

Workshop on  
Water Resources Management and Water-related Disaster Mitigation  
-innovative reservoir operation for flood risk mitigation-

# Rainfall Prediction System for the CuaDat Dam Basin

 KANSAI Electric Power Group

**MEC**

Meteorological Engineering Center, Inc.

# Summary

In order to operate the CuaDat dam more safely, we (MEC: Meteorological Engineering Center, Inc.) have developed a rainfall prediction system for the dam basin.

In this system, prediction information is updated every 6 hours and prediction lead time is 3 days(72 hours).

Output data of GFS (Global Forecast System) provided by NCAR (National Center for Atmospheric Research) of United States is used in the prediction. Spatial resolution of GFS is 50km.

WRF (Weather Research and Forecasting), which is mainly developed by NCAR, is also used in the system. By down-scaling through WRF, spatial resolution (grid size) is set from 50km to 15km and then to 5km in order to improve prediction accuracy in consideration of local topography.

The predicted results are displayed by (1)Table of predicted hourly rainfall data at the dam site and of the dam basin average, (2)Graph of predicted hourly rainfall data at the dam site and of the dam basin average, (3)Distribution of hourly rainfall.

At the present moment, a prototype of the system is experimentally operated in two servers of MEC, and the predicted data are browsed in the Internet web site. <http://meci.kir.jp/wld-hydro/vietnam/index.php>

We hope to verify accuracy of the above-mentioned prototype with observed rainfall data provided by the administrator of the CuaDat dam, and also plan to improve the software and then deliver the improved system to the administrator.

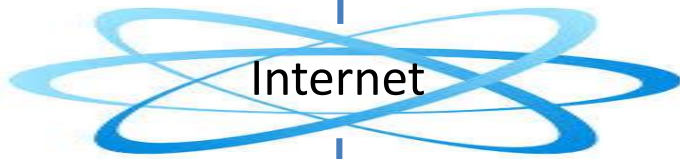
The system is possible to apply for every basin or local area. The system would be more useful for dam operation by connecting to a distributed runoff model.

# Specification

Item	Spec.
Input Data	GPV(Grid Point Value of 50km interval) of GFS(Global Forecast System) by NCAR(National Center for Atmospheric Research)
Lead time	72 hours (predict 72hours ahead)
Update	every 6 hours
Spatial Resolution	5km Downscaling (50km→15km→5km) through WRF (Weather Research & Forecast)
Output	Hourly Rainfall Data (Predicted Value is at each grid with 5km interval )
Display	browsed in the Internet web site

