Rainpower
Norwegian Technology for Clean Energy

Version; Aug 8, 2011
Rainpower is an experienced project organisation based on Norwegian technology.

Rainpower, specializing in hydropower business, delivers everything from runner replacements to complete water to wire electro-mechanical systems.

Our portfolio covers new power plants, rehabilitation, upgrade as well as service and spare parts.

- Head office at Kjeller, Norway
- 100% Norwegian ownership
- Approx. 325 employees in six countries
- Orders in 2010: € 120 million
- Revenue in 2010: € 65 million
“Rainpower continues to expand with new products and services, and to new countries and regions, with deliveries based on state of the art and proven technology. Our employees are experienced, top motivated and fully committed to deliver projects to satisfy the requirements of our customers.”
Misson, Vision, Values & Promises

Our mission:
Develop and deliver the effective, reliable and innovative energy solutions based on water.

Our vision:
The exciting and innovative supplier in our market.

Our values:
Open
Reliable
Efficient
Innovative
Available

Our promises:
We always deliver on time!
We always deliver the quality as promised!
We have the most efficient solutions!
We help you when needed!

Our brand core:
The efficient and innovative challenger!
Rainpower employees have designed, delivered and commissioned:

- **Francis turbines**: 1 – 720 MW
- **Pelton turbines**: 2 – 315 MW
- **Pump turbines**: 50 – 306 MW
- **Kaplan turbines**: 1 – 180 MW
- **Generator**: 1 – 300 MVA
## Rainpower Locations

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Rainpower Delivers

- Turbines
  - Low to medium head Francis turbine *Storm* series
  - High head Francis turbine *Hurricane* series
  - Pelton turbine *Blizzard* series
  - Kaplan turbine *Gale* * series
  - RPT reversible pump turbine *Tornado* * series
- Generator refurbishment and service
- Control systems
  - Excitation systems
  - Turbine governors and oil pressure systems
  - Automation systems
- Valves
- Gates
- Penstock
- Mechanical balance of plant

- Design (basic, conceptual and detailed)
- Site supervision, installation and commissioning

*Complete electro mechanical systems are delivered in partnership with suppliers of generators and EBoP (Electrical Balance of Plant)*

*) Model test planned during 2011*
A Project Oriented Organization

Projects delivered on time and in accordance with contractual obligations

Design and manufacturing based on Rainpower standards and design practise.

Complete technical, economical and administrative responsibility for the individual projects managed by professional project managers and project teams.

- Professional project and site managers
- Manufacturing specialists
- Mechanical and electrical designers
- Procurement managers
- Installation and commissioning engineers
- Specialists to monitor costs, progress, quality, logistics, environment, health and safety
Our hydraulic designers have been responsible for the development of a new generation turbines with world class results.

Every hydropower project is unique, and each turbine is custom engineered and optimized to obtain the highest possible efficiency level over the specified operational range in head and flow, combined with good cavitation and stability behavior.

Jan Tore Bildal
Manager of Hydraulic Department
Rainpower´s turbine laboratory in Trondheim, Norway, has the capability for model testing for the complete range of Francis, Pelton, Kaplan and pump turbines in accordance with latest international standards.
Hydraulic Design World Class Efficiency
Hydraulic Design Hurricane Series Francis Turbine

The design is developed and based on the Rainpower Storm series turbine, as well as general experience from design of high head Francis turbines. A study is in progress to get an optimal design solution for improved hydraulic performance.

Mechanical characteristics are overriding hydraulic characteristics

CFD analyses of runner and guide vanes

FEA: Calculation of runner stress levels
System Design

The waterway from intake to outlet is one of the most important parameters for our design. We have to take into consideration the water flow duration curves and flooding conditions in order to deliver an optimized power plant.

As a supplier of electro-mechanical systems we must understand the operation conditions for the plant and its role in the network including control and protection philosophy.

Based on the above parameters – and many others - we will design your power plant with focus on production, availability, minimum risk and maximum safety.

Dagfinn Nes
Senior specialist, System design
Rainpower employees make sure our customers are confident that we will design, manufacture and install their projects in a safe and timely manner.

Our advanced technology will secure profitability and problem free operation during the life time of the plant.

Carine Klemmetsen
International Account Manager
Project Execution Sourcing and Procurement

We provide an optimized solution for our customers by offering a range of suppliers worldwide in addition to our own workshop.

