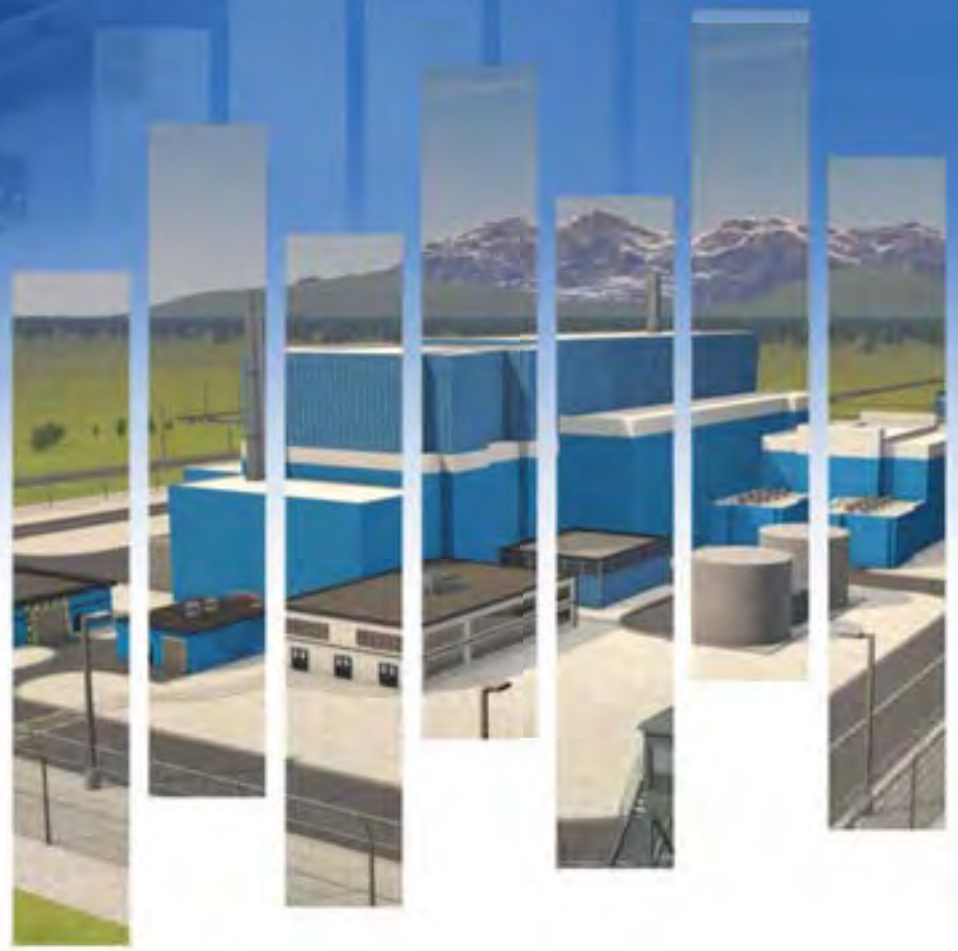

GE Hitachi advanced BWRs – key feature and market status

Central and Eastern European Nuclear Power
Warsaw, Poland
21-22 October 2014

David Powell
Vice President, Europe region
Nuclear Power Plant Sales

Who we are…

GE Hitachi Nuclear Alliance

	GE Hitachi	GNF	Global Laser Enrichment	Hitachi GE
Ownership	GE 60% Hitachi 40%	GE 60% Hitachi 26% Toshiba 14%	GE 51% Hitachi 25% Cameco 24%	Hitachi 80% GE 20%
Key segments	Services, New Units, and Canada	Fuel Fabrication and Engineering	Uranium Enrichment	Services and New Units in Japan

Leading global BWR nuclear provider

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Two strong global parent companies

GE in Europe
- Operating here for over 100 years
- 90,000+ employees
- Annual revenues of ~€18B (~20% of GE's global revenue)

General Electric
- Operating in >100 countries
- 125+ year legacy
- >300,000 employees worldwide
- 2013 global revenue €107B

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Hitachi
- 100+ year history
- >360,000 employees worldwide
- 2013 global revenue ~ €69B

Hitachi in Europe
- Operating here since 1982
- ~10,000 consolidated employees
- Annual revenues of ~€5.8B (~7% of Hitachi's global revenue)

Combined
- More than 225 years of company history
- More than 660,000 employees globally and 100,000 in Europe
- ~€175B in revenue globally and ~€24B in Europe

GE Hitachi's new reactor portfolio

light water

sodium cooled

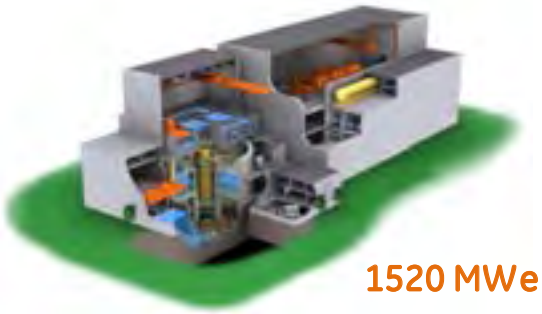
ABWR

1350 MWe

Operational Gen III technology

- Lowest core damage frequency of any Generation III reactor
- Extensive operational experience since 1996
- Licensed in US, Taiwan, and Japan

ESBWR

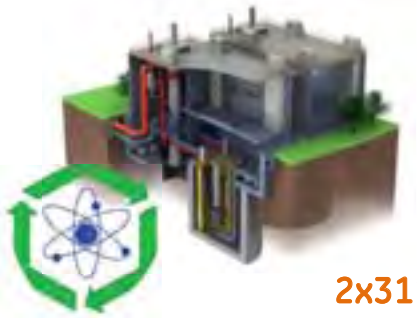


1520 MWe

Evolutionary Gen III+ technology

- Lowest core damage frequency of any Generation III+ reactor
- Passive cooling for >7 days without AC power or operator action
- Lowest projected operations, maintenance & staffing costs[1]
- 25% fewer pumps, valves & motors than active safety nuclear plants

