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Nuclear Academics Meeting 2019

UK-Hitachi Collaboration on RBWR (Resource-renewable BWR)

September 2019

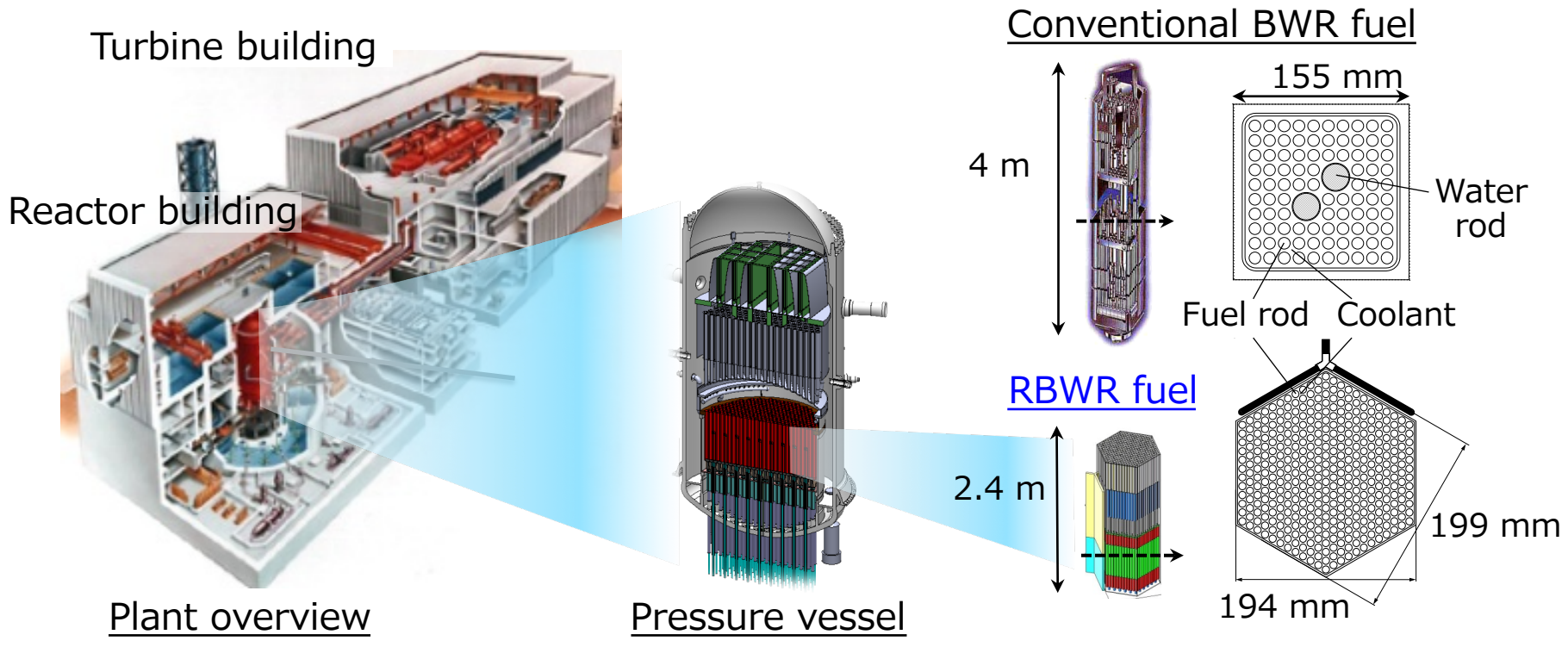
Hitachi-GE Nuclear Energy, Ltd.

Hitachi, Ltd.