All manufacturing facilities for critical components are strategic partners with strict EHS/QA/Ethics requirements, and adhere to our manufacturing standards.
Rainpower Sørumsand Verksted

• We deliver:
  – Fabrication & heat treatment
  – Large size machining
  – Assembly and surface treatment
  – Non destructive testing – level 2&3

• Hydro power products and services:
  – Turbine runners
  – Injectors, guide vanes
  – Small hydro package assembly
  – Turbine and generator refurbishment
  – Gates and penstock

• Certification:
  – NS-EN ISO 9001:2000 (QA)
  – OHSAS 18001 (Health and Safety)
  – NS-EN 14001 (Environment)

• 11,000 m2
• Capacity: 150 ton x 7,5 m
• 95 skilled employees
Rainpower Hangzhou

- Office located within 1 hour from main suppliers/production partners
- Engineering department with turbine, valve and generator design experience
- Dedicated team for production quality control present at main suppliers
- Two certified NDT operators, one with level three certificates
- 24 turbines and 20 valves delivered so far; 20 more turbines and 20 valves are in progress

- Established in 2008
- Manufacturing sourcing
- Manufacturing follow-up
- Engineering
- 40 employees
Training and development by RainpowerAcademy

RainpowerAcademy is responsible for providing our employees with the right competence in order to develop and manage today’s and future challenges.

RainpowerAcademy offers several training and development programmes, such as a project management programme with emphasis on:

- Hydropower technology
- Contract & risk management
- Professional business attitude & ethics
- Occupational health and safety
Medium and High Head Hydropower Plants

Rainpower Small Hydro AS: Small power plants
Rainpower Norway AS: Medium and large power plants

New projects and rehabilitation/upgrade projects
• Water-to-wire hydropower plants and system packages
  – Standard solutions for small hydro
  – Custom made solutions and technology development for larger power plants
  – Design based on Rainpower’s world class technology
  – Hydraulic and system design
  – Mechanical and electrical design
  – Optimized manufacturing based on customer requirements
  – Global project execution experience
• Facilitate project financing
Low Head Hydro Power Plants

Rainpower Kristinehamn AB

- Service
- Status monitoring
- Mobile machining
- Refurbishment and upgrade of Francis turbines
- Refurbishment of Kaplan turbines
  Upgrade/runner replacement (from 2012 onwards)
- Governor equipment, including electronic governor
Service

Rainpower Service AS

- Installation
- Commissioning
- Rehabilitation and upgrade
  - Turbines
  - Governors
  - Valve controls
- Gates:
  - New gates
  - Service
  - Upgrade
- Service
  - Machining
  - Weld repairs
  - Heat treatment,
  - Surface treatment, NDT

Emergency services 24-7
Generator

Rainpower Elektro AS
Rainpower Sweden AB

• Service
  - Condition assessment
  - Inspection / repair of stator windings, stator core poles and bearings
  - Cleaning with CO2 and painting

• Refurbishment and upgrade
  - Stator (wedging, re-winding)
  - Rotor (poles, ventilation, slip rings)

• Bearings
  - New segments, cast white metal

• Excitation - modernisation

• Competence
  - 10 experienced engineers / service technicians
Control Systems

Rainpower Hymatek AS

- Static and brushless excitation systems
- Electronic turbine governors and oil pressure systems, unit controllers,
- Synchronizing units
- Unit controllers and control systems for small hydro
- Service

- Market leader in Norway
- In-house developed hardware and software
- 17 professionals
Medium and High Head Hydropower Plants

Recent references

Quitaracsa; a new power plant in Peru with Blizzard series Pelton turbines
Rainpower will supply two Rainpower Blizzard Pelton 56 MW turbines with control valves and two 65.9 MVA generators and associated fittings to the Quitaracsa project, owned by Enersur in Peru. The power plant is situated 500 km northeast of Lima. Rainpower is lead consortium partner together with the Italian company STE Energy and has responsibility for all electro-mechanical equipment for the power station, dam and waterway.

