mennonite community and the national grid provider, BEL. Energy from this sector is readily available for both domestic and industrial uses. The San Marcos sites however, are located in a remote area and therefore not easily accessible. Accessing the national grid would not be feasible enough because of BNE's future energy plans. Moreover, tapping into the grid would be a costly venture and would require the installation of transformers, transmission lines, transmission posts and electrical meters.

With this in mind, power supply for the drilling phase will be provided by diesel generators. A mobile diesel generator will provide energy to the sites in the form of a 100 kVA three phase engine. This would be beneficial in the San Marcos wells where the national grid is absent. The diesel generator will be working throughout the drilling phase. Energy required for the drilling process will be supplied by the drilling rig diesel engine. This engine is self sustainable and powers both the drilling equipment and truck.

The decision to provide energy via diesel engine is primarily due to the short drilling phase and utilization of acquired resources (by product). In conclusion, BNE will utilize a diesel generator to produce and meet its electrical demand. Once on site and in operation,

BNE will ensure that the engine is enclosed a containment wall as prescribed by the Contingency Plan (Chapter 13).

9.2.2 Production Phase

Once the exploitation process has begun and in sufficient marketable quantities, BNE will require a steady and constant source of energy. In taking advantage of the gas produced by the exploitation process, BNE will pipe crude from the various wells to the Iguana Creek Facility. Once at the facility, the oil, gas and water mixture will be separated where the gas will be utilized as fuel in the turbine generating system. The Iguana Creek facility will utilize an 800-kW Solar Saturn Gas-fired Turbine Generating System to produce energy that will be used to power all the proposed and existing wells.

9.3 Alternative Energy Sources

Alternate energy can be derived from a myriad of sources including thermal, solar, wind, tidal and nuclear energy. Solar panels and wind energy are recommended as secondary sources of electricity but their use is limited to night time lighting. These two options may be used along with the generator energy source. The sites have a good potential for solar and to wind power but these should be chosen as optional. The various options for energy generation are compared in table 9.1 These options however are secondary sources of electricity which are designed to reduce the overall dependence on the primary sources.

Table 9.1 Comparison of Alternate energy for both phases.

Criteria	Solar Power	Wind Power	Generators
Installation Cost	High	High	Low
Operation Cost	Low	Low	Medium
Reliability	Dependent on available radiant energy	Dependent on wind speed	Very reliable
Environmental Pollution	Low	Low	Medium
Capacity	Requires battery storage for night time use	Requires large windmill to electrify one house	Able to work continuously
Notes	Not beneficial, too costly for developmental use.	Not beneficial, too costly for developmental use,	Adequate and can be transported from site to site. Reusable.

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. From an environmental standpoint it would be far better and safer to make use of the gases being produced as a result of oil production rather than flaring it.

9.4 Power Transmission Lines

As previously described, BNE will require a steady source of electricity. This will be facilitated by the eventual installation of a kVA transmission line from the Iguana Creek Facility to the different wells located in the BNE field. This kVA line will be accommodated inside the pipeline trench. A minimum of 12 in of backfill will be placed over the pipeline before laying a 1/0 3/C+G 25 KV 100% shielded (UL) Marine Shipboard Cable in the same trench. The trench will be backfilled to within 2 ft from surface and marking tapes for both the pipeline and power cable laid in the trench. The trench will then be backfilled to surface and the surface re-instated to original condition. The pipeline/power cable route will be marked using Triview markers with warnings in Spanish and English to provide line of sight coverage with markings at every fence and road crossing.

This facilitation is more appealing and increases the aesthetic appeal of the project sites. Moreover, it reduces the risk of fallen power lines during storms and strong winds. More information of the energy generation can be viewed on the Iguana Creek Pipeline EIA.

9.5 Fuel Management for the Energy Generation

The project sites will also require fuel for its operational purposes. The fuel sources (diesel, gasoline) are readily available from the commercial sector. The demand will be according to the different equipment most importantly the diesel generators.

9.5.1 Cooking Fuel (if applicable)

Fuel such as butane and propane used for cooking by workers (riggers) during the drilling stage will be stored using the recommended guidelines. Each site will store these fuels with the proper containment measures. The transportation of butane and propane will be the responsibility of the BNE, who will follow the recommended guidelines for the transportation of Hazardous Materials. BNE will also be responsible for the refilling and/or replacement of any faulty or corroded propane container.