PRISM



2x311 MWe

Revolutionary Gen IV technology

- 40 years of development history
- Passive air-cooling with no operator or mechanical actions needed
- The answer to the used fuel dilemma – nuclear waste reduced to ~300-year radiotoxicity[2] while providing new electricity generation
- Also a solution for Pu disposition

1 Claims based on the U.S. DOE commissioned 'Study of Construction Technologies and Schedules, O&M Staffing and Cost, and Decommissioning Costs and Funding Requirements for Advanced Reactor Designs' and an ESBWR staffing study performed by a leading independent firm

2 To reach the same level of radiotoxicity as natural uranium

GE HITACHI

Delivering new nuclear build

The future of our industry

Safety

Innovation

Predictability

Simplicity

HITACHI

GE Hitachi new nuclear plant development

Borax BWR test facility

Worldwide BWR fleet

K6/K7 – First ABWRs

ESBWR

1950's 1980's 2000's

lessons learned ... customer input ... new features ... testing ... studies ... detailed design

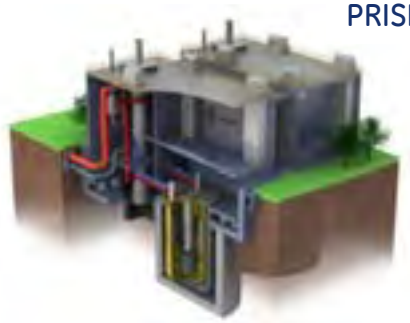
EBR

US sodium reactor experience

SEFOR, Fermi I, Seawolf, FFTF

EBR-II

PRISM



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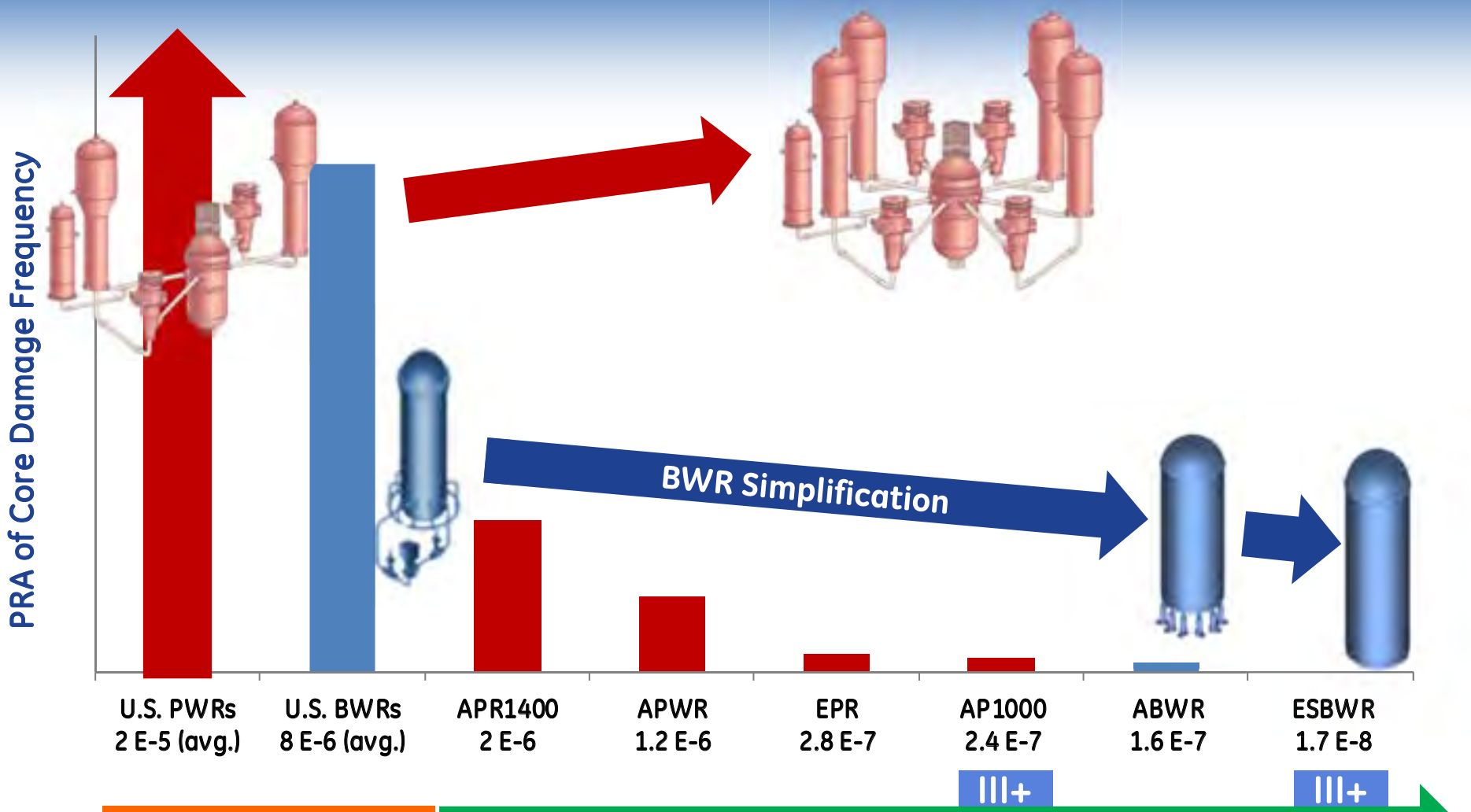
Simplicity increases safety



References: Plant licensing DCDs and publically available information
Note: PRA of CDF is represented in at-power internal events (per year)
Note: NSSS diagrams are for visualization purposes only

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Simplicity reduces equipment and maintenance

ESBWR

Everything in one vessel

Extra components impact:
- Manufacturing
- Installation
- O&M
- Decommissioning

- ESBWR doesn't require: steam generators, pressurizer, reactor coolant pumps, primary loop piping
- PWR heat exchange surfaces (steam generators) wear out over 20-30 years … 1/3 of ESBWR's heat exchange surfaces (fuel) are replaced every outage (~2 years)

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Predictability - Successful ABWR project delivery

Kashiwazaki-Kariwa 6/7 ABWR

COD 1996/1997

Hamaoka-5 ABWR

COD 2005

Shika-2 ABWR

COD 2006

First-of-a-kind units built on-time and on-budget!

