

# Small Scale Hydropower in Norway



Langdalselv

# Agenda

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Småkraft AS, brief introduction

The small hydro segment in Norway

Local footprint and added value

Challenges and opportunities

# Småkraft AS

Established in 2002 by  
5 Norwegian hydropower  
companies

Ultimo 2015 sold to foreign  
investors, administrated by  
Aquila Capital (German)

**Builds and operates hydropower plants together with the landowners.**

# Overview of Småkraft per March 2017

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## Sagelvi

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92 plants in operation 900 GWh



# Norwegian small hydro – market development

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## Comments

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- Privately owned waterfalls in Norway
- The Energy Act in 1991 introduced a free market for electricity
- A free market made it possible to realize privately owned small hydro plants
- No competition between developers until 2002
- Competition intensified from 2002 and onwards

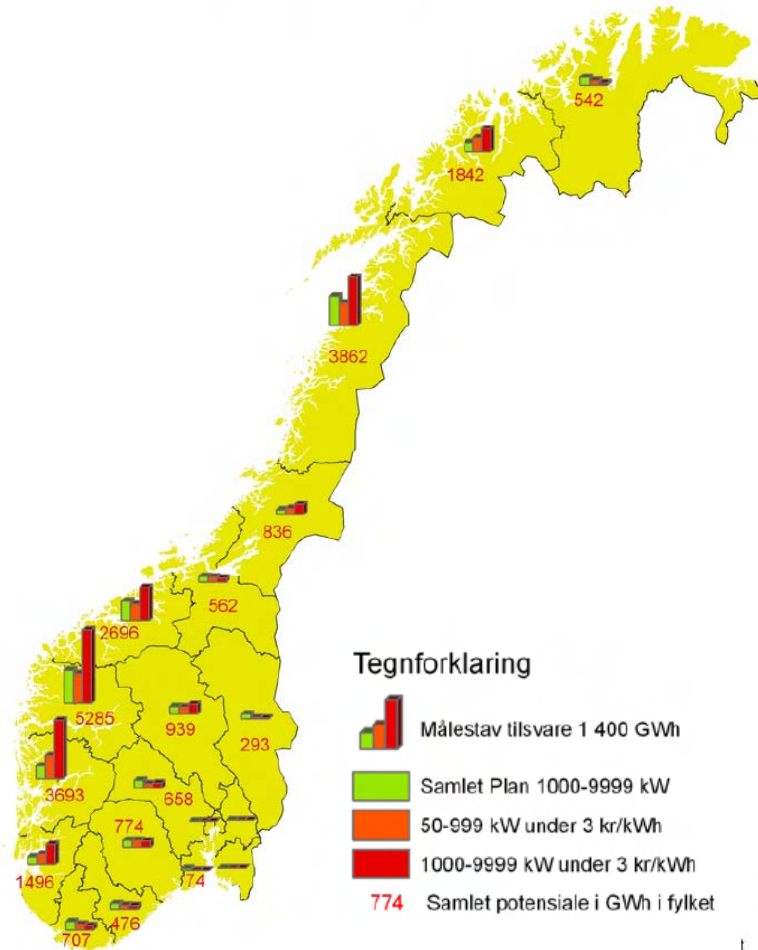
## Steinsvik

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# Small hydro potential in Norway

## Small hydro potential



## Comments

- The Norwegian Water Resources and Energy Directorate carried out an extensive study of small hydro potential in 2004
- Study indicated a small hydro potential of 25 TWh



# Overview small hydro in Norway (2014, < 10 MW)

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Total	1142 plants	9000 GWh
2002-2014	621 plants	4200 GWh
Of which:		
Small Hydro	330 plants	3800 GWh
Mini/micro	291 plants	420 GWh



Gjerde Powerplant

# Large-scale development, industrial approach

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## Industrial approach

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- Large-scale effects
- Standardization
- Simplification
- Local operation
- Technology development
- Supplier development
- Contracts adapted to suppliers

## Ekkjestølen, Røldal

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# Profit-sharing business model

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- Småkraft rents waterfall for 40 + years
- Småkraft plans, builds, owns and operates the plant for 40 + years
- Daily operation by waterfall owner
- profit split
- Profit is all income minus all costs
- Waterfall owner can buy the plant after 40 years

## Årvik plant

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## Benefits

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- ① Common interests in all aspects
- ② Easy to grasp concept
- ③ Works well also in market downturns

# Typical plant – Oftedal I

## Key information

Sirdal municipality  
Vest-Agder County

Commisioned	March 2007
Annual production	13,4 GWh
Output	3 MW
Gross head	265 m

Buried penstock, length	1550 m
Penstock diameter	800 mm

Turbine	GEA
Generator	Marelli
Control system	Teksal

## Images of plant



# Operation and Maintenance

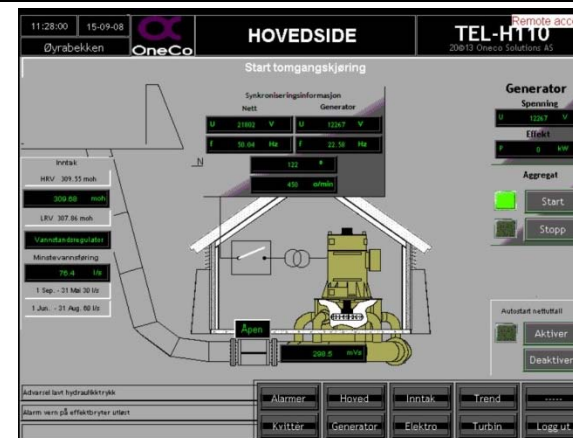
## Comments

- Remote operations
  - All plants are built for local and remote operations
  - Automatic start/stop and turbine regulation according to water inflow
- Surveillance system gives remote access to the plants via fiber communication
- **Operations in three levels:**
  - **Level 1 – Local operators:** Day-to-day light maintenance
  - **Level 2 – Småkraft personnel:** Responsible for carrying out more complicated operational tasks, monitoring portfolio, production planning, etc.
  - **Level 3 – Specialists:** External personnel engaged for specific tasks – typically technical specialists or craftsmen with certain skills

## Education of landowners



## Screenshot from PLC system





# Added value for generations

## Building infrastructure

El-Grid / internet

Local el. distribution

Roads

Water supply

Not only agriculture?  
Farming or resource  
development

Bergstø





# Wealth creation together

## Relations

**Local  
Rural  
Development  
Business  
Once in a  
generation**



**småkraft<sup>®</sup>**



# Apples, tourism and small hydro in Hardanger



Guesthouse, Hardanger Gjestegard



Ytre Alsåker power plant



# Added value to the local society

Property tax

Local

Tax on land lease

Local/Central

35 % of building cost local

Profitsharing

Maintenance personell

Longtime return on investment also after  
agreement termination.

# Grid capacity – ”chicken and egg”

- Government want more renewable energy .
- Many places the grid lack capacity to export the new energy.
- Today the new capacity have to pay the strengthening of the grid.
- **Result:** Lots of profitable projects are «Dead» due to huge grid cost.



# A push forward....



.....is not necessarily friendly.....



