KEPCO NF Overview & Nuclear Fuel Technology

27 April 2017

KEPCO NF

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Introduction of KEPCO NF

History

Global Leading Nuclear Energy Partner

1980's

1982 KEPCO NF Established
1988 Construction of the PWR Plant (200 MTU/y)
1989 Commercial Operation of the PWR Plant

1990's

1992 R&D Center Established
1998 Capacity Expansion
(350 MTU/y for PWR, 400 MTU/y for CANDU)

2000's

2006 Commenced Supply of Advanced PLUS7™ Fuel
2008 Commercial Operation of Tube Mill (1,400km/y)
2009 Capacity Expansion (550 MTU/y for PWR)

2010's

2010 Fuel Supply Contract Awarded for UAE
2011 High Performance HIPER™ Fuel LTA Irradiation
2017 Tube Mill Expansion (+300km/y)
2020 HIPER™ Fuel Commercial Supply

Nuclear Fuel

PWR

APR1400
& OPR1000

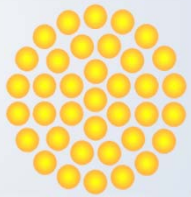
- PLUS7™
- HIPER16™

Westinghouse
Type

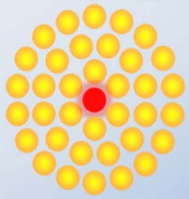
- 14OFA
- 16ACE7™
- 17ACE7™
- HIPER17™

PHWR

- 37-Element Fuel