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Advanced Boiling Water Reactor

ABWR

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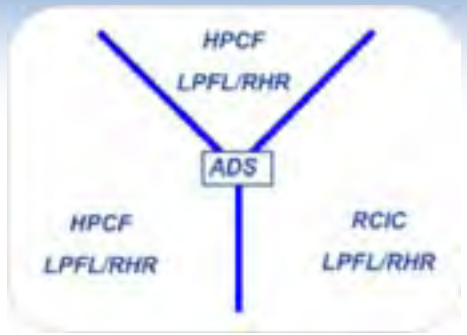
ABWR station blackout prevention and mitigation



3 x 100% nominal safety divisions

Emergency Diesel Generators

- 3 located in Reactor Building
- Each has a 7-day fuel tank that is buried in a concrete vault outside the Reactor Building

Combustion Turbine Generator

- Air-cooled – Service Water not needed

AC Independent Water Addition (ACIWA) System

- Hard-piped connections to reactor

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ABWR project experience

Operational

Kashiwazaki-Kariwa 6
COD 1996
Kashiwazaki-Kariwa 7
COD 1997

Hamaoka-5
COD 2005

Shika-2
COD 2006

Under Construction

Ohma 1
38% complete

Shimane 3
94% complete

Lungmen 1&2
94% complete
Pre-op testing

The only Gen III Reactor with operating experience … +25 years

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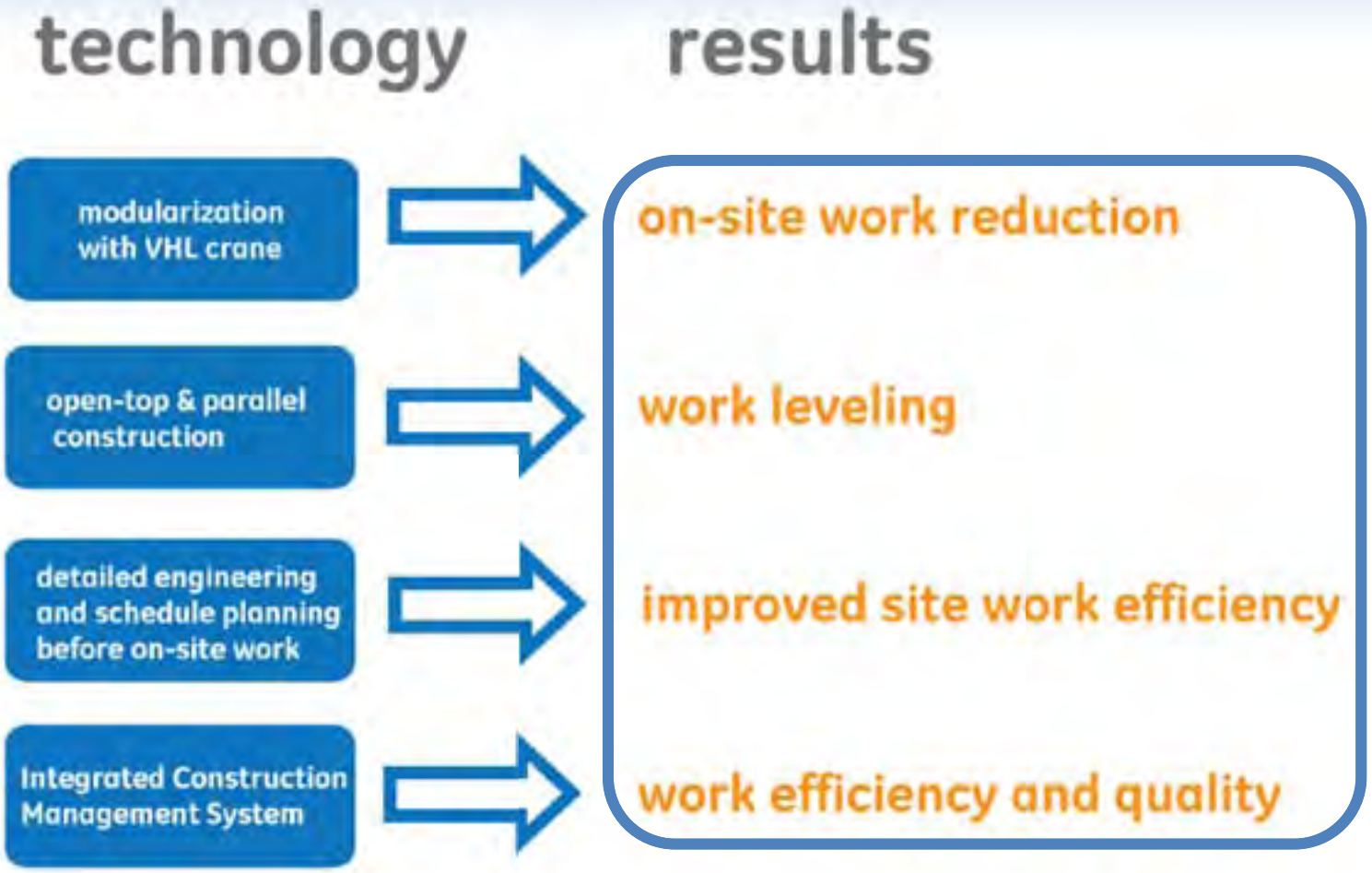
Efficient, repeatable execution model



