

# Update on the ROK's Nuclear Energy Development and Spent Fuel Management Plans and Options

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Borehole and Spent Fuel in East Asia  
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# Status & Prospects of Nuclear Power



Figure. NPPs sites in the ROK

- Kori site: 6 PWRs in operation;  
4 PWRs under construction
- Yonggwang site: 6 PWRs in operation
- Ulchin site: 6 PWRs in operation;  
4 PWRs under construction
- Wolsong site: 4 CANDUs in operation;  
1 PWR in operation;  
1 PWR under construction

	2013	2020	2030
# of PWR (GWe)	19 (17.9)	27 (28.7)	35 (39.9)
# of CANDU (GWe)	4 (2.8)	4 (2.8)	4 (2.8)
# of NPPs (GWe)	23 (20.7)	31 (31.5)	39 (42.7)

# Status & Prospects of Nuclear Power (cont)

Table. Current and planned nuclear power in the ROK

Site	Unit	Type	Capacity (MWe)	Initial Operation
Kori	Kori-1	PWR	587	Apr. 1978
	Kori-2	PWR	650	Jul. 1983
	Kori-3	PWR	950	Sept. 1985
	Kori-4	PWR	950	Apr. 1986
	Shin-Kori-1	PWR	1000	Feb. 2011
	Shin-Kori-2	PWR	1000	Jul. 2012
	Shin-Kori-3	PWR	1400	Sept. 2013
	Shin-Kori-4	PWR	1400	Sept. 2014
	Shin-Kori-5	PWR	1400	Dec. 2018
	Shin-Kori-6	PWR	1400	Dec. 2019
	Shin-Kori-7	PWR	1400	Jun. 2022
Shin-Kori-8	PWR	1400	Jun. 2023	
Yonggwang	Yonggwang-1	PWR	950	Aug. 1986
	Yonggwang-2	PWR	950	Jun. 1987
	Yonggwang-3	PWR	1000	Mar. 1995
	Yonggwang-4	PWR	1000	Jan. 1996
	Yonggwang-5	PWR	1000	May. 2002
	Yonggwang-6	PWR	1000	Dec. 2002
Ulchin	Ulchin-1	PWR	950	Sept. 1988
	Ulchin-2	PWR	950	Sept. 1989
	Ulchin-3	PWR	1000	Aug. 1998
	Ulchin-4	PWR	1000	Dec. 1999
	Ulchin-5	PWR	1000	Jul. 2004
	Ulchin-6	PWR	1000	Apr. 2005
	Shin-Ulchin-1	PWR	1400	Jun. 2016
	Shin-Ulchin-2	PWR	1400	Jun. 2017
	Shin-Ulchin-3	PWR	1400	Jun. 2020
	Shin-Ulchin-4	PWR	1400	Jun. 2021
Wolsong	Shin-Wolsong-1	PWR	1000	Mar. 2012
	Shin-Wolsong-2	PWR	1000	Jan. 2013 (?)
Wolsong	Wolsong-1	CANDU	679	Apr. 1983
	Wolsong-2	CANDU	700	Jul. 1997
	Wolsong-3	CANDU	700	Jul. 1998
	Wolsong-4	CANDU	700	Oct. 1999

