**Reasons of implementing the project**

Erdenet Thermal Power Plant supplies the factories, offices, apartment buildings in Erdenet with heating except the consumers of the Thermal Power Plant, Erdenet Mining Company and delivers its produced electricity to Erdenet-Kharkhorin Thermal Power Plant.

ETPP was first planned to produce 302.5 Gkal heating energy and 28,8 MW hour electricity and as well as its technical and economical specification.

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| --- | --- | --- | --- | --- |
| # | Main Specifications of the Plant  | Unit | T&ES | Difference |
| As Project  | In 2011 |
| 1 | Electricity produced per year | Mil/kW  | 162.3 | 134.59 | -27.71 |
| 2 | Electricity distributed per year | Mil/kW | 127.4 | 106.0 | -21.4 |
| 3 | Domestic supply of electricity | % | 21.5 | 21.24 | +0.26 |
| 4 | Heating energy distribution /total/ | Th/Gkal | 966.8 | 521.67 | -445.13 |
|  | Heating energy distribution | Vapor | Th/Gkal | 259.5 | 30.709 | -228.79 |
| Water | Th/Gkal | 707.3 | 490.96 | -216.34 |
| 5 | Fuel own consumption | For electricity | g/kWh | 225 | 315.59 | +90.59 |
| For heating | kg/Gkal | 178 | 184.79 | +6.79 |
| 6 | Working hours of electrical capacity per year as project  | Hour  | 4508 | 3739.0 | -769.0 |
| 7 | Working hours of boilers’ installed capacity per year  | % | 6-8 | 9.4% |  |

Basic equipment

* Boiler BKZ-75-39FB 7 pcs
* Turbine PT-12-35/10m 1 pc
* Turbine P-12-35/5 2 pcs

Heating Equipment:

* Fundamental Boiler PSB-500-3-23 2 pcs
* Additional Boiler PSB-500-14-23 2 pcs
* Boiler Condensing Freezer PSB-315-14-23 2 pcs
* Network Pump SE-1250-140-11-04 4 pcs
* Network Pump SE-500-70 1 pc

**RATIONALES OF THE PROJECT**

* Not operating at full installed capacity (producing 162.3 mil/kW/134.6 mil/kW which is 82% of full capacity; distributing heating energy – 955.25th/Gkal/521.7th/Gkal which is 54.6% of full capacity)
* The TG-1turbine’s working hour has been in excess of 150000 hours of guarantee given by the factory /worked 188234 hours totally/
* Production costs of electricity and heating energy are high
* No consumption of backpressure Turbine P vapor with 6 ata /5-7ata/, 126-150ton vapor at 280-300oC. *Felt, felt boots factory, Wood processing factory, Poultry husbandry, 7a, 7b, 8, 9, and 10th Apartment Building Blocks, Carpet factory, and Food factory, estimated to be the greatest vapor consumers, were not built and there is no consumption of 220 ton vapor with 6 ata P at 280oC in summer. As a result, it is impossible to work turbine 2P in non-heating seasons.*
* The project was approved by the Science and Technical Commission at the Energy Branch on Aug 22, 2002. There are many papers approving the project.
* The project’s technical and economical specifications were made by the group of scientists at University of Science and Technology and Siberian Science Academy, Russia. /2005/
* It is necessary to increase its capacity since installed capacity of energy system is 630MW, the consumption has reached to 802MW, and it has been rising constantly.

 Resolving

* Extending with 30 MW Turbine PT or K
* Replacing Turbine P-12 with Turbine PT
* Installing 25MW Turbine with 5-7 ata at 280-300oC

*It is considered that installing PT-30-3.4/10 Turbine is a beneficial version.*

Advantages of extension

* Having 4.0 hectare-own land to build extension and Grader cooling system
* Having enough capacity of equipment for additional 3 boilers
* Having own conveying wagons and railway to receive coals from mining
* Existing next to the Erdenet mining company, the biggest consumer of electricity energy in Mongolia
* The heating system is one of the sections at the plant and heating energy selling is made by Sales Department at the plant
* Now 5 and 6th apartment blocks, Technological Production Park, and many other factories having high technological vapor consumption are intending to be built. Moreover, the population growth in Erdenet is increasing over 87000 and the consumption of electricity is growing as well.
* The plant has a monopoly of producing heating energy in Erdenet.
* It is possible to be supported by the State as it’s State Share-Holding company

