

# Regulatory Framework and Technology Development for Advanced Fuel Cycle in Korea

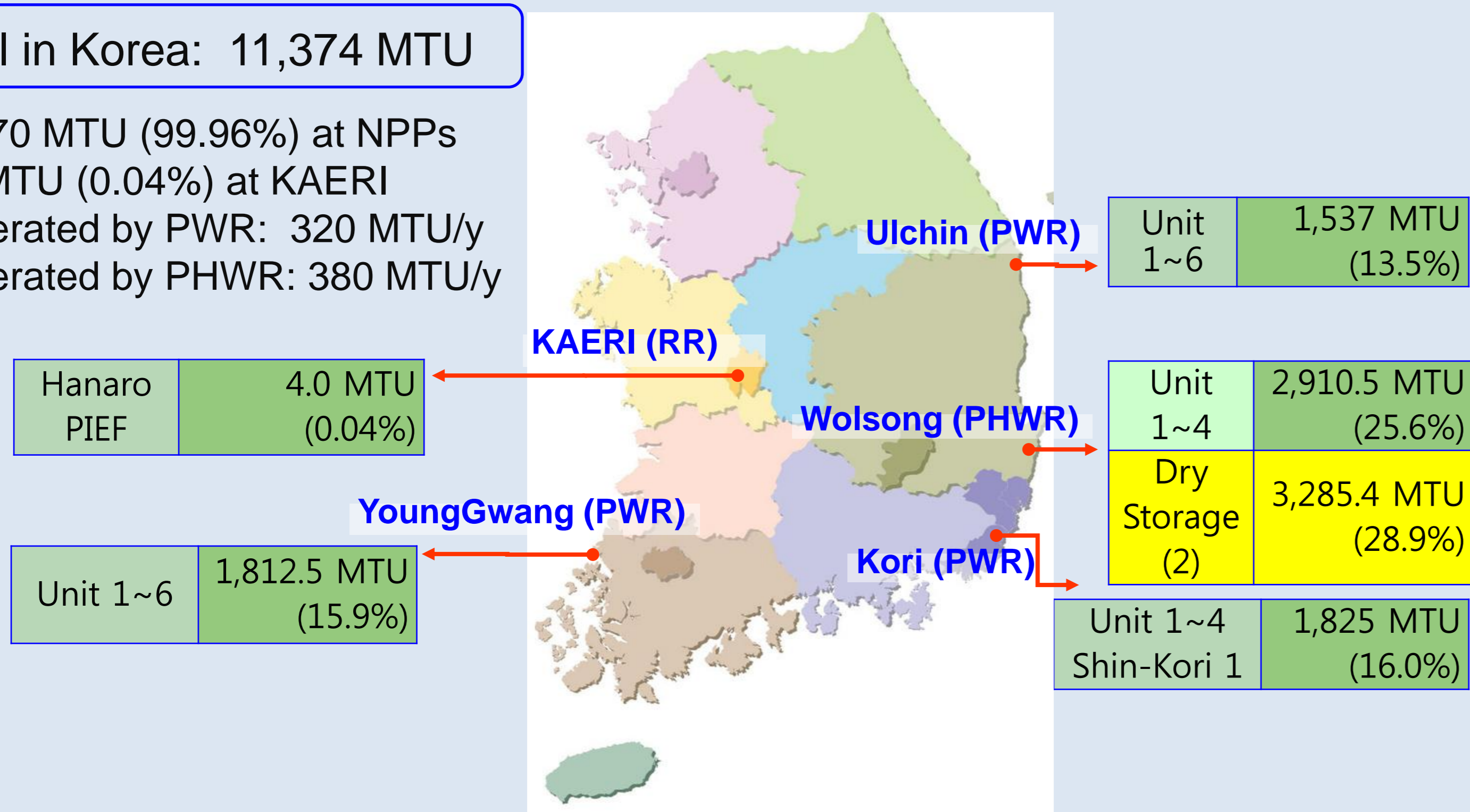
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## Spent Fuel in Korea

Total in Korea: 11,374 MTU

- 11,370 MTU (99.96%) at NPPs
- 4.0 MTU (0.04%) at KAERI
- Generated by PWR: 320 MTU/y
- Generated by PHWR: 380 MTU/y

