RIKEN Nishina Center's Response to Fukushima Daiichi Nuclear Disaster

-Radiation Screening at Fukushima, How We Dealt with Electrical Power Shortage and Other Hardship-

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JAPAN

EAST JAPAN

Fukushima prefecture

Mega-quake

- March 11th, 2011 14:46
- Magnitude 9.0
- Seismic Intensity 7 （7 is the highest on Japan’s scale)

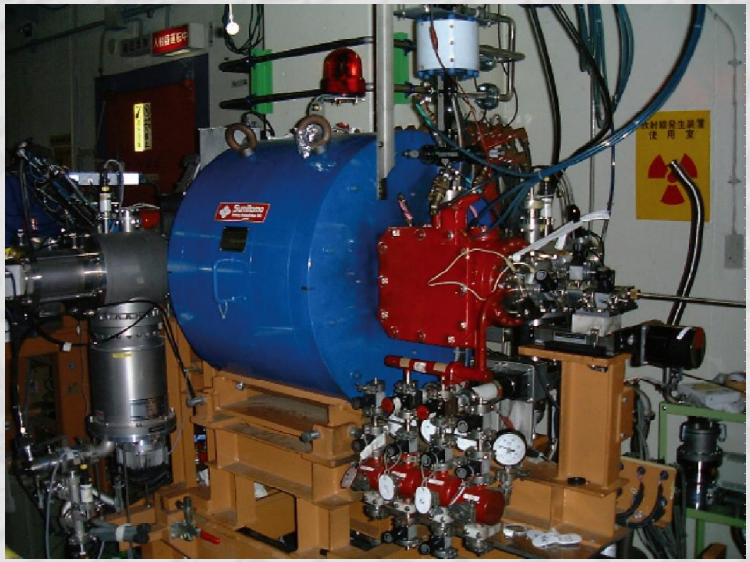
- All power transmission lines for Fukushima Daiichi NPS were brought down!

Just after the earthquake at RNC

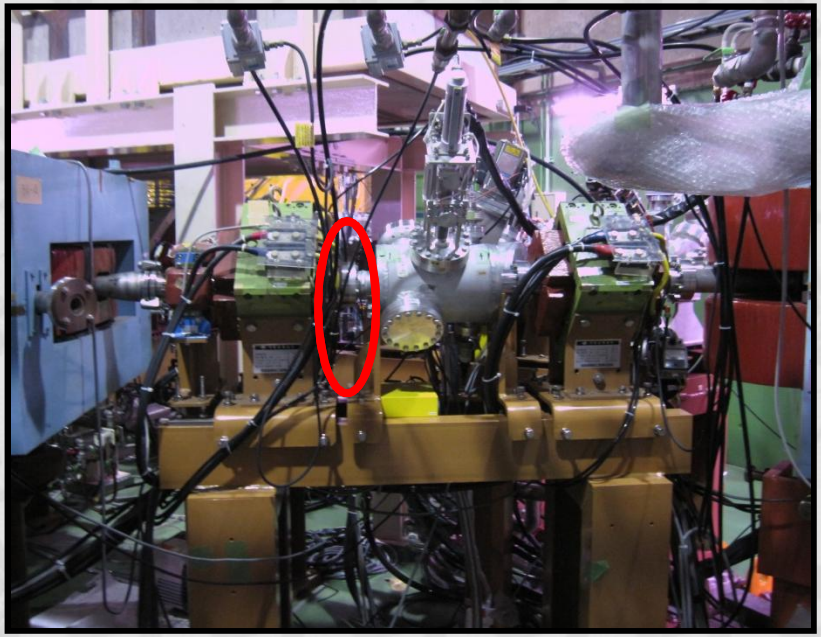
- 28Ghz ECR Ion Source (in operation)

