Geothermal Development Associates

Ulumbu 2 X 2.5 MW Geothermal Power Plant

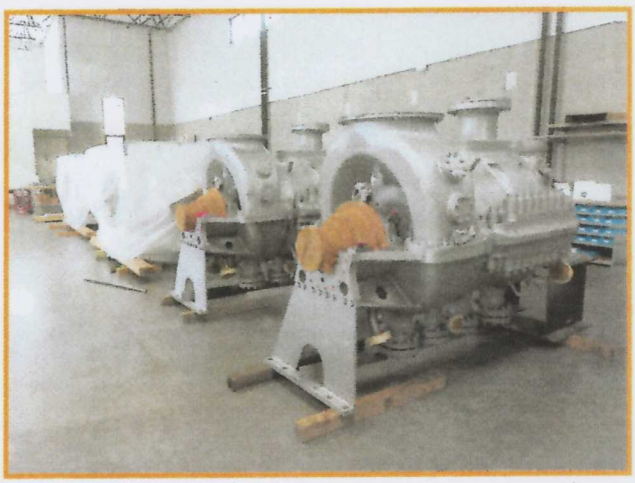
Flores Island, Indonesia

PT Perusahaan Listrik Negara (PLN) is Indonesia's state owned electricity company with a total installed electric capacity of 26,895 MW in December 2010, of which 439 MW (2%) were geothermal. PLN currently has 11 geothermal units in operation.

The Ulumbu geothermal field is located 11 km to the south of Ruteng, the capital of Western Flores, in the Kabupaten (Regency) Manggarai, Flores Island, in the East Nusa Tenggara Province of Indonesia.

Ulumbu 2 x 2.5 MW Geothermal Power Plant - Under a contract with PLN, Geothermal Development Associates (GDA) agreed to design, manufacture, test, and ship two geothermal steam turbine generator sets and related power plant auxiliary components from Reno, Nevada, USA to Surabaya, Indonesia. GDA will also provide supervision and technical support during installation and commissioning of the plant.

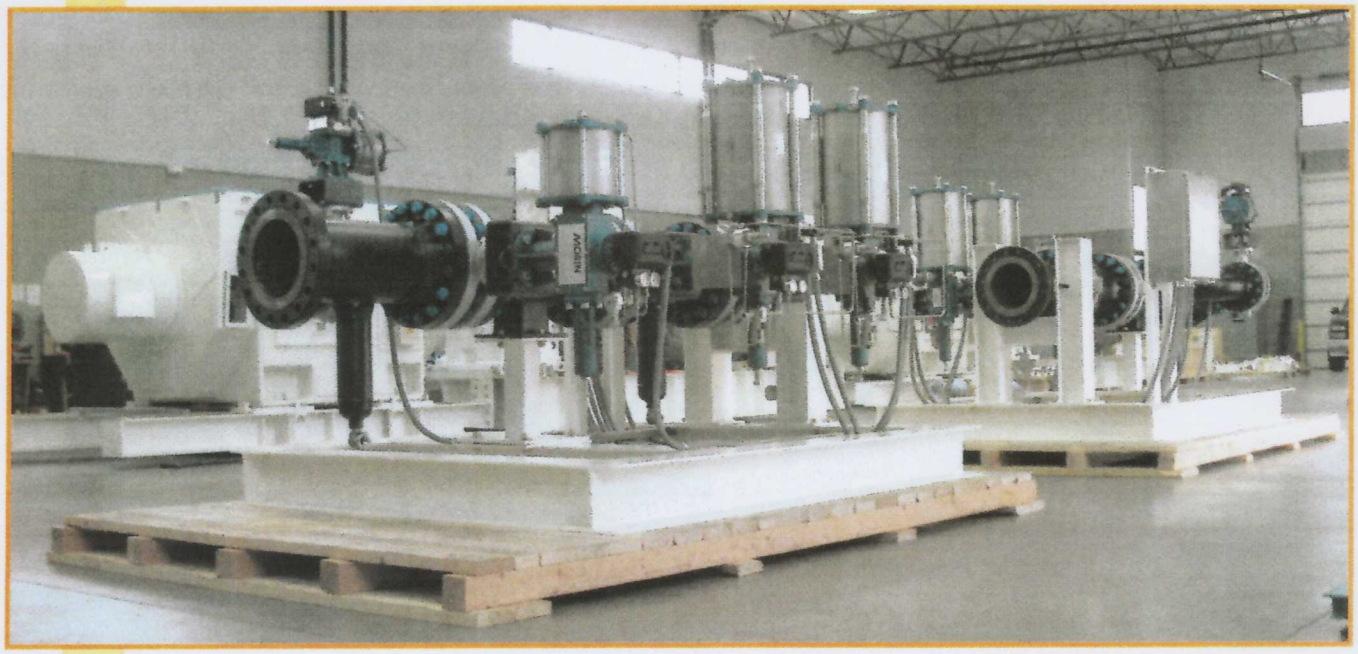
The plant was designed around two military marine propulsion turbines manufactured by GE. These turbines are further enhanced for geothermal service by GDA, PerAero Turbine Designs and Elliott Group. Upgraded materials and state-of-the-art instrumentation results in a rugged machine that is ideally suited to the rigors of geothermal service.