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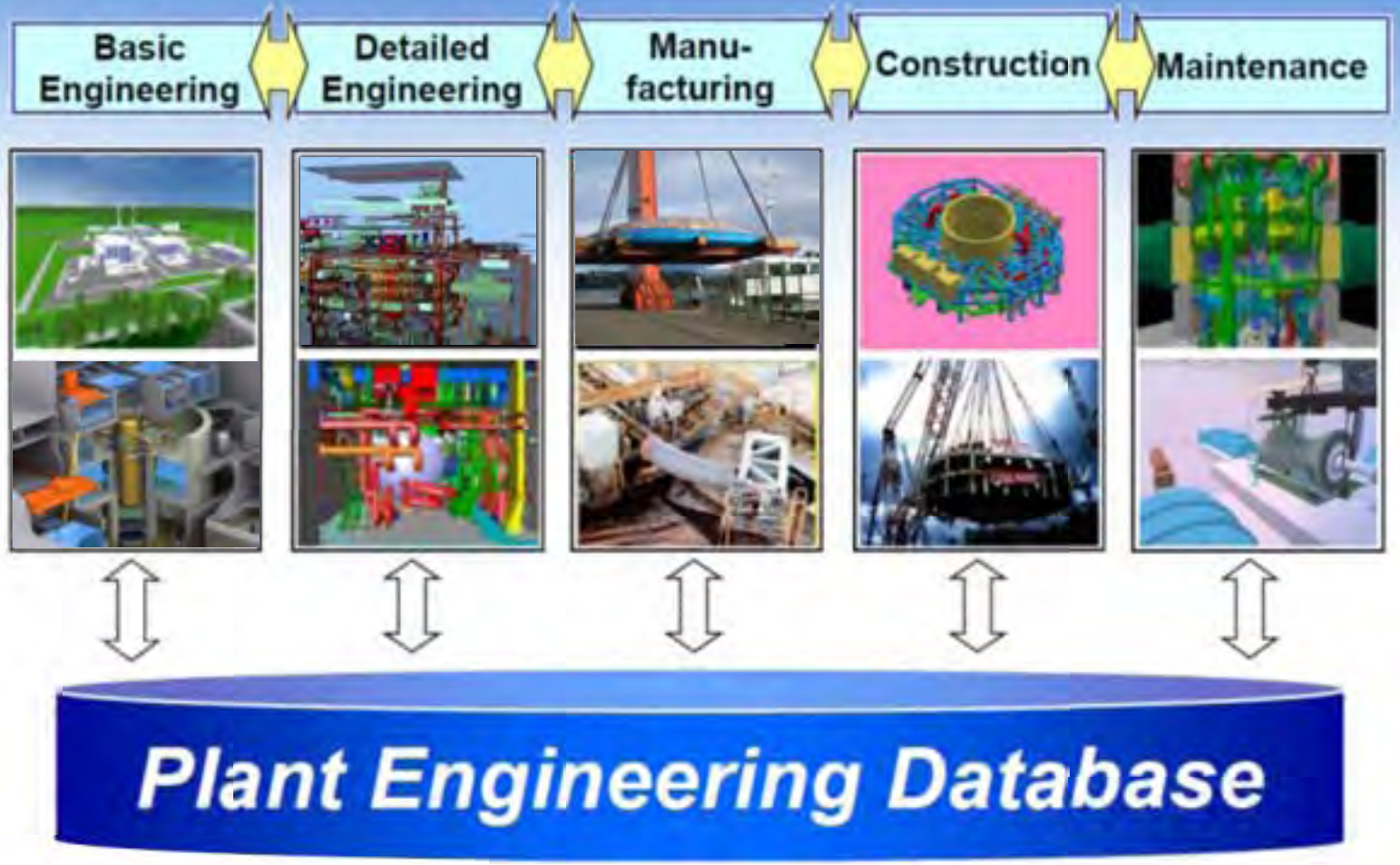
Pulling it all together with technology



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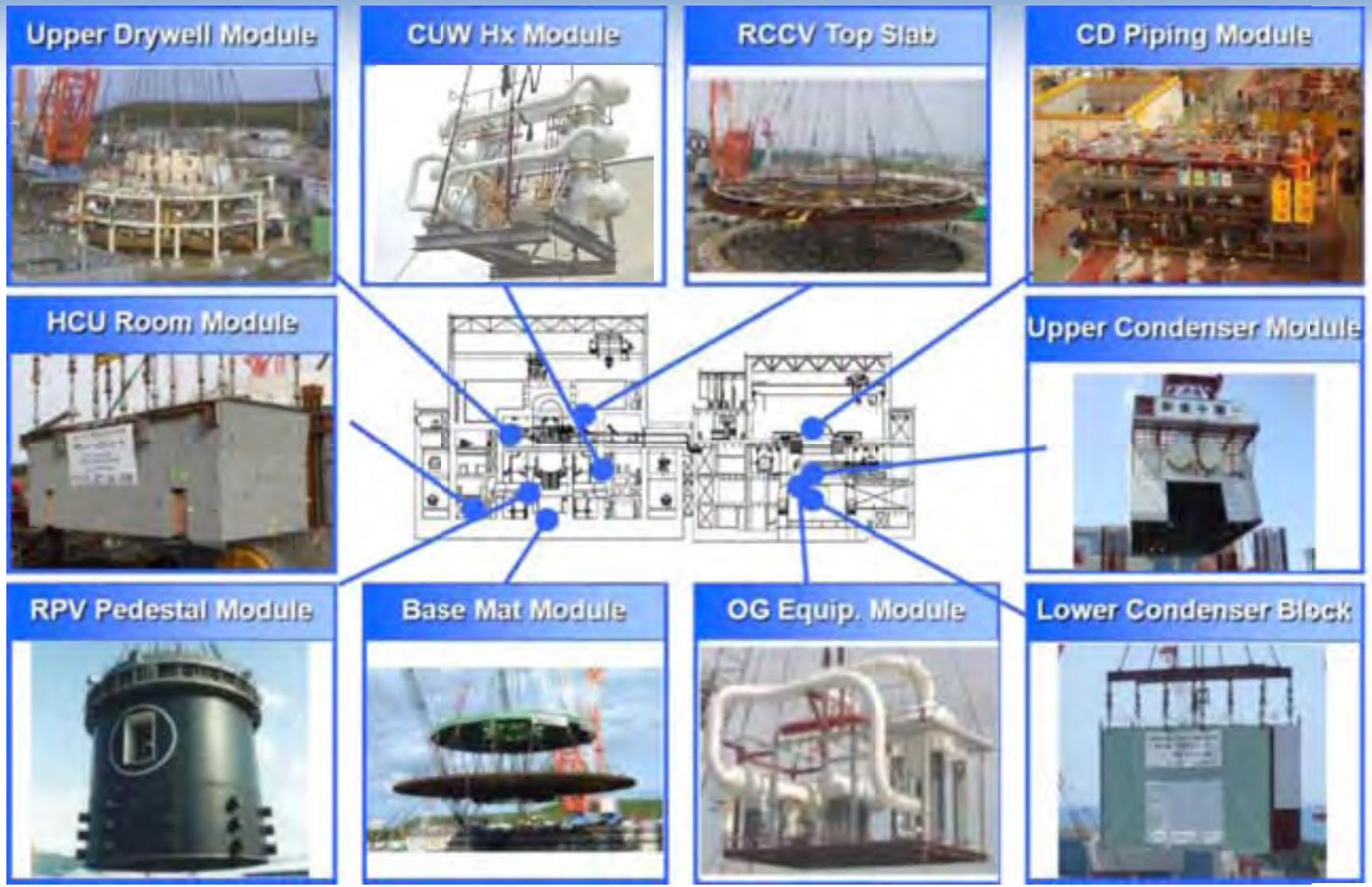
Modularisation

