IEA - INTERNATIONAL ENERGY AGENCY

IMPLEMENTING AGREEMENT FOR
HYDROPOWER TECHNOLOGIES AND PROGRAMMES

Annex IX "Hydropower Services"

The economic value of energy and water management services provided by multipurpose hydropower projects

by Karin Seelos, Rovaniemi 10.06.2014

IEA – International Energy Agency
Implementing Agreement for
Hydropower Technologies

US-Department of Energy
ORNL, ANL

Norwegian Water Resources
and Energy Directorate

AIM: Enhance the understanding of…

1. the **type of energy and non-energy services** hydropower can provide to energy security, water security and sustainable development
2. the **potential consequences** of providing such services for the **hydropower sector** in terms of required adjustments in operation, maintenance and development practices;
3. appropriate **economic assessment** methods to quantify the value of these services;
4. how the **costs** of providing multiple services are **apportioned** between the various stakeholder;
5. how **regulatory frameworks**, **market mechanisms** and **business models** can sustain or hamper the optimal deployment or development of multipurpose hydropower services

RATIONALE

Contribute factual information to:

- Policy-making and implementation of regulatory framework in the areas of:
  - Water (e.g. implementation of EU Water Framework Directive)
  - Energy (e.g. value of ancillary services for energy security)
  - Climate change (e.g. value of CC mitigation & adaptation measures)
  - Development (e.g. regional indirect + multiplier effects)
- Project planning and financing (e.g. benefit sharing)
- Licencing/relicensing
- Water pricing
- Pricing of network regulation services
- Market conditions
- Successful business models

Multipurpose Hydropower Project

Definition

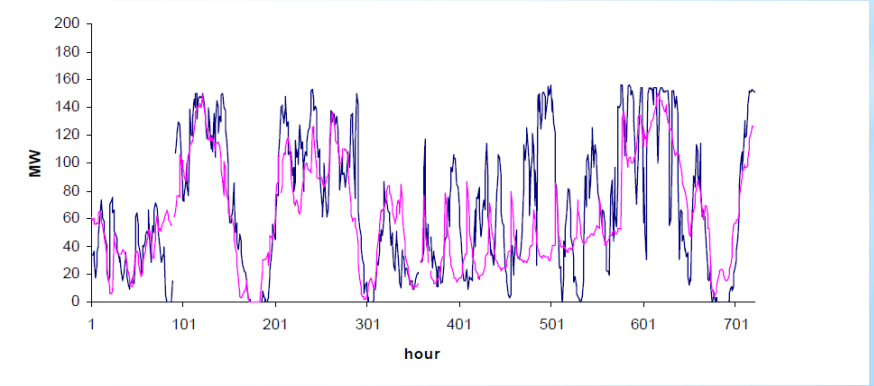
Hydropower projects which are designed and/or operated to serve beyond electricity generation one or more other purposes.

International Commission on Large Dams (ICOLD) Committee on Multipurpose Dams (2013)

Power services

Ancillary services stabilising the electric grid and contributing to energy supply security :

- Inertial response
- Governor response, frequency response or primary frequency control
- Frequency regulation, regulation reserve or secondary frequency control
- Flexibility reserve
- Contingency spinning reserve
- Contingency non-spinning reserve
- Replacement/Supplemental reserve
- Load following
- Load levelling / Energy arbitrage
- Generating capacity
- Integration of variable energy resources (VER)
- Portfolio effects
- Reduced cycling of thermal units
- Reduced transmission congestion
- Voltage support
- Improved dynamic stability
- Energy security
- Transmission deferral



- Black start capability

Non-power services

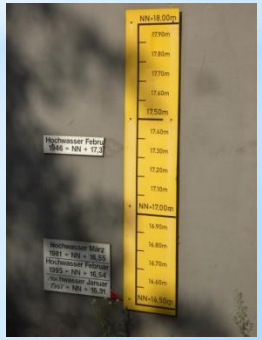
A) Water quantity management

- Flood / drought control
- Ground water stabilisation
- Increased water availability for other uses

B) Water quality management

- Oxygenation and temperature dispersion
- Cleaning of water courses from debris
- Improved sediment management
- Habitat protection (granting coverage with water)
- Barrier to saline water intrusion



Non-power services

C) Contribution to regional development

Catalyst effect for other water uses through increased availability of freshwater such as:

- Navigation (transport)
- Irrigation (agriculture)
- Leisure and tourism
- Aquaculture
- Water supply (domestic and industrial)
- Improved infrastructures (roads, access ramps, etc)

Catalyst effect for energy intensive industries

- aluminium, pulp and paper, aviation, shipyards, IT, etc.




