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HISTORY OF WATER CRISIS IN THAILAND AND ITS PREPARATION FOR THE 2015 DROUGHT


Cr: Nation Channel

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HISTOIRE DE LA CRISE DE L'EAU EN THAÏLANDE ET SA PRÉPARATION POUR LA SÉCHERESSE 2015


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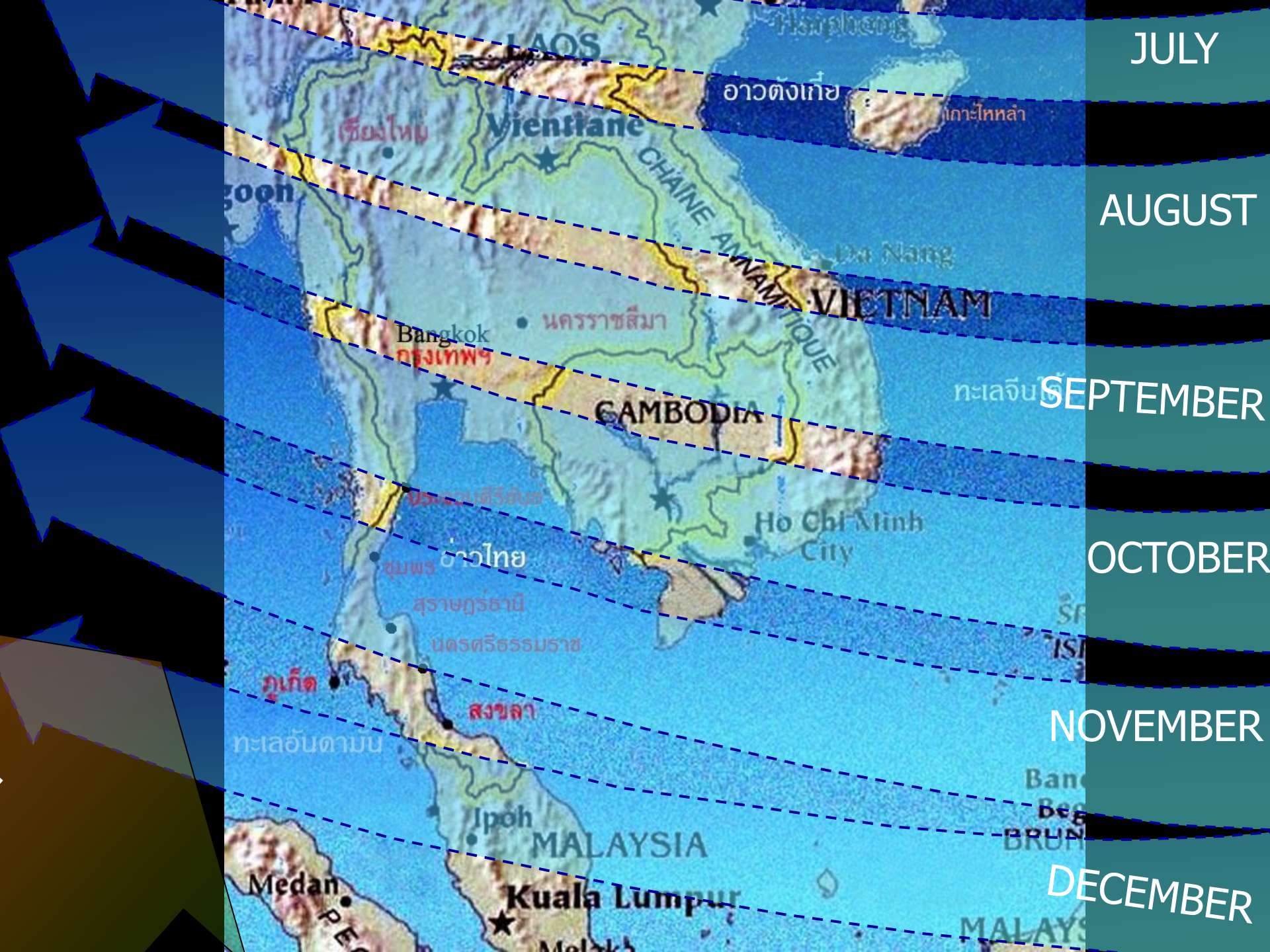

JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
LAOS
Vientiane
CHAÎNE ANNAMITIQUE
VIETNAM
Da Nang
Bangkok
CAMBODIA
Ho Chi Minh City
MALAYSIA
Ipoh
Medan
Kuala Lumpur

Mean Monthly Rainfall in Thailand

30-year period : 1981-2010

(mm)

CHAO PHRAYA BASIN

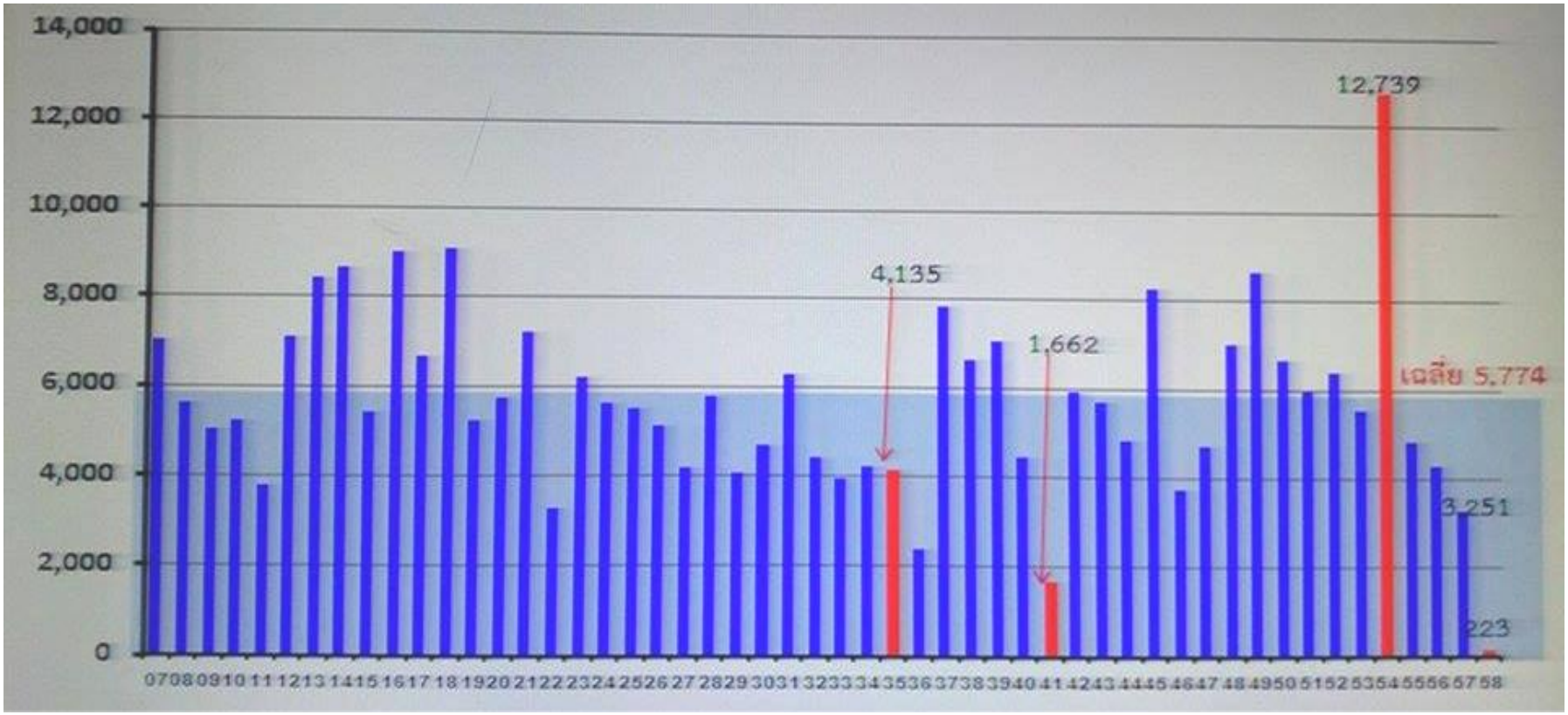
Source Rivers :