- Modified 37M Fuel



Nuclear Fuel Supply Status

Supply Status per Fuel

PLUS7™	13 Units
17ACE7™	6 Units
16ACE7™	1 Unit
14OFA	1 Unit
CANDU6	4 Units

Supply Status per NPP

* To be operated

HUN / SHN

Plant	Unit	Fuel
HUN	1,2	17ACE7™
	3,4,5,6	PLUS7™
SHN	1,2*	

WSN / SWN

Plant	Unit	Fuel
WSN	1,2,3,4	CANDU6
SWN	1,2	PLUS7™

KRN / SKN

Plant	Unit	Fuel
KRN	1	14OFA
	2	16ACE7™
	3,4	17ACE7™
SKN	1,2,3	PLUS7™
	4*	

UAE

Unit	Fuel
1,2,3,4*	PLUS7™

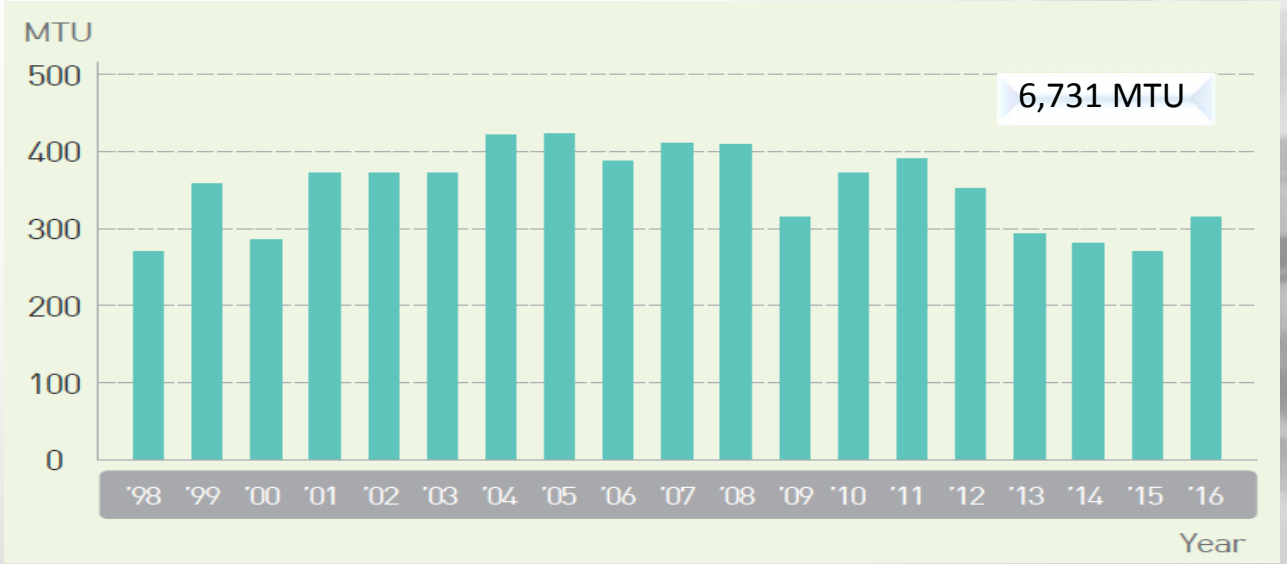
HBN

Unit	Fuel
1,2	17ACE7™
3,4,5,6	PLUS7™

Fuel Supply Record

PWR

CANDU



Nuclear Fuel Technology

Overview of Fuel Technology

Core Design and Safety Analysis

- Initial & Reload Core Design and Safety Analysis
- Fuel Engineering

Fabrication of PWR and CANDU Fuels

- PWR & CANDU Fuels
- UO_2 Powder and Fuel Components
- Tube for PWR Fuels

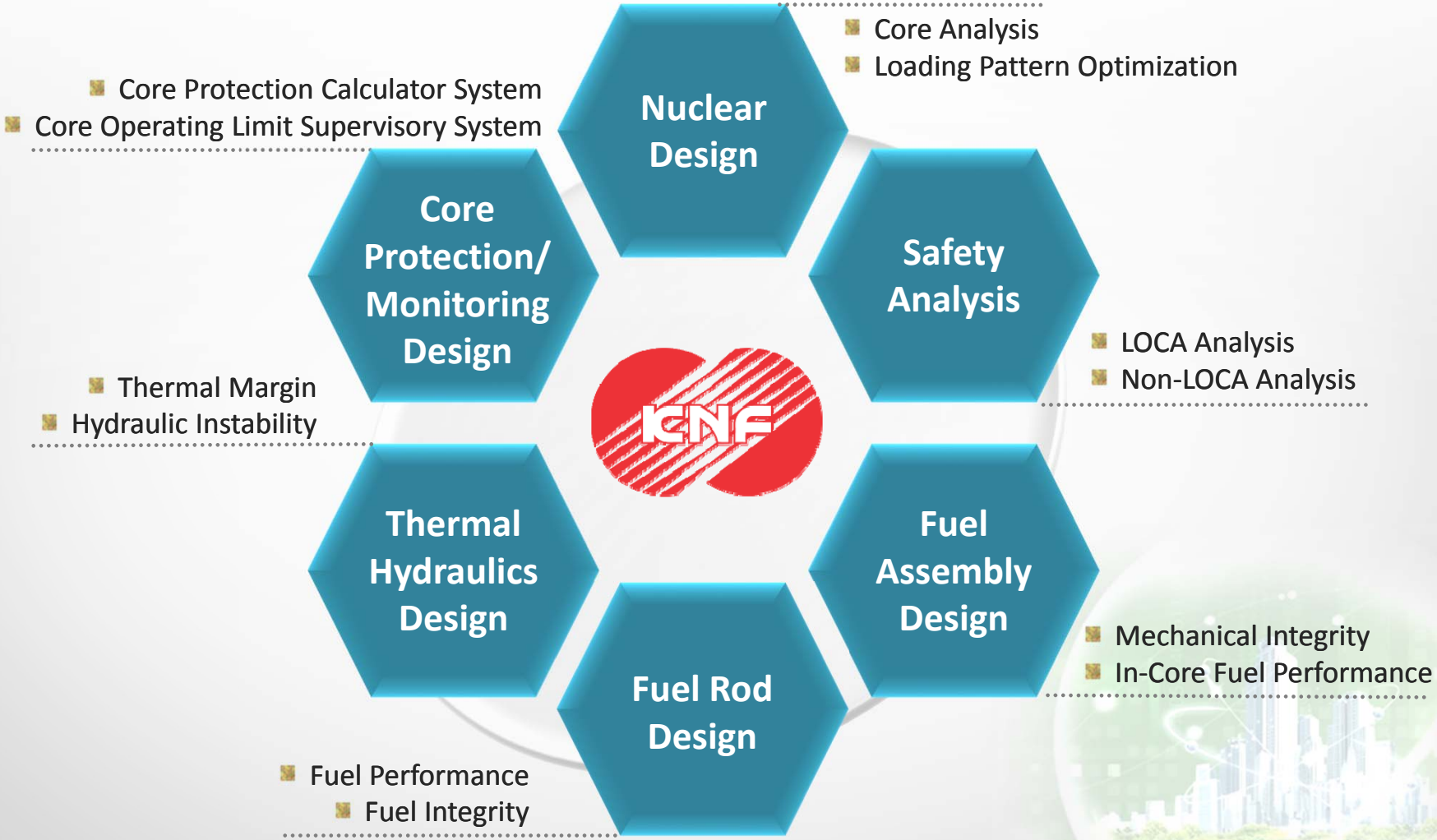
Fuel Maintenance and Service

- Coolant Activity Analysis, Root Cause for Leak
- Poolside Examination, Reconstitution, etc.