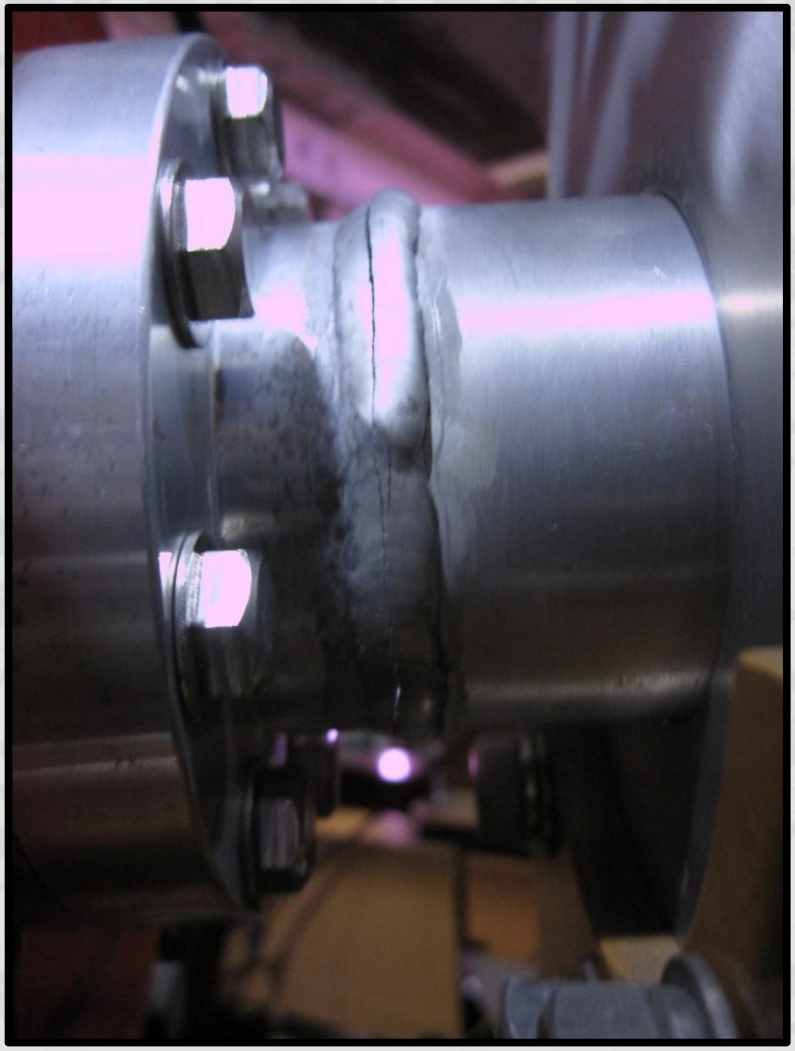
  Vacuum was broken.
- Aluminum beam ducts were broken.

  That's all of the damage.

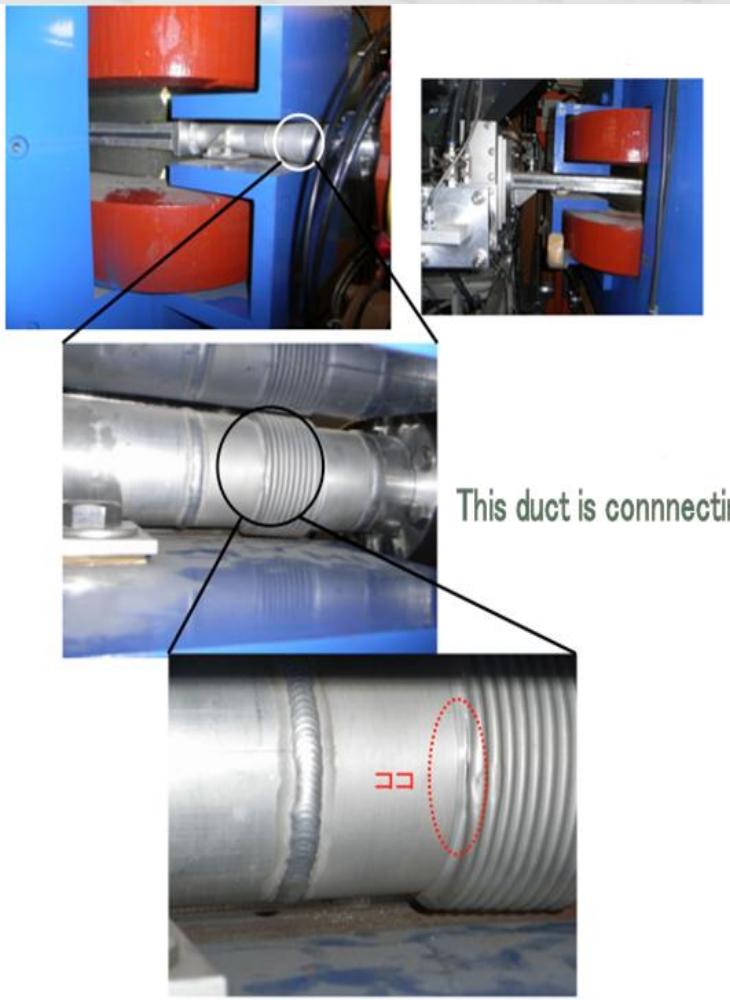


The weld point were damaged





Flexible duct had a crack



This duct is connnecting with the chamber of magnet

Tsunami

Disaster

- About 20,000 people died or were missing.

