

Proposition
Turbines and Generators
Of an European
Energy company
(two systems of 16,6 MWh)

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Aim of the proposition

In Western Europe two turbines including generator systems are available for sale , because these systems are not of use anymore. Both systems are housed in the same building and were used as emergency systems for the aluminum industry. As a result of this reason, both systems are always maintained very carefully and monthly tested , but did not run for more the 1200 hours each. In 2003 both systems are renewed completely, as was agreed by the current owner with the aluminum industry. These turbines , each with a capacity of 16,6 MWh, are very suitable for as well emergencies as well continuous operations like mining industry, villages, hospital, smelters, chemical plants etc. Especially when grid independency is required. Both turbines can easily be adapted to almost every type of fuel , just be changing the nozzles. Biofuel, biogas, gas and diesel can be applied. This proposal has the aim to give an impression of the status of these both systems to the stakeholder who wants to buy these systems.

General description;

The systems are located nearby an aluminum smelting industry for emergency purposes. Both systems are located in the same building . The systems are installed as mirrored copies of each other and in between both systems the operator room, maintenance room and control room are placed in a noise reducing small inside building. Both systems are identical. Only the fire extinguishing system is not duplicated. One water-based and one inert gas extinguisher is available for safety.



System description.

Each of the inline rotating modules are mounted on a steel beam frame. With this beam structure the inline and balancing requirements for the systems can be achieved. In case of transporting it is preferred to keep this structure as complete as possible. At some points this construction can be divided, but always special attention has to be given to alignment of the axes when installed again. The two turbine/generator systems can be split easily into two systems, or may be better they are already two systems which can be operated independently for each other.



Each system consists of

- 0 One fuel tank
- 1 Fuel pumps
- 2 Emergency batteries (in case no electricity is available for start-up)
- 3 Diesel-engine for starting
- 4 Coupling between starter and turbine
- 5 Turbine (incl noise isolator housing)
- 6 Air-intake
- 7 Exhaust system
- 8 Gearing
- 9 Coupling turbine – generator
- 10 Generator (incl noise isolating housing)
- 11 Electricity transformer
- 12 Cooling
- 13 Controls
- 14 Building(s)

Not included in the deal are the buildings and the technical components belonging to the building and real estate , like cranes, airconditioning and inside service building .

Fuel tank

The fuel tank has a storage capacity of app 4000 M3. It is a standard, general type of round storage tank. Although these tanks can be a part of the deal it is preferred not to include this in the deal. The costs of dismantling, transporting the tank and handling the fuel would be much higher than build a new one on the new location.



Fuelpumps

At this moment the fuelpump system is for practical reasons located in a separate small building. Each system is equipped with an AC and a DC pump. In case of emergency and electricity is not always available the system can startup with battery power.



Emergency batteries

For each system a battery pack with sufficient power belongs to the deal. Due to safety regulations these battery packs are installed in a separate room inside the inside building.



Diesel-engine for starting

A diesel engine ,for starting the system, is mounted in-line with the turbine axes and coupled with a detachable coupling with the turbine axis. When the turbine is running at 55% of its operating speed this starter engine is automatically decoupled from the turbine shaft and the turbine is increasing it's speeds up to its stationary speed by its own fuel energy.



Coupling between starter and turbine

The aim of this coupling is to mechanically couple the starter engine with the turbine. It is mounted on the same base plate as the diesel starter engine and with this frame mounted on the main structure beams.



Turbine (including noise isolating housing)

The turbines are of GE brand. The turbine is equipped for fuel but can easily be changed to gas combustion. Just by changing the fuel nozzles The stationary speed is 5000 rpm. A noise reduction is achieved by the housing around the turbine.



Air-intake

The air-intake is located outside the building. The system is mainly space with simple flat filtermaterial. The air-intake system is equipped with two type of heat exchangers. In case of high moisture content of the outside air, the heat of the exhaustsystem (400-500 dgr C) can be used to dry the external air. Secondly between the air-intake unit and the turbine the intake air temperature controlled by a separate heat exchanger.



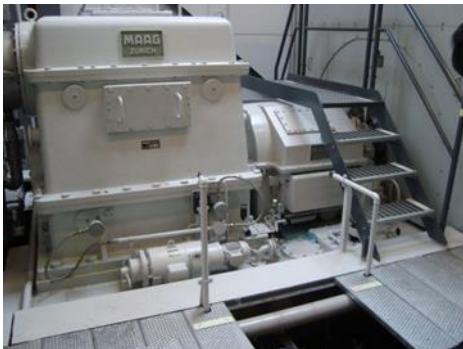
Exhaust system.

A standing pipe of app. 2,5 mtr diameter is used for exhausting . This pipe is provide with heat exchangers to extract the heat from the exhausted air and heat-up the inlet channel of the air-intake to dry the air to be used by the turbines. Optional the exhaust temperature can be used for additional



Gearing.