On-site work reduction and improved quality



Economic Simplified Boiling Water Reactor

ESBWR

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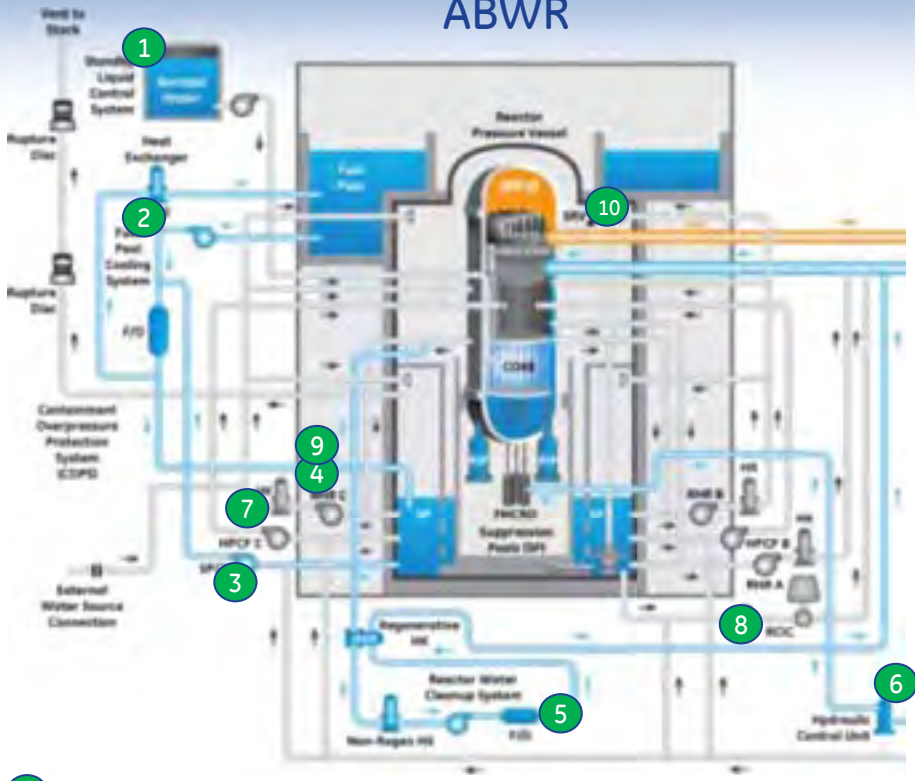
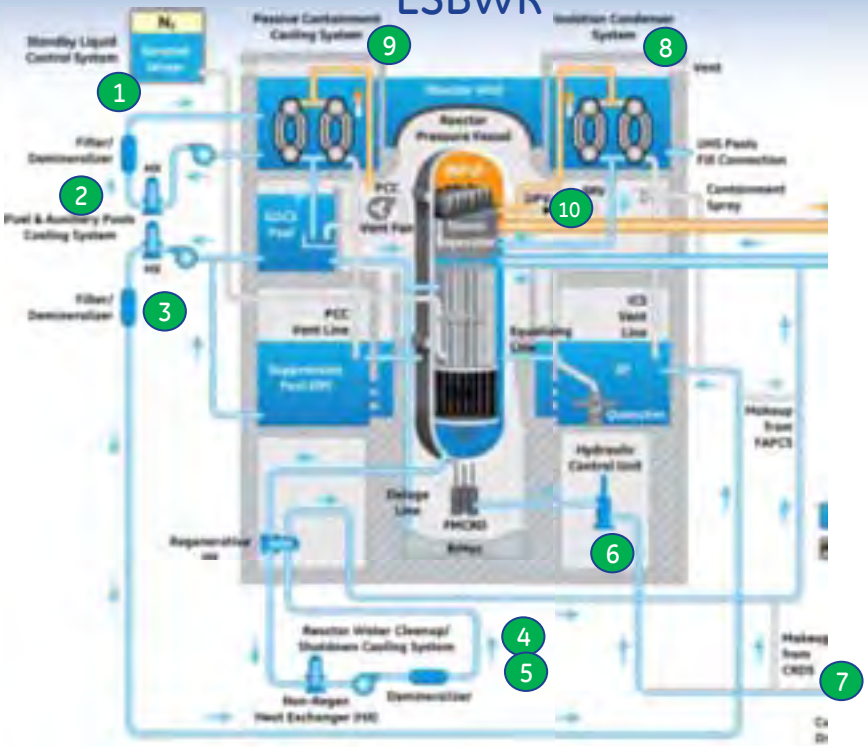
ABWR to ESBWR evolution