# Status & Prospects of Nuclear Power (cont)

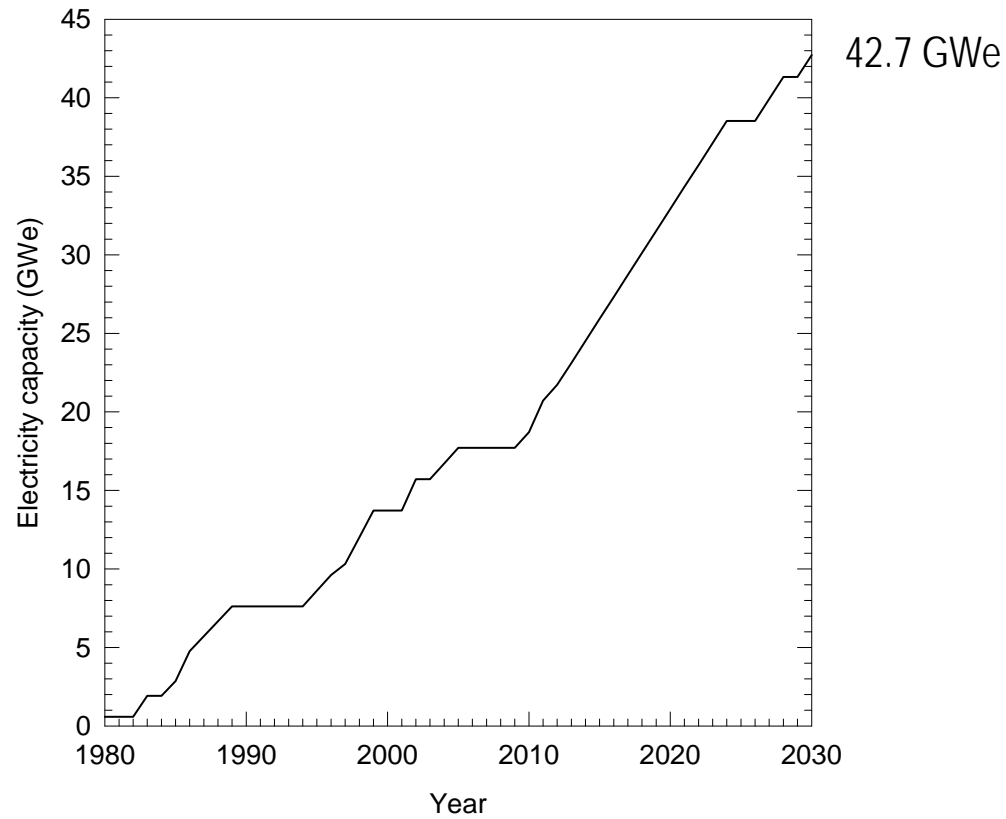


Figure. Installed nuclear capacity in South Korea (1980-2030)

# Nuclear Power Plants Deployment Scenarios

Table. Assumed NPPs deployment scenarios in the ROK

Case	Assumption
Ref. Case	<ul style="list-style-type: none"><li>- Based on the ROK government plan</li><li>- Considering life-time extension of NPPs (60y for PWRs/APWRs and 50y for CANDUs)</li><li>- No replacement of shutdowned NPPs</li></ul>
Max. Case	<ul style="list-style-type: none"><li>- Based on the ROK government plan</li><li>- Considering life-time extension of NPPs (60y for PWRs/APWRs and 50y for CANDUs)</li><li>- Replacement of shutdowned NPPs by 1.4 GWe PWRs by 2050</li></ul>
Min. Case	<ul style="list-style-type: none"><li>- Based on the ROK government plan, except of</li><li>- No life-time extension of NPPs (40y for PWRs, 60y for APWR and 30y for CANDUs)</li><li>- No replacement of shutdowned NPPs</li></ul>

# Nuclear Power Plants Deployment Scenarios

(cont)