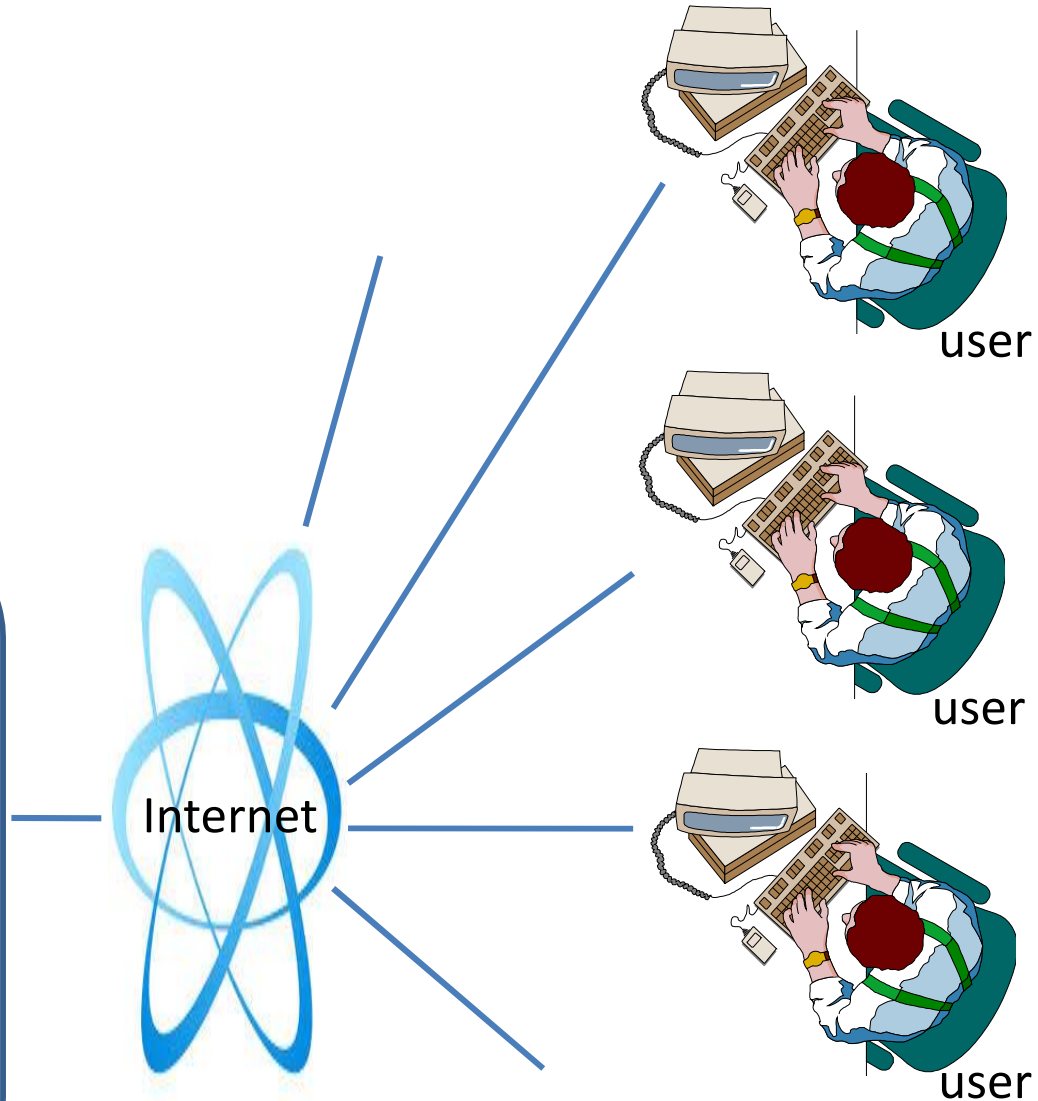
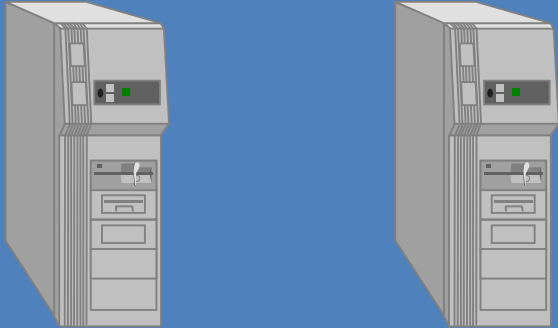
# Network