Aspects has to be solved during the extension

* To estimate to work in warm seasons under the condensation mode when installing a new turbine condensate
* To build a new gradient as capacity of the cooling water pond is not enough
* To build a new additional boilers as the consumption in Erdenet is constantly increasing

Conclusion

* The amount of an import of electricity energy will decrease when there is a stable resource of power energy in Erdenet region.
* It will be able to supply Erdenet consumers with reliable heating energy
* The amount of production of electricity energy will increase by approximately 175.3 mil/kW per year, production cost will be fallen from 85.39 tug/kWh to 73.6 tug/kWh, and the percentage of the domestic consumption of electricity will decrease to 19.76%.
* The plant will be able to work continually and constantly and the working hours of installed capacity will increase.
* The capacity and reliable production of the heating water construction network in Erdenet will improve.

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| --- | --- | --- | --- |
| # | Equipments to be built | Required budget /mil.dollars/ | Explanation |
| 1 | Turbine PT-30-3.4/10, its accessories, lines, extension building, gradient, electrical generator, transformation, and oil cutter  | 17.5 | Compared the cost of Turbine extension at the Darkhan Thermal Power Plant  |
| 2 | Boiler construction  | 1.2 | Current market price  |
| 3 | To reassemble the grader and cooler system  | 1.6 | Current market price  |
| 4 | To install 35kW power line with its relay and oil cutter  | 0.3 | In the magazine “Power Energy” #1 /page 45/ |
|  | Total  | 20.6 |  |

* It is estimated that it will be able to pay back its cost within 12.9 years.

**It is considered that extension of the plant with PT-30-3.4/0.8 turbine is a beneficial version. Technical and Economical Specifications of Extension Project**

|  |  |  |  |
| --- | --- | --- | --- |
| # | Technical and Economical Specifications | Unit |  |
| 1 | The number of boilers BKZ-3-75-39FB | Pc  | 7 |
| 2 | The number of turbines  | PT-12-35/10M | Pc | 1 |
| 3 | PT-30-3.4/0.8 | Pc | 1 |
| 4 | P-12-35/6 | pc | 2 |
| 5 | Installed capacity  | MW | 66 |
| 6 | Project capacity  | MW | 53.8 |
| 7 | Working hours of installed electrical capacity per year  | Hour  | 4695.3 |
| 8 | Electricity produced per year | Mil/kW | 309.89 |
| 9 | Electricity distributed per year | Mil/kW | 248.64 |
| 10 | Electricity  | Real  | Mil/kW |  |
| 11 | Rate  | % | 19.76 |
| 12 | Thermal energy production  | Total  | Th/Gkal  | 555.2 |
| 13 | Vapor  | Th/Gkal | 30.0 |
| 14 | Water  | Th/Gkal | 525.2 |
| 15 | Planned Fuel own consumption | For electricity  | g/kWh | 641.85 |
| 16 | For heating  | kg/Gkal | 180.26 |
| 17 | Coal consumption per year  | As planning  | Mil/Ton | 259.6 |
| 18 | In reality  | Mil/Ton | 494.8 |
| 19 | Coal heat capacity  | Gkal/kg | 3673.4 |

* Cost accounting

|  |  |  |
| --- | --- | --- |
| 20 | Total expenses | 28.181.3773.2 thous.tug  |
| 21 | Thermal energy income  | 3.543.907.6 thous.tug |
| 22 | Electricity income  | 25.723.009.2 thous.tug  |
| 23 | Total income  | 29.266.916.9 thous.tug  |
| 24 | Electricity Tariff  | 103.5 ¥/kWh |
| 25 | Thermal energy average cost  | 6.382,2 ¥/Gkal |
| 26 | Product cost of electricity  | 73.6 ¥/kWh |
| 27 | Product cost of thermal energy  | 17,803.6 ¥/Gkal  |
| 28 | Investment  | 28,386,800.0 th/¥ |
| 29 | Duration of pay back | 12.95 year  |