IEA Implementing Agreement for Hydropower Technologies & Programmes


IEA Operating Agent for Annex- XI
TAKASHI AKIYAMA
Since 1974, the International Energy Agency (IEA), has provided a structure for international co-operation in energy technology R&D.

The Implementing Agreements (IA) of the IEA are the vehicles of co-operation between countries and organisations focusing on particular energy sources, and structured with Executive Committee and Annexes.

Research projects are conducted by working groups of the Implementing Agreements called Annexes.

Many of the Annexes are based upon R&D activities going on in the different member countries.
Participating Countries & Members

- **Australia** – Hydro Tasmania
- **Brazil** – Ministry of Mines and Energy, CEPEL
- **China** – China Yangtze Power Co
- **Finland** – Finnish Funding Agency for Technology & Innovation (TEKES), Kemijoki Oy
- **France** – Électricité de France (EDF)
- **Japan** – New Energy Foundation (NEF), Agency for Natural Resources & Energy (METI)
- **Norway** – Norwegian Water Resources & Energy Directorate (NVE)
- **USA** – US Department of Energy, Oak Ridge National Laboratory (ORNL)
- **European Union**
Vision

➢ Through the facilitation of worldwide recognition of hydropower as a well-established and socially desirable energy technology, promote the development of new hydropower plants and the modernisation of existing facilities

Mission

➢ Encourage, through awareness, knowledge, and support, the sustainable use of water resources for the development and management of hydropower
A new Annex on “Processes and Decision-Making for Hydroelectric Refurbishment” to be led by Japan is being developed.
1. There are growing concerns not only in Japan but also in other industrialized nations about the aging of hydropower facilities.
2. There is a growing expectation for hydropower as a future key player in low-carbon society, as it represents a domestic, affordable and CO2-free source of energy.
3. In the western world, small- or medium-sized pumped-storage hydropower is gaining renewed recognition as a load-balancing system to complement the intermittent wind and solar power.

(Purpose)

- The taskforce is trying to gather as many good case histories as possible from around the world on the renewal and upgrading of existing hydropower plants.
- The information will be used to identify and convey effective policies, promotion support measures and innovative technologies to the rest of the world.
Progress of the Keage Hydropower Plant

COD of the Keage Plant (the first commercial power plant)

1st stage: 20 Pelton turbines (DC. and AC.)
1760kW
1897

2nd stage: 5 horizontal Francis turbines
160kW
1891

1st stage: 2 Pelton turbines (DC.)
160kW

1891

1891

1912

5700kW
1936

2nd stage: 5 horizontal Francis turbines
4800kW
1897

3rd stage: 2 vertical Francis turbines
4500kW
1979

Power house at 3rd stage (in-service)

Power house at 2nd stage (existing)

Utilizing the hydropower reflects God’ will.

Owned by THE KANSAI ELECTRIC POWER CO., INC.
Roles of Hydropower in Japan

[ Features ]
- Low Cost
- Purely Domestic
- Clean
- Renewable
- Output Stability
- Instant Start

[ Roles ]
- Leader of Power Supply
- Main Player in the Low-carbon Society
- Provider of Ancillary Service

[ Changes ]
- Social needs
- Environmental Awareness
- Aging of Facilities
- Development of Technologies
## Trend of Trigger Causes

<table>
<thead>
<tr>
<th>Trigger Cause</th>
<th>No. of Case</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>A : Ageing, Malfunction</td>
<td>38</td>
<td>35.2</td>
</tr>
<tr>
<td>B : Environmental Deterioration</td>
<td>14</td>
<td>13.0</td>
</tr>
<tr>
<td>C : Higher Performance</td>
<td>31</td>
<td>28.7</td>
</tr>
<tr>
<td>D : Safety Improvement</td>
<td>11</td>
<td>10.2</td>
</tr>
<tr>
<td>E : Third Party Factor</td>
<td>9</td>
<td>8.3</td>
</tr>
<tr>
<td>F : Accidents / Disasters</td>
<td>5</td>
<td>4.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>108</strong></td>
<td></td>
</tr>
</tbody>
</table>

### Screenin

### Case History Collection

70 Case Histories from 10 Countries
Trigger Causes to change depending on the times

**Developing**

- (A) Degradation due to ageing
  - Life extension/Demolition/Renovation

- (B) Environmental deterioration
  - Resettlement
  - Fishes
  - Animals and plants
  - Landscape
  - Sedimentation and Turbid water

- (C) Higher performance
  - Consistent development of river systems
  - Expansion of unit number
  - Multi-purpose
  - Maintenance-free
  - Cost reduction

- (D) Safety improvement
  - Higher-Specification
  - Countermeasures for earthquake

**Developed**

- (E) Third party factors
  - Conversion to other purpose

- (F) Accidents/Disasters
  - Design defect
  - Earthquake
  - Flood

- Upgrading
  - (Adding New Value)

Renewal
- (Maintaining Existing Value)

Influence by adjacent development

Ancillary Services
- Asset Management
Category-1. Public Policies, Facilitation Measures, etc.

Key Points

a) Energy policies of Countries & States

b) Investment incentives;
   Feed-in-Tariff (FIT), Renewable Portfolio Standard (RPS)

c) Integrated management of water resources and river systems

d) Asset management, strategic asset management and Life cycle cost analysis

e) Projects justified by the Non-monetary valuation of stabilizing unstable power system in the up-coming low-carbon society

f) Environmental conservation and improvement
Key Points to be focused and analyzed

◆Summary Report (Volume 1) ⇐ 78 pages

Category-2. Modern Technologies, Systems, Materials, etc. Key Points

a) Technological innovation & deployment expansion of Electro-Mechanical (E/M) equipment

b) System and Reliability Improvement in Protection & Control (P&C)

c) Technological innovation, deployment expansion and new materials used for Civil Engineering (C/E) works

d) Integration of other renewable energies into hydropower systems

◆Case Histories Report (Volume 2) ⇐ 598 pages
For more information, visit the IEA Hydro website at

www.ieahydro.org

Thank you

Kansai’s Kurobe Dam, the tallest dam in Japan