



ITA TUNNELLING
AWARDS 2017

PROJECT
OF THE YEAR
- UP TO €50 MILLION -

The Fjærland Hydro Power Plants

Ola Kvammen



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Stakeholders

Project Owner: Sognekraft AS

Developer: Småkraft AS

Architect: Paal J Kaars Arkitekter AS

Civil design: Småkraft AS

Engineering geology: Dr.Ing. Bjørn Buen AS

Mechanical design: Småkraft AS

Electrical design: Småkraft AS

Tunnel and Civil contractor: Lemminkäinen Norway AS

Mechanical Contractors: WS Montasje AS

Electrical works: OneCo

Supplier penstock: Brødrene Dahl AS (Saint Gobain)

Supplier turbine: Andritz Hydro AS

Supplier generator: Leroy Somer Norge AS(Emmerson Electric)

Transformer: ABB AS



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The Fjærland HPP in brief

Developer: Småkraft AS

Project owner: Sognekraft AS

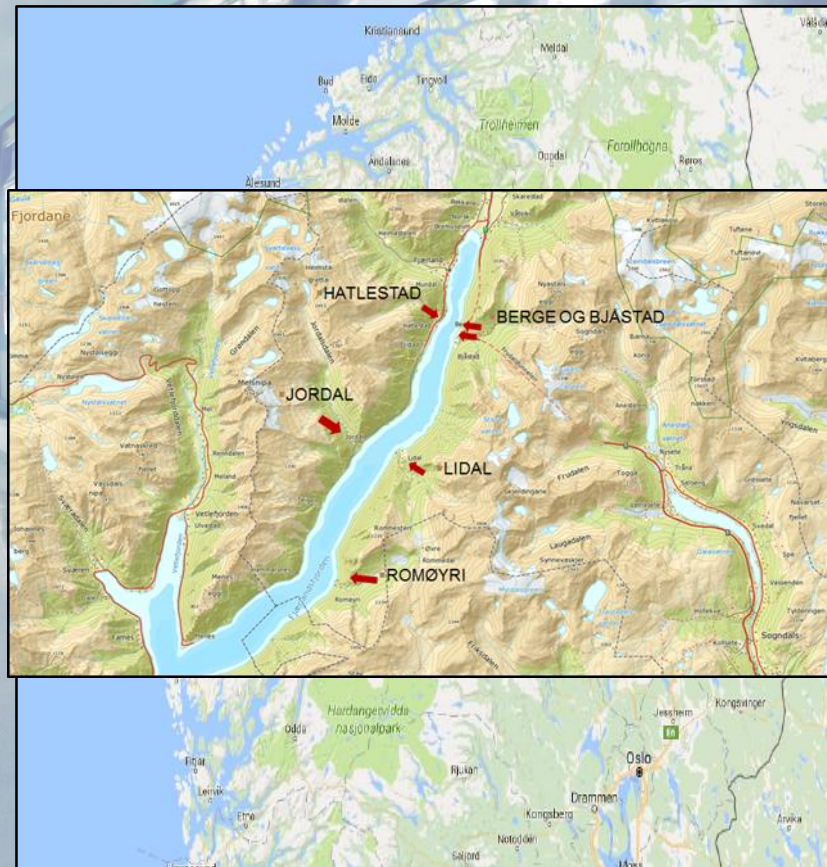
6 Hydro power plants: Lidal, Romøyri, Berge, Bjåstad, Hatlestad og Jordal.

Installed effect: 41 MW

Yearly production: 114 GWH

Equivalent to consumption of 5000 homes

Gross heads from 260 to 636 m.





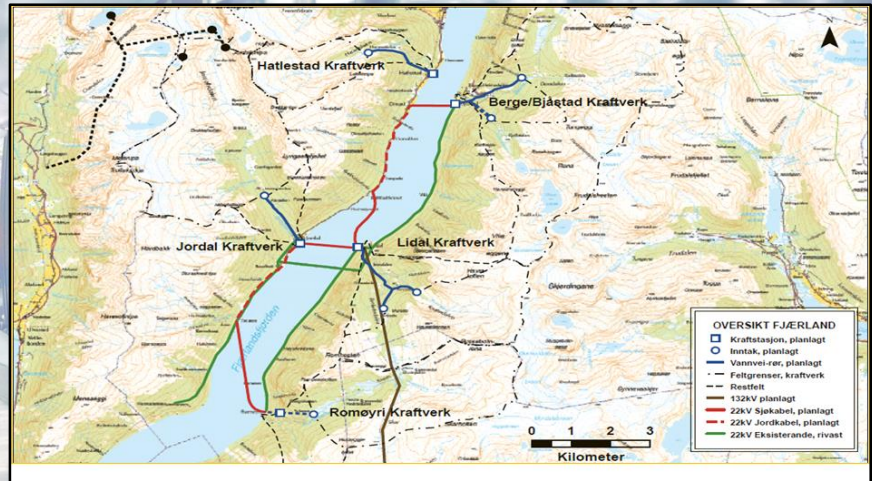
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Project scope

The development also includes:

- Installation of grids 22 KV from each power plant to main transformer.
- Installation of 132 KV main transformer at Lidal.
- The construction of an 18 km 132 KV grid in order to connect with the main supply grid.





