The 51st JAIF annual conference

HITACHI
Inspire the Next

Involvement in the New Nuclear Power Station in the UK

Masahito Yoshimura
Senior Vice President and General Manager
Global Business Development and Management Division
Hitachi-GE Nuclear Energy, Ltd.

April 10, 2018

1. Why Overseas Nuclear Business?

HITACHI
Inspire the Next

Nuclear Manufacturer's Responsibility

- Revitalize Fukushima, Ensure long-term safety for domestic NPP
- Preserve high-quality nuclear technology, human capital, supply chain

Current situation of Nuclear Business

- Long-term suspension of domestic NPP causes low predictability to future nuclear business in Japan
- The biggest challenge we face is to survive in an overseas new NPP market needed for preserving the nuclear technology and human capital, where the competition has been increased by the new entrant of state-owned companies, China, etc..

It is imperative to implement reliable and efficient NPP
for revitalizing nuclear industrial base of Japan

Worldwide Promoting Construction of New Nuclear Power Plants

2. Business Environment of UK New Build

HITACHI
Inspire the Next

- Overseas NPP construction business is becoming tougher competition
  - Utilities' requirement level to manufacturer have upgraded from "Equipment Supplier" to "Business Development Partner"
- UK is one of the countries which has "Bankable" Business Environment

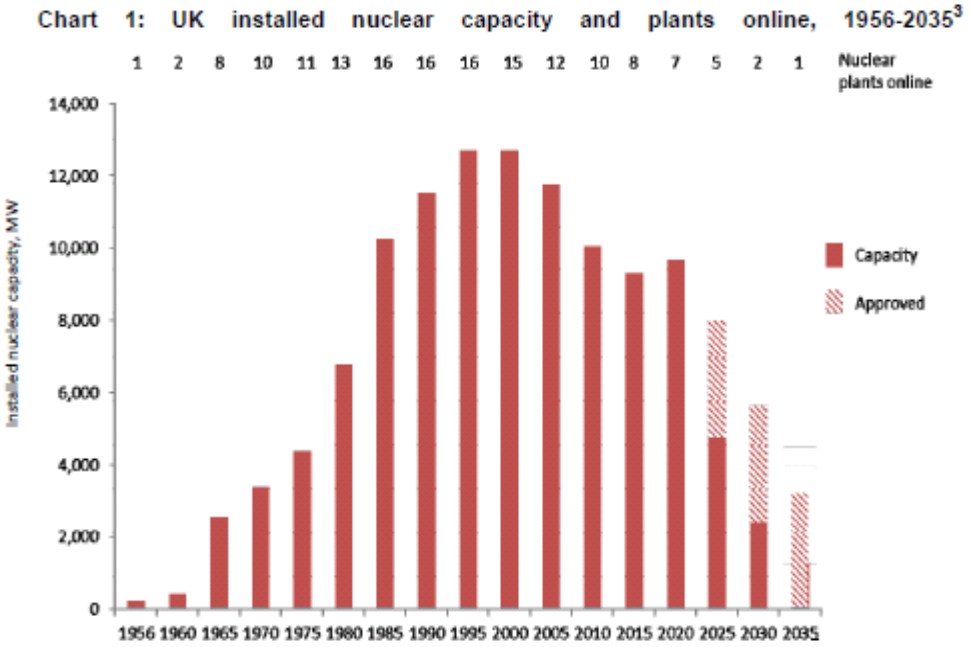
Key "Bankable" Criteria	UK Environment
Stable Pro-Nuclear Policy	UK government decided much greater reliance on nuclear power
Foreseeable Electricity Market Mechanism	Contract for Difference(CfD) provides stability and predictability to future revenue streams
NPP Operation Expertise /Business Know-how	Establishment of Exelon-JAPC joint venture company "JExel Nuclear"
Proven Reactor, Transparency in Licensing Process, Organization Structure for Minimizing EPC Risk	Proven most advanced reactor (ABWR), GDA process, Menter Newydd (JV of Hitachi, Bechtel, JGC)

3. Business Environment for Nuclear Power in UK

HITACHI
Inspire the Next

UK Market Trend

- UK became energy import country since 2004 due to the limited amount of oil & gas reserves in the North Sea.
- Currently 15 reactors in 8 nuclear power plants in operation. (provide around 10% of total electric power supply)
- All 14 GCRs will be closing down by 2030, starting from 2023.