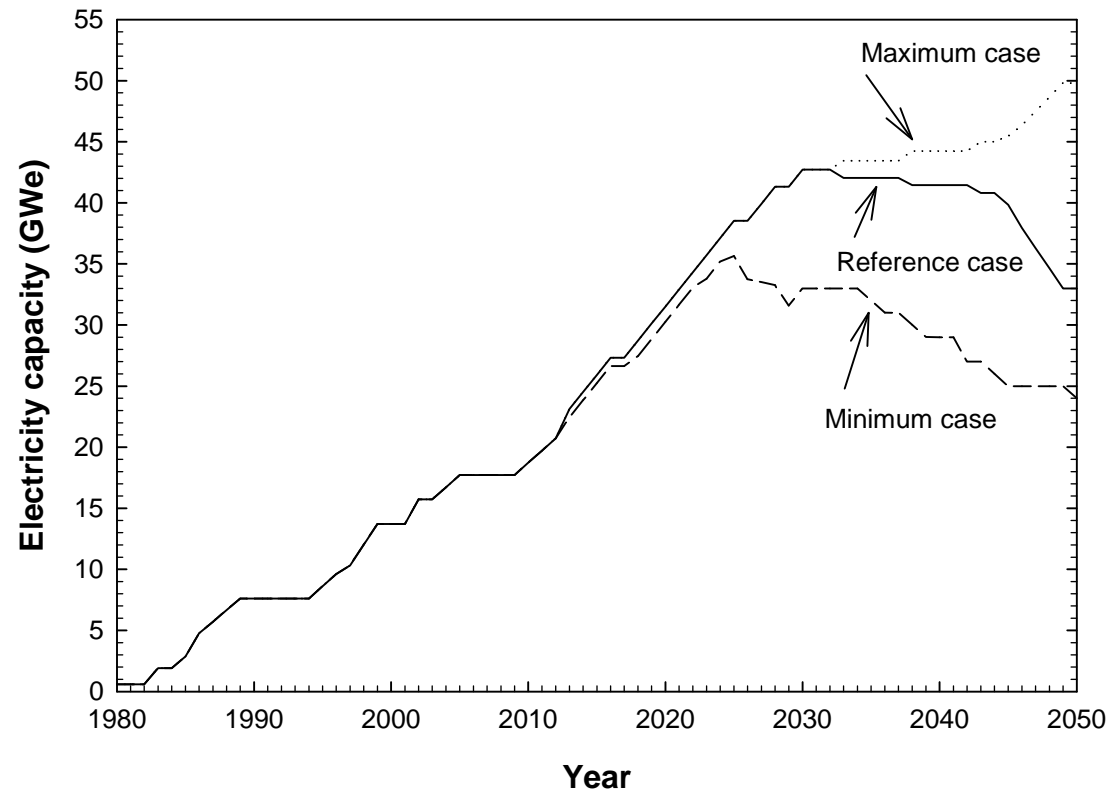


Figure. Installed nuclear capacity in South Korea (1980-2050)

# Nuclear Power Plants Deployment Scenarios (cont)

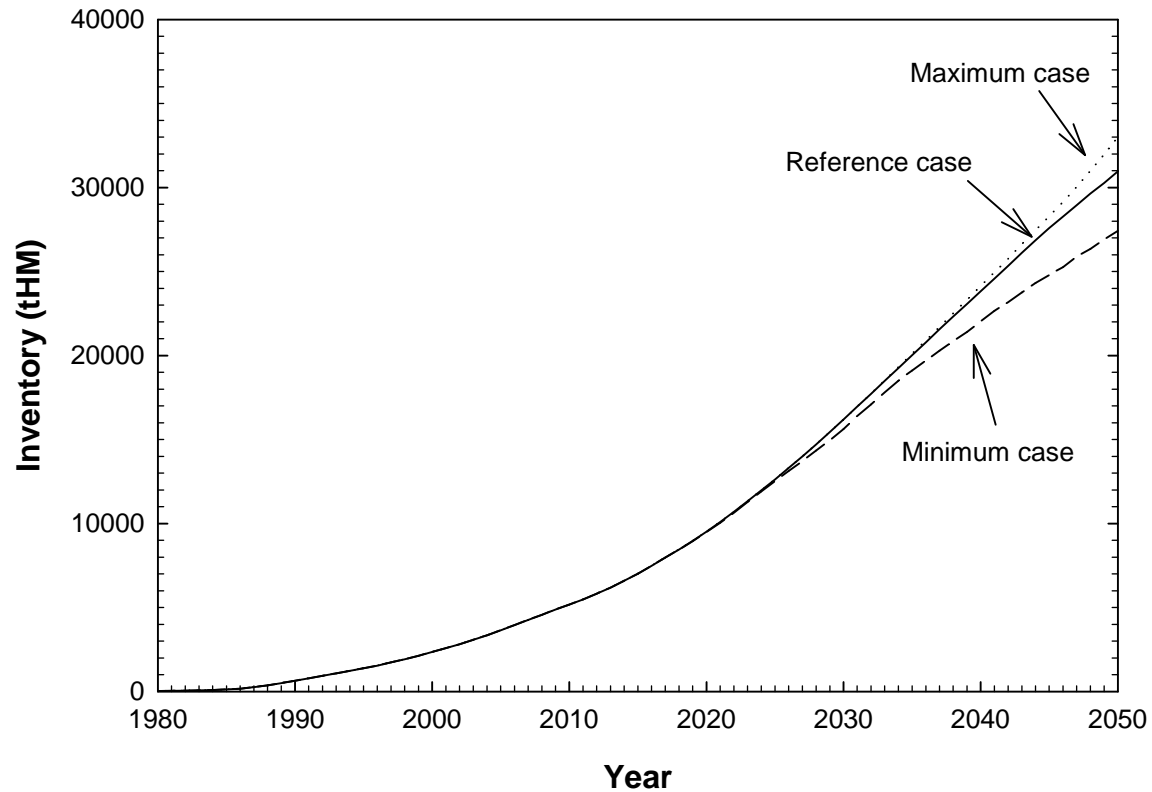


Figure. Cumulative inventory of PWR spent fuel in South Korea (1980-2050)