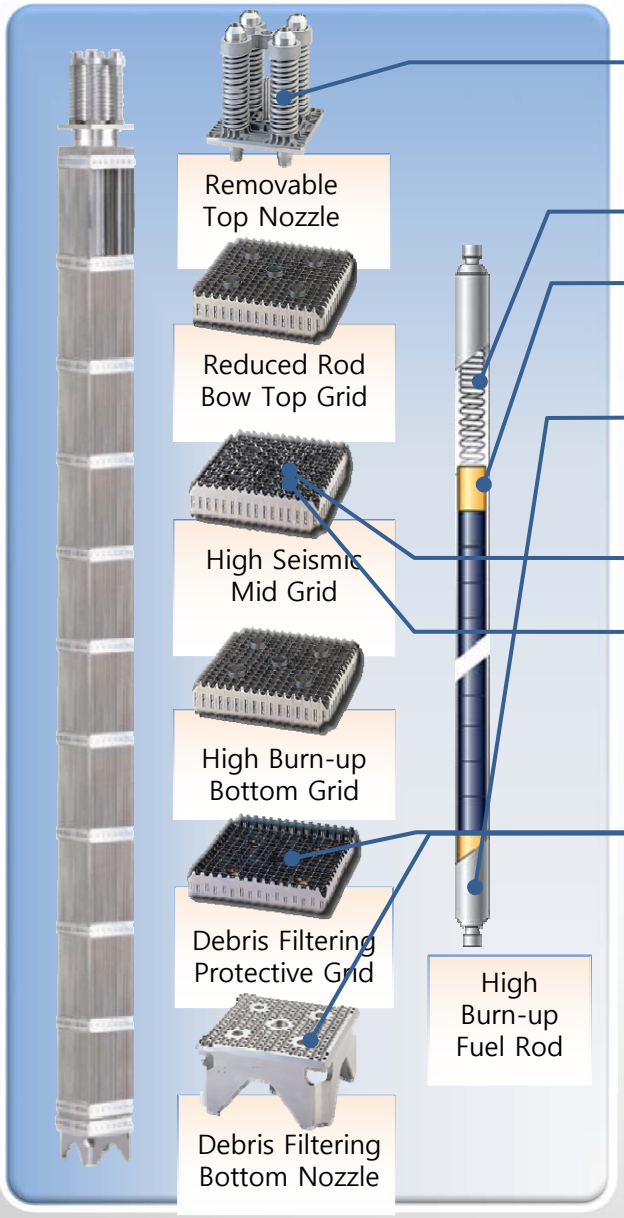
Research and Development

- Material, Nuclear Fuel Component & Assembly
- Design Code & Methodology

Core Design & Safety Analysis



PLUS7 Design Features and Benefits



- Removable Top Nozzle : Possible to Reassemble Easily
- Variable Pitch Spring : Provides Enough Plenum Volume
- Top & Bottom Axial Blankets : Increases Neutron Economy
- Long Bottom End Plug : Debris Failure Protection
- Mixing Vanes: Improves Thermal Performance
- Conformal Spring & Dimple: Improves Fretting Wear Resistance
- Debris Filtering System: Minimizes the impact on Fuel from debris

