



IEA :Implementing Agreement for Hydropower Technologies & Programs
workshop, ANNEX-11,HydroVision International 2011 Sacramento, California : 18th July, 2011



WORKSHOP

on

Best Practices for Renewal and Upgrading
of Hydropower Facilities
to Maintain and Provide Value
to the Power System

HydroVision International 2011
Sacramento, California



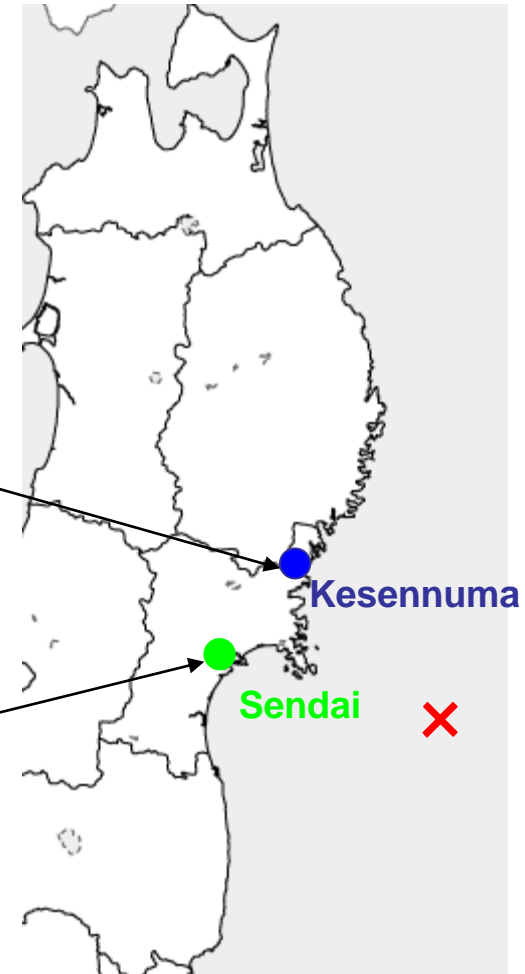
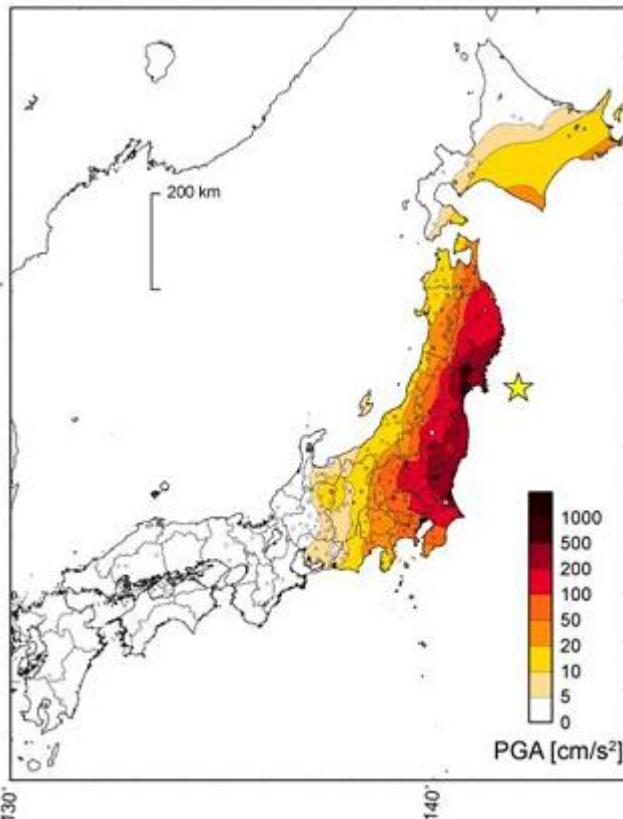
The Great East Japan Earthquake on March 11th 2011

- Unprecedented and complex disaster
 - Massive earthquake
 - Series of tsunami
 - Accident of nuclear power plant
- Resulted in
 - 15,506 people dead; 7,297 people missing
 - 105,074 houses destroyed; 112,405 people evacuated
 - Recovery and reconstruction work underway
- Received from many of you
 - words of condolences and encouragement
 - deployment of rescue team
 - relief supplies and funds

Deeply appreciated !