Source: "Nuclear capacity in the UK" published in March 2017, BEIS

UK Energy Policy

- Primary objectives; Energy security, decarbonizing, energy efficiency
- Promote various and price-competitive source of low carbon electricity including renewable energy and nuclear energy.
- CfD and capacity market introduced as a support program for low carbon electricity.

CfD: Contract for Difference

4. UK Nuclear New Build Programs

HITACHI
Inspire the Next

NuGen [AP1000]
(Toshiba 100%[*1])

1,200MW Class×3

*1: According to media, Korea Electric Power Corp. obtained Priority Negotiating Rights in Dec. 2017.

Horizon Wylfa Newydd [UK-ABWR] (Hitachi 100%)

(Enough space for additional units)

1,350MW Class×2

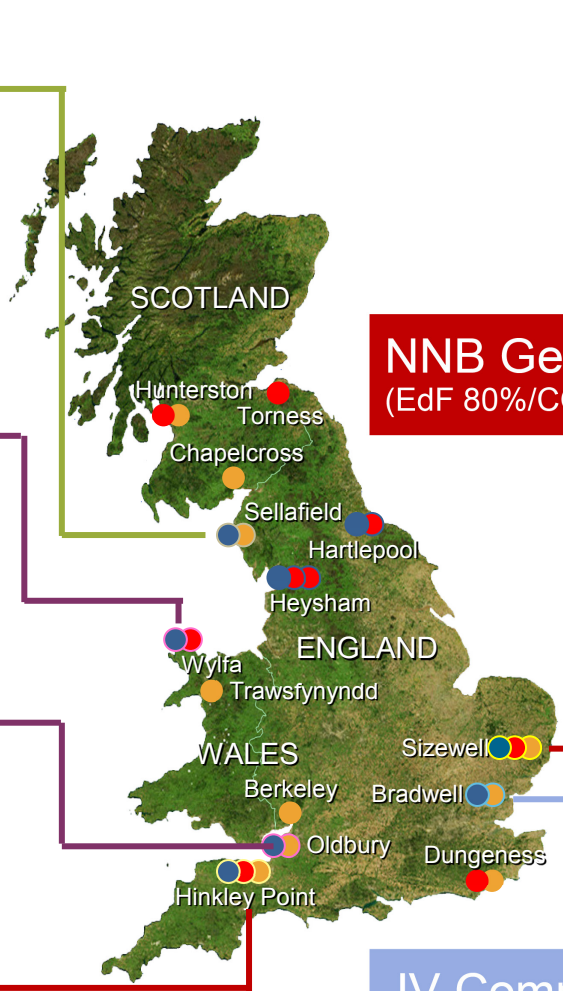
Horizon Oldbury [UK-ABWR] (Hitachi 100%)

1,350MW Class×2

NNB Genco [EPR]
(EdF 66.5%[*2]/CGN 33.5%)

1,600MW Class×2

*2: Maintain Minimum 50%, and further dilution will be pursued.



NNB Genco [EPR]
(EdF 80%/CGN 20%)[*3]

*3: Development phase

JV Company [HPR1000]
(EdF 33.5%/CGN 66.5%)[*4]

*4: GDA Assessment and development phase

ABWR: Advanced Boiling Water Reactor
HPR: Hualong Pressurized Reactor

5. About Horizon Nuclear Power Ltd.

HITACHI
Inspire the Next

Name of Company	Horizon Nuclear Power Limited
Representative	CEO Duncan Hawthorne **The former President & CEO of Bruce Power L.P.**
Head Office	Gloucester, U.K.
Business	Development of nuclear power plants
Date of Establishment	January 2009, Joint Venture of RWE and E.ON

- **From French Utility EdF, Horizon purchased lands earmarked for new nuclear power plants at Wylfa in North Wales and Oldbury in England.**
- **RWE and E.ON have decided not to continue with the NPP development in the UK, associated with Germany's nuclear phase-out policy after Fukushima accident.**
- **November 2012, Hitachi completed the acquisition of Horizon from RWE and E.ON.**