9.5.2 Fuel Storage and Transportation

Fuel for the drilling operation stored in a 2000 gallon tank with bonded secondary containment. If additional fuel is required it will be gotten from the local supplier who will be responsible for the transportation. It is anticipated that no fuel other than the specified fuel will be kept on site for the duration of the drilling operation. In addition, no fuel will be stored on site once the production phase commences.

The fuel demand for the generator and drilling rig engine can range from 3 gallons/hr to 7 gallons/hr. BNE will make every effort to mitigate any localized spills that can occur as a result of fuel dispensing. This would include the use of drip pans and absorbent materials.

The tanker truck will be ensured to follow the environmental clearance process, which requires only notification, and follow up inspections by relevant authorities, including DOE and the National Fire Service (NFS). The transportation of fuel to the drill sites will be the responsibility of local supplier, who will follow recommended guidelines for the transportation of Flammable Materials. The accidental spill of fuel will be avoided as much as possible. A Spill Prevention Control and Countermeasure Plan (SPCC) has been developed to address all issues pertaining to spill and leaks at the respective sites. See the SPCC plan for further details.

9.6 Impacts and Mitigative Measures

The installation of the temporary diesel generator and drilling rig engine has the potential to create negative environmental impacts in the following areas:

- Orientation to the site will focus on the environmental contributions that these have on the project sites. BNE should place the exhausts/mufflers in less visible locations provided there is enough wind.

- Negative impacts can result from the sitting and placement of the diesel generator. These may include diesel and waste oil spills and leaks. BNE will ensure that measures in place to prevent this and if there is any spills will be mopped up and disposed according to the environmental guidelines. All waste oil or contaminated fuel will be removed from the site and taken to Ladyville for remediation.

- Negative impacts will result from the operation of the generators. Noise displacement will be minimized by installing adequate mufflers and maintaining these at all times. Modern generators have a portable house that encloses the engines thereby further reducing the noise produced by the generators.

- Waste batteries, if any, will be removed from the well sites and properly discarded.

Table 9.2 Matrix of potential impacts to the environment within the project area as a result of power generation, plus proposed mitigative measures and residual impact ratings

Category of Project Activity	**Preferred Options for Carrying out Project Activity**	**Direct and Indirect biological and physical Impacts**	**Recommended Mitigative Measures**	**Residual Impacts Mag/ Dir/ Dur/ Slope**
A. Drilling Phase:	1.0 Diesel Generators	Excessive noise pollution	Use silencers on muffler, route muffler pipes underground or use generator housings	low/ dec/ short/ local
		Pollution risk due to accidental spill from fuel and oil storage tanks	Place fuel tanker in an enclosed bond wall with 110% capacity of fuel tank	
			Transport fuel in sealed containers only	
		Air pollution and combustion fumes	Keep engines properly serviced used recommended fuels and additives only	
	2.0 Alternative Sources	Not viable at this point	Not viable at this point	

9.7 Power and Generation Facility

The gas stream from the coalescer will be fed to an 800kW Solar Saturn Enclosed (1800 rpm, 480V, 60Hz) Continuous Duty Propane Gas Turbine Generator Set with PLC controls to allow the gas turbine to be fuelled by the circa 2000 btu/cuft associated gas. The generated power will be used at the Iguana Creek Processing Facility and distributed to the individual well sites to power the Pumping Units and auxiliary lighting etc.

9.7.1 Power Distribution System

The electricity generated for distribution will be transformed from 480V up to 22kV for distribution.The distribution system will be by 1/0 3/C+G 25% 100% Shielded Marine Cable (Figure 9.1) which will be buried some 12 inches above the oil pipeline in the same trench at a burial depth of no less than 42 inches from surface.

Both the Polypipe oil line and the power transmission cable will be marked with Detectable Underground Utility Marking Tapes. In addition, line marker flags will be placed at every road, drive and fence crossing with “Danger Petroleum Pipeline – Call BNE 823 0354” and “Danger Electricity Transmission Line – Call BNE 823 0354”

At each of the well sites the power transmission line will terminate in a distribution enclosure where the power transmission cable will be taken off to each individual well site. At each well site the power transmission cable will terminate at a 22kV to 480V step

down transformer to power the Pumping Unit prime mover and auxiliary services and lighting.