At Fukushima Daiichi NPS

- 3 reactors melted-down
- 3 reactor houses had hydrogen explosions
- 4 units were heavily damaged out of 6

3 days after the earthquake

- RI contamination came to RNC.
- The all radiation controlled area was closed.

RIKEN Monitoring Post

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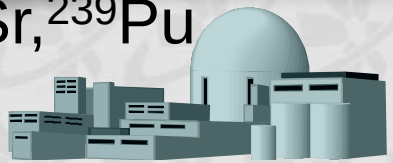
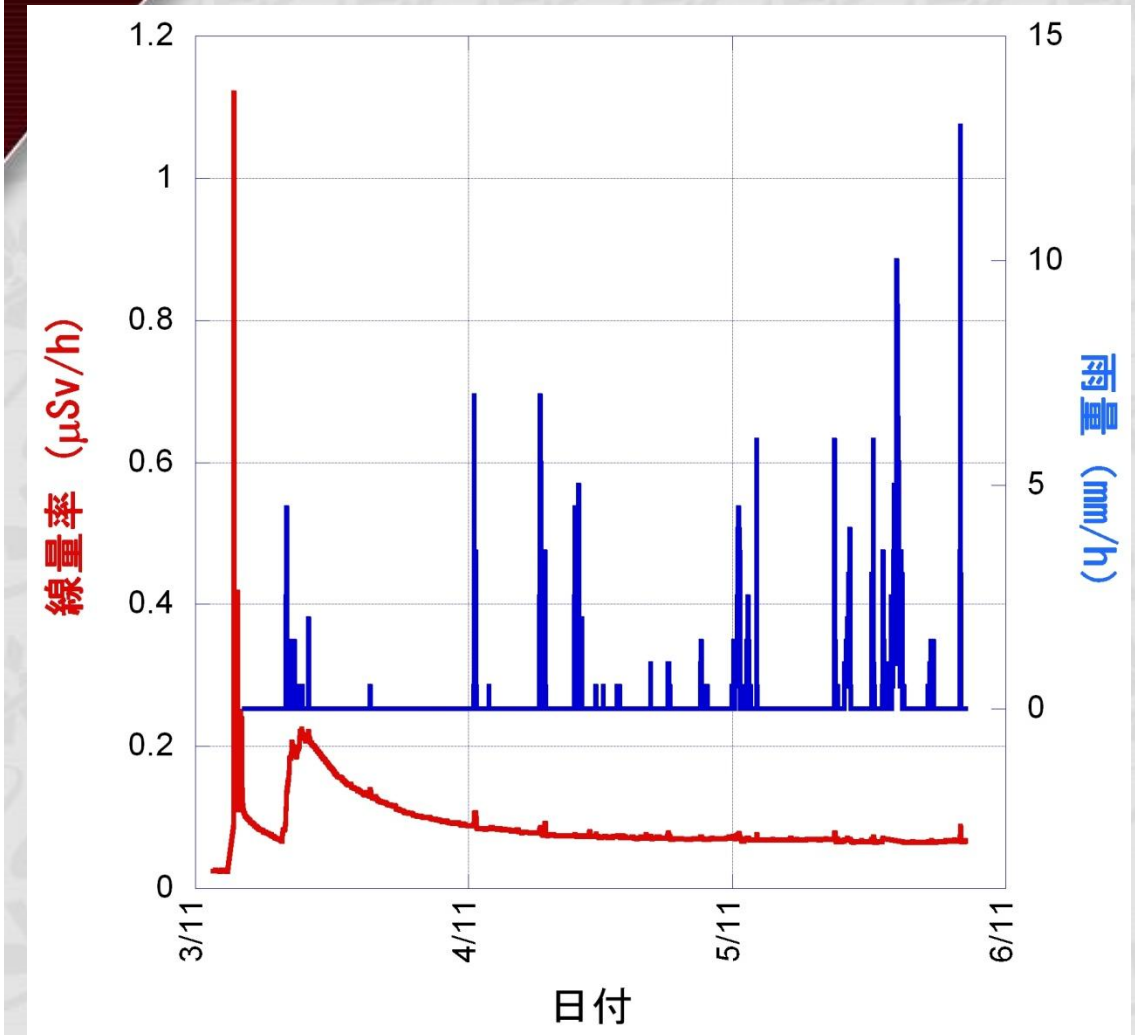
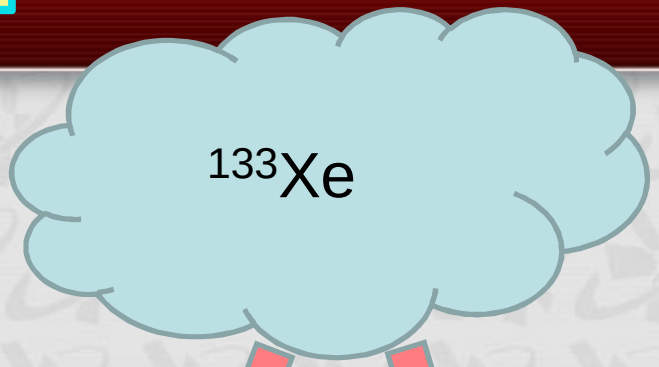
$^{90}Sr, ^{239}Pu$