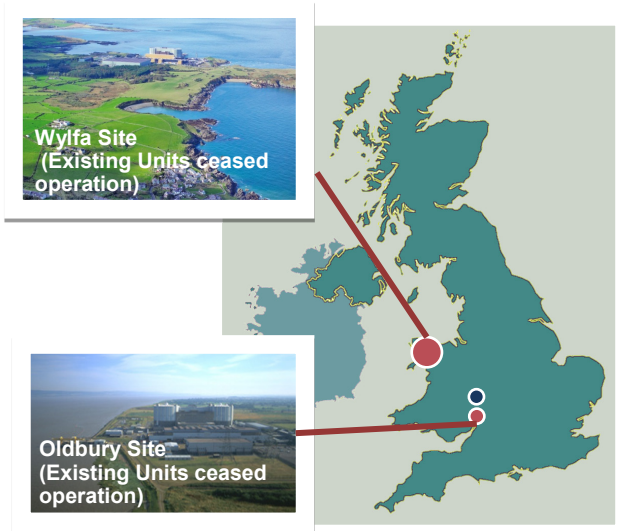
Shareholder	Hitachi, Ltd. (100%)

6. About Horizon Project

HITACHI
Inspire the Next

- Establish Two 1,350 MW class Advanced Boiling Water Reactors (ABWR) at Wylfa Newydd site first, Oldbury will follow.

Licensing	■ Completed Generic Design Assessment (GDA) in December 2017. ■ Site Licensing process in progress.
Engineering, Procurement & Construction (EPC) Arrangements	■ Formed “Menter Newydd”, a joint venture of Hitachi Nuclear Energy Europe, Bechtel Management Company and JGC Corporation in May 2016. The JV is responsible for construction of Wylfa Newydd plant.
Operational Support	■ Horizon concluded an agreement with Japan Atomic Power (JAPC) and Excelon. These two companies formed a Joint venture “JExel Nuclear” in April 2017 for further assistance.



(Conceptual Bird's-eye view)

7. Completion of GDA for UK-ABWR

HITACHI
Inspire the Next

Hitachi-GE has been honored to receive a Design Acceptance Confirmation (DAC) from ONR, and Statement of Design Acceptability (SoDA) from Environment Agency and Natural Resources Wales on 13 Dec. 2017.

Cyfoeth Naturiol Cymru Natural Resources Wales

Environment Agency

Generic assessment of candidate nuclear power plant designs

statement of design acceptability for the UK ABWR design

Hitachi

Office for Nuclear Regulation

ONR-GDA-DAC-17-002

GENERIC DESIGN ASSESSMENT

DESIGN ACCEPTANCE CONFIRMATION

FOR THE HITACHI-GE NUCLEAR ENERGY, LTD. UK ABWR NUCLEAR REACTOR

The Office for Nuclear Regulation (ONR), in accordance with the document New Nuclear Reactors: Generic Design Assessment Guidance to Requesting Parties, Version 3 September 2016, hereby gives Hitachi-GE Nuclear Energy, Ltd. a Design Acceptance Confirmation (DAC) for the UK ABWR nuclear reactor.

This DAC:

(a) is given following the assessment of the material included in the GDA Submissions described in the Annex; and

(b) does not guarantee that ONR will grant permission for the construction of a power station based on the UK ABWR nuclear reactor design at a particular site in Great Britain. Any organisation intending to build and operate an UK ABWR reactor in Great Britain must first obtain from ONR a nuclear site licence, as required under the Nuclear Installations Act 1965.

(c) is valid for a period of ten years beginning on the date on which it is issued.

Signed

Date of Issue

13th December 2017

Mr Mark Foy
Chief Nuclear Inspector
Office for Nuclear Regulation

Signing Ceremony

Hidetoshi Takehara, Hitachi, Ltd., Nuclear Energy Business Unit, Chief Operative Officer

Mark Foy, ONR, Chief Nuclear Inspector

Tim Jones, Natural Resources Wales, Executive Director

Stephen Hardy, Environment Agency, Nuclear Regulation Group Manager

8. Future Developments on UK Project

HITACHI
Inspire the Next

- Managerial judgement towards FID (Final Investment Decision)
  - Completion of GDA, site license, and other needed regulatory processes
  - Reasonable level of strike price
  - Formation of financial structure including government support