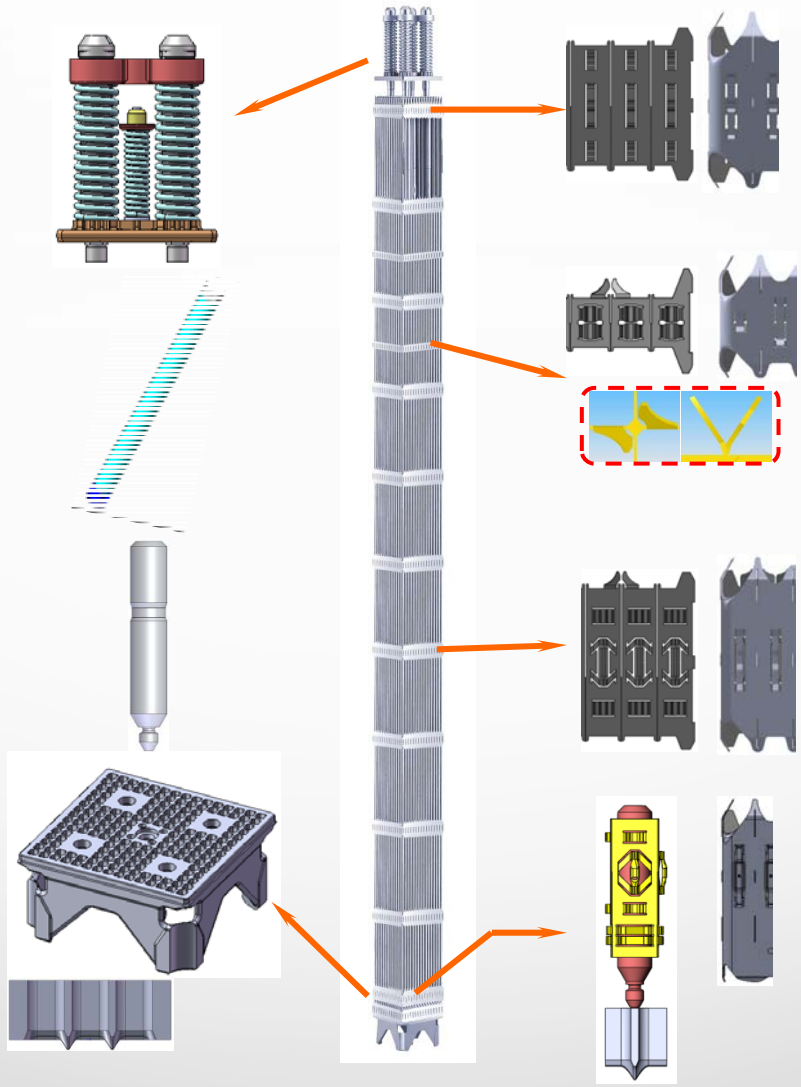
HIPER16 Design Features and Benefits

KEPCO NF

Fuel Development: '05~'10
LTA Program: '11~'15
Commercial Supply: '20~

*** HIPER16 Fuel : CE type 16x16 Advanced Fuel**

- **Integral Top Nozzle**
  - Minimize FA Bow
  - Easy Reconstitution
- **High Strength G/T**
  - 0.3g Seismic Load
  - Inner Dashpot Tube
  - Minimize FA Bow
- **High Burnup Fuel Rod**
  - Advanced Cladding
  - Large Grain Pellet
  - Optimized Plenum Spring
- **Low Pressure Drop Bottom Nozzle**
  - Maximized Rec. Flow Hole
  - Low Pressure Drop