ABWR



ESBWR



1. Standby Liquid Control System – **simplified** design
2. Fuel and Aux Pool Cooling – **equivalent** designs
3. Suppression Pool Cooling & Cleanup System – **equivalent** capability
4. Residual Heat Removal System – **equivalent** for shutdown cooling
5. Reactor Water Cleanup System – **equivalent** designs
6. Hydraulic Control Unit – **equivalent** design
7. High Pressure Core Flooder – replaced by HP CRD makeup
8. Reactor Core Isolation Cooling – replaced by Isolation Condenser
9. Residual Heat Removal Containment Spray – replaced by PCCS
10. Safety Relief Valves – Diversified with Depressurization Valves

*Systems are **equivalent** or **simplified***

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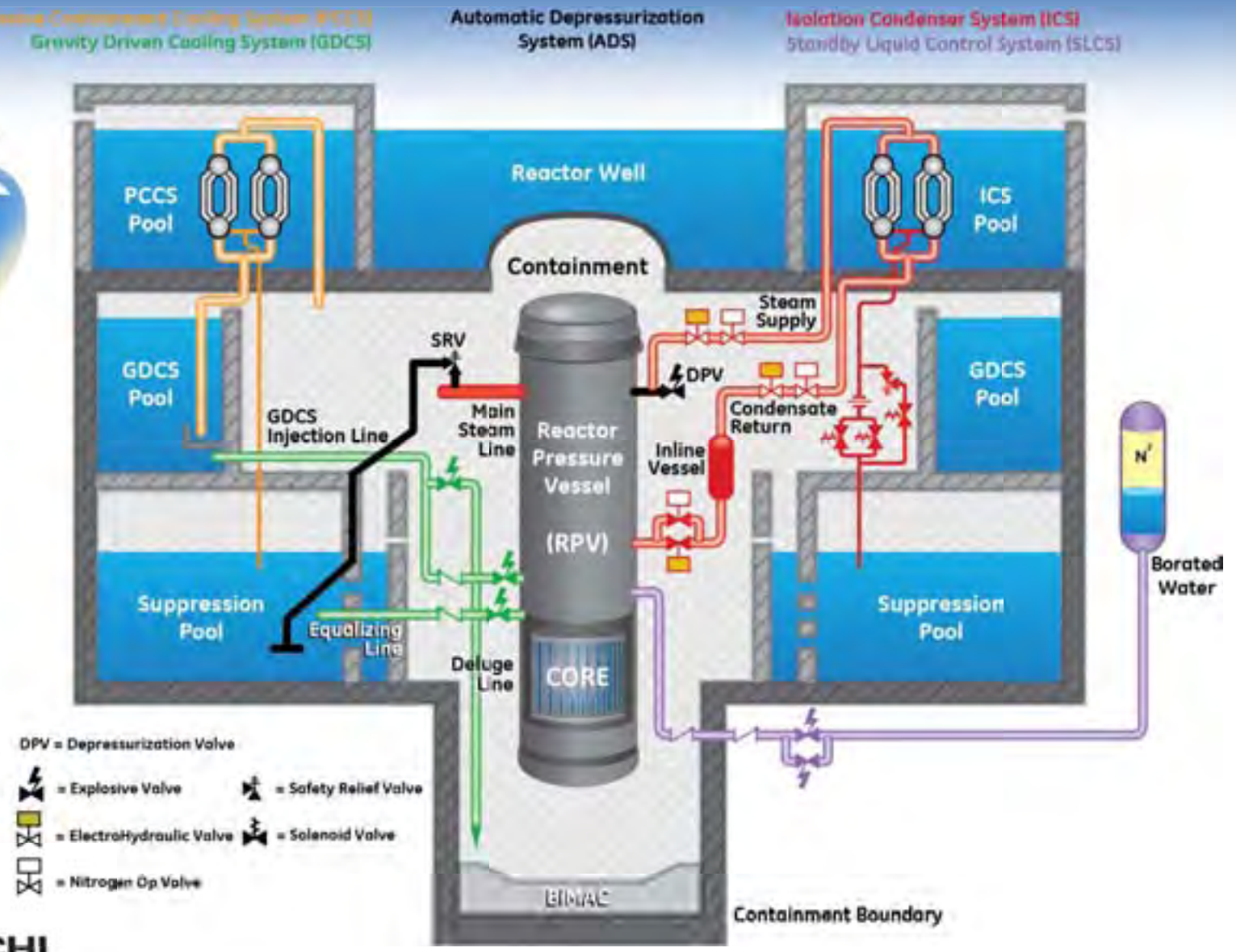
ESBWR passive safety systems