Non-power services

D) Human development

Project related investments to improve living standards of people such as:

- Health services
- Education
- Sanitation
- Community services
- Housing
- Livelihoods
- Nutrition and food supply




Non-power services

E) Environmental services

The projects global and local environmental services:

- Reduction of GHG emissions
- Reduction of atmospheric emissions
- Creation of wetlands
- Micro-climate around reservoirs

Document economic value creation of services provided by multipurpose HPPs beyond electricity generation

Power services

- **Energy management**
  - frequency regulation
  - voltage support
  - spinning reserve
  - synchronous reactive power modulation
  - improved efficiency of thermal units
  - improved system operation reliability
  - improved black-start capability
  - GHG emissions reductions

Non-power services

- **Water management** (quantity & quality)
  - Flood/drought control
  - Ground water stabilisation
  - Increased water availability for other uses
  - Oxygenation and temperature dispersion
  - Clensing of water, sediment and habitat management
- **Regional development**
  - Navigation (transport)
  - Irrigation (agriculture)
  - Leisure and tourism
  - Aquaculture (fisheries & food)
  - Energy intensive industries
  - Human development

- ✓ Energy security
- ✓ Climate change mitigation
- ✓ Increased deployment of variable renewables

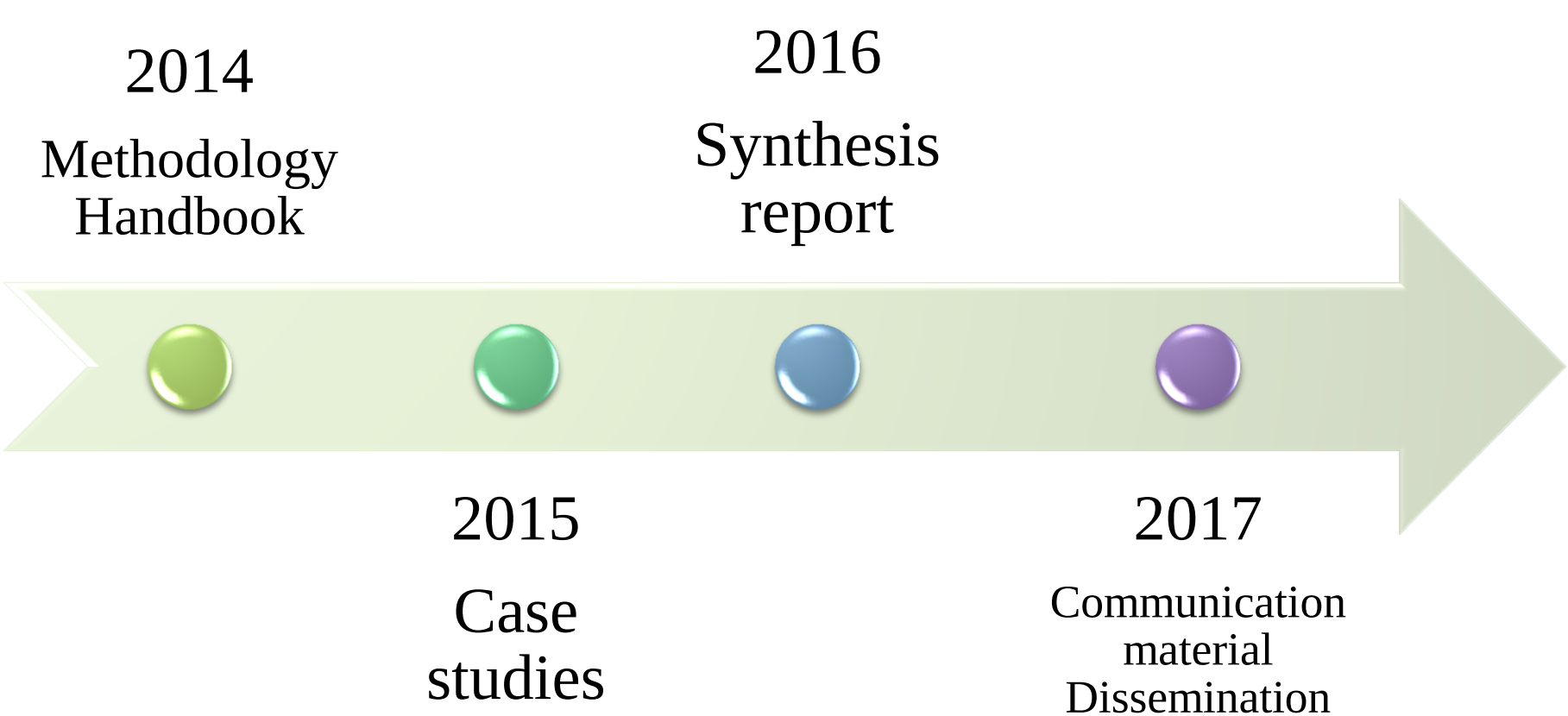
Policy arenas

- ✓ Water security
- ✓ climate change adaptation
- ✓ socio-economic development

Approach

- **Case studies from different river basins across the world with assessment methods validated by internationally recognised economists**
- **Supported by a methodological handbook providing advice on:**
  - which economic assessment method to use for documenting the value of specific energy & water management services
  - type of information to collect for case studies through templates
- **Synthesis report presenting facts gathered through case studies according to the study's five aims presented in slide #2**

Timeline


2014
Methodology Handbook
2015
Case studies
2016
Synthesis report
2017
Communication material Dissemination

Collaboration Framework

- Partnering Organisations (PO):
  - IHA
  - ICOLD
  - EURELECTRIC

  with collaboration from the World Bank
- All can contribute case studies and participate in the review of the handbook and synthesis report
- IEA: coordination, validation of economic methods, production of synthesis report
- Over 20 multipurpose hydropower project owners and operators have committed to produce case studies
- POs and contributing companies acknowledged in synthesis report
- All organisations active in dissemination

Kiitoksia oikein paljon !

Thank you for your attention !

For more information

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