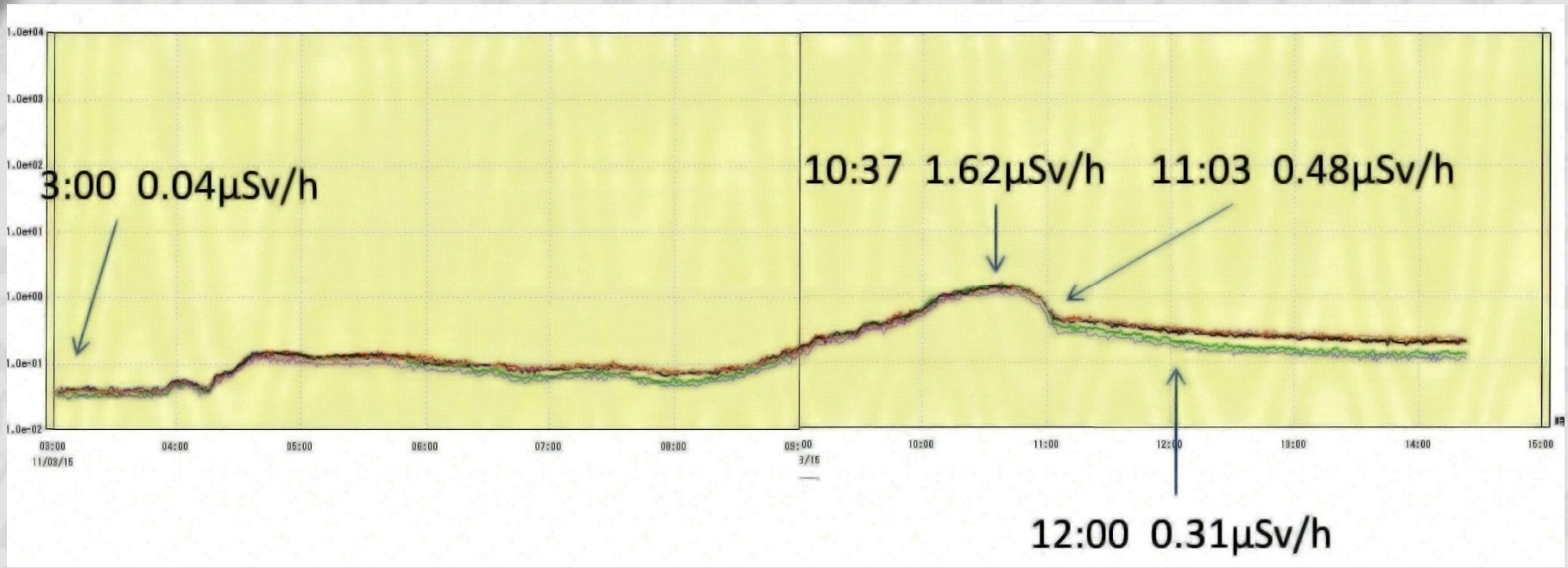






^{137}Cs ^{132}Te ^{131}I

March 16 at RIKEN Nishina center



Tokyo Electric Power Corporation (TEPCO)