# Nuclear Power Plants Deployment Scenarios (cont)

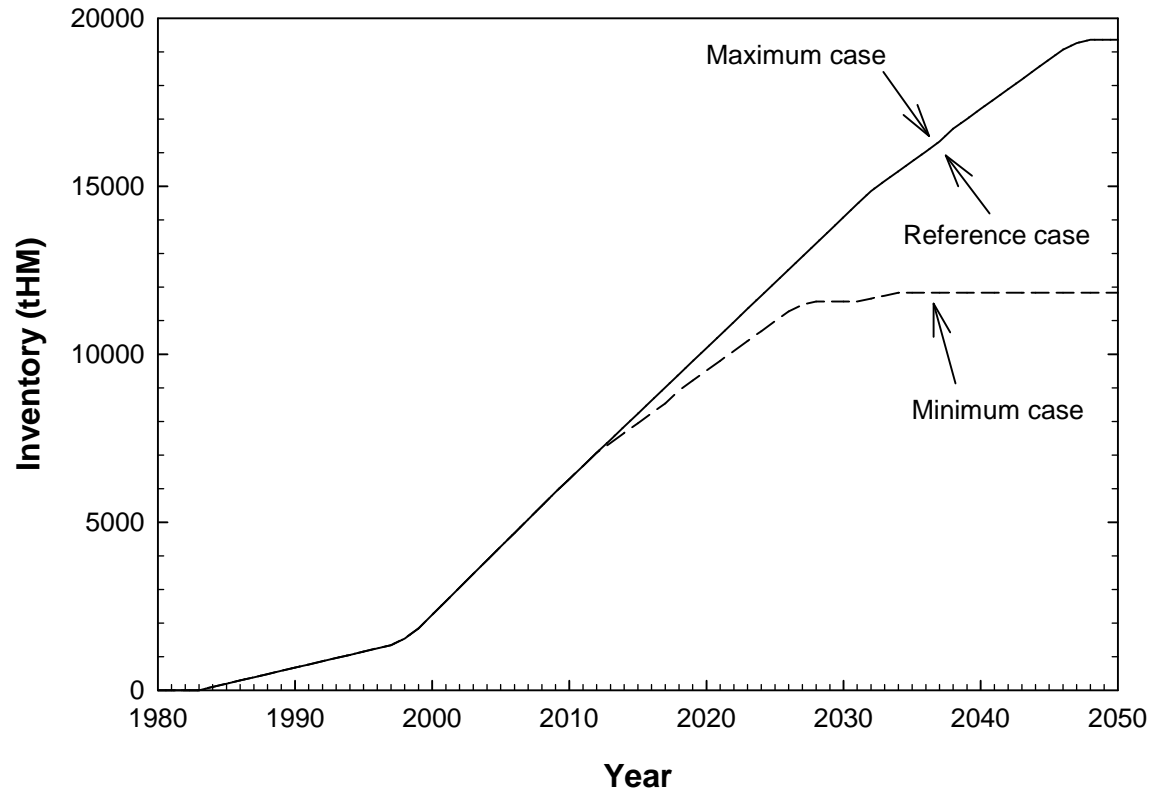


Figure. Cumulative inventory of CANDU spent fuel in South Korea (1980-2050)