The gearing is of Swiss manufacturing and used to reduce the turbine rotation speed down to a speed required for the generator (50Hz)



Generator (including noise isolating housing)

The generator is also mounted on the main beam frame and covered by a noise isolating housing. Power electronics and voltage regulation components are mounted in and some outside this housing. The housing is equipped with liquid and gas heat exchangers to control the inside temperature. The generator brand is AEG.



Electricity transformer.

Near to the generator inside the building a transformer for internal use is located. Outside the building the main system transformer for the grid is located. This transformer is built on its own frame.



Cooling.

The cooling of the main system is done by water. In this case ground water of 16 mtrs deep is used and pumped back. This is possible because of the availability of an underground water source. In case of another production location the cooling is a point of attention.

Controls

All controls are located in the inside building. Components used are of German, Swiss and American manufactures. Each system has its own control boxes. One operating screen is available for each system is available for the operator.



Although completely automated the system is also remote controllable. For this system on location at two places (controlspace and service office), at the energy company offices and at the aluminum industry.



The operating system is graphical based on Windows NT professional. It is mainly mouse controlled and easily to communicate. English and Icelandic language are applied. It looks that the language is easily changeable by adding a new language file.

All relevant variables are measured and saved. Temperatures, pressures, operating times, speeds, levels, flows, power, voltages, frequencies, vibrations, limit values, actual values, setting values, fuel, bearings, winding temperatures etc.

Building(s)

As said buildings and real-estate do not belong to the deal. It might be an idea to ask for the architectural design of the current building because it is very simple of construction, efficient ,meets the requirements, has a nice outlook and is of course suited for the systems.

Testrun.

During inspection for this proposition a test run of the system has be done and successful finalized. For practical reasons we have decided not to do a fast startup, but a normal startup. The system is able to startup up-to full capacity within 5 minutes in case of emergency , but we preferred a normal startup because then the heating of the system is more balanced. Because of safety provisions nothing of the system can be seen during a run. Therefore it is decided the make some screen movies to give an impression of the startup. No special occasions happened during the startup.

A start-up and test-run for inspection of the systems is possible coming weeks , as long as the system is not yet dismantled for making the premises free for new industrial activities. Due to the costs of testrun it is preferred to have such a testrun as a conditional constraint of the payment terms.

Maintenance equipment/Spareparts

Maintenance equipment and spareparts as far as available on the current location belong to the deal too.

Specifications ;

Plant is in a top condition and only used for emergency (stand-by).

Power Plant data:

Each system

Gas Turbine General Electric; PLGE 676D341 equipped for diesel

Output 16.600 kWh

Speed 5.100 rpm

Generator AEG; S7083 d4

Power 20.000 KVA

Speed 1.500 rpm

Frequency 50 Hz

Voltage 6,3 KV

The capacity of the system can easily be expanded by using the heat of the exhausts (app. 500 degrees).

When two systems are installed nearby each other a binary system could be applied. Investment of app. 7.000.000 and generate app 9 MWh from the heat. In other cases as alternative the rest heat can be used for heating purposes like vaporizing , process heating etc.

Diesel consumption is 380 kg.MWh

Fuel change by changing nozzles.

Current variable operational costs € 5.60 /MWh

Documentation;

It looks that all documentation is available from the very first period too. Logbooks and checklists of daily, weekly and monthly tests or also available. Not only internal procedures of Current owner , but also the agreed requirements of the aluminum industry made this procedures necessary.

Electrical schemes, spareparts list , mounting instructions, mechanical drawings, service and operating manuals, maintenance procedures, testing procedures are all documented and will be made available after closing the deal. Some are in Icelandic language.

Of all modules of the systems high resolution detailed photos are available. Also some MP4's made of the operator screen during the test run are available.

Dismantling;

For dismantling and transport preparation it is to be considered to weld and mount a subframe to fix all the rotating inline modules as much as possible.

Dismantling is excluded.

The current building is built after the systems were installed in the past. So for this reason partly one wall of the building has to be broken down. The current owner is aware of this necessity and approves it.

A more detailed analysis should be done with the people who will do the dismantling and installation to look for the possibility to divide the basic beam structure into two parts.

All connecting wires of the cabinets can be disconnected very easily and the cabinets can be placed into sea containers. The transformers and air-intake units are easy to prepare for transport.

Packaging

The sensitivity of all equipment is high in case of (sea)transport. Therefore woodprotection with steel subframes and the use of seacontainers is required. It is calculated that the two systems can be packed into 10+ seacontainers.

Transport

Special individual transport is preferred. A nearby harbor offers the possibility to load a vessel and ship the equipment. Transport with air-suspension trucks will benefit the systems.