Established 1889

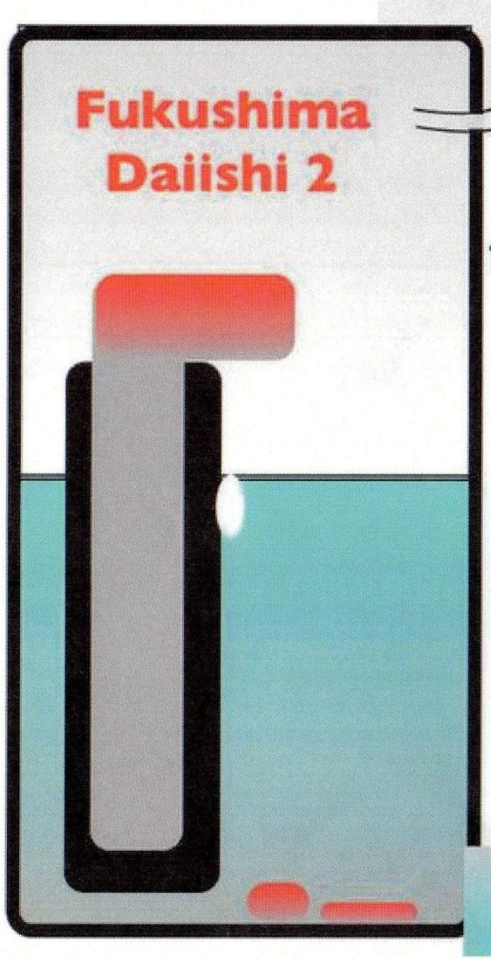
- The world's largest with 64 GW.
- 17 BWR plants with capacity of 17.3 GW.
- "Daiichi" means "Number one" and there is No.2 NPS in Fukushima as well.
- TEPCO dote GE.
- Toshiba and Hitachi are licensee of GE.

Fukushima Daiichi NPS

Unit N0.	Capacty	Manufacturer	Type	Commission
1	460 MW	GE	BWR	1971
2	784 MW	GE	BWR	1974
3	784 MW	TOSHIBA	BWR	1976
4	784 MW	HITACHI	BWR	1978
5	784 MW	TOSHIBA	BWR	1978
6	1100 MW	GE	BWR	1979

Prof. Ben Monreal on Mach 16

UCSB Department of Physics



Meltdown + containment failure:

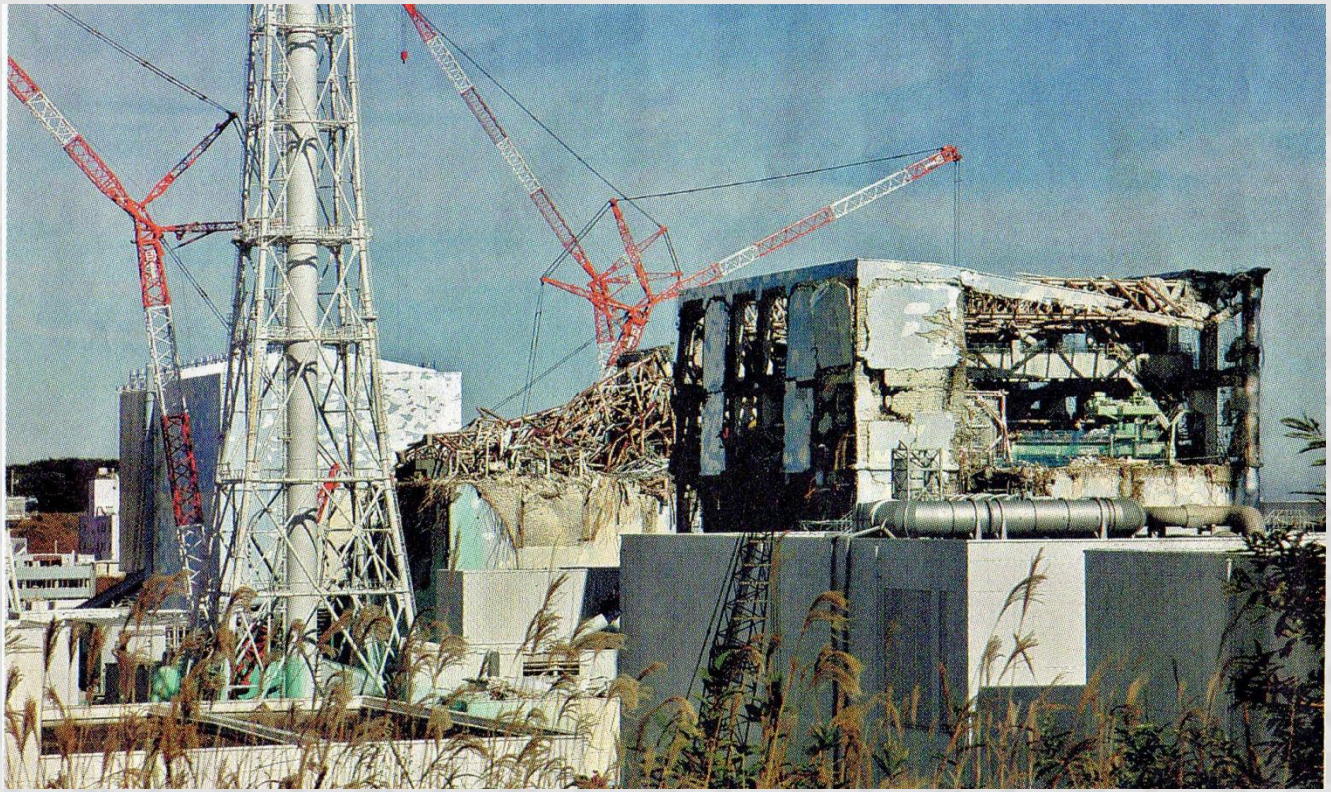
In Zircalloy casing:
fuel + fission products + actinides