- Detailed Approach for "On-Time On-Budget" NPP Construction

Phase	Considerations	Description
E (Engineering)	・Design and deliverable control ・Minimize design change	・Innovative project management platform (configuration management, etc.) ・Design change control procedure
P (Procurement)	・Quality assurance of specialised component ・On-time delivery ・Cost reduction	・Japanese advanced manufacturing & experienced workforce ・Japan and UK proven supply chain collaboration
C (Construction)	・Front-loaded construction engineering(Schedule synchronization of EP & C) ・ABWR construction know-how delivery	・Logic base of domestic ABWR construction experience ・Standardized large modules ・Visualization tools(e.g. Installation Simulator)

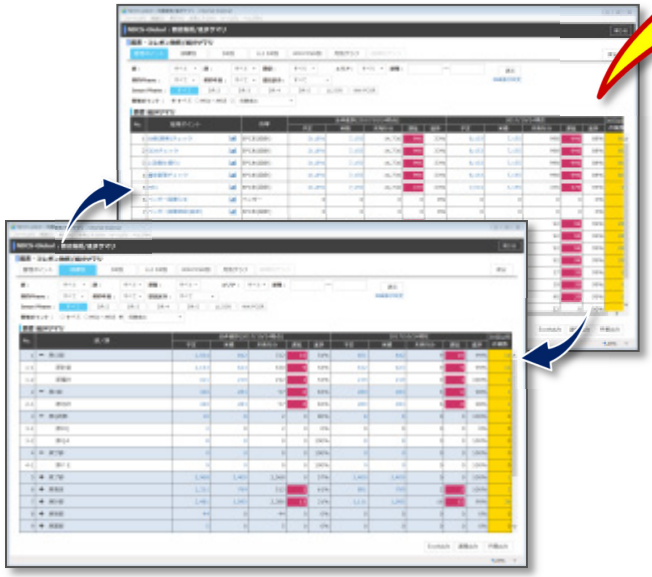
9. Engineering) Configuration Management

HITACHI
Inspire the Next

Innovative Project Management Platform (Deliverable Control, etc.)

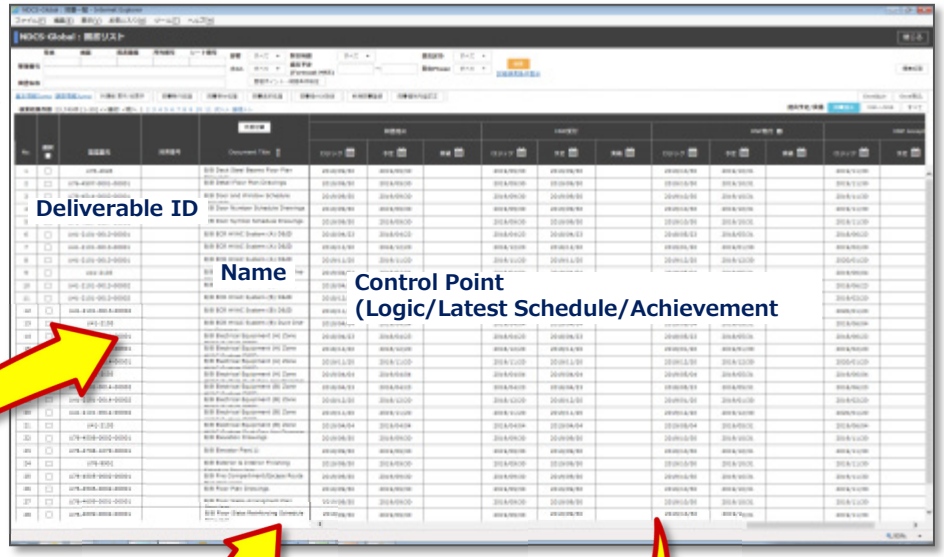
A TOP View

B Schedule Control



Drill down

D Deliverable Control



Deliverable ID

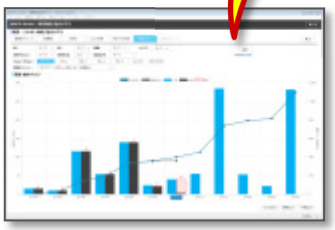
Name

Control Point
(Logic/Latest Schedule/Achievement

Relationship between upstream and downstream

Drill down

C Graph



E Relation Map

F Monthly/Weekly Reports

HITACHI
Inspire the Next

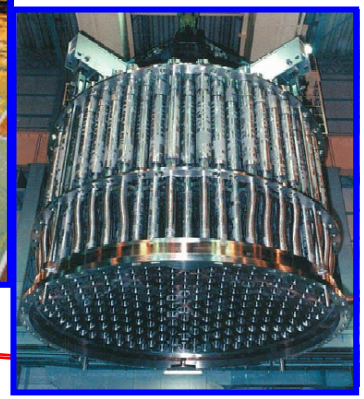
Japanese Advanced Manufacturing & Experienced Workforce