Ping, Wang, Yom and Nan in Northern Thailand


Ping River
Wang River
Yom River
Nan River
Mae-Ngat Dam
Kewkhoma Dam
Kewlom Dam
Maeguang Dam
Sirikit Dam
Kwaenoi Dam
Pasak River
Bhumipol Dam
Sakaekrang River
Tabsalao Dam
C 2
Chao Phraya Dam
Pasak Dam
Kraseao Dam
Rama VI Dam
Gulf of Thailand

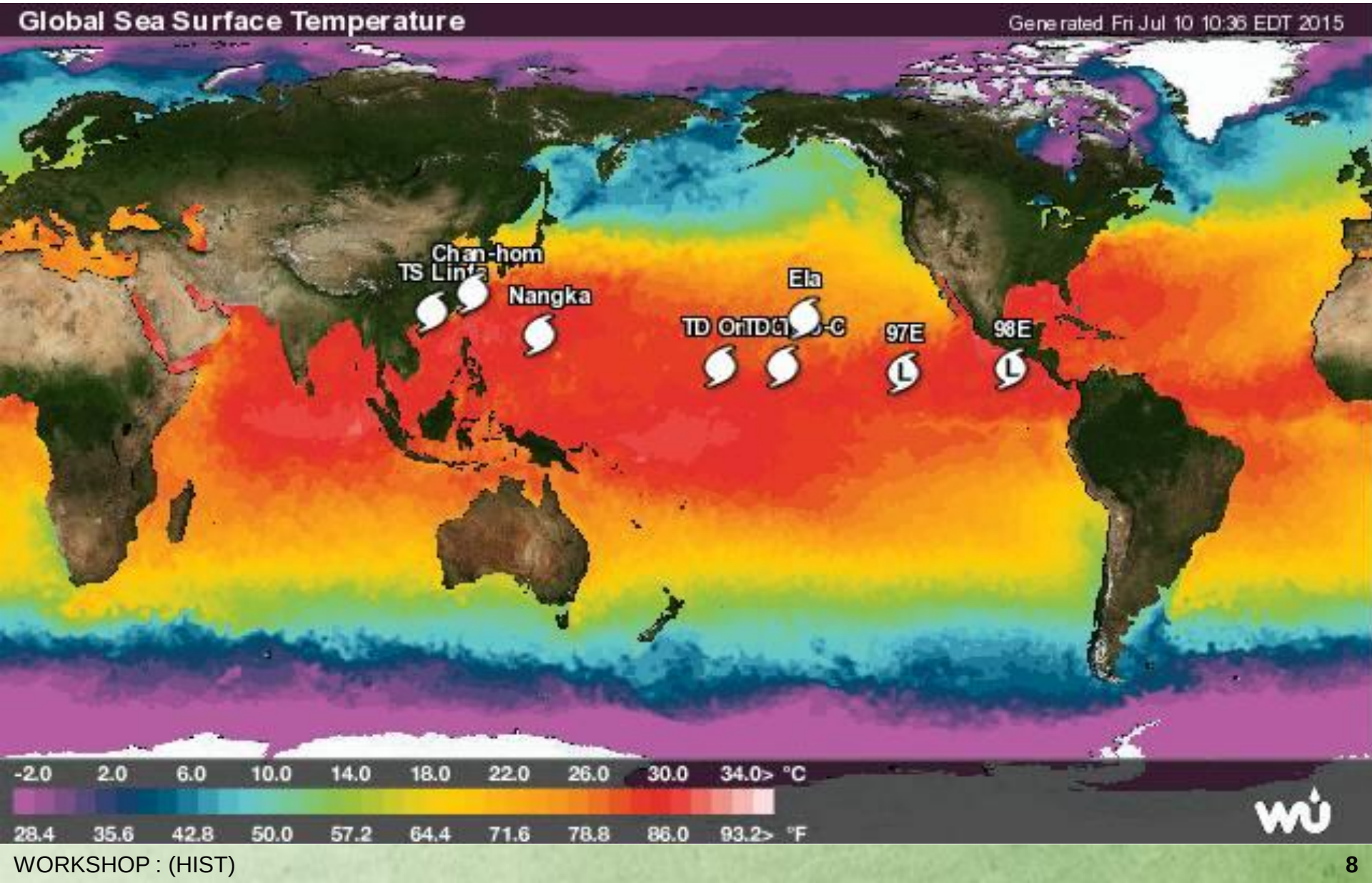
Yearly Inflows into Bhumibol Dam

Unit : MCM.