In cooling water:
fission products like Cs, I, Tc

In steam:
fission products like Xe, Kr, Rn

In environment:
Xe, Kr, Rn

After hydrogen explosions



Manpower spent in Fukushima

- I visited 3 times for a total of 16 days.
- Mar.29-April 2 ⇒18 μSV, 3.6 μSV/day (50km)
- May 4-8 ⇒ 20 μSV, 4.0 μSV/day (40km)
- July 28-Aug.2 ⇒ 25 μSV, 4.1 μSV/day (22km)

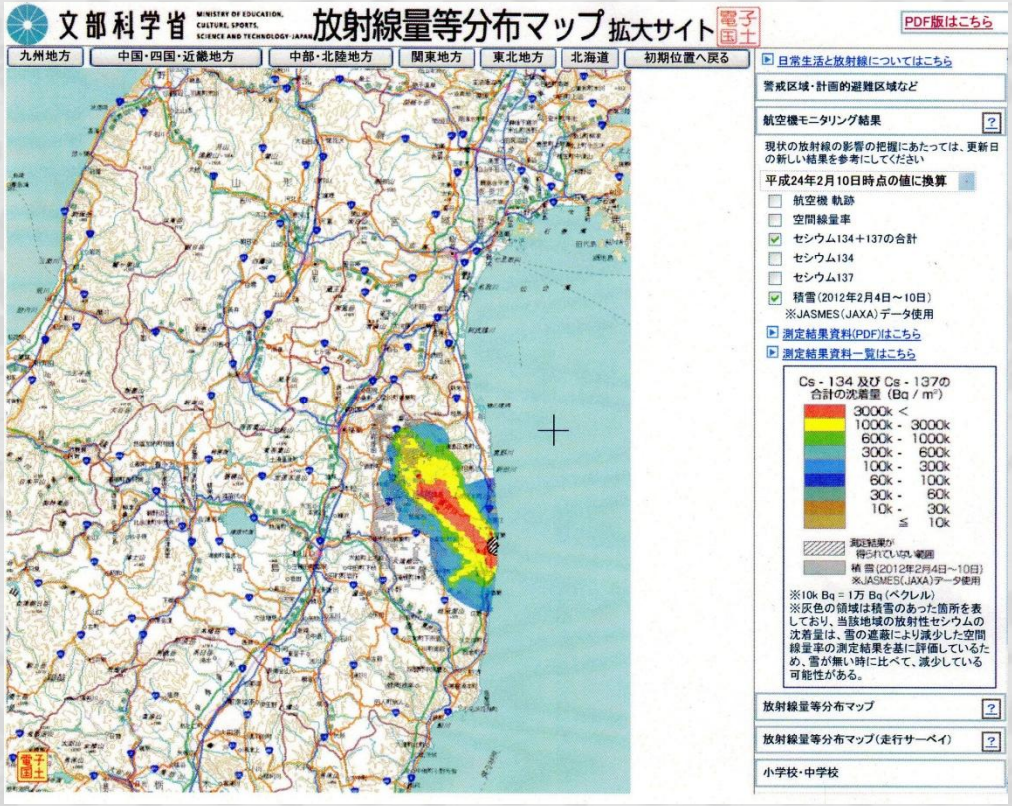
Screening

Total

	March	April	May	June	July	August	Sum	ratio
Number of RNC	6	13	12	5	2	1	39	
Total number (MD)	10	35	37	13	5	2	102	28.3%
Trip days (MD)	7	19	10	5	2	0	43	
Total of N.Physics	109	99	94	39	11	9	361	100%