It is possible to transport several modules of the systems within a short timeframe after closing the deal. So in case desired on the new location the first activities for installing the complete systems can be started and shown shortly after starting the dismantling. (e.g. exhaust systems, transformers, air-intake units, electrical cabinets, etc)

Installation

It is not yet known where the equipment will be installed nor it is known the equipment will be split. For support during installation and commissioning support is available (on cost base) to supply services.

Timeframe

The sales is considered as closed when the first payment is received at the current owners account.

The premises has to be cleared and cleaned, because new premises activities are scheduled for this area.

At this moment the equipment is disconnected from the national grid, and after approval of the deal and receiving of the first payment, available for dismantling.

Indications for dismantling, packaging, shipping, installation, training and commissioning time and costs are given in the proposal of Verkis hf.

Payment procedures;

The two systems are sold as an undividable deal, because the dismantling has to start at the same time. In special occasions it can be considered that to sell each system to another buyer or optionally store one system temporarily and start the dismantling at the same time.

The deal is considered as agreed at the moment the first payment of 70% is received at the owners bank account.

A second payment of 20 % has to be received before starting dismantling or at least four weeks after the first payment..

The final payment of 10% has to be received before the equipment will leave the current premises or at least 8 weeks after the second payment.

For all costs to be made for the project separate payment procedures will be agreed in advance.

Prices;

Price (two systems)	: see cover letter. (Ex Works)
Cost to pay by buyer	: Duties, taxes
	Disassembly , packing, transport to location
	Installation, and commissioning
	Training
	Building or hall on new premisses
	Licenses, permits etc

Unique point of this proposition;

The delivery time for an almost new turbine system is app 5 months instead of more than 24 months for a new system. The financial savings to achieve are equal or better due this short delivery time compared to new turbines.

Redundancy of this equipment is very high.

Turbines have been operational for less then 2 months

Turbine can be inspected in full operational mode.

Expertise for transfer and training is available.

All Western-Europe and American quality components

Original spareparts are available and will stay available for long periods.

In case of maintenance always one turbine system stays operational.

Fully documented systems.

Experienced operator for support available.

Can be equipped easily for other types of fuel.

Attachments;

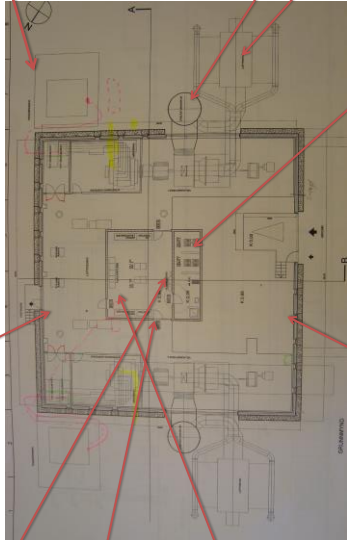
On request more information is available



