Challenges in reaching healthy rivers and sustainable hydropower - 27<sup>th</sup> of May 2021, European River Symposium



**Towards sustainable hydropower in Norway** - by modern ecological design of measures and mode of operation





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# Half-full or half empty?

- Status and outlooks
- Management tools
- Political signals and priorities
- Emerging good examples
- Ambitious level
- Norway vs. other countries







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## The Norwegian HP portfolio





<u>Source;</u> <u>NVE (2020) and Halleraker et al (2021)</u>

### Norwegian experiences, R&D and handbooks – environmental design to mitigate HP impacts





Laboratorium for ferskvannsøkologi og innlandsfiske (LFI)

# Mitigation measures to reduce hydropower impacts in the RBMP's

- RBMPs adopted, with adjustments, by the Ministry (July 2016)
  - 387 water bodies specified in decision
  - Flow measures in more than 50 HP watercourses by 2033
  - Estimated production loss: 1.1 -1.7 TWh (Apr 1-1.5 % of the total production)
- Political signals on hydropower and biodiversity from parliament (2016)
  - Increase revision of terms (to enable minimum flow release)
  - Modernise legal possibilities for mitigation requirements

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#### Mitigating impacts from hydropower in priority water bodies by 2021-2033

River basin districs	Flow	Other	
	measures	measures	Total
Glomma/Västerhavet	35	33	68
Vest-Viken	35	56	91
Agder	17	8	25
Rogaland	2	1	3
Hordaland	10	13	23
Sogn/Fjordane	13	48	61
Møre/Romsdal	12	10	22
Trøndelag	8	10	18
Nordland	16	23	39
Troms	8	21	29
Finnmark	4	4	8
Norway	160	227	387

Norwegian Ministry of Climate and Environment

Ref. Pedersen/Hamnaberg (2018). A Norwegian approach to determining the significant adverse effects for GEP - Hydro Power, Brussel, 20 Apr 2018.

## All emerging good practice ?

		Alta	Surna	Storelva, Blekvatnet
icense River charact.	Key species	Atlantic salmon	Atlantic salmon	A. salmon, Seacharr
	Impacted river	> 10 km with NSR	> 10 km with NSR	5 + 2 km (anadroumose)
	Priority HP name	<u> </u>	<u> </u>	<u> </u>
	First operation	1987	1968	1952
	Modernised license	Test regime - after R&D	Royal Resolution - 2021 (March)	Royal Resolution 2019 (Sept)
	Туре			
HP charact	Head	185 m	400 m	92 m
	MW (GWh)	150 (762)	127 (< 893)	1.2 (4.7)
	Max turbine Q	96	38	1.8
Flow mitigation measures	Environmental (base)flow	16 - 45 m³/s	15 3/s	0 (residual flow)
	By-passed reach	Not required (short)	New measures from 2021	0 (residual flow)
	Fish migration flow	Yes	Yes	Not considered?
	By-pass valve	Yes	Yes	Yes (2019)
	Operational restrictions (hydropeaking)	Yes - very strict up/down	Yes - downramping (specified)	Yes - gradually (not specified)
nys-chem leasures	Multiple intakes	Yes to mimick natural ice/water temp		Not considered?
ish migration aid		Dam above natural barrier	Dam above natural barrier	Not required (but relevant)

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Vannkraftkonsesjoner som kan revideres innen 2022 Nasjonal gjennomgang og forslag til prioritering





Source; <u>WISE dashboard</u>

# **Towards sustainable mitigations in Norway**



### **Promising**

- Several best practise examples in place or in process
  - Environmental design of salmon rivers
  - Fish migration aids (safe up/down)
- Acknowledging «new» impacts that need mitigation
  - Supersaturation
  - Water temp/ice cover
- Intensified revision of terms
  - Focus on mitigating HP impacts
  - More Eflows than prior to 2013



continuity for fish





Mitigation for sediment alteration

Mitigation for rapidly changing low flow

Mitigation for

flows

Mitigation for physico-chemical alteration

Mitigation for



- Modern licenses enabling implementation of monitoring and HP mitigation (without impact on use) still pending in many licenses
- Lack of updated national WFD HP guidelines after 2016
- Regulated lakes and "ordinary" riverdependent biodiversity?





Emerging good practise





Compensating with fish stocking

Compensating habitat loss with fish stocking

## **Thanks for listening - Questions?**



#### **#N - POTENTIALLY LICENSES UP FOR REVISION**



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