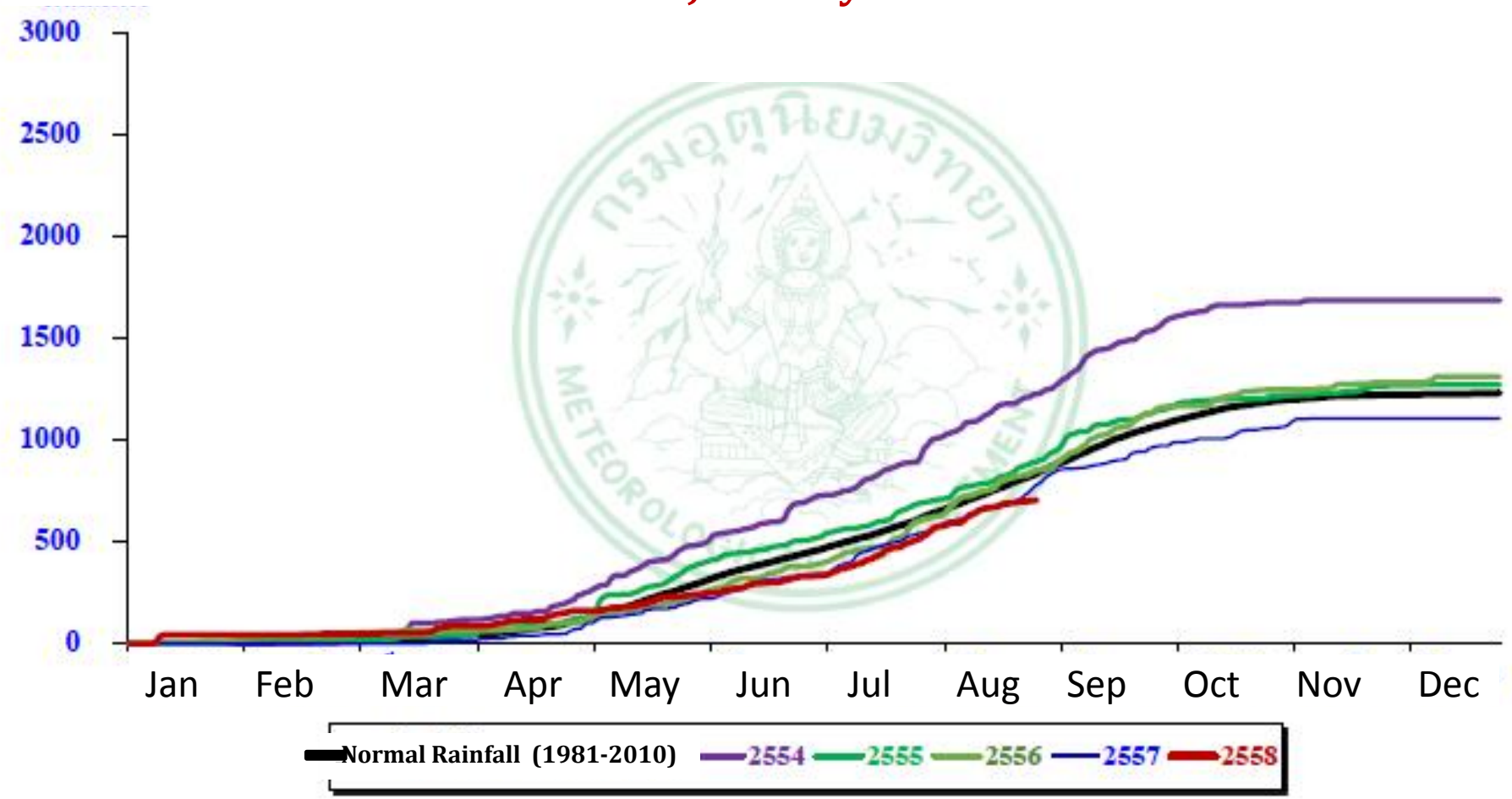
Year

Global Sea Surface Temperature



Accumulated Rainfall in the North Region

Since 1st January – Present



Accumulated Rainfall in the Central Region