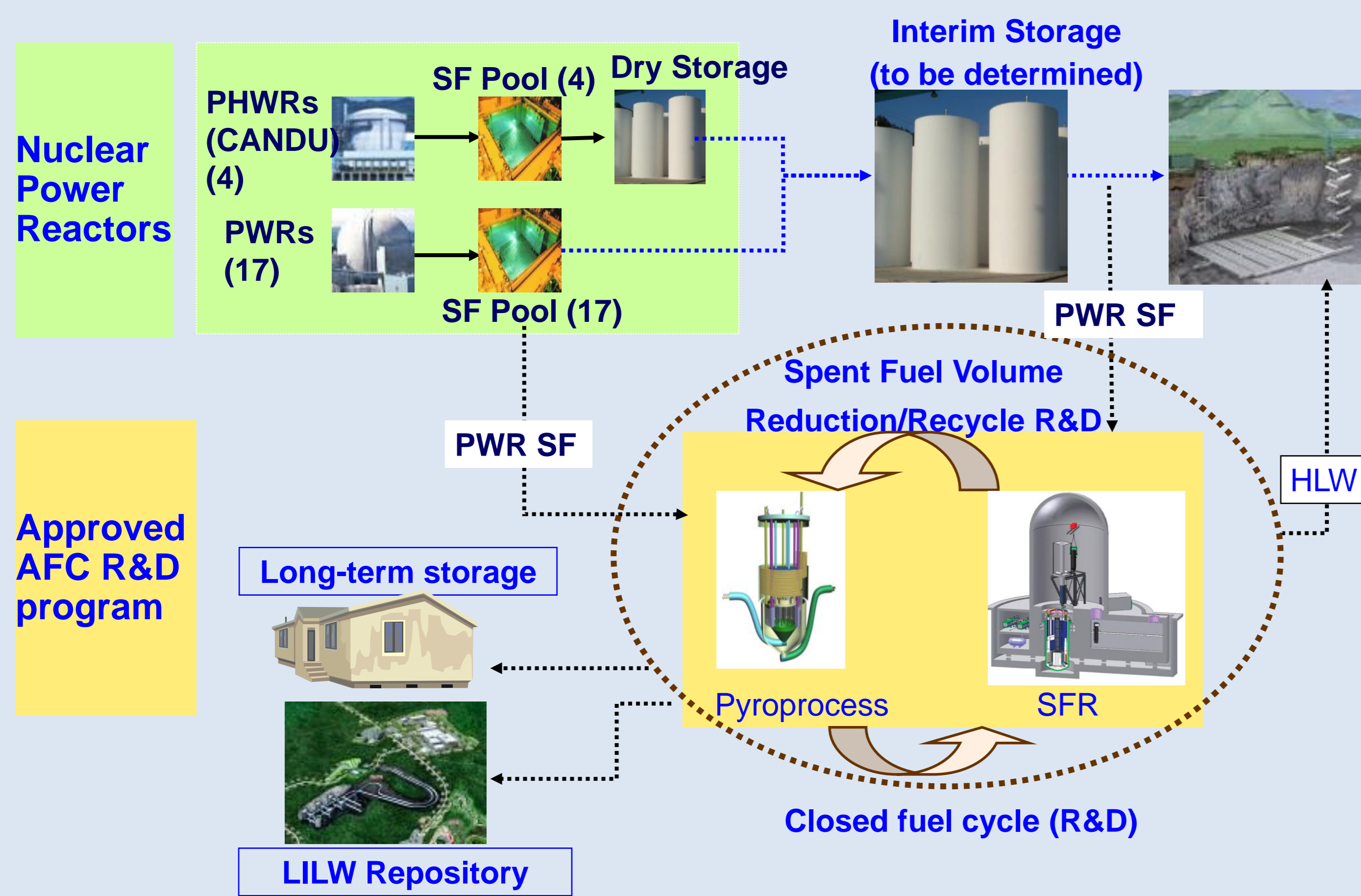


## Regulatory prospective in AFC

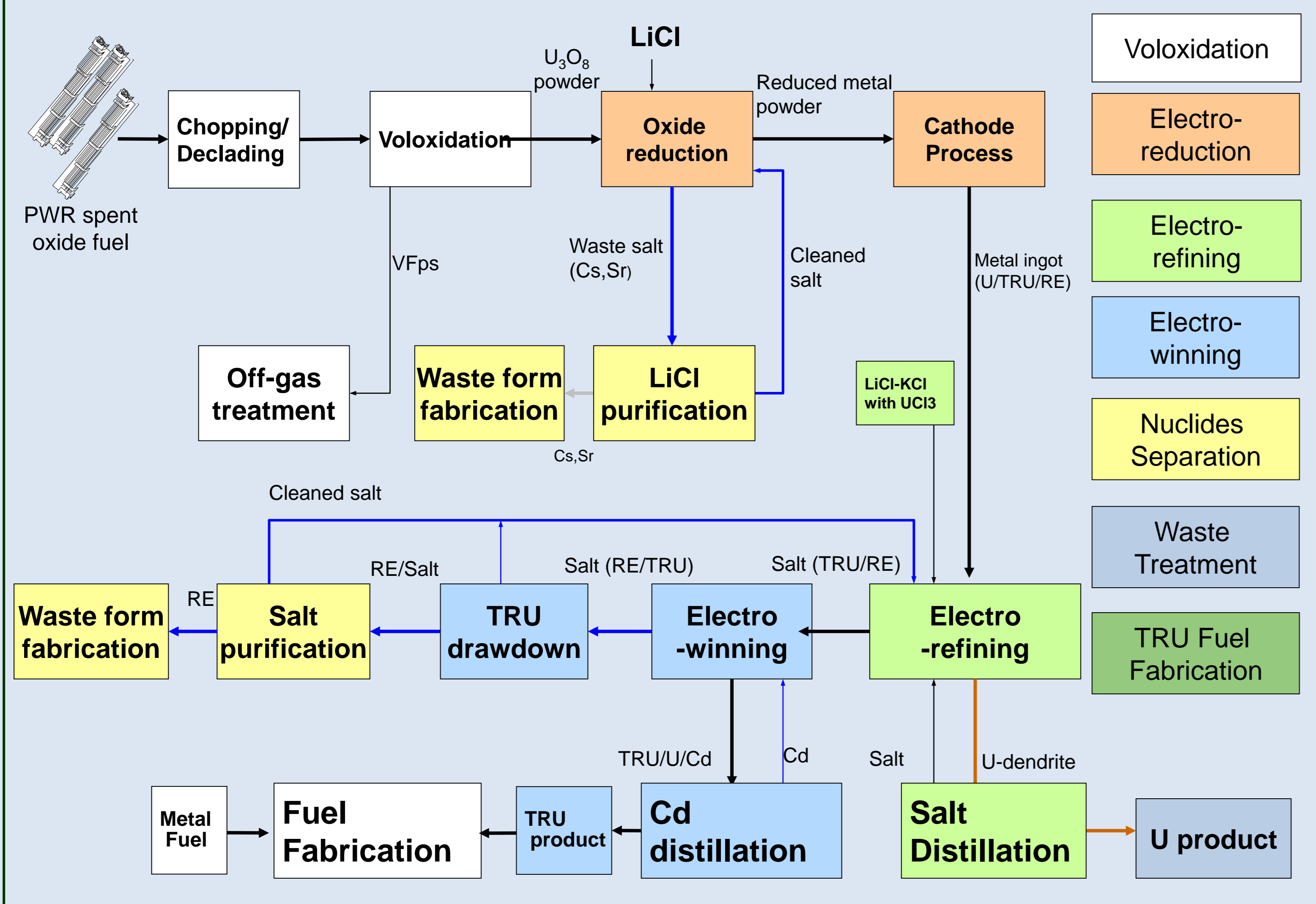
Each Process	Process Step	Condition	Target	Regulatory Prospective
Chopping & Decladding	Rod Cutting /Decladding	* Room Temp. * Air atmos.	* 99.99 %	Metal waste generation: - high or low level waste?
Voloxidation	Powdering	* 1250 °C * Air atmos.	* 100 % * Cs : 2 % * VFP : 0 %	Effluent filtering system: - Evaluation of filtering and design of air cleaning unit - Spent filter management
Electro-Reduction	Electro-Reduction	* 650 °C * Ar Atmos.	* U/TRU : 99.5 % * NM : 100 % * RE : 10 % * Cs/Sr : 0 %	System safety including - Reduction process safety - Cs, Sr separation from salt - Cs, Sr long term management and accountability - Criticality safety - Proliferation Resistance - Corrosion of vessel and electrode
	Cathode Consolidation	* 800 °C * Ar / vacuum atmos.		
Electro-Refining	Electro-Refining	* 500 °C * Ar atmos.	* U : 99.3 % * TRU : 5.7 % * NM : 0 % * RE : 37.5 %	System safety including - Separation of UCl <sub>3</sub> - Safety of salt distillation and ingot generation - Effluent control - Nuclear material control and accountability - Criticality safety - Proliferation Resistance - Corrosion of vessel and electrode
	Salt Distillation	* 1300 °C * Ar / vacuum atmos.		
	U Melting			
Electro-Winning	Electro-Winning	* 500 °C * Ar atmos.	* TRU : 98.3% * U : 100%	System Safety including - RE separation and waste form - Nuclear material control and accountability - Proliferation Resistance - TRU, U, RE handling - Criticality safety - Corrosion of vessel and electrode
	Cd Distillation	* 700 °C * Ar atmos.	* RE : 1.1%	
	TRU Draw Down	* 500 °C * Ar atmos.	* TRU : 100 % * RE : 10 %	
Salt Waste Treatment	LiCl Purification	* 650 °C * Ar atmos.		Waste management safety - System scale-up - Cs, Sr management - TRU, RE management - Waste form fabrication and acceptance criteria - Using oxygen in hot cell
	LiCl-KCl Purification	* 650 ~1100 °C * Ar atmos.		
	Salt Waste Form Fabrication	* 650 ~1150 °C * Air atmos.		
Off-gas Treatment	VFP treat	* 1000 °C ~ room temp.	Air atmos.	Effluent control - Meet effluent control criteria - filter management
	Cl <sub>2</sub> gas treat	* Capture in salt		