Controls in turbine building
right turbine



Halon extinguishers



Old building drawing just for overview

Extinguishers are building related so not duplicated



Transformer left turbine



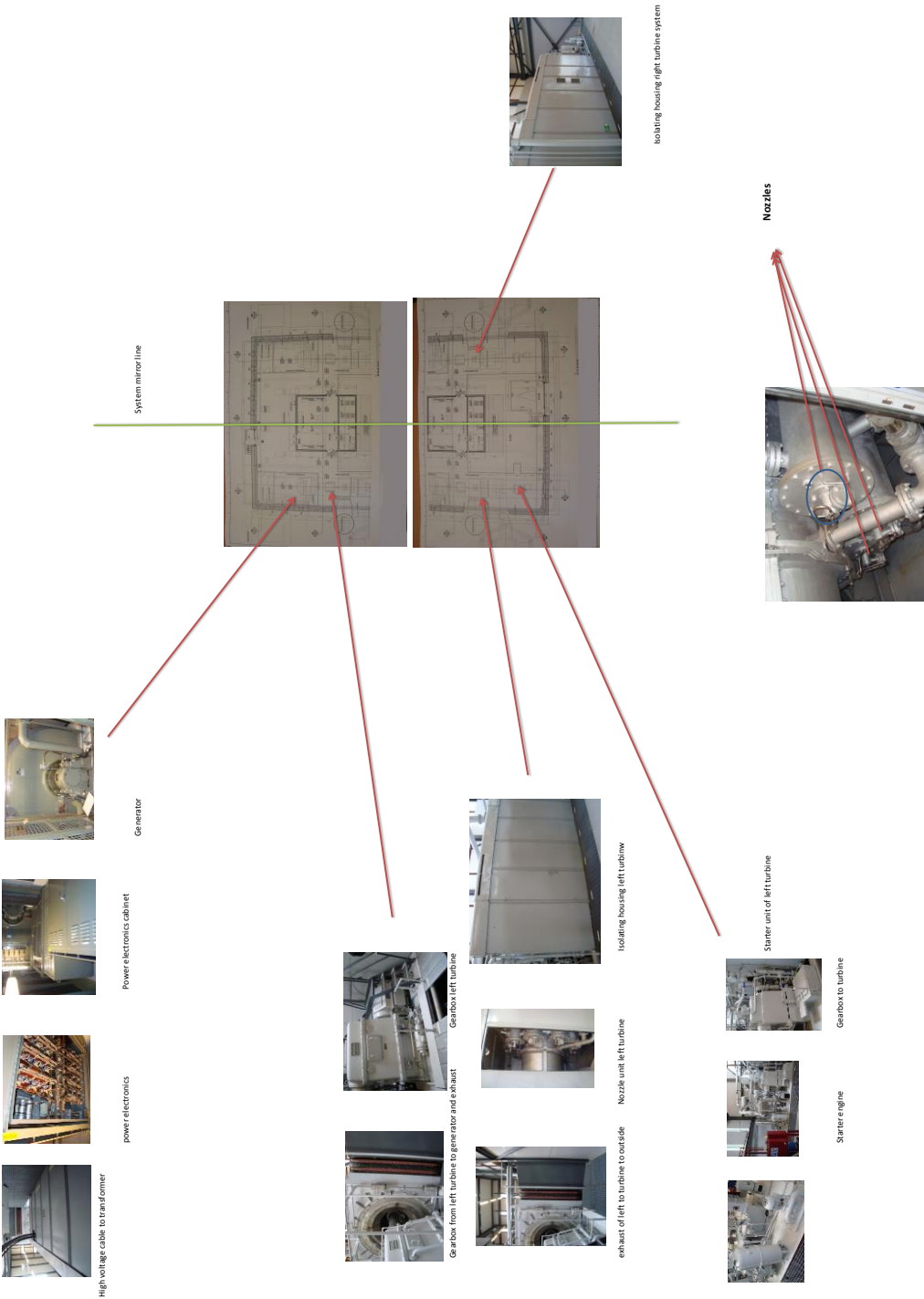
Emergency battery packs to both systems

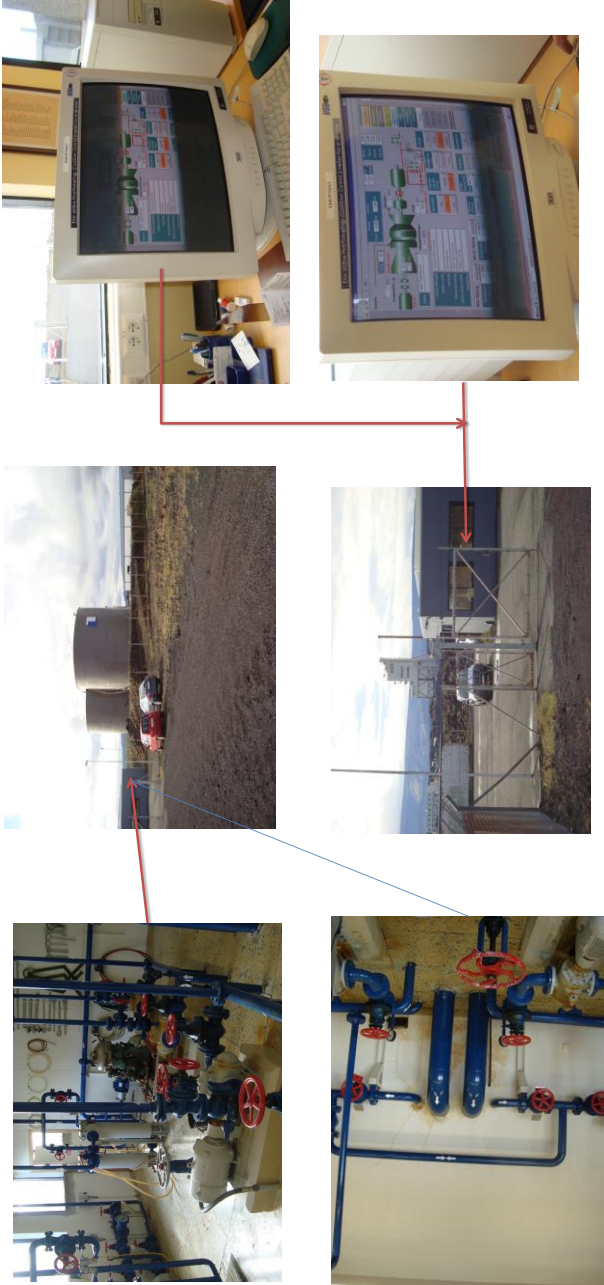


Water extinguishing system



Air intake and exhaust left turbine





Fuel tanks and pumping house with remote control of turbines