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ESBWR … 'Proven' innovation

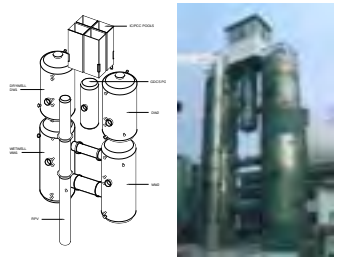
PCCS heat exchanger test

Depressurization Valve test

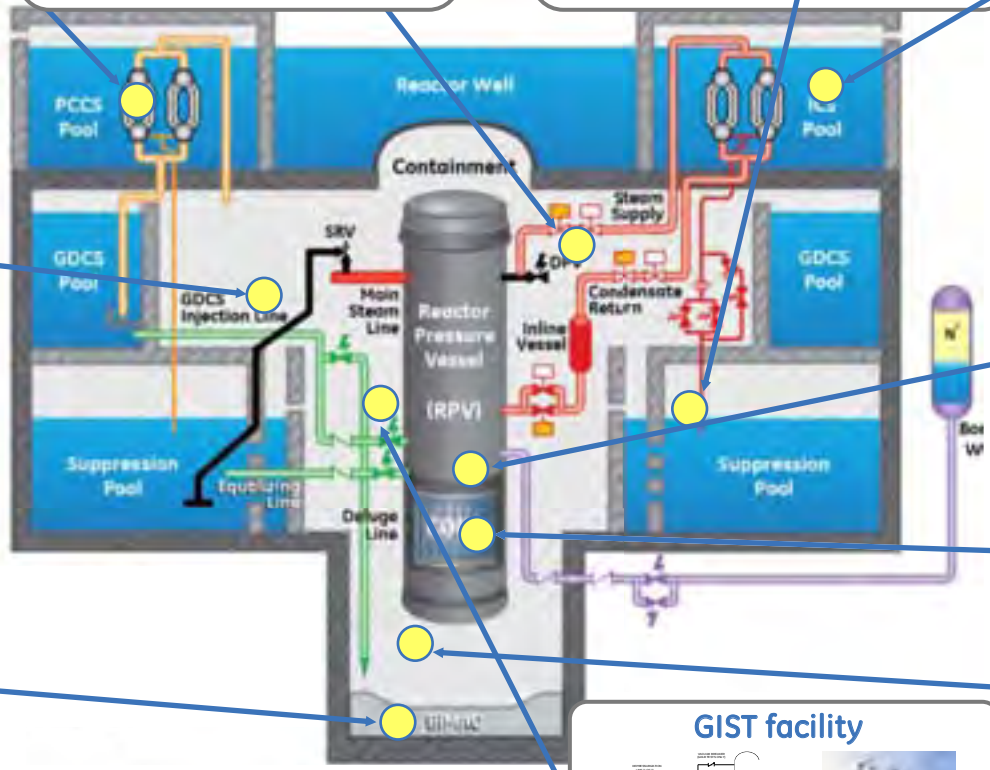
drywell to wetwell vacuum breaker test

Isolation Condenser Testing

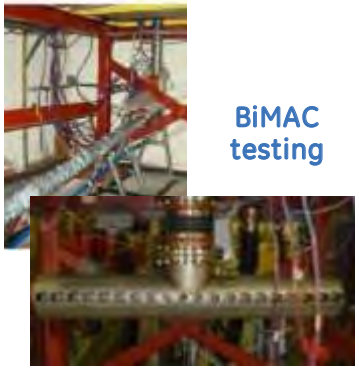
Panda Full Height Containment Test facility



natural circulation proven at Dodewaard



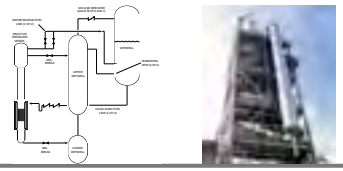
BiMAC testing



FMCRDs from ABWR

fuel – modified GNF2e

GIST facility



ESBWR design certified

- NRC approval of ESBWR design September 16, 2014
  - Issued Supplemental Safety Evaluation Report/NUREG-1966, Supplement 1
  - Will publish 10CFR52 Appendix E to Federal Register within 30 days
  - Dominion (Virginia) and DTE Energy (Michigan) combined construction and operating license applications (COLAs) reference ESBWR design certification

HITACHI

Developing Nuclear in Poland and UK

GE & Poland - Growth in Partnership

GE presence 2014: Investor, citizen

Since 1992

10.000 employees in 2014

Headquarters

Bank BPH S.A (GE Capital group)
(Warsaw, Gdansk, Cracow)
GE GG&O
(Warsaw)

Sales offices

GE Lighting
GE Healthcare
GE Wind
GE Aviation
(Warsaw)
GE Energy
(Warsaw, Katowice)
GE Oil&Gas Sourcing
(Rzeszow)

Technology centers

Engineering Design Center
(Aviation, Energy, O&G)
(Warsaw)
GE Healthcare IT Center
Katowice

Plants

Aviation
(Dzierzoniow,
Bielsko-Biała)
GE Industrial
(Klodzko,
Lodz,
Bielsko-Biala)

Engineering Design Center (EDC)

Established in 2000, currently: 1600+ engineers
Partnership between GE and Institute of Aviation
Work on technologies and products for:
- GE Aviation: Aircraft Engines, Aviation Systems
- GE Oil & Gas: Drilling & Production (Sub Sea), Turbomachinery
- GE Power & Water: Thermal, Aero

GE Aviation plants (2)

Avio Poland – Bielsko-Biała
2013 acquisition, 400 people
Turbine components R&D and manufacturing facility
UEC Poland – Dzierżoniów
2007 acquisition, 200 employees
Specializes in machining and fabrication of small
to medium sized engine components and assemblies

GE Capital group – BPH Bank

GE Capital group present in Poland since 1995
BPH Bank joined the group in 2008
One of the best brands in banking sector,
currently 5500 employees

Bank BPH
grupa GE Capital
Po prostu fair

GE Industrial plants (3)

3 locations: Kłodzko, Bielsko-Biała, Łódź
Present in Poland since 1996, 2000 employees
This triangle of facilities cooperate closely to manufacture a wide range of components and end products like circuit breakers load break switches, contactors and control and signal units, all utilized both by the industry and in our daily life

Identifying potential project partners

Polish Memorandums of Understanding

- Manufacturing
  - Energomontaz Polnoc
  - Polish former shipyards
  - Rafako
- Engineering
  - EnergoProjekt Warszawa
  - National Center for Nuclear Research (NCBJ)
  - SNC Lavalin Poland

Polimex Mostostal

RAFAKO

ENERGOPROJEKT-WARSZAWA SA

Providing

- Supplier conferences
- Supplier training
- Quality requirements
- Expected needs of the project

NATIONAL CENTRE for NUCLEAR RESEARCH Świerk

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Developing Poland's nuclear knowledge base

GEH and Poland's technical universities

- MOUs signed with
  - Gdansk Technical University
  - Koszalin Technical University
  - Szczecin Technical University
  - West Pomeranian Technical University
  - AGH Technical University
  - Warsaw University of Technology
- Technology lectures held with
  - Gdansk Technical University
  - AGH Technical University
  - Koszalin Technical University
  - Szczecin Technical University
  - Warsaw University of Technology
- Donations of several licenses of Gate Cycle®,
  - Warsaw University of Technology and
  - Gdansk Technical University
- 1,600+ engineers at GE's Warsaw Design Center
- Hosted 29 Polish university interns in Wilmington, NC
- Hosting three engineers from NCJB and WUT … training on boiling water reactor codes and methods

AGH

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Warsaw University of Technology

University of Szczecin

Gdansk University of Technology

National Centre for Nuclear Research Świerk

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Significant Presence in the UK

