Water Resources and Hydropower Development in Asia,
Vientiane Lao PDR March 1, 2016

IEA Implementing Agreement for
Hydropower Technologies & Programmes

International Energy Agency, and Launch of the Final Reports of Annex XI

IEA Operating Agent for Annex-XI

TAKASHI AKIYAMA

IEA Implementing Agreement for Hydropower Technologies & Programmes

- 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**

IEA Hydropower Vision & Mission

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

IEA Hydro: New & Ongoing Annexes Phase 5 (2015-2019)

Hydropower Implementing Agreement

Annexes (Working groups)

- Annex II Small Scale Hydropower
- Annex IX Valuing Hydropower Energy and Water Services
- Annex XI Renewal & Upgrading of Hydropower Plants
- Annex XII GHG Emissions from Freshwater Reservoirs
- Annex XIII Hydropower and Fish
- Annex XIV Management Models for Hydropower Cascade Reservoirs

A new Annex on "Processes and Decision-Making for Hydroelectric Refurbishment" to be led by Japan is being developed

Annex-XI Renewal & Upgrading of Hydropower Plants

(Background)

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

1868 | 1912 | 1926 | 1951 | 1989 | 2011

Meiji | **Taisho** | **Showa** | **Heisei**

- Meiji Restoration
- 82 First electric ramp
- Sino-Japanese War
- Russo-Japanese War
- World War I
- World War II
- Reorganization of power company
- 66 Nuclear
- 70 EXPO
- 73 Oil shocks
- 78
- 90- Bubble burst
- 97 COP3
- Great East Japan Earthquake Fukushima No. 1 crisis

Beginning of hydropower development | Dam construction | Large Dam | Environmentally-conscious development

1891 ▼ **COD of the Keage Plant (the first commercial power plant)**

Pelton turbine

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

1897
1760kW

1891
160kW

2 Pelton turbines
(DC.)

2nd stage:
5 horizontal Francis turbines

1912
4800kW

Power house at 2nd stage (existing)

3rd stage:
2 vertical Francis turbines

1936
5700kW

Power house at 3rd stage (in-service)