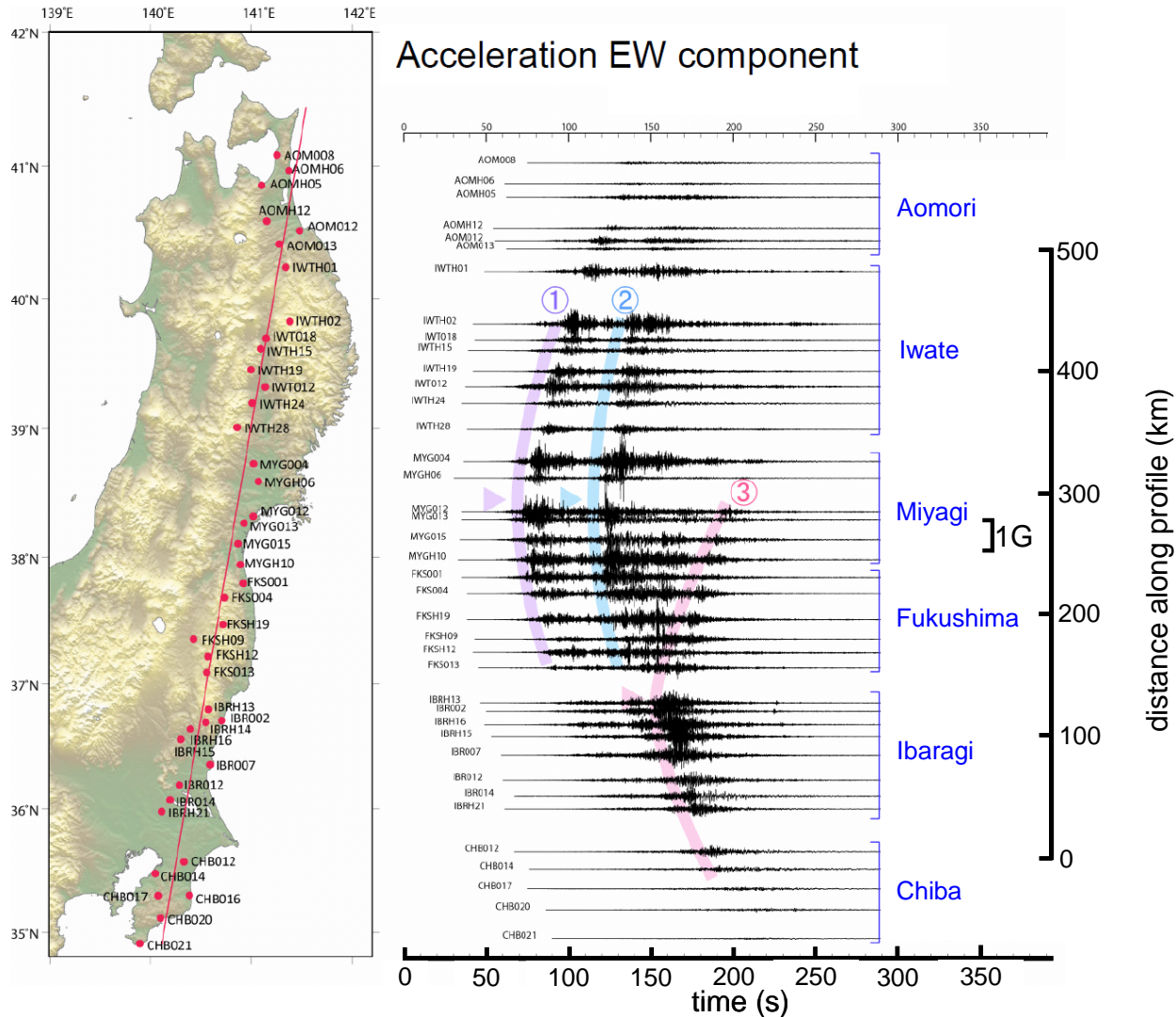
The Great East Japan Earthquake

- Date : Mar. 11, 2011
- Magnitude : 9.0
- Depth of earthquake center : 24km





Acceleration of the Earthquake

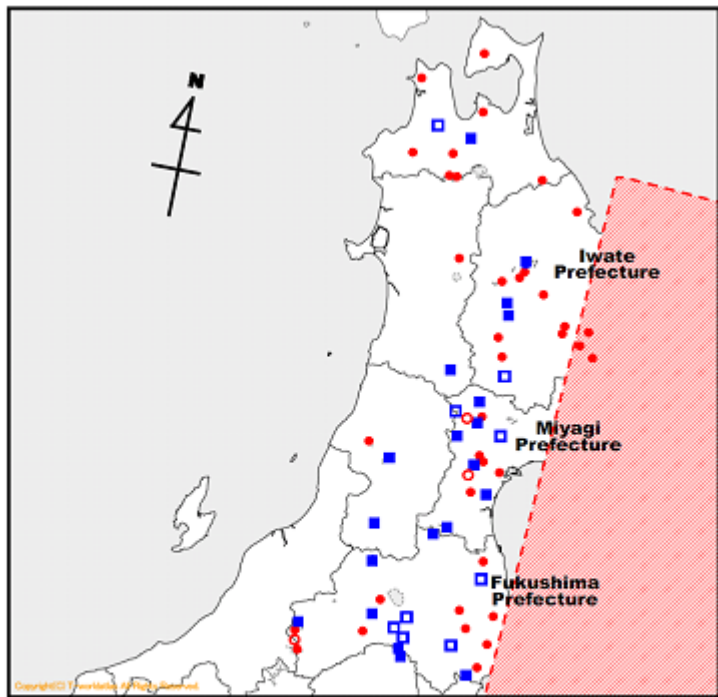




Damage by the Earthquake



Damage to Dam



Projection of fault surface (NIED Fault Model)

● Concrete gravity ○ concrete arch ■ Rockfill □ Earthfill

Inspection of dams after the main shock



| Jurisdiction (Number of dams) | Ower | Number of dams | |
|---|--------------|----------------|--|
| | | inspected | suffered unusual behavior* or damage (failure) |
| Ministry of Land, Infrastructure, Transport and Tourism (150) | Central Gov. | 46 | 11 |
| | Local Gov. | 104 | 8 |
| Ministry of Agriculture, Forestry and Fisheries (172) | Central Gov. | 51 | 4 |
| | Local Gov. | 121 | 23(1**) |
| Electric Power Companies (69) | Hokkaido | 8 | 0 |
| | Tohoku | 24 | 0 |
| | Tokyo | 29 | 1 |
| | J-Power | 7 | 1 |
| | Kansai | 1 | 0 |
| Total | | 391 | 48(1) |

*unusual behavior: small increase of leakage & uplift, nominal settlement and others