**NCAR**  
(National Center for Atmospheric Research)  
**GFS**  
(Global Forecast System)



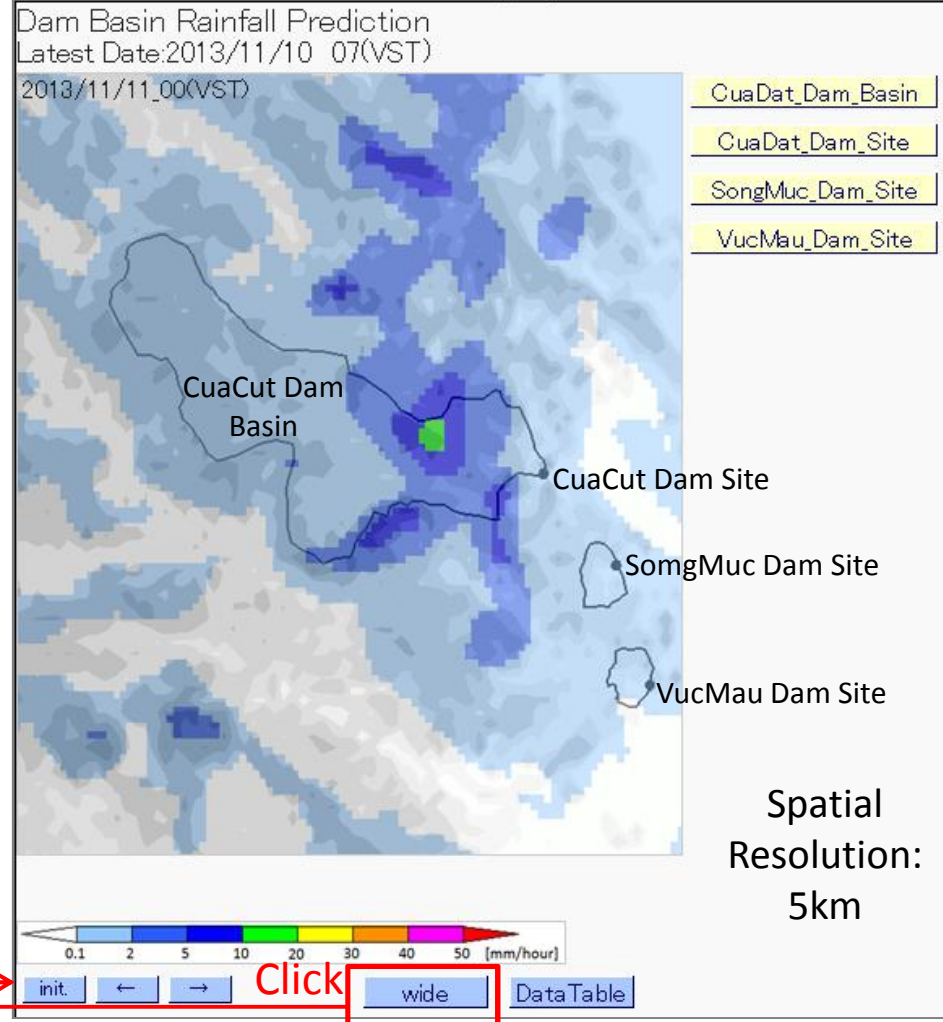
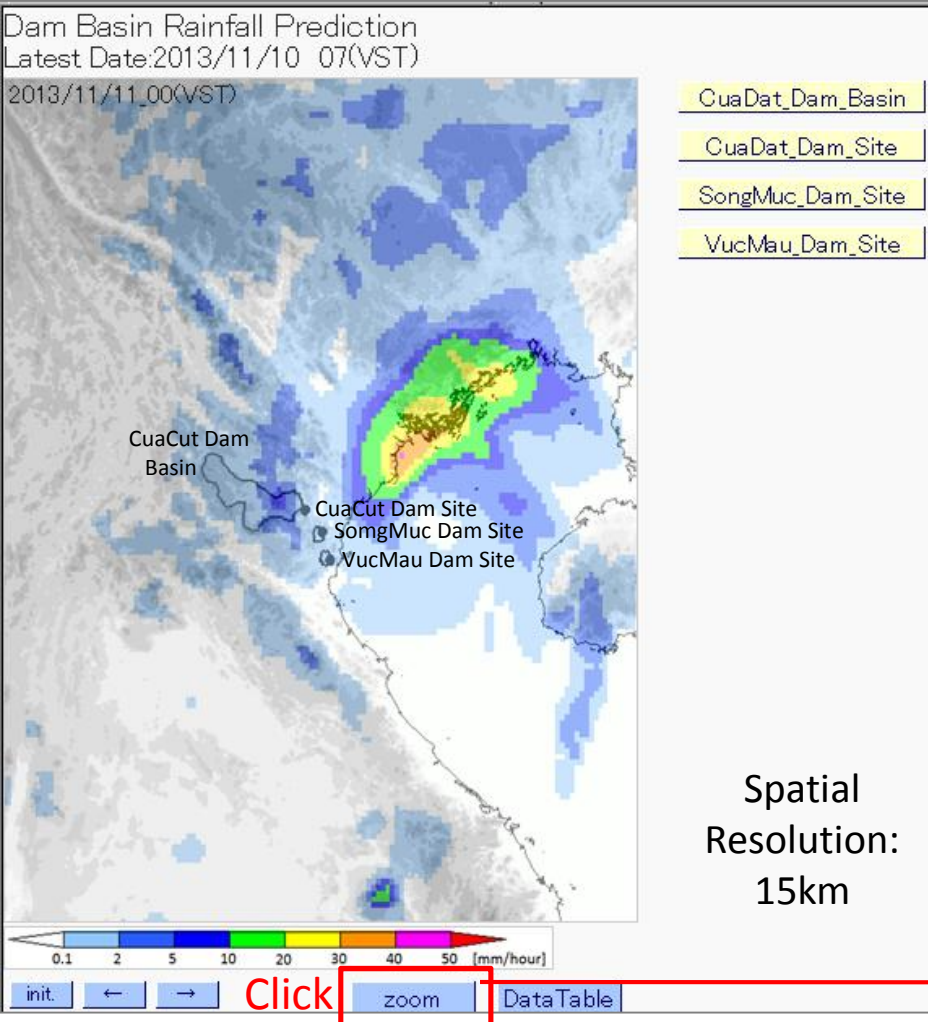
**WRF**  
Down-scaling  
(50km→15km→5km)

