



THE INTERNATIONAL ENERGY AGENCY TECHNOLOGY
COLLABORATION PROGRAMME ON HYDROPOWER

IEA Hydropower



New Frontiers in Sustainable Hydropower Development

Hydropower Sustainability Forum

Oslo, Norway 4-6 September 2017

IEA Hydropower TCP highlights

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Status of Program: Annexes

Technology Cooperation Program on Hydropower

Annexes

ANNEX II
Small Scale
Hydropower

ANNEX IX
Valuing
Hydropower
Energy and
Water
Services

ANNEX XII
GHG
Emissions
from
Freshwater
Reservoirs

ANNEX XIII
Hydropower
and Fish

ANNEX XIV
Management
Models for
Hydropower
Cascade
Reservoirs

ANNEX XV
Maintenance
Works and
Decision-
Making for
Hydroplant
Renewals



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Status of Hydropower Market and Technology Trends

- There is a solid future for hydropower as a key player in a low-carbon society as it represents a domestic, mature, affordable and sustainable source of energy.
- Hydropower provides a renewable base load and important load-balancing system capabilities for the increased penetration of intermittent wind energy and solar power.
- Flexible hydropower provides a wide range of non-energy services, including flood protection, irrigation flows, water supply, recreation and navigation.
- With the electricity sector changing continuously, a program of hydropower research is essential to ensure its place in the future sustainable energy supply mix.
- Hydropower technology advancements provides activities in OECD countries.
- Deployment of new hydropower will continue strongly in non-OECD countries.



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IEA Hydro Annex II (*Hidden Hydro*)

Elands
irrigation dam

RSA

Potential:
~3.5 MW
~25 GWh annually





Annex IX: Valuing Hydropower Services

Annex IX Objectives:

- Identify the energy and water management services created by hydropower developments and their spatial and temporal distribution.
- Enhance the understanding of the economic values and costs related to the provision of energy and water management services as well as of other socio-economic contributions by multipurpose hydropower projects.
- Analyse and suggest appropriate methodologies to estimate the value of these services and generate policy recommendations for optimum development.



Annex IX: Appropriate Approaches to Estimate Fair Value for Allocation of Various Water Management Services

Water Service	Proportional to water-use	Commercial benefits	Intrinsic value	Conflict resolution	Holistic approaches
Flood Reduction	✓				
Navigation/Transport		✓			
Recreation		✓	✓	✓	
Irrigation	✓	✓			
Water Supply	✓				
Socio-economic Contributions			✓	✓	✓
Aquaculture		✓			
Water Quality			✓		✓



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Solar

Hydropower – Supporting other Renewables



Hydro



Wind





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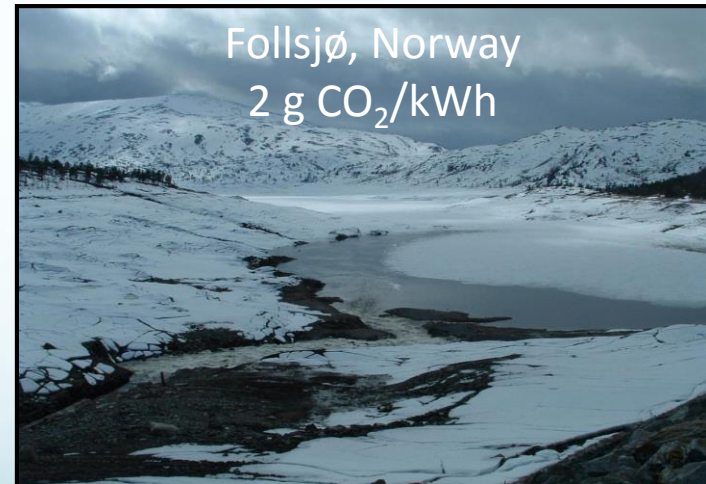
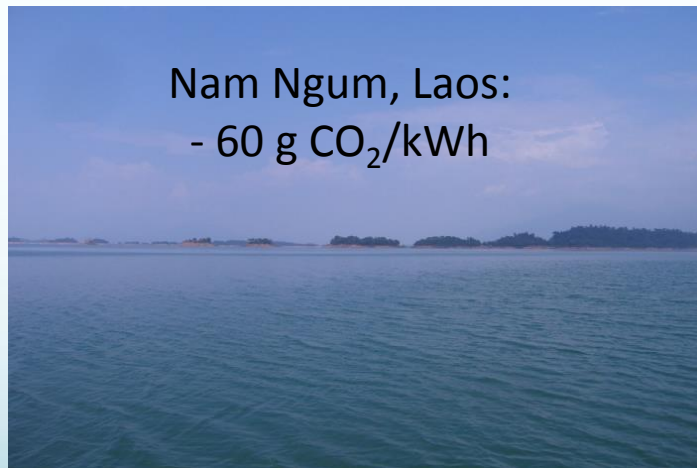
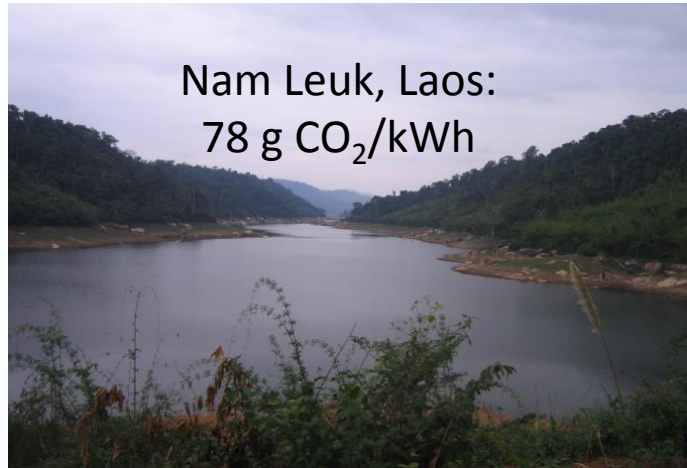
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Annex XII: Hydropower & the Environment: Managing the Carbon Balance of Freshwater Reservoirs





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Embrettsfoss HPP in the Drammen River, Norway



Environmental Indicators

Environmental indicator	Declared unit:	
	1 kWh, from raw material extraction to the distribution net	
Global warming:	2,19	g CO ₂ equivalents/DU
Energy consumption:	1,19	kWh/DU
Renewable energy share:	99	%
Indoor climate	Not relevant	
Chemicals	No chemicals from the candidate list	



Annex XIII: Hydropower and Fish



The Mandal river in Southern Norway Decades ago poluted by by acid rain from coal fired thermal plants in European countries that almost killed all troat and salmon

Today a living river with values for fish migration, recreation and clean electric energy generation



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Conclusions

Hydropower TCP countries will continue to identify and address emerging issues on status and future roles of hydropower in mature energy markets.

- The transformation of energy markets that include hydropower, covering changing demand patterns – industry composition, emerging industries and increase in residential grid-connections
- Increased generation from other renewable sources, e.g. wind, solar and ability of hydropower to provide storage
- Approaches and economics for life extension and modernization
- Policy and regulatory frameworks to remove barriers and provide incentives for investment



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Thank you

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