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Project scope

The scope of the Lemminkäinen
Contract:

Contract value: € 23 mill.

Consisting of:

- Lidal HPP
- Romøyri HPP
- 5 Intake constructions
 - Hatlestad, Bjåstad, Romøyri, Kvanndøla and Breisete

- 2,5 km headrace tunnel
- 1,1 km penstock shafts
- 5 Intake structures
- 2 Power plants

Construction period: August 2015 to
September 2017.



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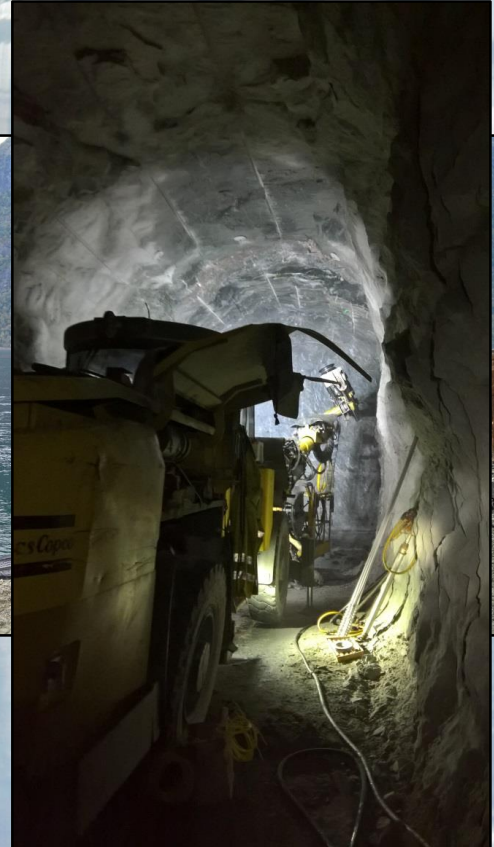
Project scope

A bit out of the ordinary:

- With many challenging elements.
- No existing infrastructure.
- With opportunities for all parties.

The tunnel excavation method:

- Was executed in accordance with the Norwegian philosophy.
- Achieving exceptional excavation rates taking the given conditions into consideration.





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Considerable interaction results

Thanks to positive interaction
before start-up.

Changes in design and partly
methodology which lead to:

- Improved scope and complexity
- A more efficient way of work
- All within the terms of strict environmental requirements.



- **Reduced construction time by approx. 2 years.**





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The first steps at Lidal HPP





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Operative 4 days after mobilization

Major challenges:

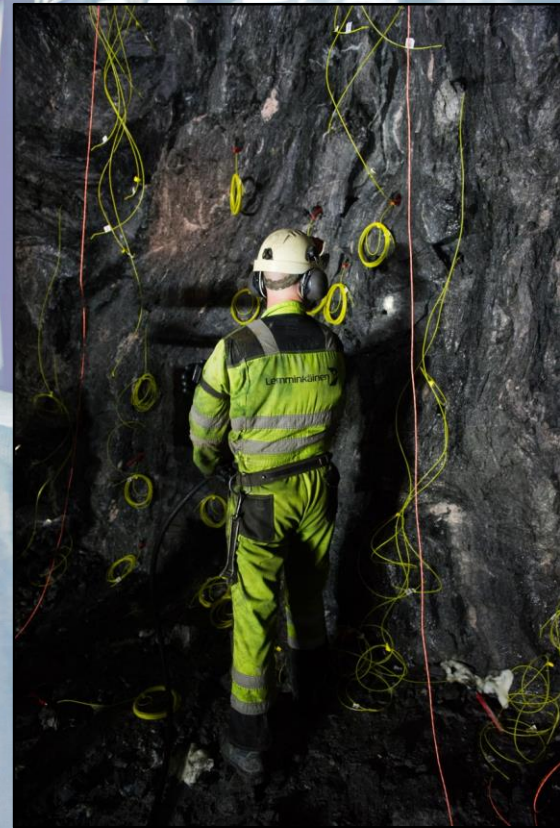
- Rock burst

- Logistics, due to lack of road access

Excavation rates:

- Best week(s) - +120 m.

- Average week – 85 m.





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Challenging winter operations





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Supply-road within environmental standards

For supply and emergency.

- Length 18 km.
- Operative from February to April.
- Mobilization of heavy equipment for summer operations.
- Transport of heavy equipment for the client.
- A very environmentally friendly method, no visible wounds in the surface.





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The final result





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The final result

The key to success:

- Positive interaction between developer, contractor and authorities.
 - Shorter construction period.
 - Start of renewable energy sales way ahead of schedule.
- High focus on operational planning and logistics.
- Excellent and cost efficient workmanship.





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Achievements

The final result will become a beautiful feature along the shoreline of Fjærlandsfjorden:

- Leaving only small environmental impacts on all interventions, due to.
 - Innovative operational solutions.
 - Excellent workmanship
- Positive interaction resulted in completion approx. 2 years ahead of schedule.
 - Commercial and environmental positive impact, providing earlier sales of renewable energy.





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