



Picture of turbine wheel

## Kjaernes Minikraftverk Røyrvik i Nord-Trøndelag Norway

**Client:**  
Rustad Energi AS

**Owners (eiere):**  
75 % Svein Rustad  
25 % Tyngdekraft-Sofienlund Ltd.



### Key figures (nøkkeldata):

- H: 206 m
- Qm 0,175 m<sup>3</sup>/s
- Qt : 0,40 m<sup>3</sup>/s
- P : 630 KW
- E : 3,0 GWh
- Cost– 8,0 mill kr
- Spes. cost 2,66 Kr/GWh

**Construction time (byggetid):**  
12 months (måneder)

**Year (år):**  
8/2007 – 8/2008

**Commissioning:**  
12/2009

**Financing:**  
Landkredit Bank



Powerhouse In an old barn



Intake



Control system



Turbines and generators during assembly

## Brief project description

Sofienlund is the responsible engineer for the whole project comprising the following main key design elements: initial planning and concession application, conceptual design, detail design of intake dam and intake structure, penstock, powerhouse, tailrace channel, complete electro-mechanical works and high voltage 0,69/22kV transformer. We will also be responsible for the commissioning and future operation.

The project will be a run-of-the-river project and is located on the central north part of Norway in a county named Nord-Trøndelag. The small creek Litjelva has an average water flow of about 0,175 m<sup>3</sup>/sec. The turbine scaling will initially only be  $Q_t = 0,75 * Q_m \Rightarrow Q_t 0,13 \text{ m}^3/\text{sec}$  due to the concession terms. The plant is simulated to generate about 3 GWh on an annual average with a residual water flow in the river equal to 5% of  $Q_m$  throughout the whole year.



The intake is a concrete structure anchored to solid rock with rock bolts. The intake forms an integral part of the dam and will reach a total height of about 4 meters and the crest length is about 12 meters.

The penstock is 1200 m with DN 600 pipes of PE and ductile cast iron as seen on the picture above. The total gross head will be 245m. The slope is quite steep at an average of about 12 degrees, but the topography comprises moraine soil almost all the way and there will only be one anchor block along the penstock between the PE-pipe and the ductile cast iron pipe. The penstock will be buried with a minimum of 1 meter overburden to keep it steadily on place.

The powerhouse has a solid foundation of concrete and founded in soil and gravel. The volume of the foundation has to withstand the dynamic water forces from the penstock at 70 ton. The top construction will be the existing silo part of an old barn as shown on the picture above.

The power plant has a water-level control.

The power grid is only 150 m away from the power plant and a buried 22 kV high voltage power cable will be connected to the grid.



### Project team

Project manager	Einar Sofienlund,
Hydrology	Einar Sofienlund,
Civil engineer	Jann Biedilae and Einar Sofienlund,
Mechanical engineer	Bjorn Undrum and Einar Sofienlund,
Electrical engineer	Einar Sofienlund,