## Problem

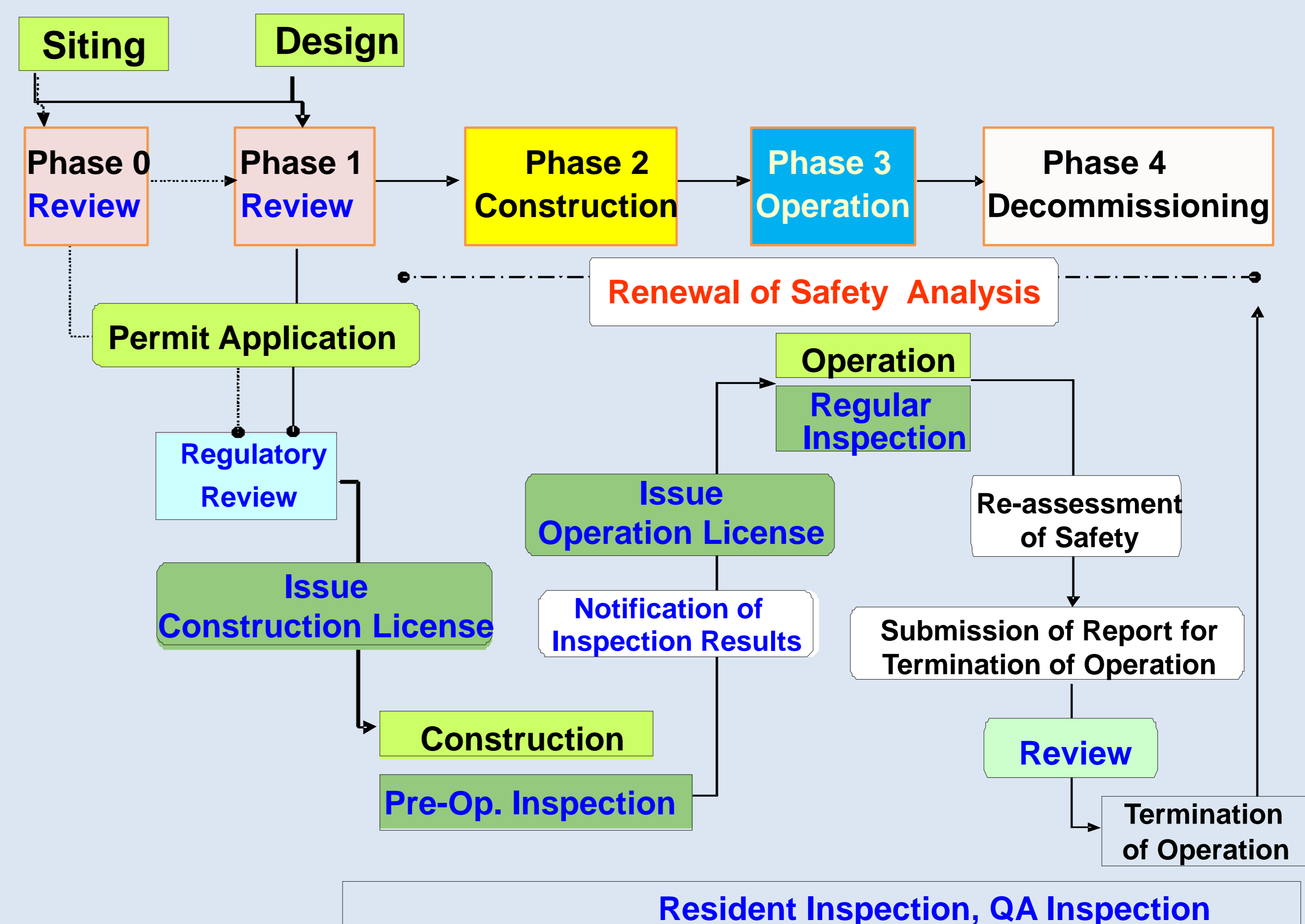
- Interim storage is needed by 2016 (time is under recalculation by KRMC)
- SF interim storage is being driven by KRMC



## Pyroprocessing



## Authorization process in AFC



## Conclusion

The Korea Institute of Nuclear Safety (KINS) has been conducting the research project to develop regulatory framework for AFC facility by reviewing Atomic Energy Safety Act (AESA). The regulatory technology development for the AFC facility are consisted of the establishment of the AFC licensing regulatory system, the establishment for the AFC criteria and standards, and the development of the safety evaluation technology for the AFC system. Using the result of this research, KINS will prepare a comprehensive set of safety standards including radiation shielding and protection, criticality, chemical hazards, fire and explosion, off-gas treatment, and high-level and low-level radioactive waste management.