

KNF-
FUEL-01

HIPER16, HIPER17 PWR Fuel

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KNF is a sole owner of HIPER16(Korean Standard Nuclear Power Plant Type) and HIPER17(Westinghouse Nuclear Power Plant Type); these nuclear fuels are at world's highest level in burnup performance, thermal margin, seismic performance, reliability and manufacturability, and will be commercially provided to nuclear power plants from 2022 which will bring KNF an ample experience in industry.

※ **HIPER** : High Performance with Efficiency and Reliability

Description

● Background

- Provide a safe, economical, high-performance nuclear fuel that KNF has a sole ownership of it

● Purpose and Necessity

- Enhance the burn-up, reliability, thermal margin, seismic performance and manufacturability
- Needed to secure an exclusive technology ownership to avoid proprietary issues

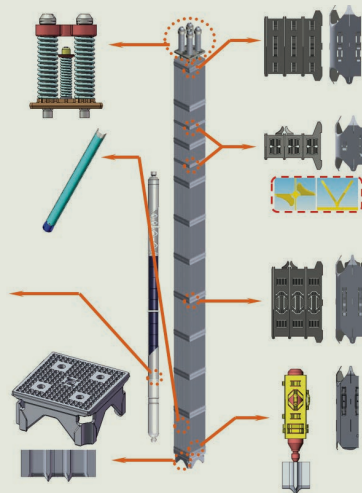
● HIPER16

- **Integral Top Nozzle**
 - Minimized FA Bow
 - Easy Reconstitution

- **High Strength G/T**
 - 0.3g Seismic Load
 - Inner Dashpot Tube
 - Minimized FA Bow

- **High Burnup Fuel Rod**
 - Advanced Cladding
 - Large Grain Pellet
 - Optimized Plenum Spring

- **Low pressure Drop B/N**
 - Maximized Rec. Flow Hole
 - Low Pressure Drop



- **Top Grid (1)**
 - Minimized Rod Bow
 - Vertical Spring / Dimple
 - Inconel Top Grid

- **IFM Grid (2)**
 - Proven Mixing Vane
 - Tear-Resistant Outer Strap
 - Anti-Hangup Round Corner

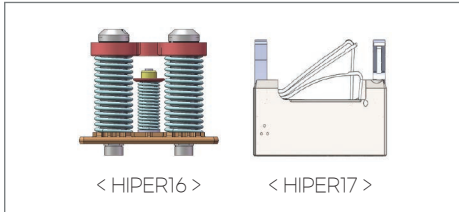
- **Mid Grid (9)**
 - Anti-Fretting Grid Spring
 - Tear-Resistant Outer Strap
 - Anti-Hangup Round Corner

- **Bottom Grid (1)**
 - Debris Filtering Grid
 - Anti-Fretting Grid Spring
 - Anti-Hangup Round Corner

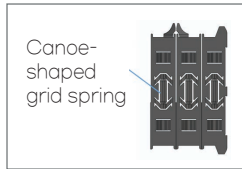
Distinctiveness

● Characteristics

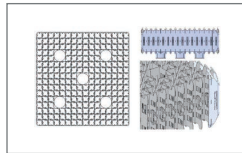
- Using non-linear hold-down spring reduces fuel assembly bowing



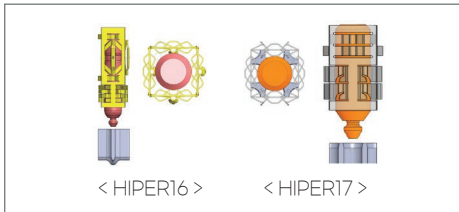
- Using canoe-shaped grid spring prevents fretting wear and fuel failure



- High seismic resistant mid grid



- Upgraded debris filter prevents fuel failure



● Benefits

- Ensure safe and competitive nuclear power plant by enhancing burn-up, reliability, thermal margin, seismic performance and manufacturability

Experience

● HIPER16

- LTA in-pile test and evaluation are completed
- Commercial licensing for domestic PWR Plants is underway

● HIPER17

- LTA in-pile testing in domestic commercial PWR plant is completed
- Preparing for domestic commercial licensing

Deliverables

- Fuel assembly for PWR Korean Standard Nuclear Power Plant(HIPER16)
- Fuel assembly for PWR Westinghouse 17-type Nuclear Power Plant(HIPER17)
- Components for fuel assembly and design technology

Technology Readiness Level (TRL)

Actual system proven through operation

Business Model

Technology Transfer

Licensing

Joint Search

Service Execution

Others

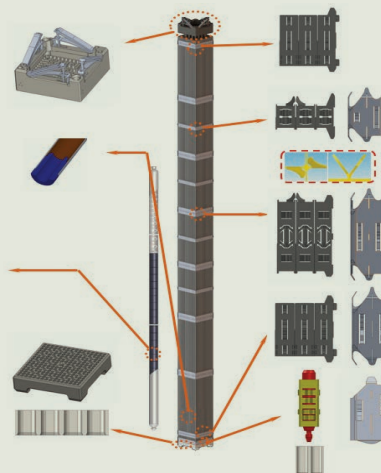
● HIPER17

- **Integral Top Nozzle**
 - On-Off Holddown Spring
 - Minimized FA Bow

- **High Strength G/T**
 - 0.3g Seismic Load
 - Minimized FA Bow
 - Inner Dashpot Tube

- **High Burnup Fuel Rod**
 - Advanced Cladding
 - Large Grain Pellet
 - Optimized Plenum spring

- **Low Pressure Drop B/N**
 - Maximized Rec. Flow Hole
 - Low Pressure Drop



- **Top Grid (1)**
 - Minimized Rod Bow
 - Anti-Fretting Grid Spring
 - Inconel Top Grid

- **IFM Grid (4)**
 - Proven Mixing Vane
 - Tear-Resistant Outer Strap
 - Anti-Hangup Round Corner

- **Mid Grid (6)**
 - Anti-Fretting Grid Spring
 - Proven Mixing Vane
 - Anti-Hangup Round Corner

- **Bottom Grid(1)**
 - Anti-Fretting Grid Spring
 - Scratch-Resistant Spring
 - Anti-Hangup Round Corner

- **Protective Grid (1)**
 - Debris Filtering Arch
 - Anti-Debris Fretting