Rector Pressure Vessel

Core Shroud

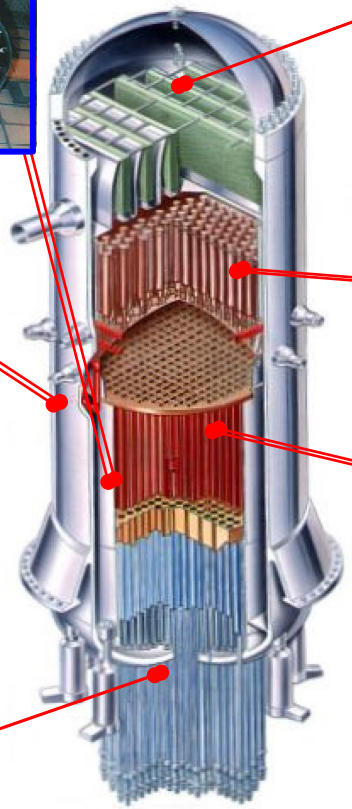
Steam Dryer

Rinkai Works Products

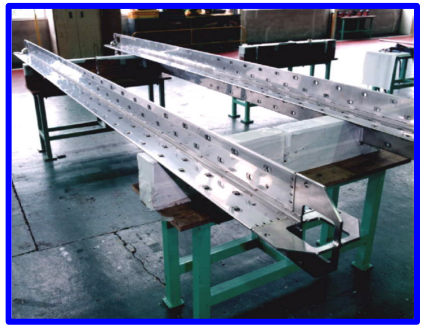


Moisture Separator

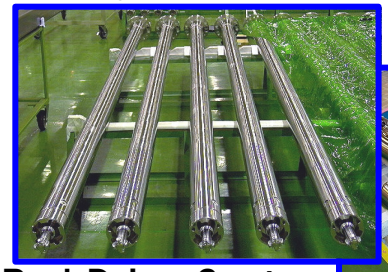
Channel Box



Fuel Assembly



Control Rod



Control Rod Drive System

11. Procurement 2) Focus on Education & Training

HITACHI
Inspire the Next

Develop young engineer's skills through Japan Skills Olympics Competition

Hitachi-GE 2017 Results

Category	Number of participant	Award
Mech. Drawing &Design	2	GOLD: 1 SILVER: 1
Construction Steel Work	1	SILVER: 1
Welding	2	BRONZE: 2

12. Procurement 3) Global Supply Chain

HITACHI
Inspire the Next

Japan and UK Supply Chain Collaboration

Strength of UK companies:

- UK construction know-how
- Localised component manufacture
- Bulk materials
- Long-term service and support

Strength of Japanese companies:

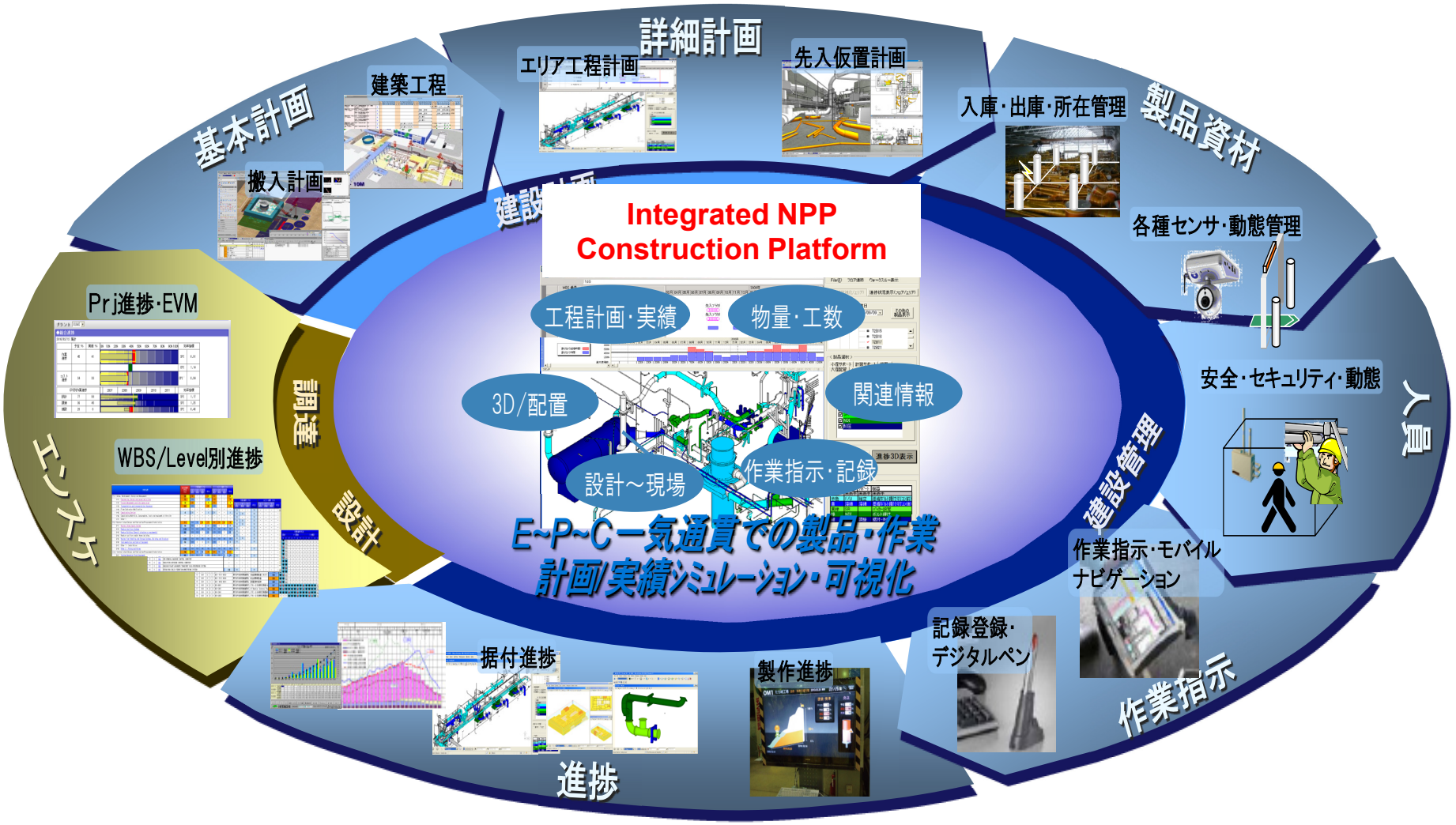
- ABWR technology (HGNE)
- Specialised component manufacture
- ABWR construction know-how

Opportunities for collaboration :

- Japanese manufactures securing long-term service support from UK firms
- Japanese constructors partnering UK firms to exchange experience
- Japanese firms localising a presence to the UK, to enhance ongoing involvement
- Joint-ventures around manufacturing, to supply components to future units