Contents

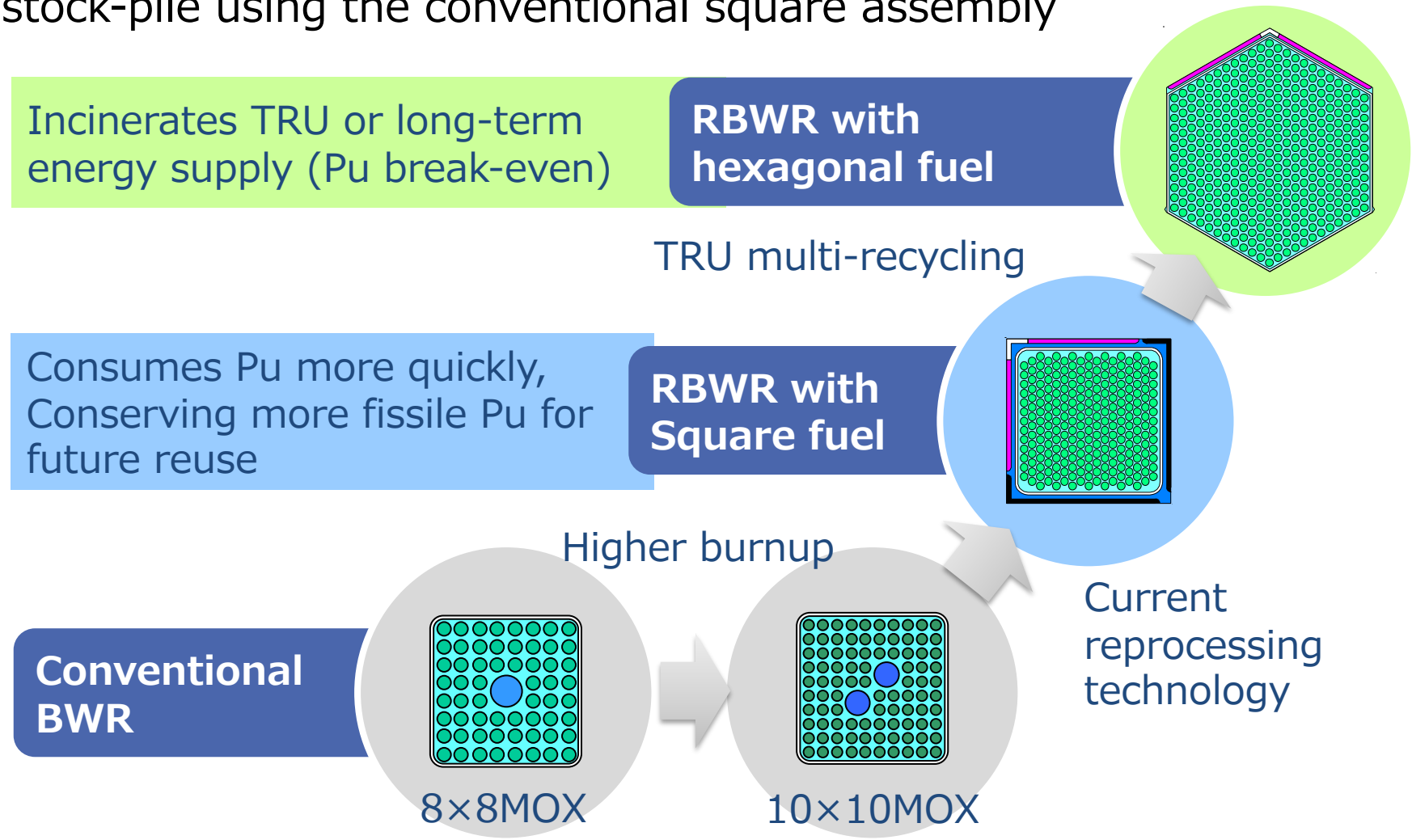
Introduction: What is RBWR?

- An innovative BWR concept, aiming at providing an alternative way to secure long-term energy supply and to reduce environmental impact by nuclear waste
- Harder neutron spectrum, achieved by a triangular lattice with tight pitch and two-phase flow of coolant



Introduction: Evolution of RBWR

- RBWR will be deployed along with social needs and available technologies: firstly deployed as a burner of plutonium (Pu) stock-pile using the conventional square assembly