# Status of Spent Fuel Stored at NPPs Sites

Site	Unit	Type	Inventory of spent fuel (tHM) stored in the pools as of the end of 2009	Estimated inventory of spent fuel (tHM) stored in the pools as of the end of 2012
Kori	Kori-1	PWR	124	159
	Kori-2	PWR	281	320
	Kori-3	PWR	763	820
	Kori-4	PWR	594	651
	Shin-Kori-1	PWR	-	40
	Shin-Kori-2	PWR	-	20
	Shin-Kori-3	PWR	-	-
	Shin-Kori-4	PWR	-	-
	Shin-Kori-5	PWR	-	-
	Shin-Kori-6	PWR	-	-
	Shin-Kori-7	PWR	-	-
	Shin-Kori-8	PWR	-	-
Yonggwang	Yonggwang-1	PWR	496	553
	Yonggwang-2	PWR	381	438
	Yonggwang-3	PWR	271	331
	Yonggwang-4	PWR	278	338
	Yonggwang-5	PWR	153	213
	Yonggwang-6	PWR	126	186
Ulchin	Ulchin-1	PWR	369	426
	Ulchin-2	PWR	341	398
	Ulchin-3	PWR	258	318
	Ulchin-4	PWR	253	313
	Ulchin-5	PWR	102	162
	Ulchin-6	PWR	78	138
	Shin-Ulchin-1	PWR	-	-
	Shin-Ulchin-2	PWR	-	-
	Shin-Ulchin-3	PWR	-	-
	Shin-Ulchin-4	PWR	-	-
Wolsong	Shin-Wolsong-1	PWR	-	-
	Shin-Wolsong-2	PWR	-	-
Wolsong	Wolsong-1	CANDU	759	1045
	Wolsong-2	CANDU	709	1003
	Wolsong-3	CANDU	691	985
	Wolsong-4	CANDU	686	980
			(3049 tHM in dry storage facilities)	(3049 tHM in dry storage facilities)

# Dry Storage Facilities at Wolsong



Figure. Concrete silo and MACSTOR/KN-400 at Wolsong (Google Earth, October 10, 2010)

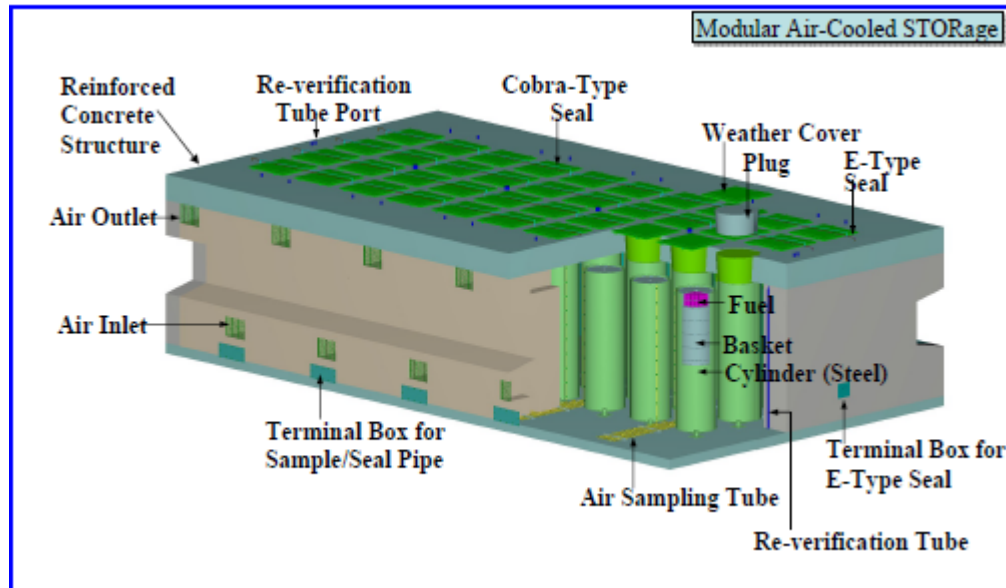
# Concrete Silo at Wolsong

- Concrete Silo
  - Storage capacity: 10.4 tHM
  - Out diameter: 3.1 m
  - Height: 6.5 m
- 300 concrete silos (3,120 tHM) have been installed at Wolsong since 1990.