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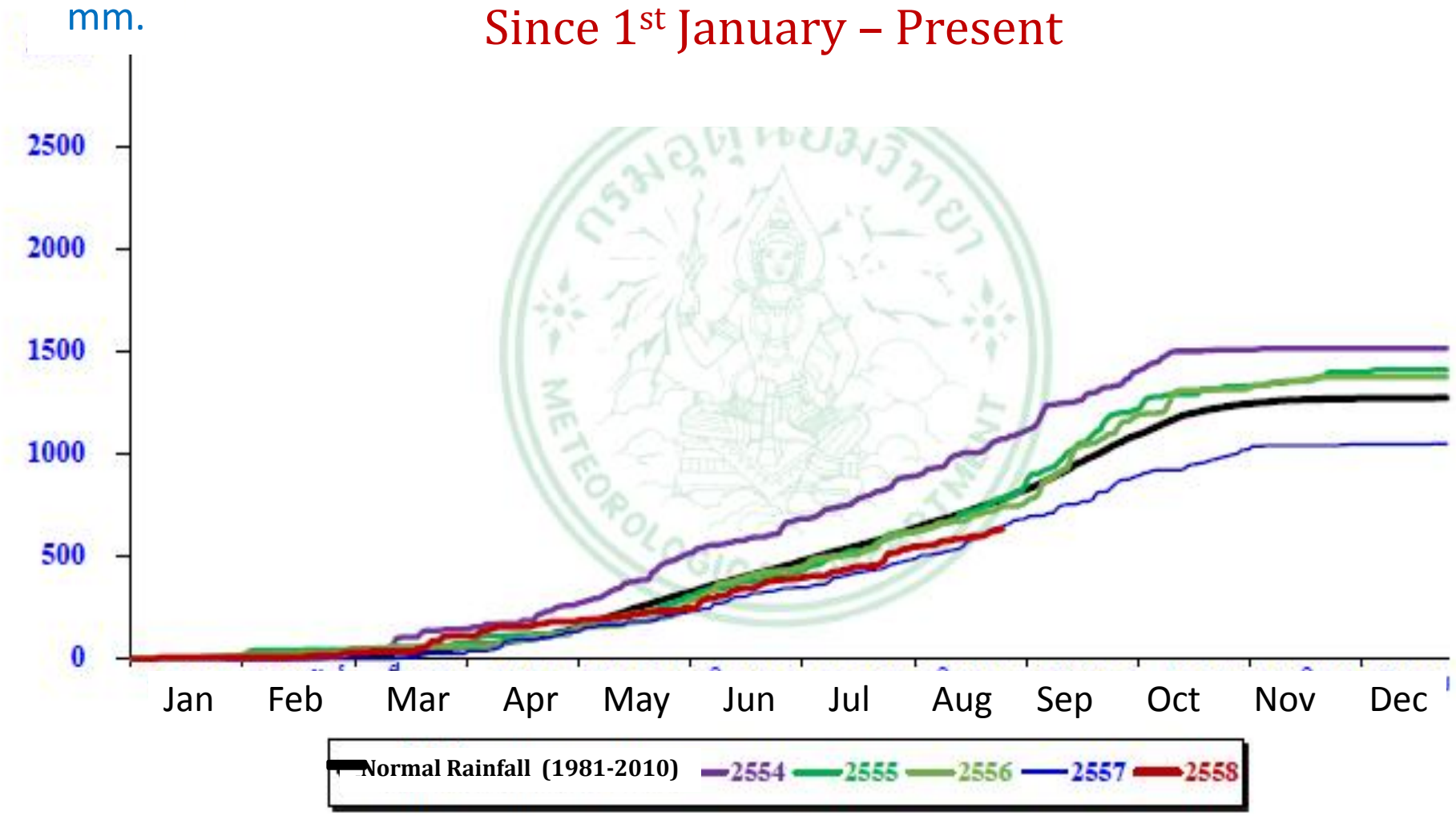
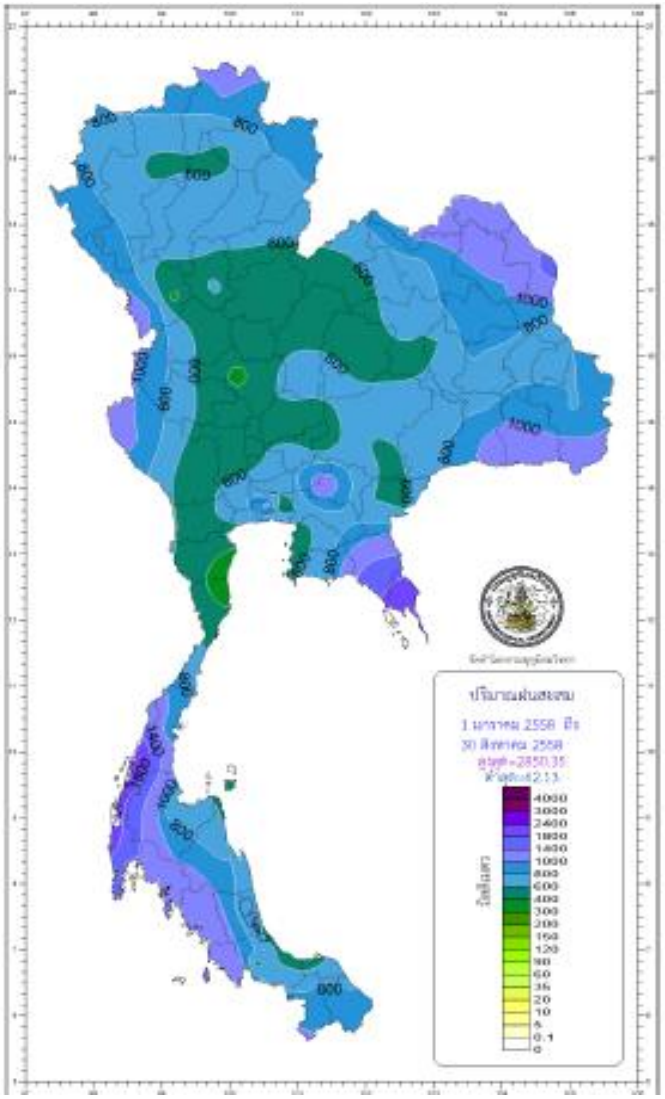
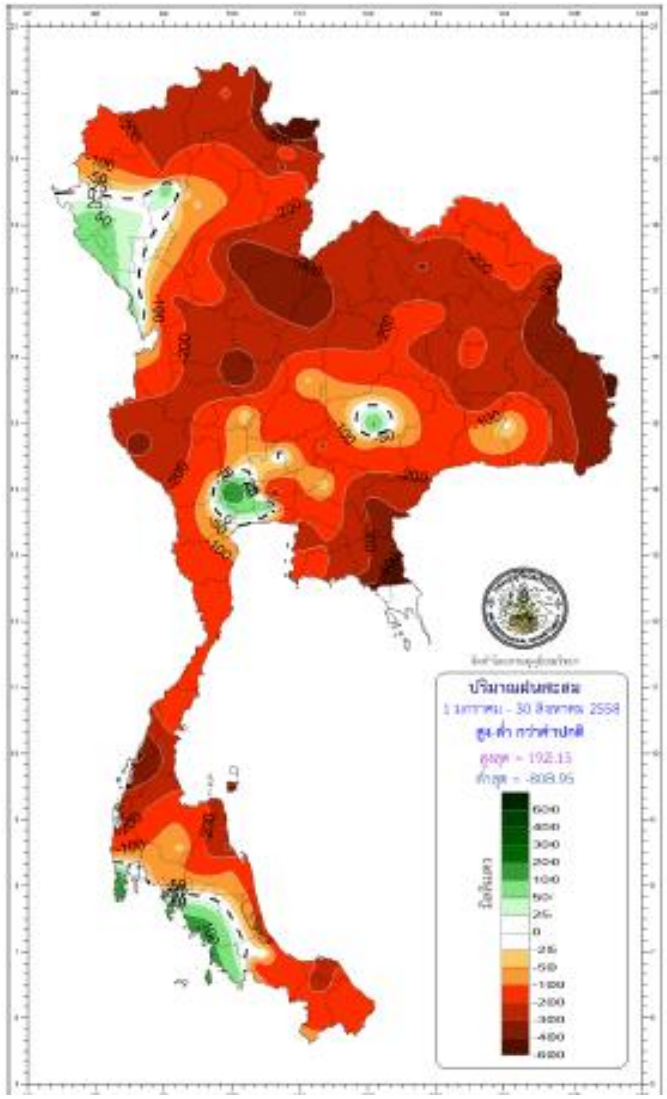