Increasing the demand for drinking water

1979
4500kW

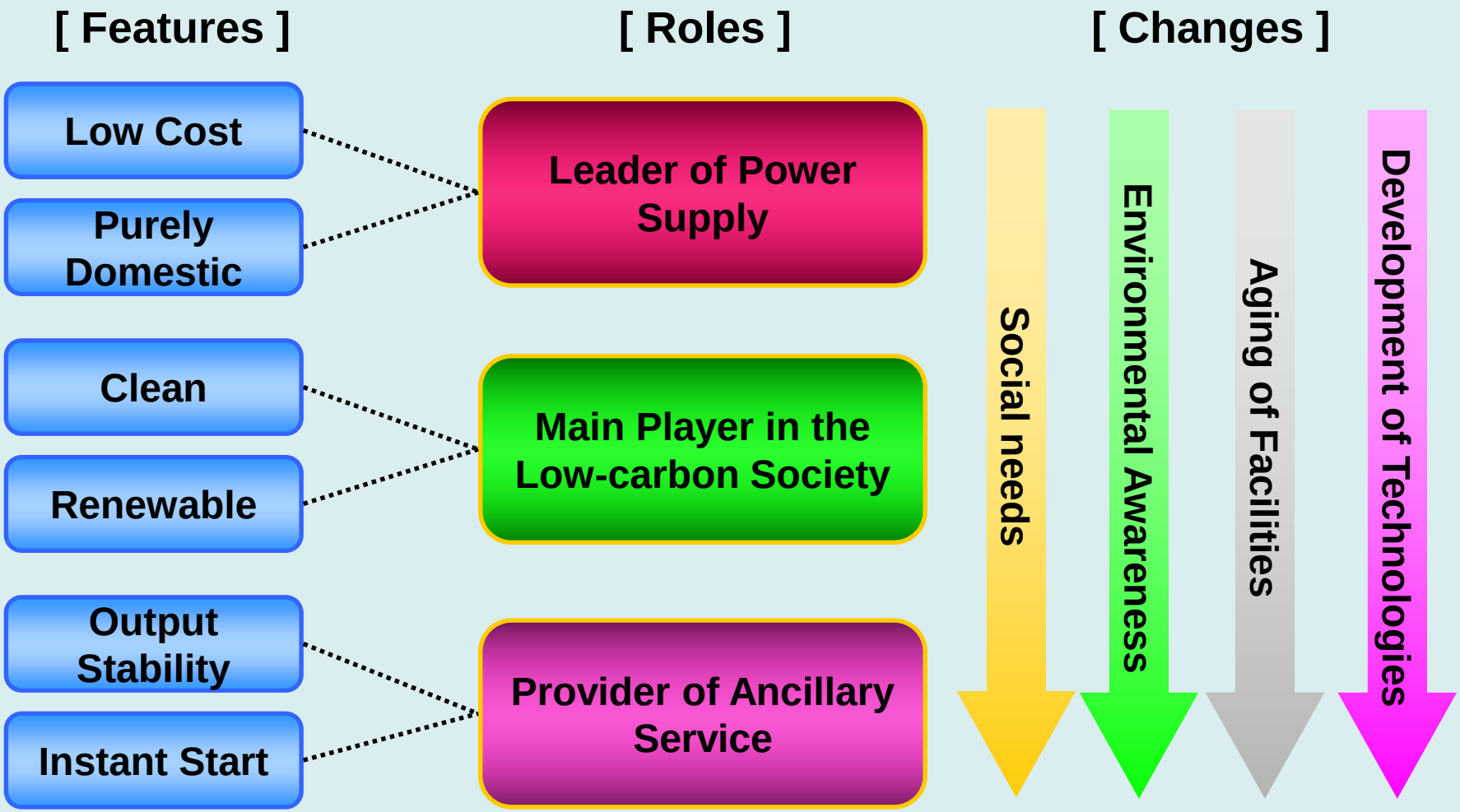
125-year-old

Present
4500kW

Utilizing the hydropower reflects God' will.

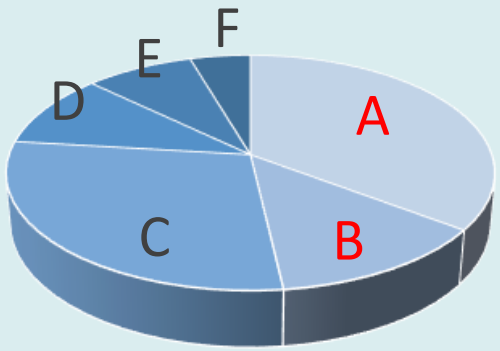
Owned by THE KANSAI ELECTRIC POWER CO., INC.