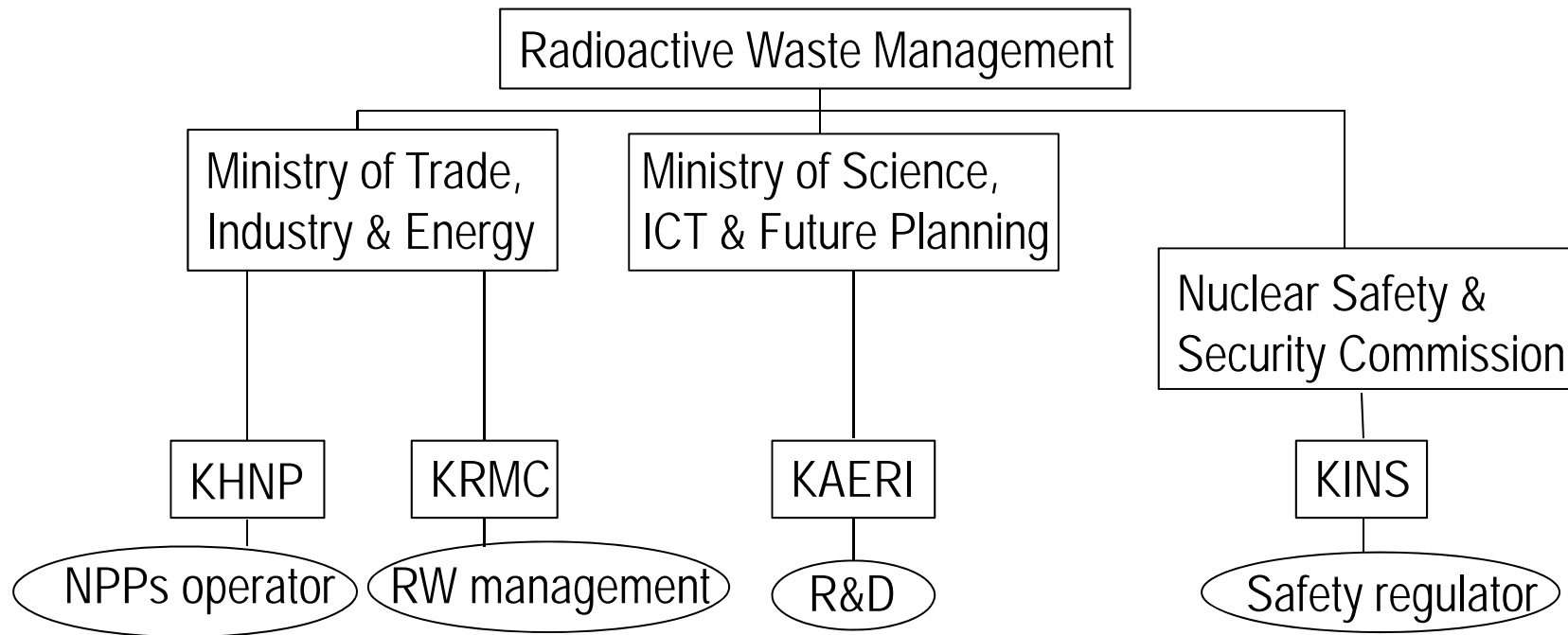


# MACSTOR/KN-400 at Wolsong

- MACSTOR/KN-400
  - Storage capacity: 461 tHM
  - Dimension: 22 m (L) x 12.5 m (W) x 7.5 m (H)
  - Height: 6.5 m
- 7 MACSTOR/KN-400 modules (3,227 tHM) have been installed at Wolsong since 1990.