- **Top Grid (1)**
  - Minimize Rod Bow
  - Vertical Spring/Dimple
  - Inconel Grid
- **IFM Grid (2) with Mixing Vanes**
  - Proven Mixing Vane
  - Tear-resistant Outer Strap
  - Anti-hangup Round Corner
- **Mid Grid (9) with Mixing Vanes**
  - Anti-Fretting Grid Spring
  - Tear-resistant Outer Strap
  - Anti-hangup Round Corner
- **Bottom Grid**
  - Debris Filtering Grid
  - Rod Grappling Spring
  - Long Solid End Cap

Fuel Fabrication Facilities

In Operation

Rod & Assembling

Plant 1

Reconversion & Pelletizing

Plant 2

Tube Manufacturing

TSA Plant

NSA Plant

Under Construction

Integrated Fuel Fabrication

Plant 3

Operation Schedule

From Jan 2021

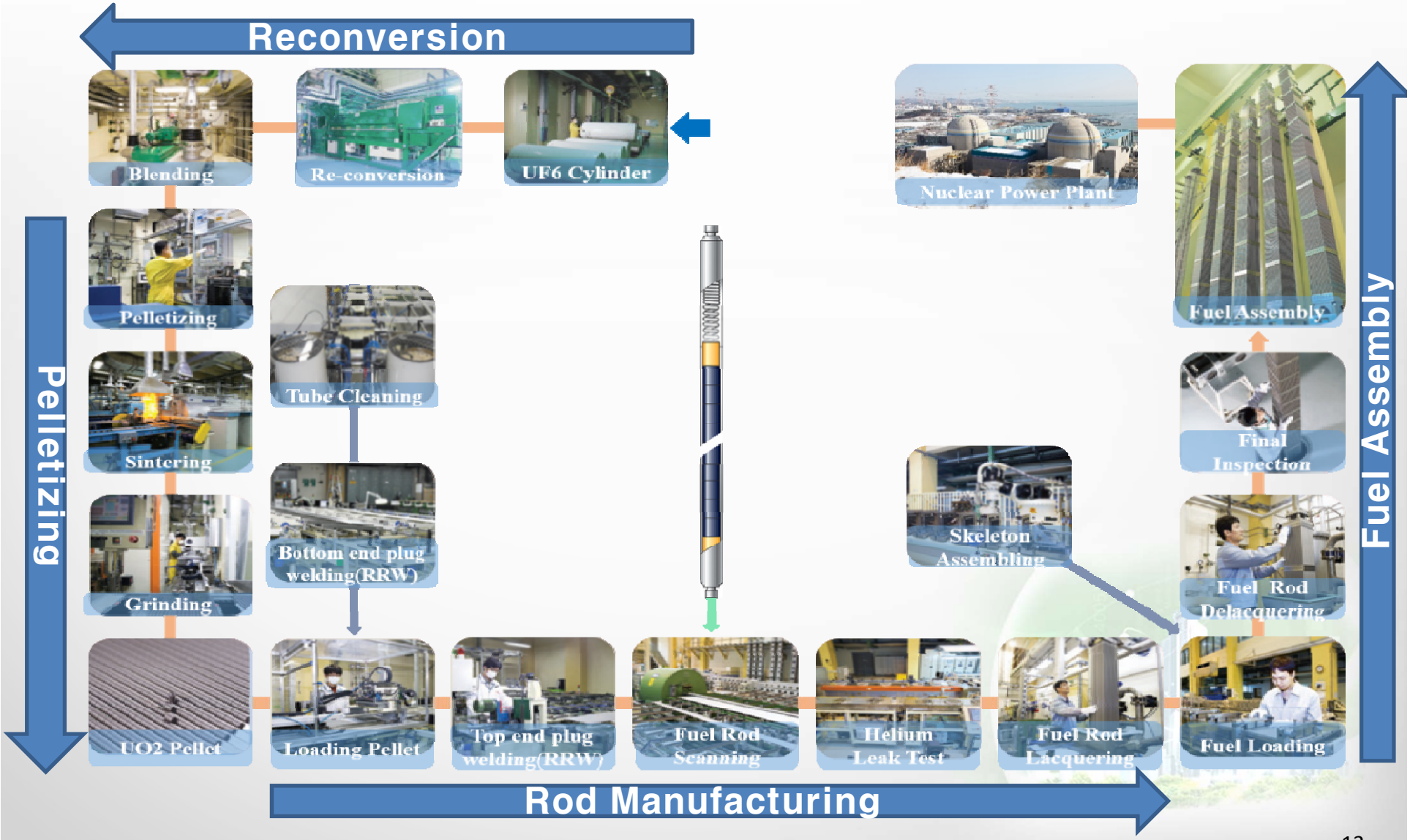
Capacity (PWR)