Roles of Hydropower in Japan



Trend of Trigger Causes

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

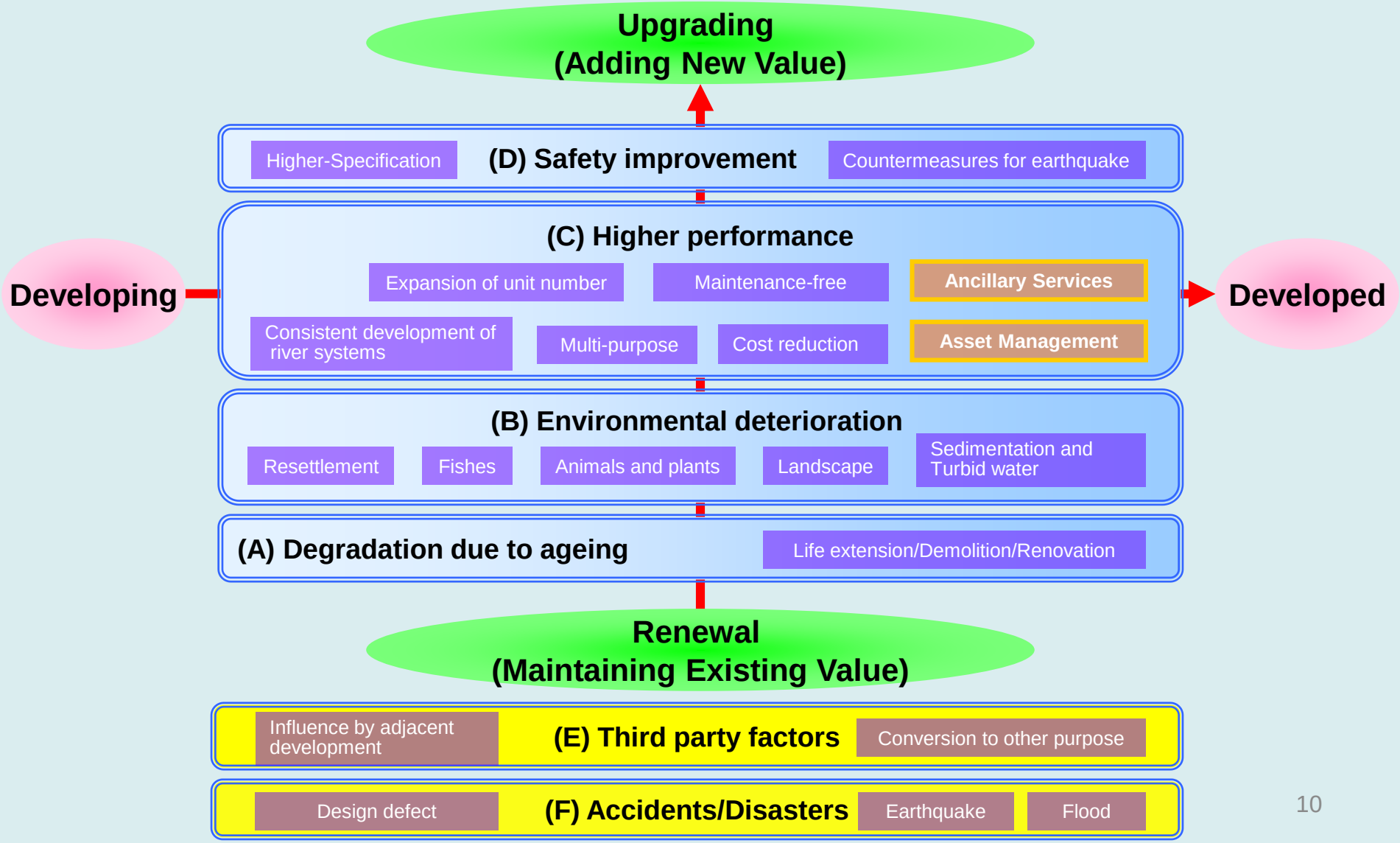


Screening

70 Case Histories from 10 Countries

Case History Collection

Trigger Causes to change depending on the times



Key Points to be focused and analyzed

◆Summary Report (Volume 1) ⇐ 78 pages

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

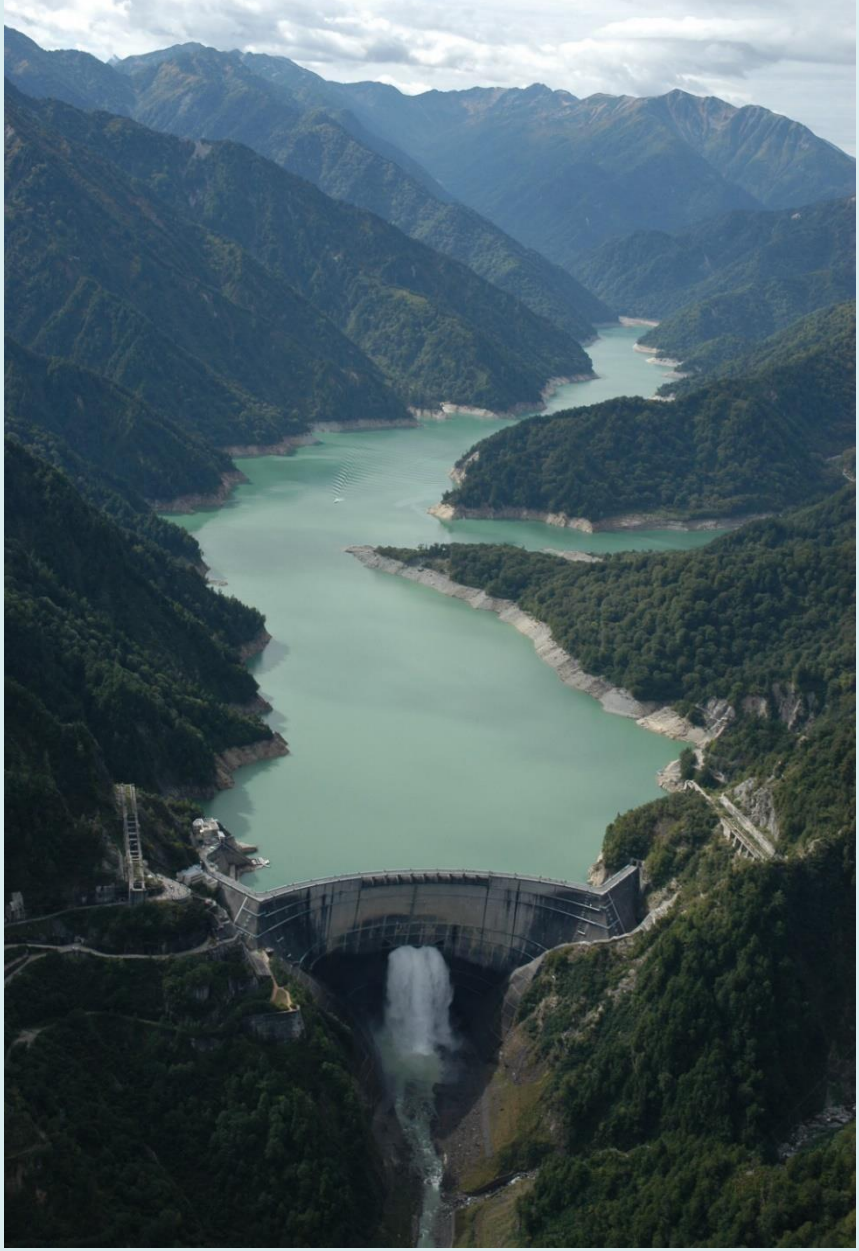
d) Integration of other renewable energies into hydropower systems

◆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