Rainfall in 2015 compared with the Normal Rainfall in 1981-2010

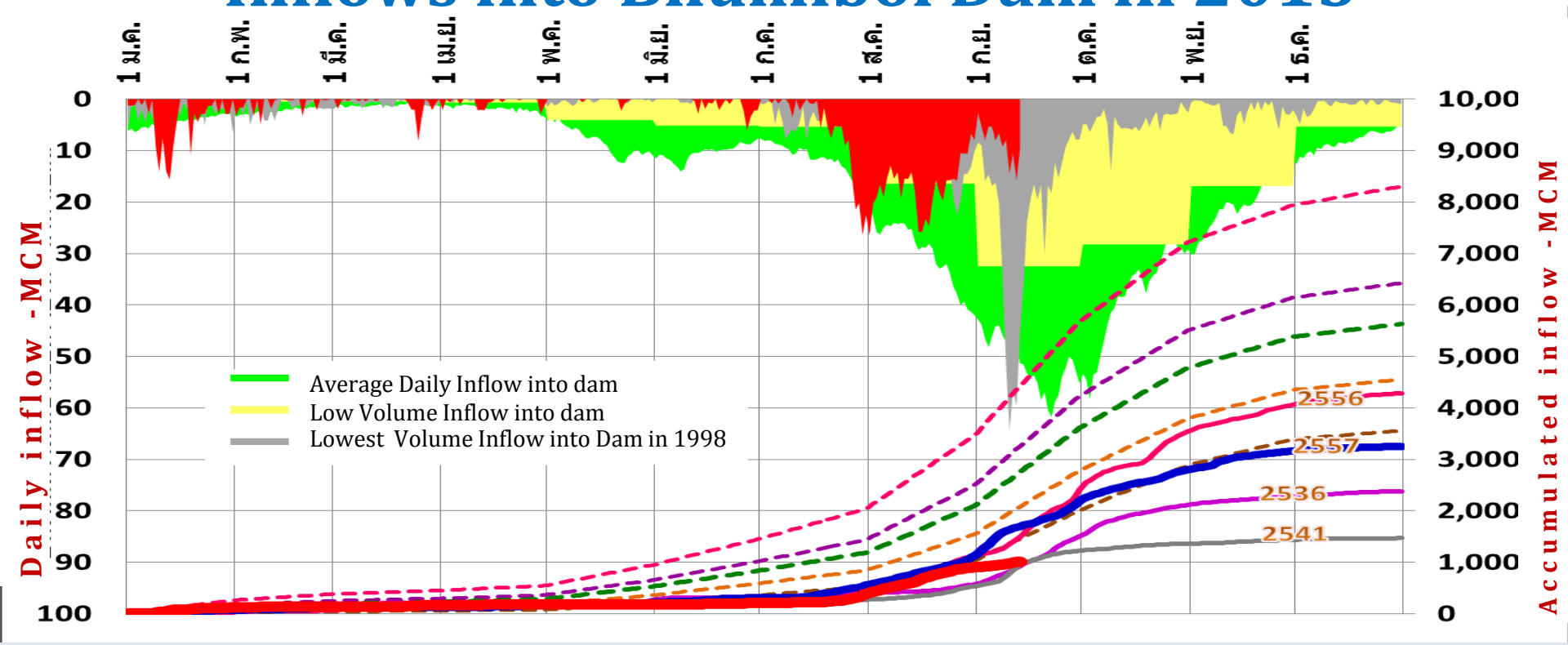




CPC/IRI Early-Month Consensus ENSO Forecast Probabilities

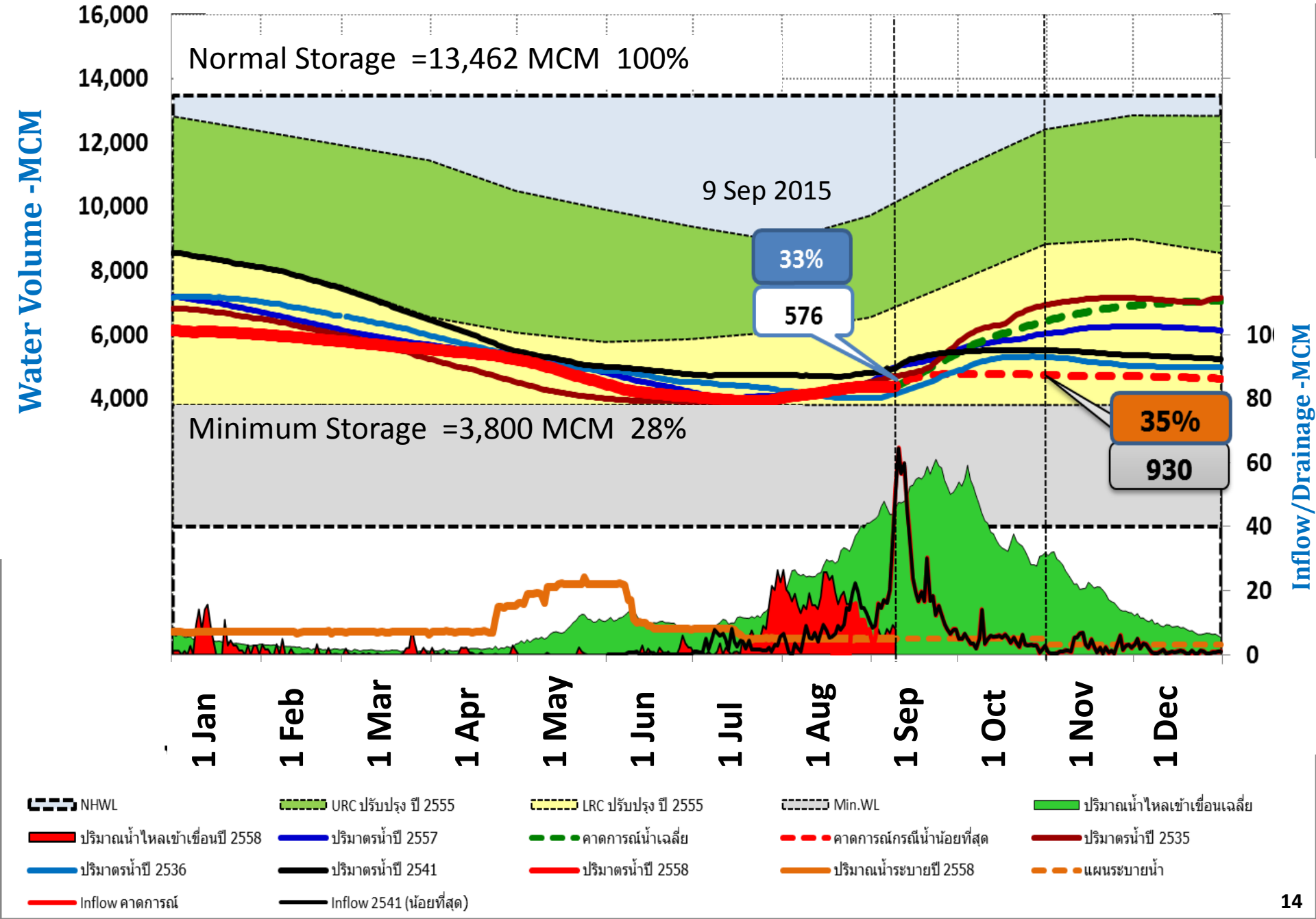
Season	La Niña	Neutral	El Niño
JAS 2015	~0%	~0%	100%
ASO 2015	~0%	1%	99%
SON 2015	~0%	1%	99%
OND 2015	~0%	1%	99%
NDJ 2015	~0%	2%	98%
DJF 2015	~0%	5%	95%
JFM 2016	1%	7%	92%
FMA 2016	2%	13%	85%
MAM 2016	2%	28%	70%

