Background

1885 -
- first electric hydro power plant in Norway
- supply for the towns and Rural areas, light
- power intensive industry, pulp and paper, chemical, smelting
1945 -

- Rebuilding the country after World War II
- Growing demand for electricity
- Rapid development of new hydropower plants
HYDROPOWER IN NORWAY

Mean annual production

TWh/yr

1900  1920  1940  1960  1980  2000

1997: 112 TWh/yr
1960s- 1980s

- Growing public concern about the environment
- Conflicts, demonstrations
- Demand for EIAs
- Alternatives
- Mitigating measures
- Protection plan
- Master plan
Protected river systems

1973 - 2009

Protection Plan I - VI

388 river systems are protected from hydropower development

Out of a total, theoretical potential of 214 TWh, 50 TWh is protected against HP development
1984 - 92

- Master Plan for the remaining hydropower resources.

- Priority grouping of projects depending on economy and environmental impacts.
Hydropower potential 1.1.2015
Mean annual production 213,9 TWh, ref 1981-2010

- Developed; 131,9 TWh
- Protected; 49,6 TWh
- License granted; 4,0 TWh
- Under constr; 1,6 TWh
- Appl/Notific; 7,7 TWh
- Small hydro inkl. 13,4 TWh
- New Prod > 10 MW, 4,3 TWh
- Rejection; 1,4 TWh

Norwegian Water Resources and Energy Directorate
01.02.2016
Impact assessment (IA)

- Environment
  - Hydrology
  - Geology
  - Landscape
  - Local climate
  - Water quality
  - Freshwater biology
  - Terrestrial biology
  - Cultural monuments

- Natural resources
  - Agriculture
  - Forestry
  - Freshwater resources
  - Marine resources
  - Minerals & gravel

- Community
  - Industries
  - Population
  - Service
  - Local financials
  - Infrastructure
  - Social conditions
  - Health
  - Outdoor life
Focal Issues in Licensing

- Environmental, Cultural and Social Impacts
  - (National Framework)
  - (EU Water Frame Directive)
- Secure delivery of Energy
- New Renewable Production
  - Norw/Swe 26,4 TWh by 2020
  - EU directive 67,5 % renewable
The Norwegian Hydro Power System

- Reservoir capacity: 85 TWh (62 bill. m³)
- Reservoir capacity is about 70% of mean production capacity
- Approximately 50% of total reservoir capacity in Europe
Water Inflow and Electricity Generation during a year

TWh

Filling of reservoirs
Mean inflow
Generation from reservoirs
Generation from inflow

Week no.

Norwegian Water Resources and Energy Directorate
Revision of conditions

- **Licence** is normally issued for unlimited time.
- **After 30 years** it is possible to request a revision of the licence conditions.
- The purpose of revision is to **update and “modernise”** the conditions in order to meet new environmental requirements.
- Revision is thus **limited to environmental issues**, e.g. minimum/environmental flow, environmental funds (new), restriction on manoeuvring reservoirs.
- **Limiting reservoir levels** (HRWL / LRWL), are normally not subjected to revision.
Revision of Conditions (2)

- All Hydropower Licenses (400) are subject to revision of conditions within 2022.
- Revision will be done within the framework of EU water directive (as much as possible within national priorities)
- Revision might reduce electricity Production by 3-4 TWh

Annual Production
Cost/benefit issues

Restoration potential:
• Fish and fishing
• Biological diversity (endangered spp)
• Landscape and recreation

Production loss:
• Environmental flow
• Dam maneuvering restrictions
Main challenge
Global environment vs nature protection?
Thank you for your attention