**The failed one was on a non regulated river.

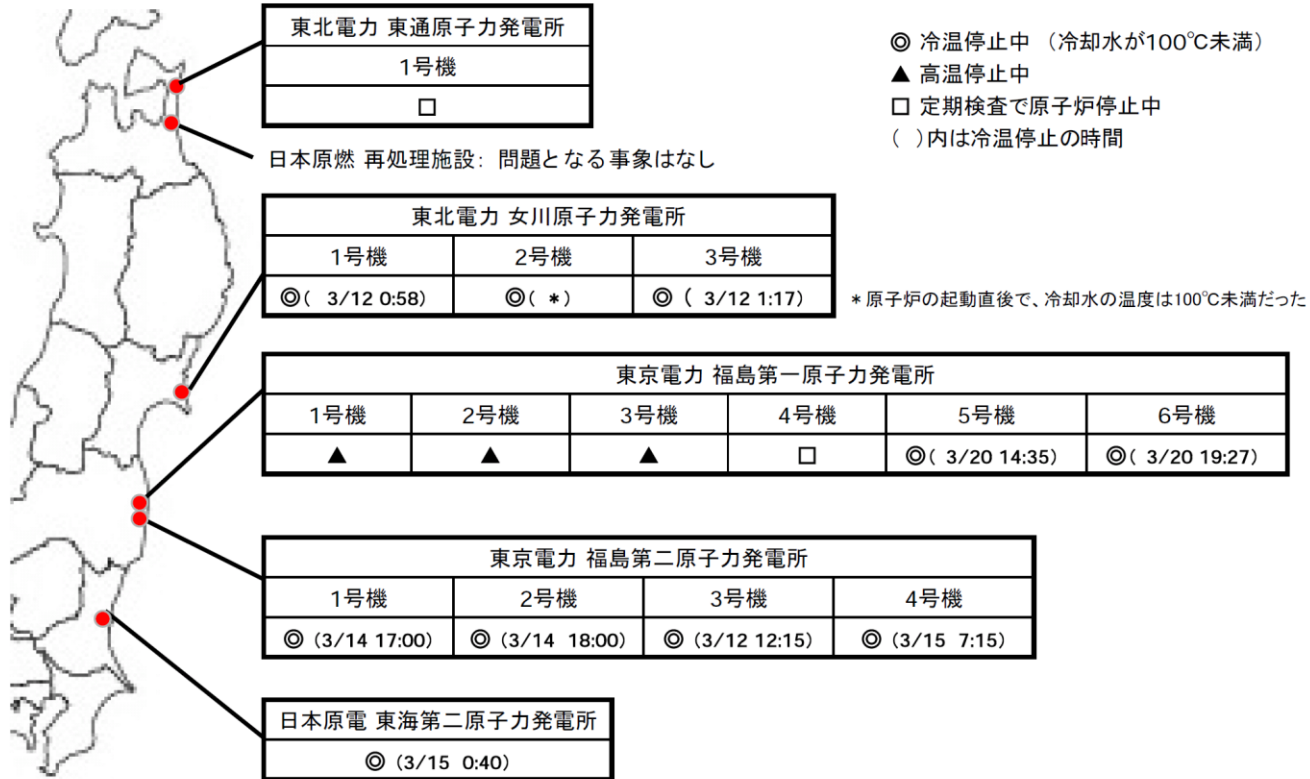


Damage to Thermal Power Plants

- 火力設備については、太平洋側では、津波による揚炭機の大破など大きな設備被害が発生。東京湾岸等の地域では、ボイラチューブ損傷等による被害が発生したが比較的短期間で復旧。
 - ・ 東北電力では、火力設備 1,099.6 万kWのうち(地震時 929.6 万kW運転中)、今回の地震・津波で 479.6 万kWが運転停止。現在 275 万kWが運転再開。
 - ・ 東京電力では、火力設備 3,864.5 万kWのうち(地震時 2,770.0 万kW運転中)、今回の地震・津波で 847.5 万kWが運転停止。現在 267.5 万kWが運転再開。

Damage to Nuclear Power Plants

東日本大震災の影響を受けた原子力施設の現状





New energy policy to be discussed in Japan and worldwide

➤ Who is the **main player** in the upcoming low carbon society?

- Nuclear power ?
 - More safety and reliability required?
- Wind power ?
 - Potential, Intermittency, Noise?
- Solar power ?
 - Cost, Intermittency, Only daytime?
- Hydro power ?
 - Potential, Cost, Environmental impact?
- Others ?



Feature of Hydropower

- Contribution to
 - Low carbon society
 - » Clean (emits no CO₂)
 - » Renewable
 - » Long life
 - Stability of power system
 - » By offering ancillary service
 - Energy security
 - » Stable
 - » Purely domestic
- Demerit
 - Environmental impact and high cost (by new development of large dam)



Main Objectives of Annex-XI

- First, existing hydropower plants to be well maintained to extend life

- Next, when feasible, existing hydropower plants to be renewed and upgraded

because;

- Less environmental impact
- Abundant technical data and information
- Hopefully, good relationship with local society
- Less cost and time

Scope of Annex-XI

- Further next, new development of hydropower plants



Key Points to realize the objectives

Category-1. Public Policies, Facilitation Measures, etc.

- a) Energy policies of Countries & States
- b) Investment incentives; Feed-in-Tariff (FIT),
Renewable Portfolio Standard (RPS),
Subsidies, Financial assistance, Tax deductions, etc.
- c) Integrated management of water resources and river systems
- d) Asset management, Life cycle cost analysis
- e) Non-monetary value of stabilization of unstable power system in the
up-coming low-carbon society
- f) Environmental conservation and improvement
- g) Assessment of non-powered dams, irrigation channels, etc.



Key Points to realize the objectives

Category-2. Modern Technologies, Systems, material, etc.

- a) E/M equipment in technology innovation & deployment expansion
- b) System Improvement for Protection & Control
- c) Civil and Building Works in technology innovation & deployment expansion, along with new material
- d) Integration with other renewable energies
- e) Others



Join this 1-day workshop to:

- Become aware of good case histories and modern technologies for the renewal and upgrading of ageing hydropower plants, including hydropower projects to provide ancillary services for the integration of intermittent wind and solar power generation
- Learn how to establish the economic values of water and energy services provided by multi-purpose hydropower projects beyond the generation of renewable electricity
- Collaborate with other industry experts to gain insight about upgrading existing hydropower plants and retrofitting existing non-powered dams
- Participate in the review of best practices being compiled by the U.S. Department of Energy Hydropower Advancement Project
- Get details on the activities of the International Energy Agency's Hydropower Implementing Agreement, Annex IX, and Annex XI, and find out how you can benefit from this work