Inflows into Bhumibol Dam in 2015

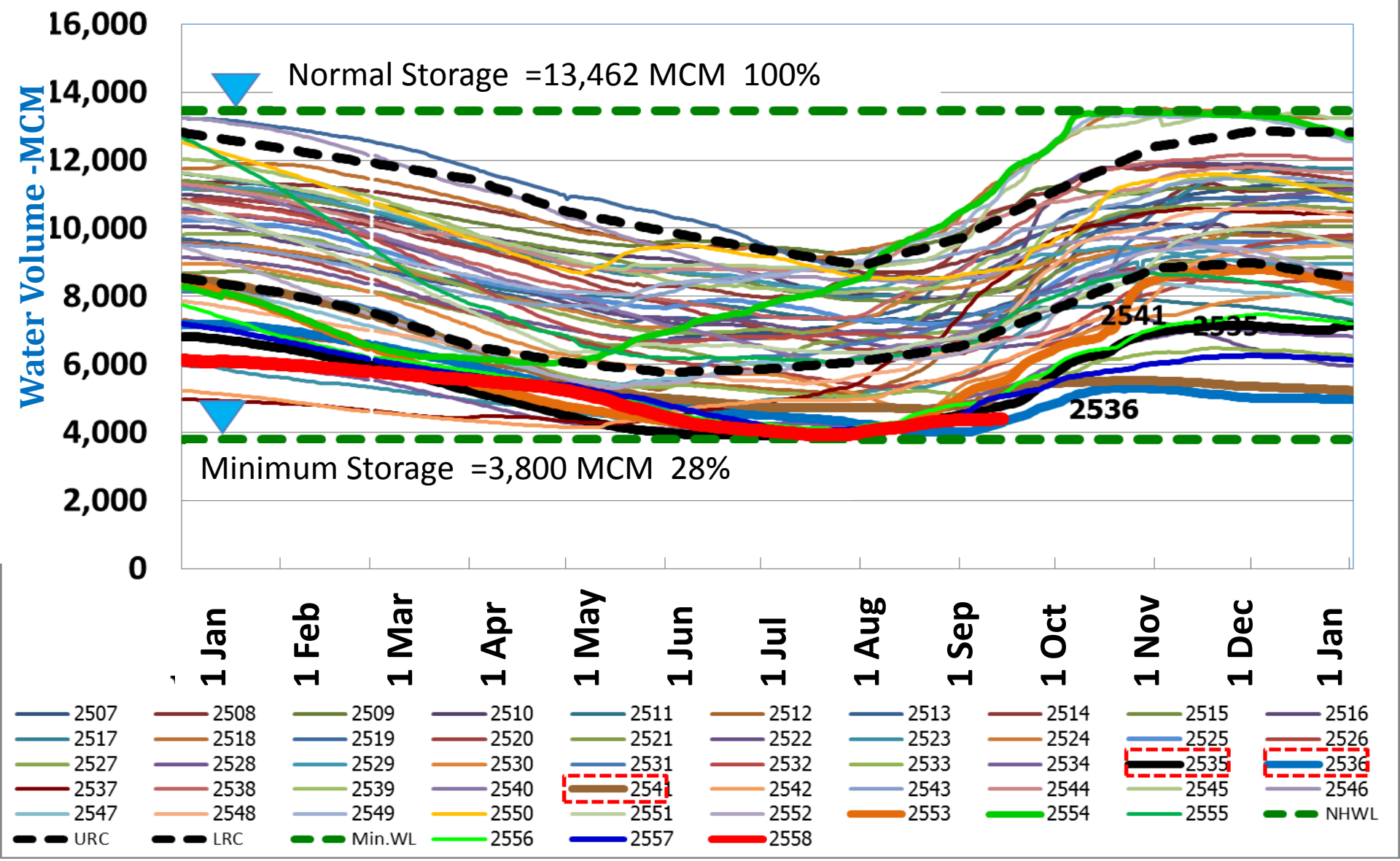


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
ค่าเฉลี่ย	136	63	39	54	253	312	367	922	1,539	1,205	605	256	5,750
2530	104	30	12	46	43	224	19	893	1,246	979	793	268	4,658
2535	102	25	5	0	1	31	143	611	1,305	1,208	353	351	4,135
2536	151	32	31	0	49	68	73	174	925	612	164	102	2,382
2541	80	51	27	2	13	4	99	262	690	137	69	36	1,470
2557	67	39	14	35	63	90	245	577	1,050	619	361	89	3,250
2558	117	23	24	16	4	27	170	524	109*				1,014*
เทียบกับค่าเฉลี่ย	-14%	-63%	-39%	-70%	-98%	-91%	-54%	-43%	หน่วย %				
เทียบกับปี 41	46%	-54%	-13%	880%	-68%	542%	73%	100%	หน่วย %				
	37	-28	-4	15	-9	23	72	262	หน่วย ล้าน ลบ.ม.				368*