Introduction: Evolution of RBWR

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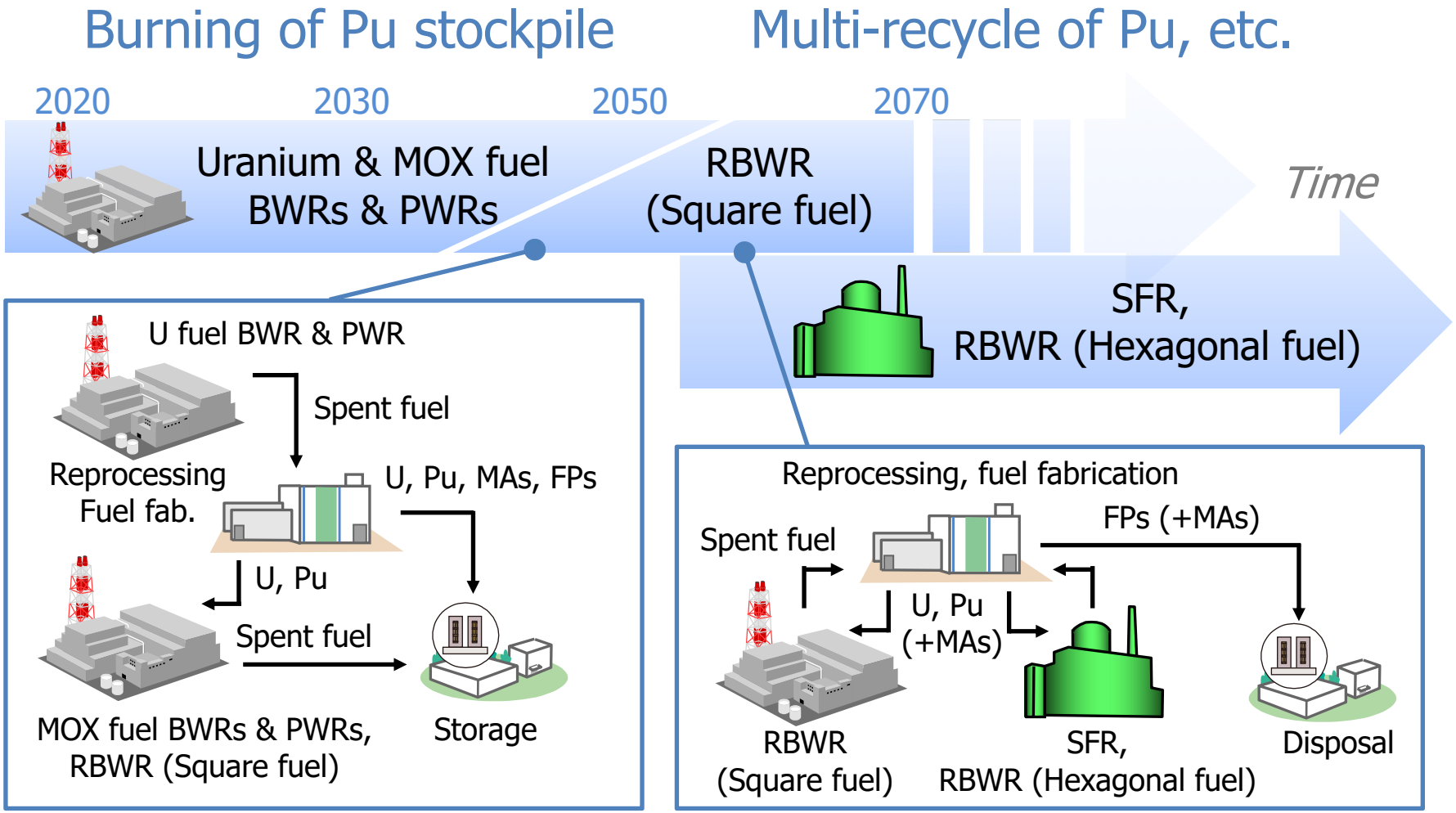
- RBWR with square fuel is planned to be deployed from mid 30's



FP: Fission product MA: Minor actinide (TRU except Pu), SFR: Sodium cooled fast reactor

Status of UK-Hitachi collaboration

- MOU was signed between BWR Hub and Hitachi-GE in 2016
- Newly 3 themes started in 2018 and 1 theme will start in 2019

R&D direction

BWR Research Hub and Network

Oct 2016～ (MOU)

Hitachi-GE Nuclear Energy, Ltd.