Calculation server      Web server



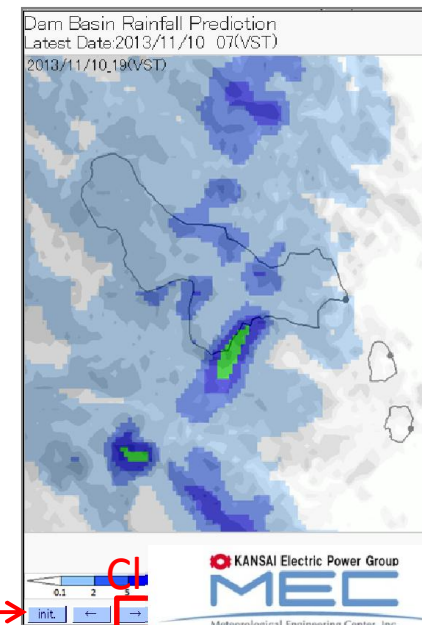
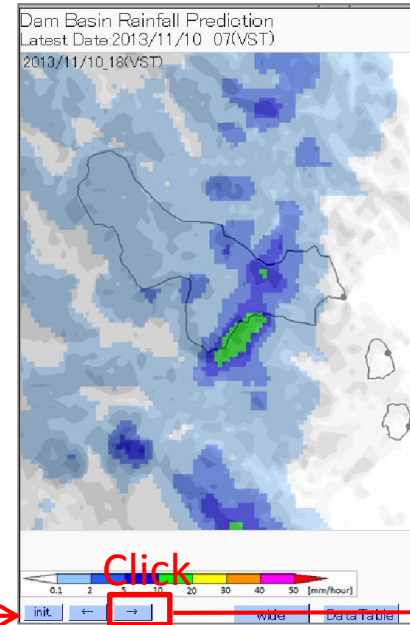
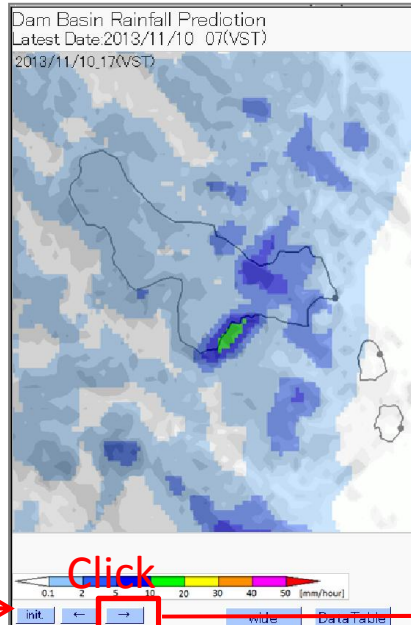
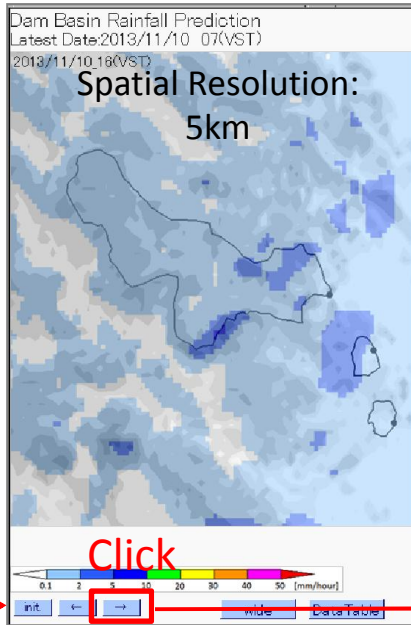
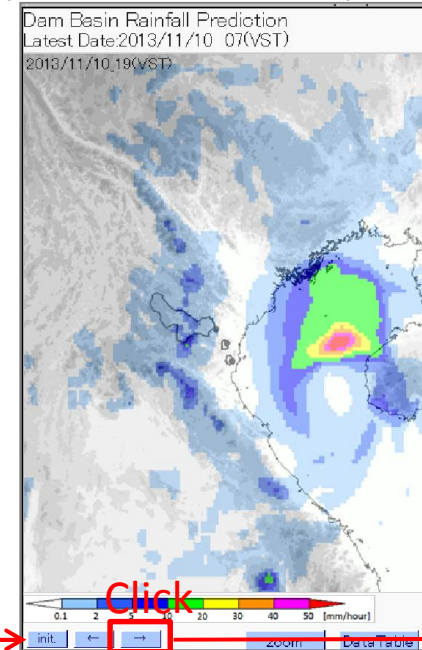