GDA specializes in packaging these turbines with high quality equipment from key vendors. The turbine drives a synchronous generator, manufactured by Kato Engineering, through a speed reduction gear manufactured by Lufkin Industries.

GDA designed and supplied all turbine-related control valves, the lube oil console, and the remote control systems that will be used for the project.

The plant was shipped just five months from the contract effective date in twelve containers. Construction is expected to commence in November 2013.

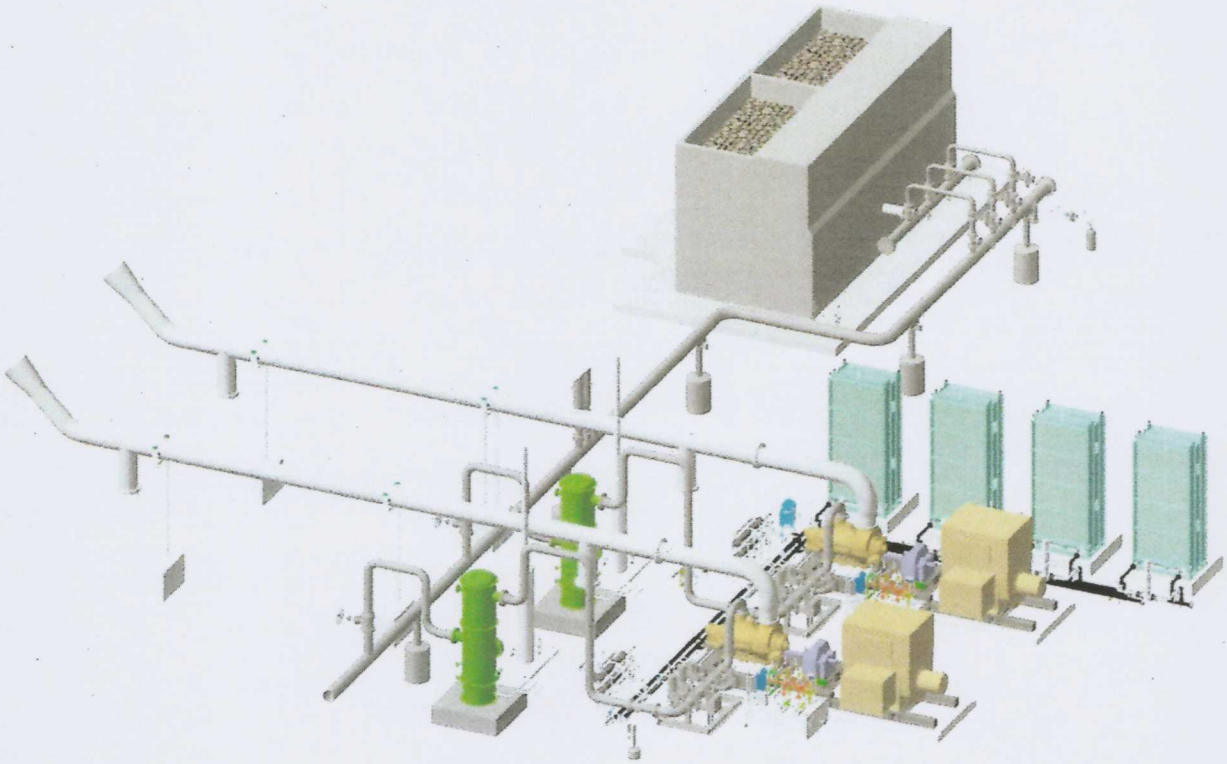


Unit Specifications	
Mass Flow	35,800 kg/hr
NCG	3%
Turbine Inlet Pressure	1000 kPa (abs)
Turbine Exhaust Pressure	98 kPa (abs)
Turbine Inlet Temperature	180°C
Gross Generator Output	2500 kW
Component descriptions are as follows:	
Steam Turbine	GE 7-stage single axial flow turbine enhanced for geothermal service by Elliott Group, Fairfield, CA, USA
Generator	2500 kW, 0.8 pf, 11kV, 1500 rpm, TEWAC Kato Engineering, Mankato, MN, USA
Gearbox	2500 kW, N1600C, double helical, AGMA 1.89 SF Lufkin Industries, Lufkin, Texas, USA
Lube Oil System	1750 liter tank, AC & DC pumps, duplex filters Geothermal Development Associates, Reno, NV, USA
Turbine Inlet Control Valve Assembly	Vanessa valves, Morin actuators, Westlock positioners Geothermal Development Associates, Reno, NV, USA
Remote Control Panels	Allen-Bradley ControlLogix redundant PAC with POINT I/O Geothermal Development Associates, Reno, NV, USA

Geothermal Development Associates (GDA) is a privately held U.S. corporation with over 30 years of experience in geothermal power and direct use applications. Our core group of engineers, geologists, geoscientists and support staff has the capability to oversee projects during every stage, from resource exploration and well-testing to the commissioning of a new power plant.

Since the company's incorporation in 1978, GDA has been involved in numerous geothermal projects around the world, including some in their home state of Nevada. For several years, GDA served as a lead consultant on many geothermal projects, providing assistance with tasks such as permitting, land acquisitions, well-testing, and power plant engineering and supervision.

Beginning in 2002, GDA has taken on the role of designing and packaging turbine generator sets. GDA also designs and fabricates associated equipment such as lube oil consoles, hydraulic power units, complete electrical control systems, and other components using state of the art technology.



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