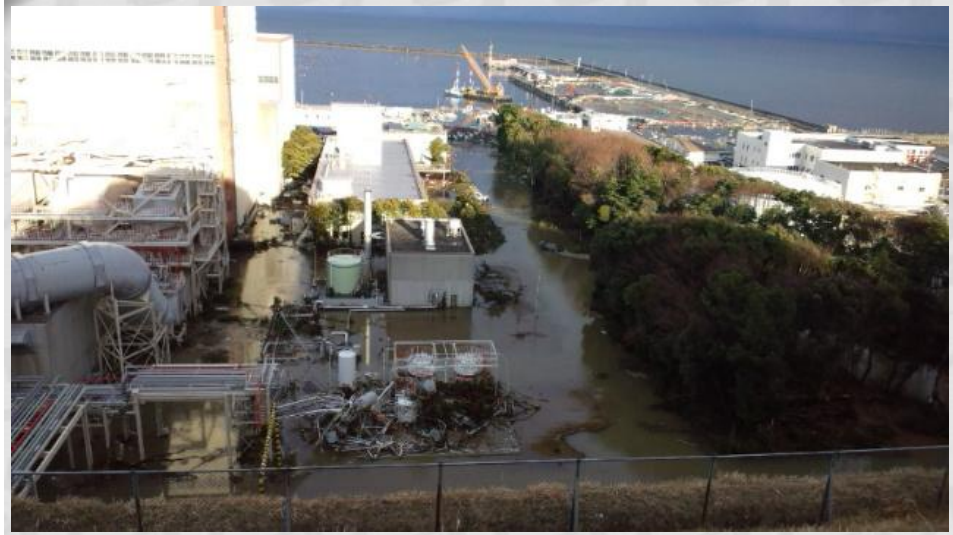
Soil sampling and measuring

- RNC measured 294 soil samples for 30 person-days.
- http://ramap.jaea.go.jp/map/



Electrical power shortage

Sunken TEPCO's Hirono thermal power station



Hirono power station (25km)

Test operation of all accelerators.

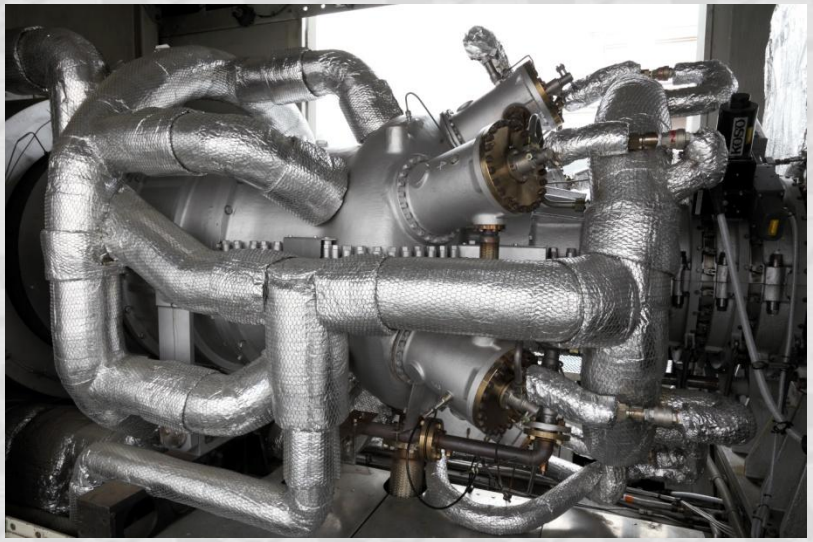
Power shortage

Scheduled Blackout

- Actually no official Schedule
- 50Hz and 60Hz
- 15% cut legally in summer
- Special contract 30% off 68 days (Normal 16 days)
- RIKEN Energy Saving committee 25% CUT
- Tokyo Disneyland built 4 x 5.5MW PS before summer