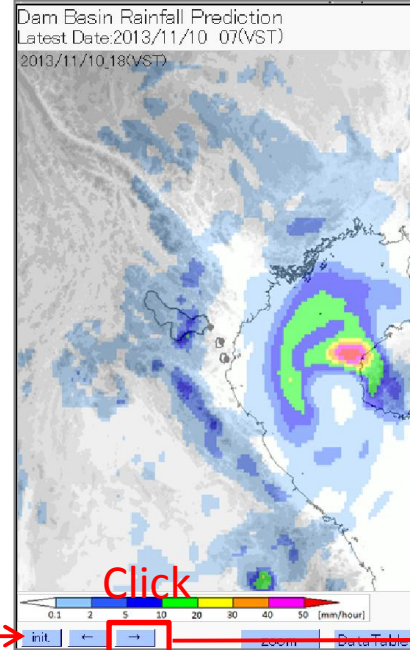
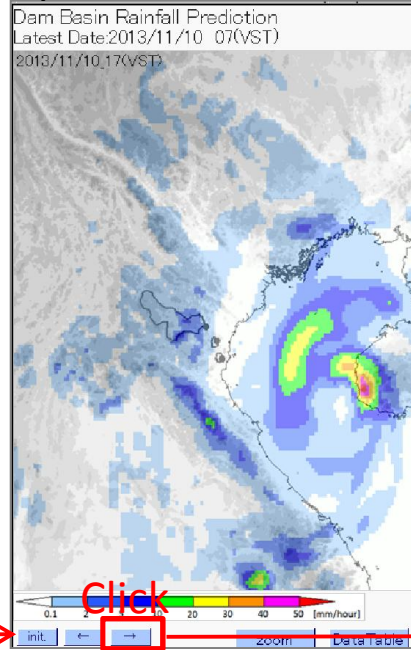
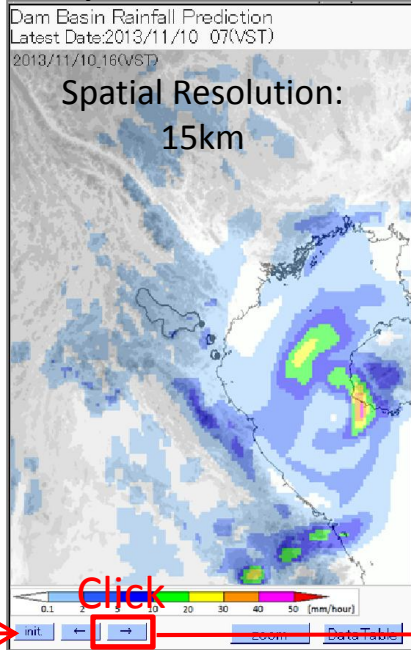
# Display (1/3)

Hourly Rainfall Distribution predicted at 2013/11/10 7:00, for 11/11 00:00 (17hours ahead)