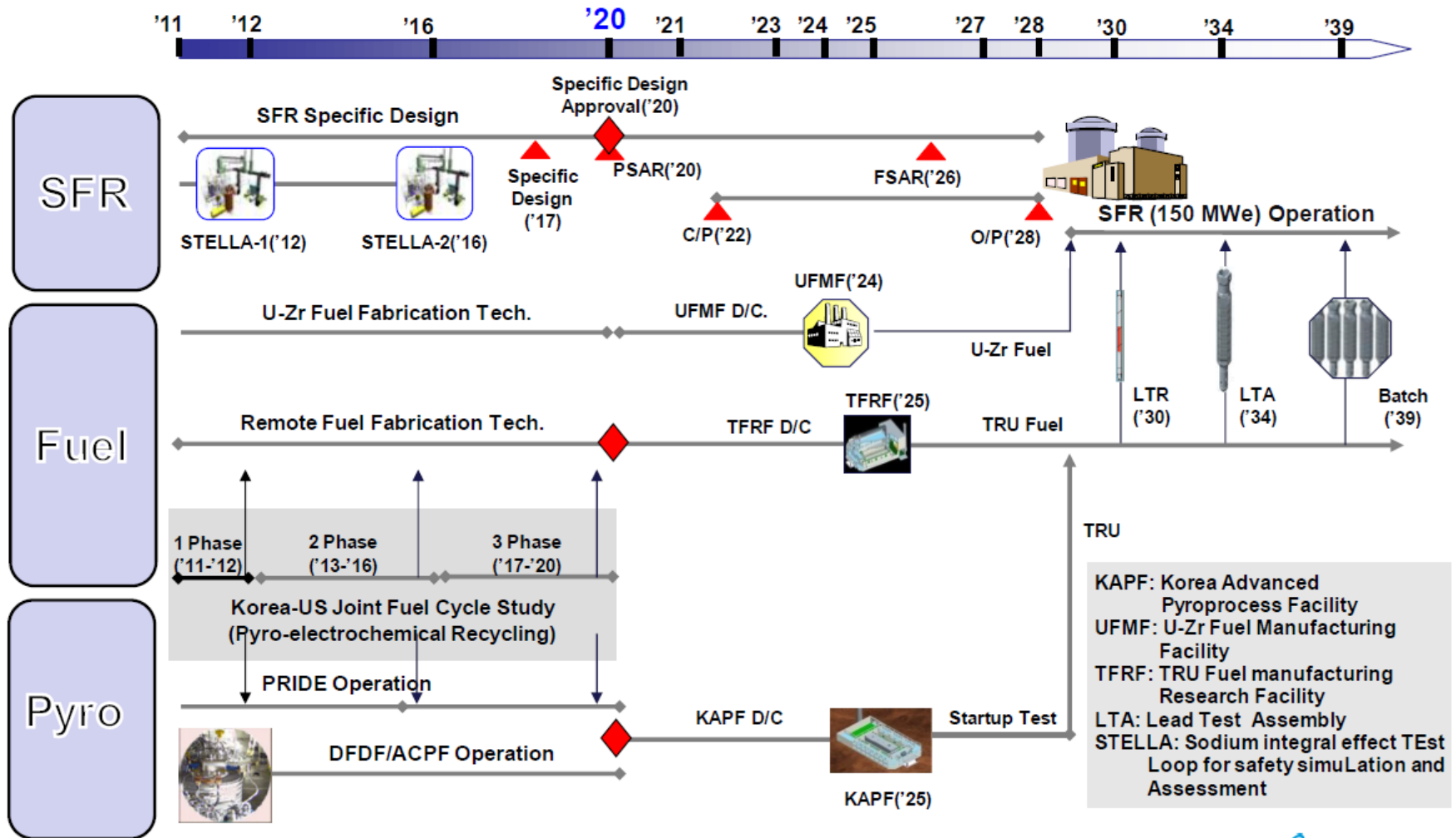
# Radioactive Waste Management Organizations



# National Policy on Spent Fuel

- At its 253rd meeting in 2004, the Atomic Energy Committee (AEC) announced that national policy for spent fuel management would be decided later in consideration of progress of domestic and international technology development, and that spent fuel would be stored at a reactor site by 2016 under KHNP's responsibility.
- Since the ROK has not decided whether to directly dispose of or recycle spent fuel, currently, it has no national plan on geologic disposal of spent fuel either.

# KAERI's Plan on Pyroprocessing and Fast Reactors



(Quoted from a presentation material of Chan-Bock Lee, et al. in March 2013)

# Assumed Load Map in Nuclear Fuel Cycle Activities in the ROK

- Around 2020: Starting AR and/or AFR interim dry storage of spent fuel in the ROK
- Around 2050: Starting operation of geologic disposal site for CANDU spent fuel
- Around 2070: Starting operation of geologic disposal site for PWR spent fuel
- (Based on a KRMC report in 2011)



# Concluding Remarks

- Public consultation process of spent fuel management would start in the ROK soon, which will critically affect nuclear fuel cycle activities and development in the ROK in the coming years.
- Results of a 10-year US-ROK joint study on pyroprocessing, which has started in 2011, would affect future nuclear fuel cycle activities and development in the ROK to some extents.