Water Situation of Bhumibol Dam in 2015



Water Volume in Bhumibol Dam



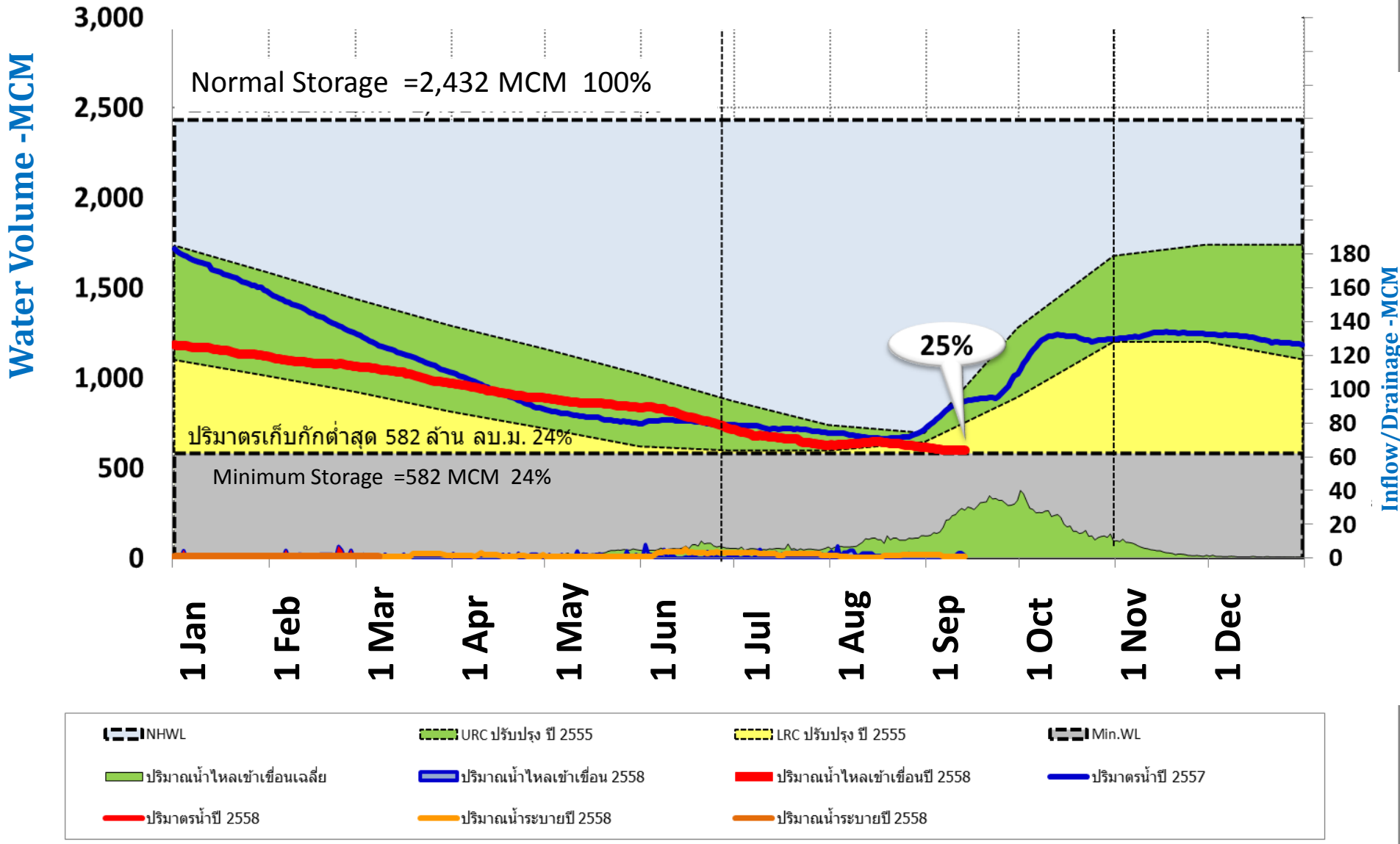

NATION
PHOT

Water Forecast for Bhumibol and Sirikit Dams

After rainy season on 31 October 2015

Dry Season (Nov.-Apr.)	Available Amount 1 Nov. MCM	Plan Release MCM	Actual Release MCM	More/Less than Plan	Availablel Amount 1 May MCM
2536/**37**	2,835	2,000 *	1,893	-107	1,721
2541/**42**	4,518	3,000 *	2,711	-289	2,682
2547/**48**	11,070	7,130	7,231	101	3,340
2548/**49**	12,025	6,000	7,152	1,152	6,594
2549/**50**	16,099	8,500	9,647	1,147	7,961
2550/**51**	12,211	7,000	9,510	2,510	3,966
2551/**52**	10,736	8,000	9,139	1,139	3,728
2552/**53**	8,720	6,000	7,656	1,656	1,703
2553/**54**	9,627	6,800	6,873	73	4,187
2554/**55**	16,238	11,865	13,276	1,411	5,129
2555/**56**	8,612	6,800	7,192	392	2,418
2556/**57**	6,343	3,000	4,792	1,792	2,794
ปี 2557/**58**	**5,216**	**1,900***	**2,950**	**1,050**	**3,351**
ปี 2558/59	**2,507**	Inflow into dam BB = 2541, SK = 2530 Drainage from SK in Sep. =9 MCM/day, Oct. = 5 MCM/day			
	Decrease from a previous forecast 150 MCM				
Average (exclude 2011)	**10,066**	**6,113**	**7,214**	**1,101**	**4,004**

Water Situation of Ubolrat Dam in 2015



Mitigation Plan for 2015-2016

- Adjust cropping schedule for wet season rice
- Delay of not planting paddy area
- No dry season crop of rice
- Minimum release from reservoirs
- Digging of shallow wells
- Artificial rain making

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Weather modification by artificial rain making

US 20050056705A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2005/0056705 A1**

(43) **Pub. Date: Mar. 17, 2005**

Bhumibol Adulyadej

(54) **WEATHER MODIFICATION BY ROYAL RAINMAKING TECHNOLOGY**

(76) Inventor: **His Majesty King Bhumibol Adulyadej**, Bangkok (TH)

Correspondence Address:
The Office of His Majesty's Principal Private Secretary
BANGKOK 10200 (TH)

(21) Appl. No.: **10/662,145**

(22) Filed: **Sep. 15, 2003**

Publication Classification

(51) **Int. Cl.**[7] **E01H 13/00**

(52) **U.S. Cl.** **239/2.1**

(57) **ABSTRACT**

Process of rainmaking and moving cloud using 'Royal Rainmaking Technology' is described for weather modification by means of chemical seeding comprises steps of "Triggering", to activate cloud formation; "Fattening", to promote cloud growth; "Moving", to move cloud to a designated area, and "Attacking" to initiate rainfall from cloud. Attacking can be done by at least 3 different techniques; by 'Sandwich Seeding Technique' for 'warm cloud', by 'Glaciogenic Seeding Technique' for 'cool cloud', or by 'Super Sandwich Seeding Technique' for mixed phase cloud. 'Enhancing' is for enhancing amount of rainfall and prolonging raining duration including increasing area coverage. Weather modification extends to dispersion of cloud into clear flight path, prevention of hail formation, and inducing rainfall from stratiform clouds onto a valley or any catchment areas. Seeding may be performed inside or outside a cloud or to the top or underneath any isolated cloud or cloud band.

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3 Steps of Royal Rainmaking Process

1st Step	Triggering	• using chemicals to stimulate more cloud density
2nd Step	Fattening	• the rain clouds to grow up and make water droplets condense
3rd Step	Attacking	• flying the plane into the impregnated clouds, to further modify the surroundings and speed up the process.

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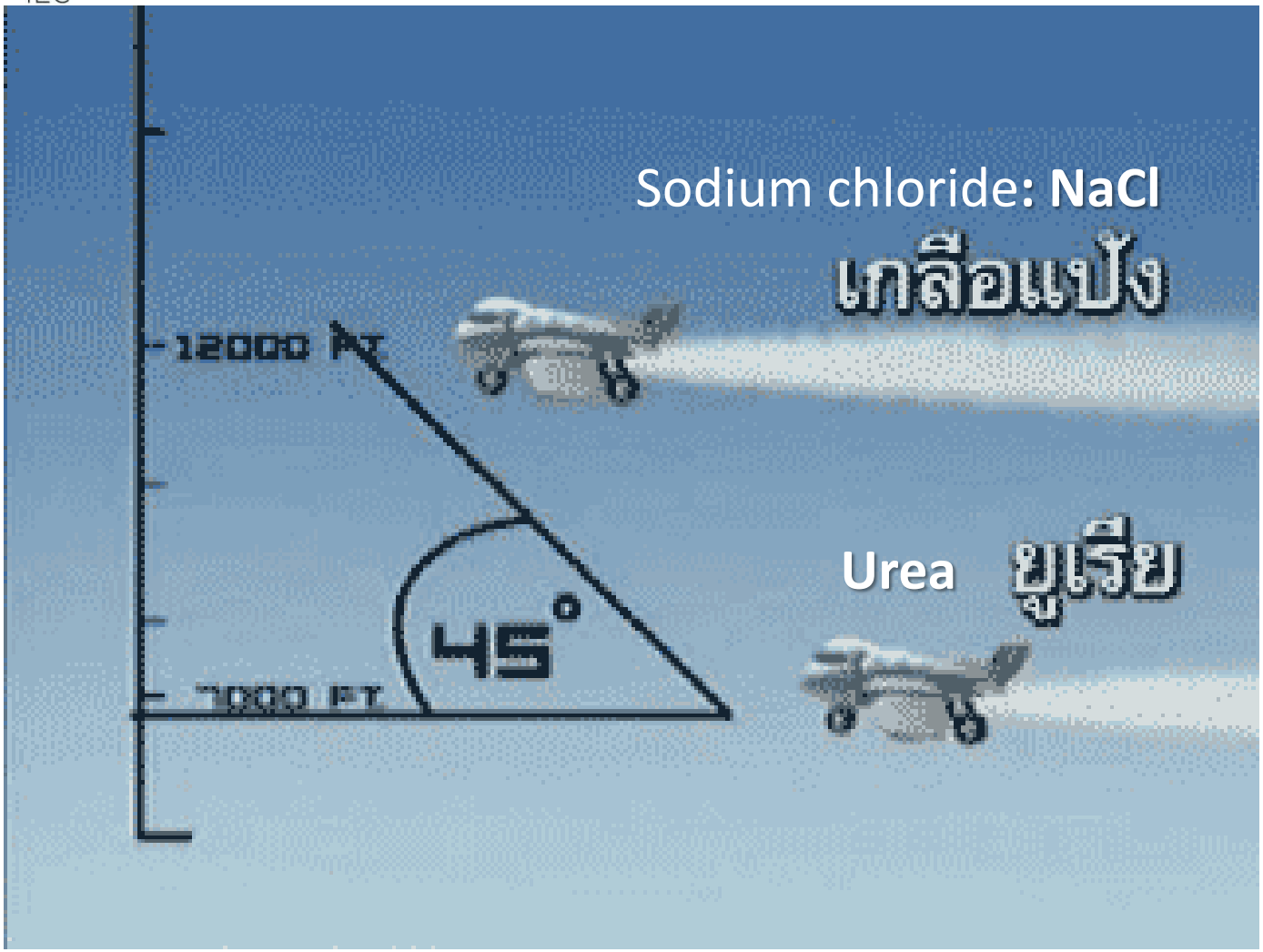
Fattening the scattered clouds to be more density