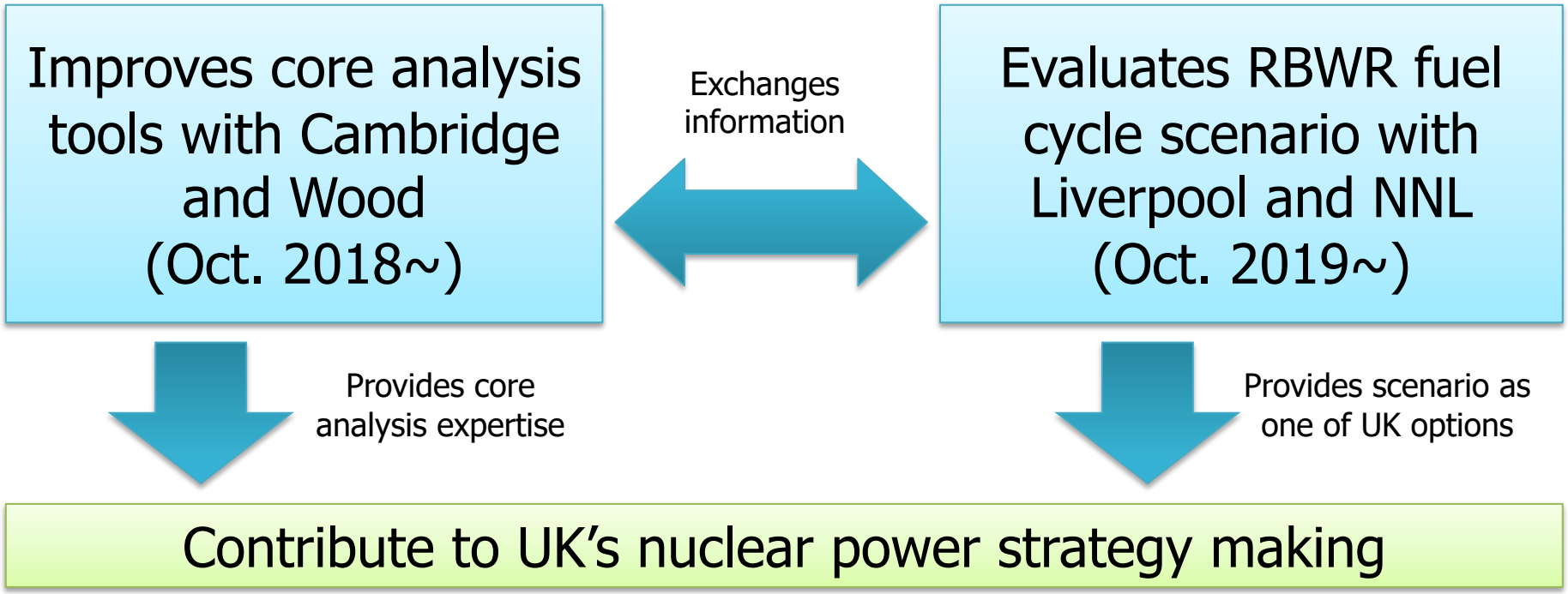
Provides R&D needs

R&D themes

No.	Field	Theme	Partner	Period
1	Material & Chemistry	Waste solidification	Imperial	2014~17
2		Co-60 deposition mechanism	Manchester	2014~17
3		Co-60 deposition mechanism (Ph.2)	Manchester	2018~
4		SCC mechanism of Ni based alloy	Manchester	2018~
5	Sensing	Pipe-wall thickness inspection	Bristol, RCNDE	2015~
6	Reactor physics	RBWR core analysis	Wood	2017
7		RBWR core analysis (Ph.2)	Cambridge, Wood	2018~
8		Fuel cycle scenario with RBWR	Liverpool, NNL	2019~

UK-Hitachi collaboration for RBWR

- CDT with Cambridge supported by Wood and Hitachi-GE started at October 2018: core analysis tools for RBWR will be improved
- PhD project supported by Liverpool, NNL and Hitachi-GE will start at this October: fuel cycle scenario and consideration of advanced fuels with RBWR will be evaluated (supported – via access to experts - by BEIS Reactor Physics Phase 2 Nuclear Innovation Programme)



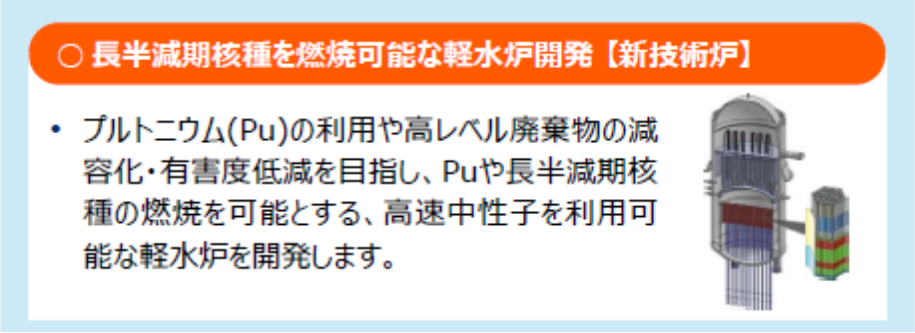
Current status of Japan

- The 5th Strategic Energy Plan of Japan was issued by Japanese government on July 2018.
- It is saying the basic policy of Japan is to promote a nuclear fuel cycle that reprocesses spent fuels and effectively utilizes the plutonium etc. retrieved, from the viewpoint of effective utilization of resources and reduction of the volume and harmfulness of high-level radioactive waste*.

  * https://www.enecho.meti.go.jp/en/category/others/basic_plan/5th/pdf/strategic_energy_plan.pdf

- Following this plan, METI announced start of a project to support R&D for innovative technologies of nuclear power from FY2019 to FY2027**.