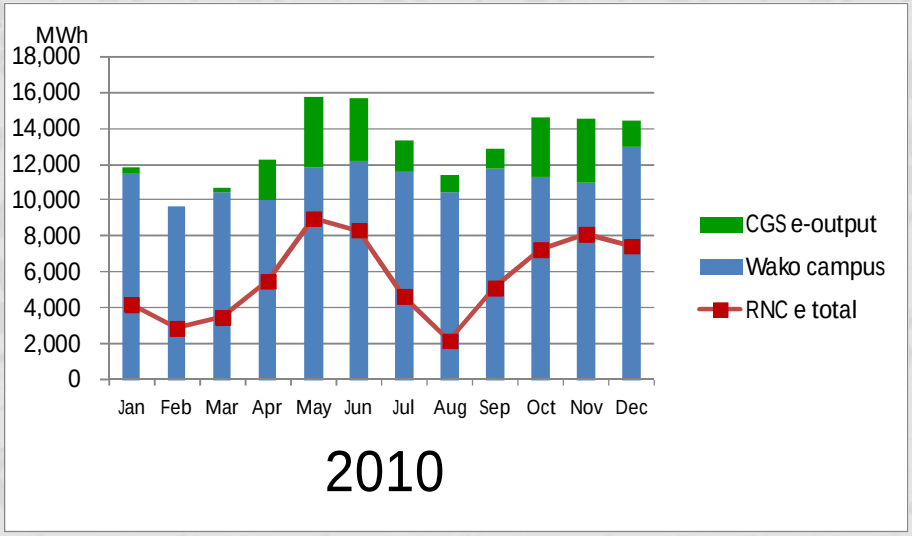
We have co-generation

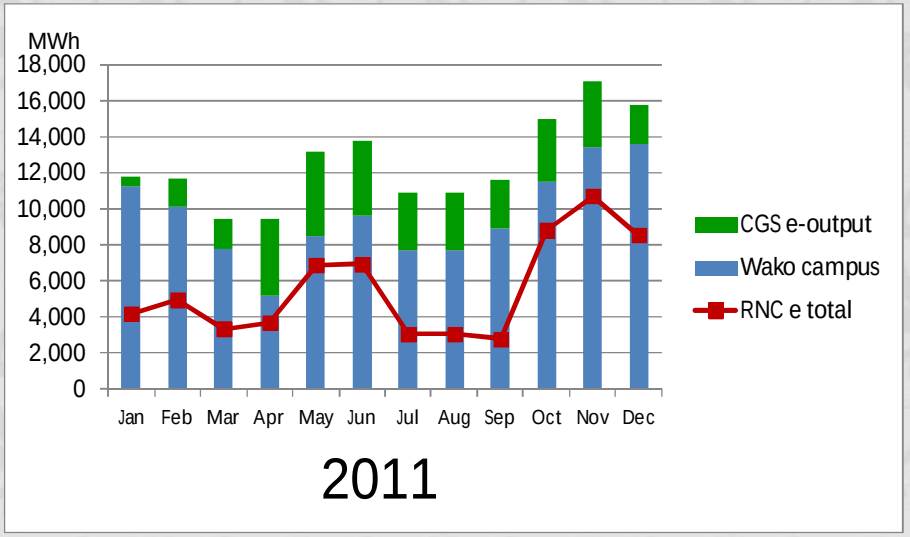
- None stop operation
- 6.5MW output



Consumption

In autumn, normal operation started





New CGS

Too Little, too late, But better than nothing.

TYPE:MWN TCG2020V 16K

2 x 1.5 MW

Conclusion

- Experiments were done well under the power shortage.
- Many numbers of RNCs did a good job of screening and etc., as volunteer.
- CGS was very useful in such condition too.
- Earthquake-resistant level :Horizontal 0.3G and Vertical 0.15G (both at ground level) is sufficient !

Thank you for your kind supports

- Operation “Tomodachi”
- Thai EGAT supply GTGs
- Taiwan’s donation was the Largest
- Thank you all of you!

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