HITACHI
Inspire the Next

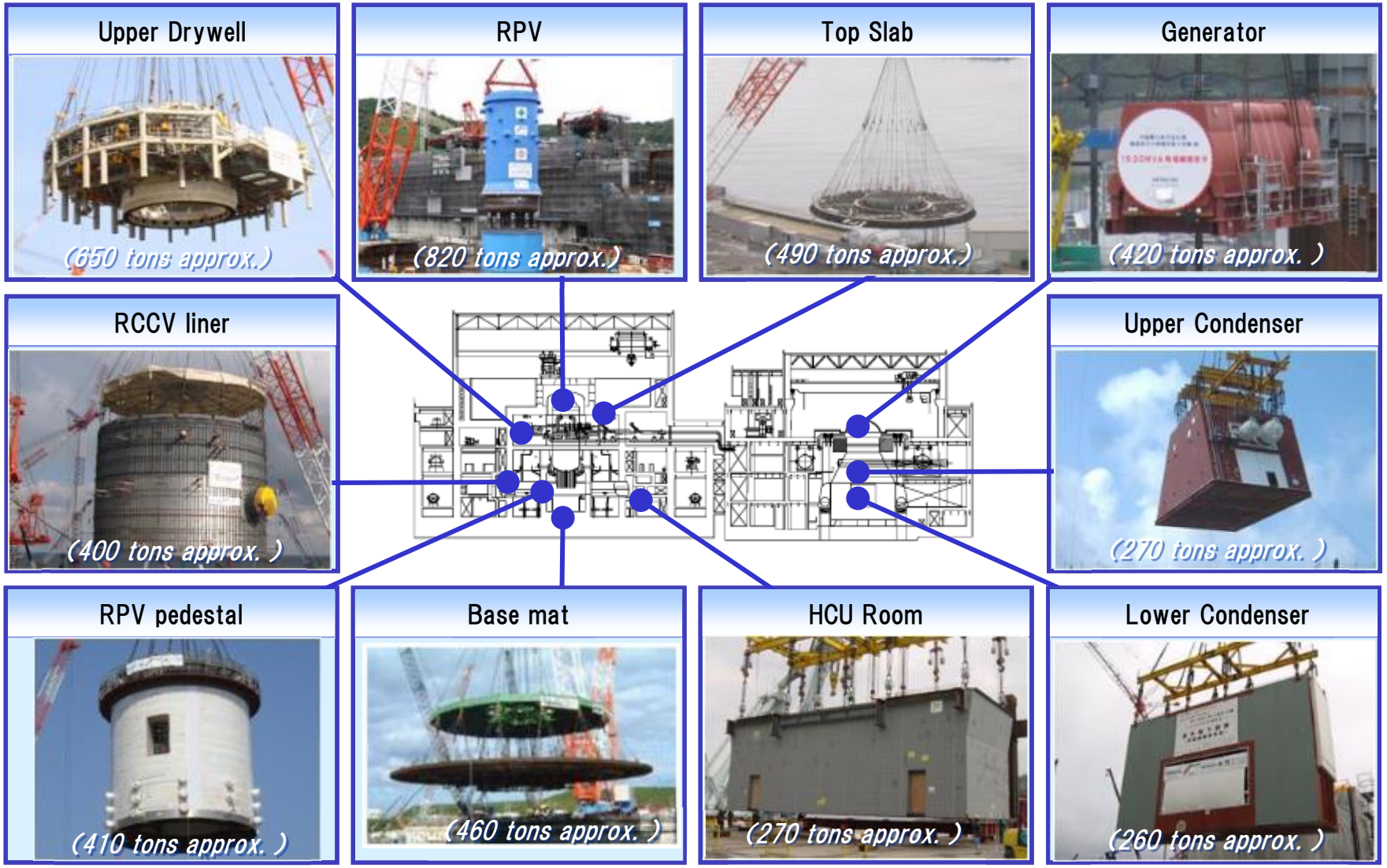
Logic base of domestic ABWR construction experience enables UK Horizon project's on-time on-budget delivery