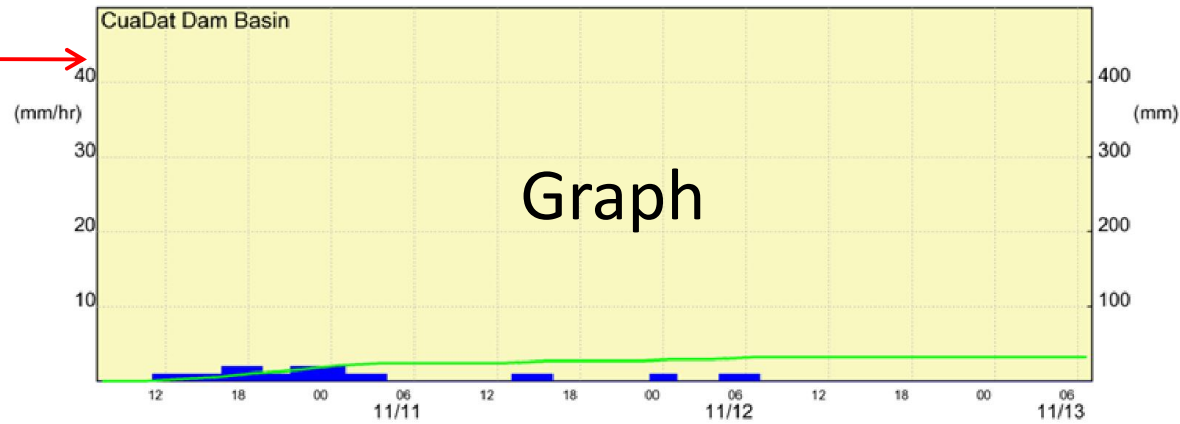
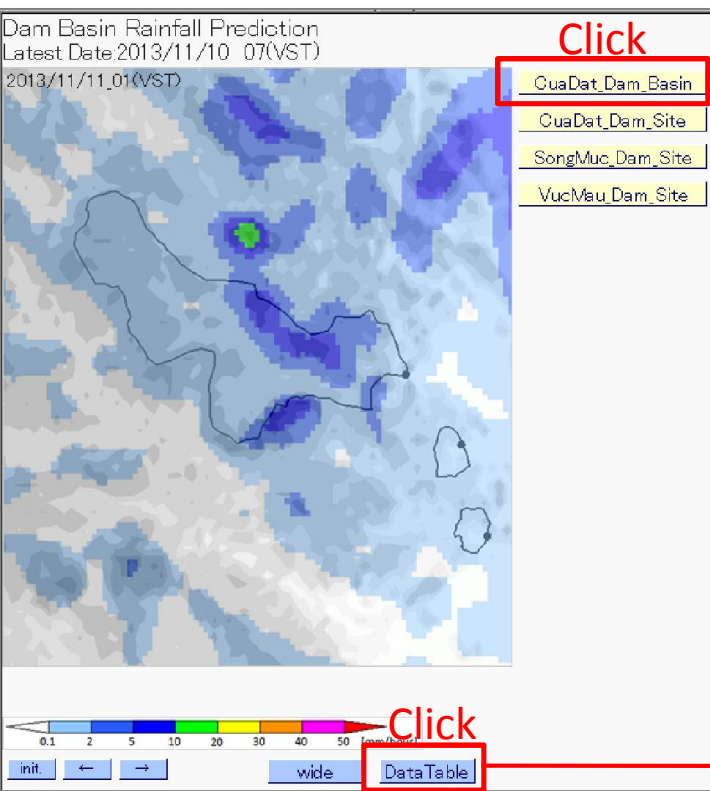
# Display (2/3)

Hourly Rainfall Distribution predicted at 11/10 7:00, for 11/10 16:00-19:00 (9-12hours ahead)



# Display (3/3)

Hourly Rainfall predicted at 11/10 7:00, for until 11/13 7:00 (72hours ahead)