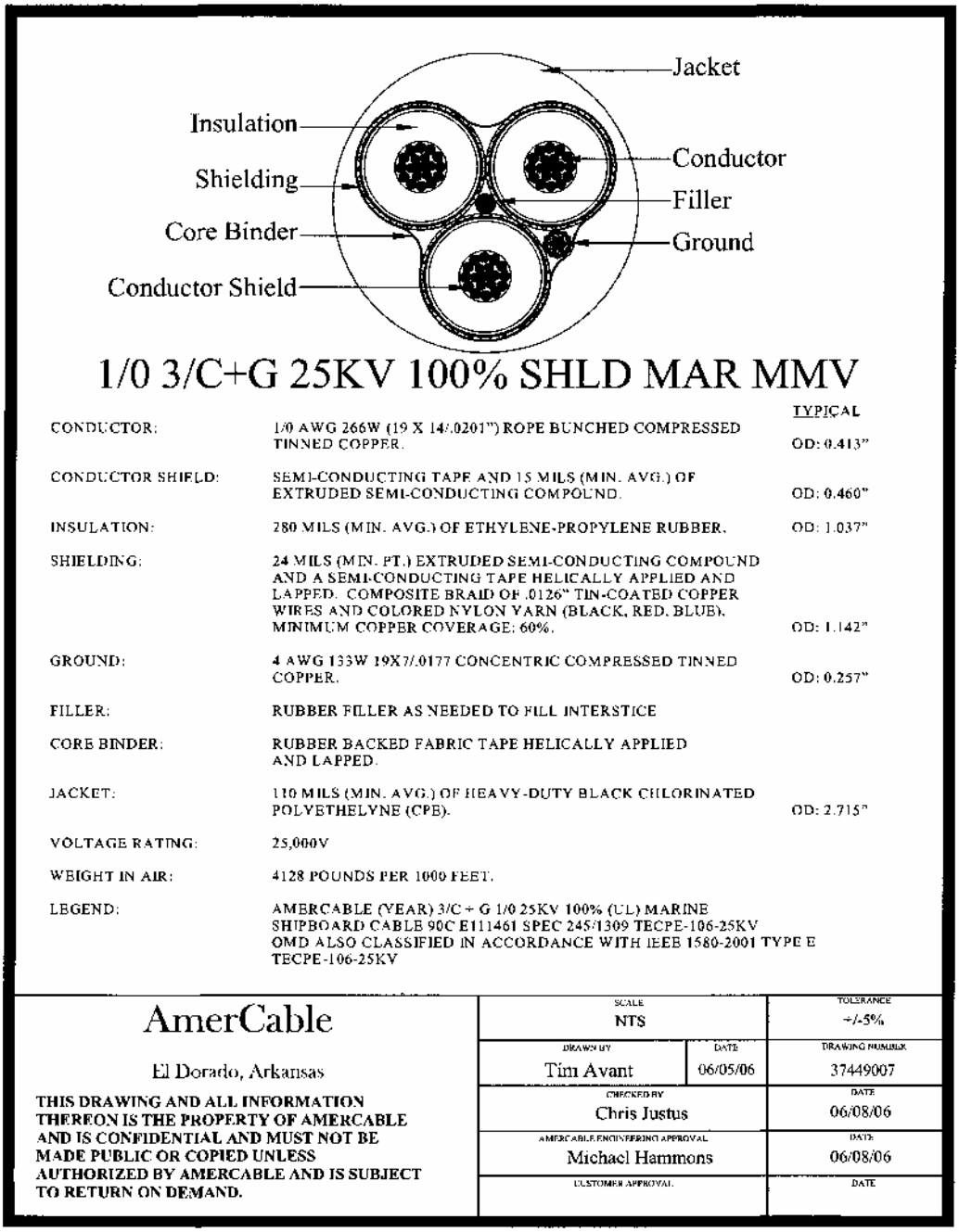

Fig. 9.1 Power Transmission Cable