250 MTU/y

Production Capacity

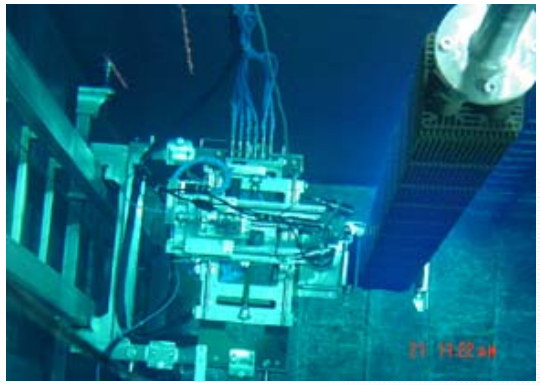
Current	Future
PWR: 550 MTU/yr (Max. 700)	PWR: 800 MTU/y (Max. 1,050)
PHWR: 400 MTU/yr	PHWR: 400 MTU/yr
Tube: 1,700 km/yr	Tube: 2,000 km/yr

Fuel Fabrication Facilities

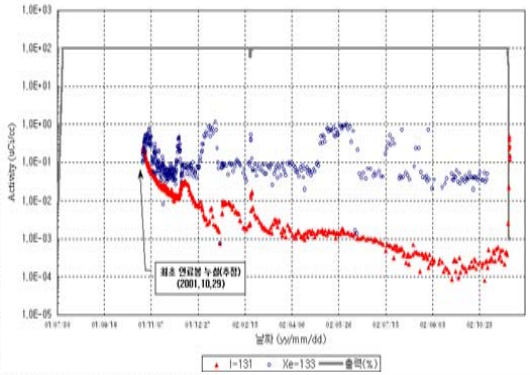


Fuel Service

Fuel Performance Examination

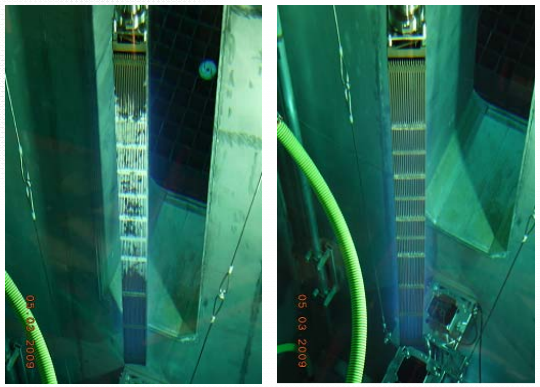


Coolant Activity Analysis



Fuel Inspection and Repair

Crud Removal



Thank you