  ** https://www.meti.go.jp/main/yosan/yosan_fy2019/pr/en/denga_riyou_05.pdf

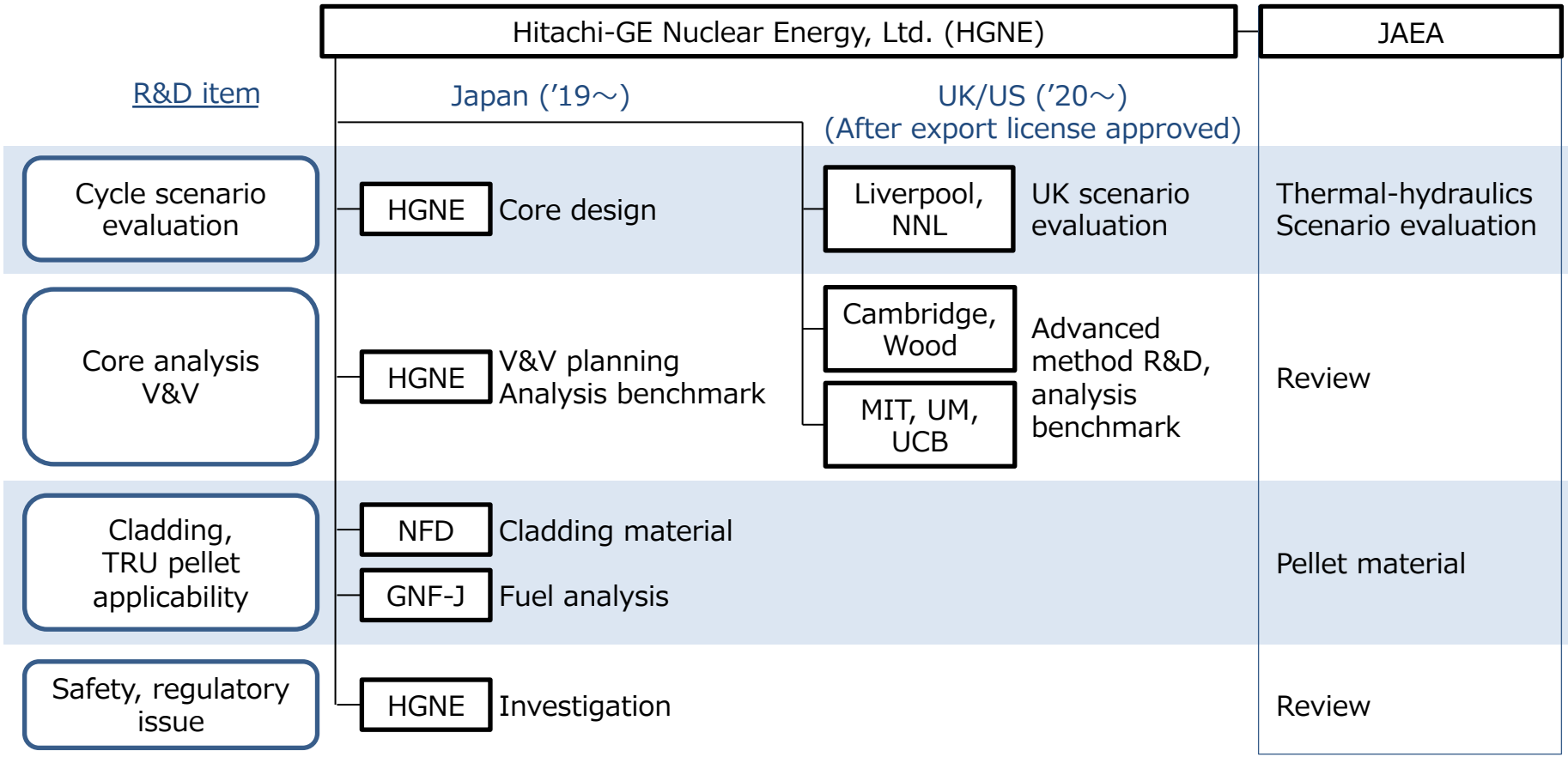


← LWR capable to burn long-lived TRU is presented as an example of R&D theme

- Hitachi-GE submitted a proposal for RBWR.

Vision

- Hitachi plans to extend collaboration to include UK and US from ’20, based on the current on-going partnership.



JAEA: Japan Atomic Energy Agency
GNF-J: Global Nuclear Fuel – Japan Co.
NFD: Nippon Nuclear Fuel Development Co., Ltd.
UM: University of Michigan
UCB: University of California Berkeley

Vision

- Hitachi is eager for further extension of collaboration, by exploring possibility of UK-Japan collaboration co-funded by Japan and UK

Needs of Japan
- Pu utilization
- Flexibility of Fuel cycle

Needs of UK
- Pu utilization?
- SMR?

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✓ Discussion about common R&D needs for UK and Japan
✓ Planning to share R&Ds

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✓ Makes proposal to UK and Japan

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Inspire the Next