Seeding chemicals



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Attacking Mixed (warm and cool) cloud by cloud seeding technique called 'Super Sandwich Technique'

เครื่องบิน Super King Air (แบบเย็น) Super King Aircraft (Cool cloud)

ปล่อยสารซิลเวอร์ไอโอไดด์ บริเวณยอดแบบ
ระดับความสูงประมาณ 20,000 ฟุต

Seeding silver iodides at the top clouds of the high level about 20,000 ft.

Casa aircraft (Warm cloud)

เครื่องบิน Casa (แบบอุ่น)

โปรยสารเคมีโซเดียมคลอไรด์ บริเวณไหล่แบบ
ระดับความสูงไม่เกิน 10,000 ฟุต

Seeding Sodium chloride at shoulder clouds of the high level not over 10,000 ft.

Caravan aircraft (Warm cloud)

เครื่องบิน Caravan (แบบอุ่น)

เครื่องบิน Casa (แบบอุ่น) Casa aircraft (Warm cloud)

โปรยสารเคมียูเรีย ที่ฐานแบบ

Seeding urea at the cloud base

โปรยสารเคมีลูกระเบิดจัด (น้ำแข็งแห้ง) ใต้ฐานแบบ

Seeding dry ice at the cloud base

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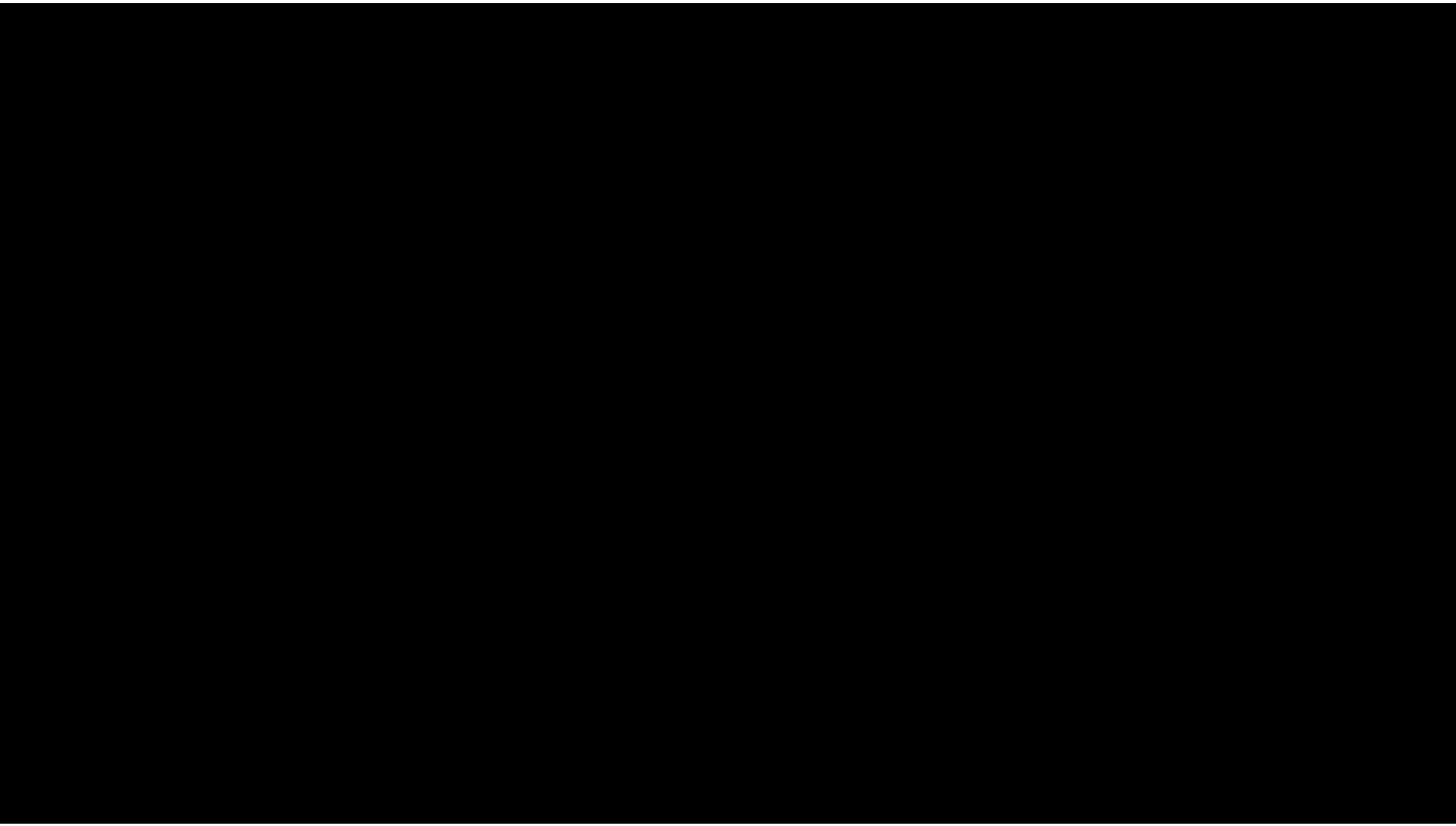

Summary of rain making operation for 2015

- Operation in 11 provinces.
- More than 642 flights operation (1,042 hrs) till beginning of rainy season.
- Estimate increase in inflow into reservoirs 1,024 mcm.