Time	CuaDat_Dam_Basin		CuaDat_Dam_Site		SongMuc Dam Site		Vuc Mau_Dam_Site	
	Hourly	Acc.	Hourly	Acc.	Hourly	Acc.	Hourly	Acc.
11/10 08	0	0	0	0	0	0	0	0
11/10 09	0	0	0	0	0	0	0	0
11/10 10	0	0	0	0	0	0	0	0
11/10 11	0	0	0	0	0	0	0	0
11/10 12	1	1	0	0	0	0	0	0
11/10 13	1	2	0	0	0	0	0	0
11/10 14	1	3	0	0	0	0	1	1
11/10 15	1	4	1	1	2	2	2	3
11/10 16	1	5	1	2	2	4	0	3
11/10 17	2	7	2	4	0	4	0	3
11/10 18	2	9	0	4	0	4	0	3
11/10 19	2	11	0	4	0	4	0	3
11/10 20	1	12	0	4	0	4	0	3
11/10 21	1	13	0	4	0	4	0	3
11/10 22	2	15	1	5	1	5	0	3
11/10 23	2	17	1	6	1	6	0	3
11/11 00	2	19	0	6	1	7	0	3
11/11 01	2	21	0	6	0	7	0	3
11/11 02	1	22	0	6	0	7	0	3
11/11 03	1	23	0	6	1	8	0	3
11/11 04	1	24	0	6	1	9	0	3
11/11 05	1	25	0	6	1	10	0	3
11/11 06	1	26	0	6	1	11	0	3
11/11 07	1	27	0	6	1	12	0	3
11/11 08	1	28	0	6	1	13	0	3
11/11 09	1	29	0	6	1	14	0	3
11/11 10	1	30	0	6	1	15	0	3
11/11 11	1	31	0	6	1	16	0	3
11/11 12	1	32	0	6	1	17	0	3
11/11 13	1	33	0	6	1	18	0	3
11/11 14	1	34	0	6	1	19	0	3
11/11 15	1	35	0	6	1	20	0	3
11/11 16	1	36	0	6	1	21	0	3
11/11 17	1	37	0	6	1	22	0	3
11/11 18	1	38	0	6	1	23	0	3
11/11 19	1	39	0	6	1	24	0	3
11/11 20	1	40	0	6	1	25	0	3
11/11 21	1	41	0	6	1	26	0	3
11/11 22	1	42	0	6	1	27	0	3
11/11 23	1	43	0	6	1	28	0	3
11/11 24	1	44	0	6	1	29	0	3
11/11 25	1	45	0	6	1	30	0	3
11/11 26	1	46	0	6	1	31	0	3
11/11 27	1	47	0	6	1	32	0	3
11/11 28	1	48	0	6	1	33	0	3
11/11 29	1	49	0	6	1	34	0	3
11/11 30	1	50	0	6	1	35	0	3

**Table**

# Benefit & Cost

## Benefit

In dam operation, the system is useful for the followings;

- to prepare necessary works before flood control operation
- to operate spillway gates safely during flood control operation
- to decrease the downstream risk caused by a sudden or large discharge from spillway, by an advance warning for the downstream
- to increase electric power generation (kWh) by full and continuous operation of power plants before spillway discharge.

## Cost

The costs of the system are as follows.

- Initial cost: approximately  $\text{¥}5,000,000$ (JPY) = \$50,000(USD)
- Running cost: only the Internet's cost



# Schedule (Proposal)

YEAR てえ	2013	2014	2015	2016	2017-	notes
month	12	1 12	1 12	1 12	1	
Operate prototype						MEC is/will be doing it in MEC's servers with no fee. <a href="http://meci.kir.jp/wld-hydro/vietnam/index.php">http://meci.kir.jp/wld-hydro/vietnam/index.php</a>
Acquire observed data						Could MEC acquire past rain gauge records from the dam administrator?
Verify accuracy of prototype						If the above request is possible, MEC will do it with no fee.
Improve software						MEC will do it with no fee.
Check accuracy in real time						MEC is hoping the dam administrator would do it.
Install the improved system						MEC will do it to the dam administrator. Initial Cost is necessary.
Use system for dam operation						Running Cost is only the Internet's cost.

# Contact Address



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in MEC

THE KUROBE DAM (Height=186m)

The Highest dam in Japan, constructed, operated and owned by The KANSAI Electric Power Co., Inc.



Disaster Prevention Research Institute  
Kyoto University

Thank you

 KANSAI Electric Power Group

**MEC**

Meteorological Engineering Center, Inc.