14. Construction 2) Standardized Large Modules

HITACHI
Inspire the Next

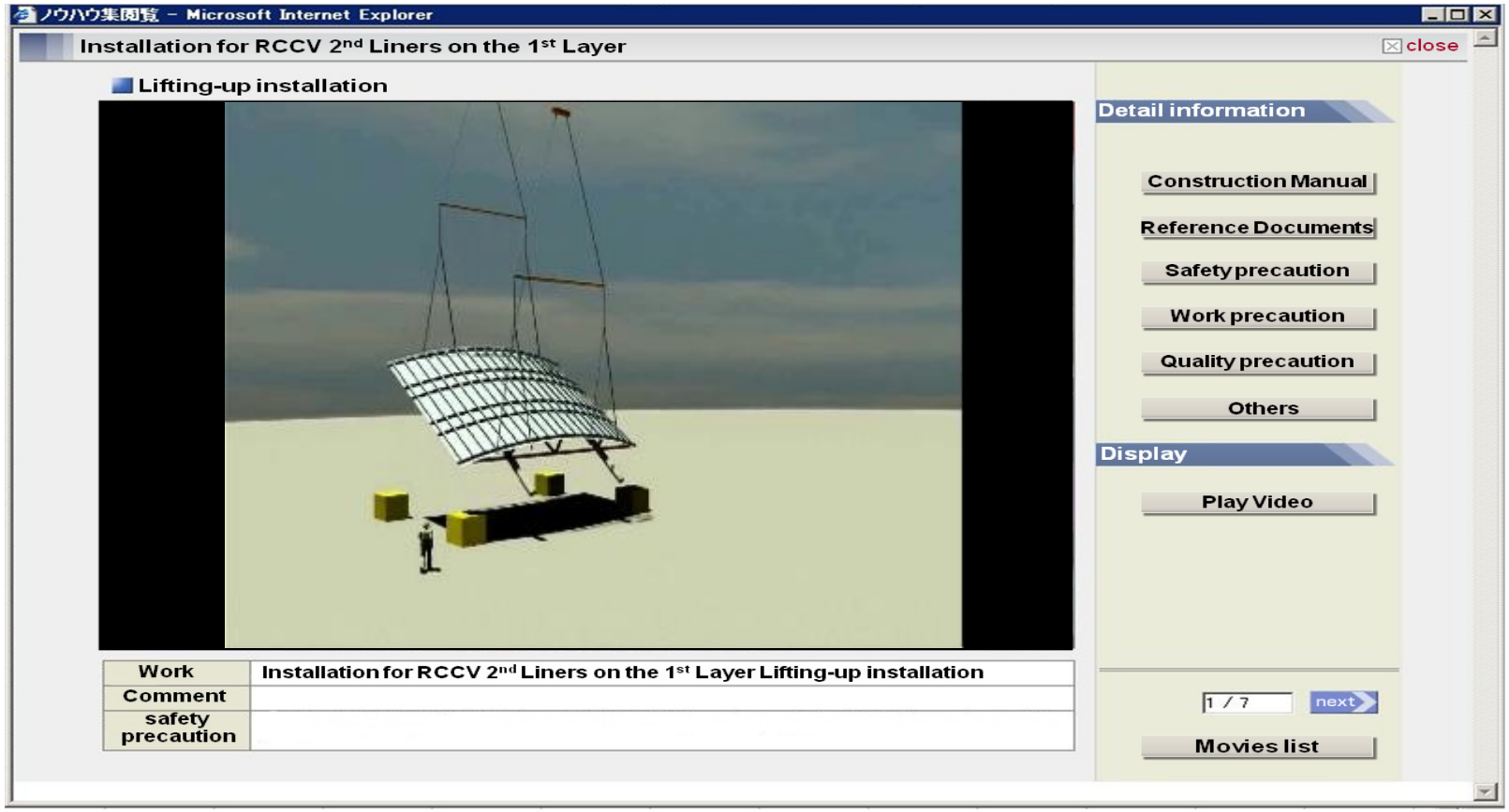
Modular design reduces onsite operations, that mitigate quality and process risk



15. Construction 3) Skill Transfer

HITACHI
Inspire the Next

Before process operation is started, each work steps can be ensured by visualization tools(e.g. Installation Simulator)



16. Development of Global Standard Plant

HITACHI
Inspire the Next

Implementation of reliable and efficient NPP

Current

Compliant to JP Regulatory Standards

Shimane-3/Ohma-1

As a Global Standard Plant

Wilfa Newydd 1&2

Future

Technical Transfer to NPPs in Japan

Higashidori-1/Kaminoseki-1

Deploy to world market

Economy & Efficiency

- Optimized construction cost based on standardized plant design
- Operational cost reduction resulting from uprated plant utilization

Plant Performance

	Domestic average	ABWR
In service	13 mos.	18 mos.
Outage	3 mos.	30 days
Utilization	70%	90%

Maintain workforce and enhance technology through continuing NPP constructions

17. Conclusion

HITACHI
Inspire the Next

We hope to

- Contribute to solving the world's environment & energy issues, through our proven ABWR design, on-time and on-budget delivery with reliable supply chain and construction technique.
- Bring back the latest safety and efficient nuclear technology to Japan based on the overseas experience in construction and operation of NPP.
- Maintain workforce and enhance technology through continuing NPP constructions. Secure industrial infrastructure underpinning of Fukushima Daiichi NPP decommissioning and nuclear safety in Japan.

One for all, all for one.

Thank you for your kind attention!