

# LFR R&D Needs:

## Topic 2

- Topic 1: Core and Fuel
- **Topic 2: Design and Thermal-hydraulics**
- Topic 3: Materials and coolant technology
- Topic 4: Energy Conversion Systems
- Topic 5: Safety and Instrumentation

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# Focus on...

## **PRIMARY SYSTEM CONFIGURATION (and T/H):**

1. Pool stagnation zones: develop design to prevent stagnation
2. Pool thermal stratification: design may help to prevent
3. Lead has high freezing point (327°C) with a potential for coolant solidification: Primary and DHR design may help to address the issue;
4. Sloshing: show it is not an issue or develop anti-sloshing design
5. Continue investigation on seismic isolation systems

**Note that for most of the above points simulation can play a very important role taking into account the present calculation capability**

## **COMPONENTS Development (only primary pool):**

1. SGs: efficiency of double tube – continue exp. on SGTR to show not an issue
2. Primary pumps design: low dp, low speed, new design under development
3. DHRs: prevent freezing (at least one week grace time)  
identify DHR2 solution (several possibilities)
4. improve/simplify FAs design – show grids are viable

# Focus on...

## **FUEL HANDLING SYSTEM:**

1. Show cover removal as a viable option
2. Develop FHM and FAs pathway to water pool
3. Decrease (by design) the FAs length;
4. Evaluate fuel storage option inside vessel (strongly help fuel handling)

## **INSPECTION SYSTEM:**

1. SGs: prove continuous monitoring of SGs double tube solution
2. Develop in-vessel “viewing system”
3. Design and test main vessel inspection system
4. Further improve capability of component removal from primary system

# Focus on...

## **SEVERE ACCIDENT (?):**

1. Experimental investigation on fuel behavior after clad melting essential for designers (core catcher or not ?)
2. After exp.s simulations may play again an important role to design systems prone to fuel dispersion and identify measures
3. Investigate external vessel cooling as a final cooling system and consequences of freezing on the core.

## **THERMAL HYDRAULICS and SIMULATION:**

1. Simulation tool V&V: especially for low flow, low turbulence conditions
2. Need to take into account 3-D effects in system codes
3. Still need of dedicated experiments (heat transfer, FIV etc.)

# Main priorities for LFR Topic 2

- **PRIMARY SYSTEM CONFIGURATION**  
simulation may play a key role
- **DEDICATED COMPONENTS** Development
- **FUEL HANDLING SYSTEM**  
Long FAs, cover removal
- **INSPECTION SYSTEM**  
in vessel inspection system, comp. removal
- **SEVERE ACCIDENT (?)**
- **THERMAL HYDRAULICS**  
Experiments, simulation tools V&V

Several synergies with SFR development