Chevez; a new power plant in Peru with Blizzard series Pelton turbines
Empresa de Generación Eléctrica Cheves S.A. (SN Power in Peru) has commissioned Rainpower to supply equipment to the Cheves power station, which is situated near Churin, northeast of Lima. The order covers project management, design, purchasing and installation, as well as supply of two of Blizzard design 87 MW Pelton turbines with runners, two ball valves, two turbine governors and Rainpower Hymatek excitation equipment. In addition Rainpower will supply cooling systems and other mechanical equipment. On this project Rainpower is working with ABB, Canada and the French company Jeumont Electric.
Medium and High Head Hydropower Plants
Recent references

Aslancik; a new power plant with Storm series Francis turbines
The Turkish energy company Aslancik Electrik Üretim Anonim Şirketi has awarded Rainpower a contract for supply to the power station Aslancik, which is situated on the Black Sea coast near to the town of Trabzon in Anatolia. Rainpower’s involvement includes project leadership, design, purchasing and installation as well as two 60 MW Francis turbines with Rainpower Storm runners, two gate valves, two Rainpower Hymatek turbine governors, cooling systems and other mechanical equipment. Rainpower is also the consortium lead partner in this project which is being carried out with Končar in Zagreb, Croatia, and Alstom Grid in Ankara, Turkey.

Small Hydro Plants to Tussa Energy in Norway; new power plants with Blizzard series Pelton turbines
In December 2010 an agreement was also made with Tussa to supply four small plants in Standal, Viddal, Dalegjerdet and Draura in Sunnmøre. This order consists of four vertical Pelton turbines with penstock, main control valves and generators. The four small power plants will provide 5000 households with clean and renewable energy. An additional contract was awarded to Rainpower early 2011 for the same power plants consisting of complete Electrical Balance of Plant and Automation Systems.
Medium and High Head Hydropower Plants

Recent references

Rainpower has entered into an agreement with the Swiss energy producer Ofima for delivery of equipment for the Robiei power plant. The contract comprises pump turbines and a Francis turbine with equipment; replacement of the electro mechanical equipment at the plant, as well as four reversible pump turbines adjusted to a head between 284 and 395 meters, with maximum effect of 41 MW. One Francis turbine is adapted to a head between 270 and 390 meters, with maximum effect of 27 MW. The deliveries include inlet and outlet valves, as well as oil pressure systems. Due to the large variations in head, Rainpower will perform model testing of two different turbine runners. The project will be carried out by a consortium with Alstom in Switzerland, which will deliver the generators/motors and the inlet valves for the pump turbines.
Medium and High Head Hydropower Plants

Recent references

**Svartisen; a new large power plant in Norway**
Rainpower delivers Svartisen unit 1 for Statkraft Energi AS. The power plant is located near the glacier Svartisen, in Nordland county. Rainpower delivers complete turbine, main valve and turbine governor. The turbine’s effect is 250 MW. This is one of the largest hydropower developments in Norway during recent years. The upgraded power plant will make use of existing waterway of Generator 2, which was delivered by Kværner in 1993. Rainpower is also delivering a new 350 MW turbine runner for Generator 1, model tested at the Trondheim laboratory.

**Courbaisse; an upgrade project in France for EDF Energy**
Rainpower has entered into an agreement with the international energy group EDF Energy for a study of hydraulic systems, and delivery of two refurbished turbines for the Courbaisse power plant. This is phase two of the Tinée power plant, located near Plan du Var, north of Nice. The river power plant has a capacity today of 25.5 MW. The project is particularly important because it opens up for Rainpower in the French refurbishment market.
Medium and High Head Hydropower Plants

Recent references

Binga; an upgrade project in Philippines with Storm series Francis turbines
On the Philippines Rainpower is upgrading the Binga power plant, which belongs to SN-Aboitiz. We deliver four new Francis runners, each 33.1 MW, turbine parts, turbine governor with oil pressure system, site management and performance tests. Rainpower will also deliver excitation equipment of the generators.

Rendalen 2; a new power plant in Norway with Storm series Francis turbine
For the new power station in Rendalen, which will replace the existing station, Rainpower will deliver the turbine and the pressure shaft and associated parts. The customer is Eidsiva Hydropower AS. The power station will be built inside the mountain in the immediate vicinity of the existing Rendalen power station, which was completed in 1971. The water is transferred via a 29 km long transfer tunnel between Glomma by Høyegga and Northern Rena river at Lomnessjøen. The turbine produces 100 MW, with a head of 185m, and in addition to this Rainpower will deliver the main valve, turbine governor, installation and commissioning. For the waterway Rainpower will supply 140 m of penstock, with a diameter of 3.8 m, butterfly, straws hatch, cross sport and valve in the clear chamber with tubes. The delivery will be completed in October 2012.
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