GE has been in the UK since the 1930s

18,000 employed

25 manufacturing sites

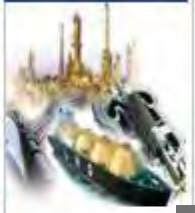
£12bn invested since 2002

GE's largest single presence outside US

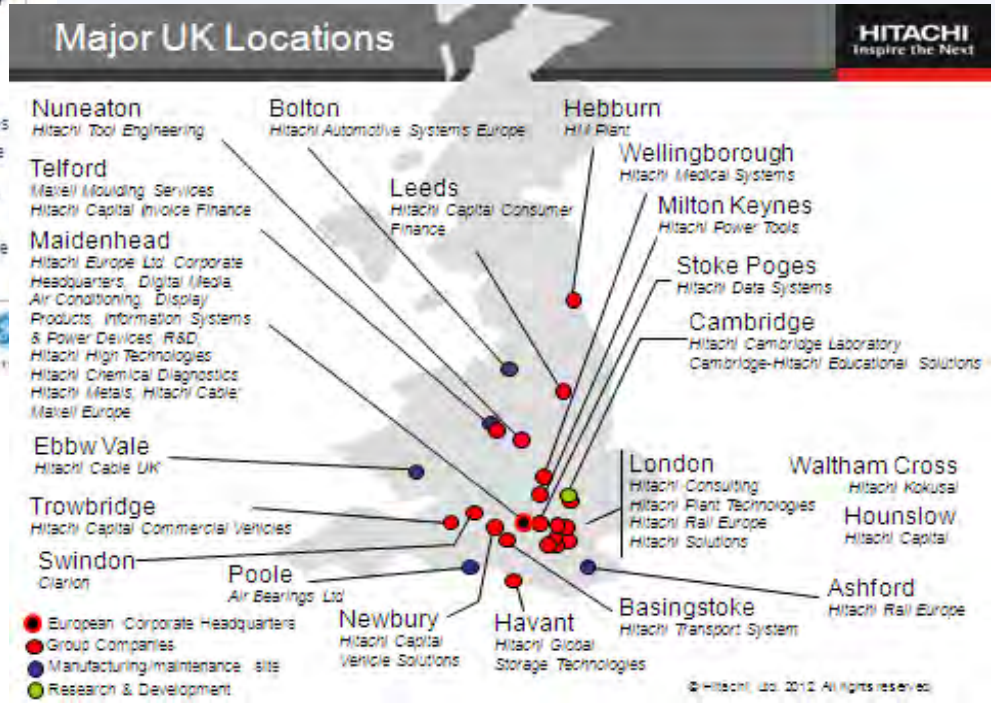
Installed technology meets 18% UK electricity needs

Automated 80% UK transmission / distribution networks

Largest sponsor of London Olympics

Power & Water	Energy Services	Oil & Gas
		
• Power generation • Renewable energy • Gas engines • Nuclear • Gasification • Water treatment and process chemicals	• Power gen services • Digital Energy • Measurement and control solutions • Industrial solutions • Environmental services • Parts and repair services	• Drilling production – land, offshore, subsea • LNG and pipelines • Refining/petrochemical • Industrial power gen • Complete lifecycle services

Over 18,000 GE employees with 25 manufacturing sites in the UK



Over 3,000 Hitachi employees in over 20 locations in the UK

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ABWR Deployment in the UK

Horizon Nuclear Power, Ltd.

100% owned by Hitachi, Ltd. (Nov. 2012)

- **New Wylfa site**
  - Location: Anglesey, Wales
  - Adjacent to site w/2 Magnox reactors
  - Two planned ABWR units
- **Oldbury site**
  - Location: South Gloucestershine
  - Adjacent to site w/2 Magnox reactors
  - Two planned ABWR units
- Generic Design Assessment process started in April 2013 – Step 2 completed and Step 3 underway since September 2014.
- GE Hitachi supporting Hitachi GE's Front-End Engineering and Design.
- ABWR Justification submitted to DECC and consultation completed.
- 2 Supply Chain events held and further planned.

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PRISM development for UK plutonium

- PRISM currently being considered in the UK for plutonium reuse.
- UK government policy to re-use plutonium and looking for alternative solutions to provide better value.
- PRISM the technology that "ticks all the boxes".
- PRISM declared a "credible option" by the NDA and work proceeding.
- Potential to extend PRISM to close the fuel cycle - reduce used nuclear fuel to ~300-year radiotoxicity[1] while generating electricity.

[1] To reach the same radiotoxicity as natural uranium

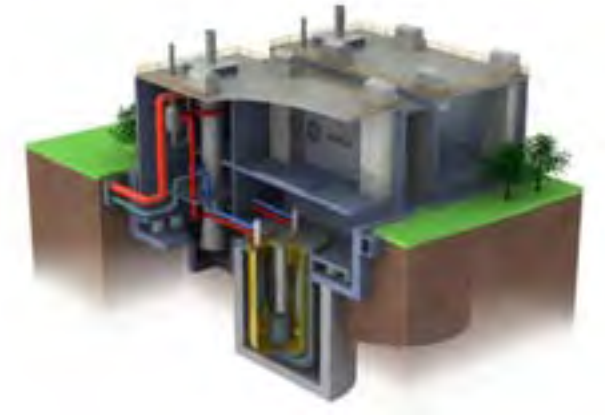
HITACHI

An important strategic decision for the UK

The reuse of the UK's plutonium stockpile sets a long-term nuclear direction…

PRISM provides the UK:

- the ability to fulfill its long-term management of plutonium with a solution that provides value.
- an option to close the fuel cycle.
- a world technical leadership position and a new future for West Cumbria



"The last generation to talk about solving the back end, or the first to do it?"

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Conclusions

Leading nuclear innovation for

60 years and beyond …

Vallecitos - 1957

Dresden-1
BWR/1

Oyster Creek
BWR/2

Humboldt Bay
natural circulation

Cofrentes
BWR/6

KK6/KK7
ABWR

North Anna-3
ESBWR

PRISM

HITACHI

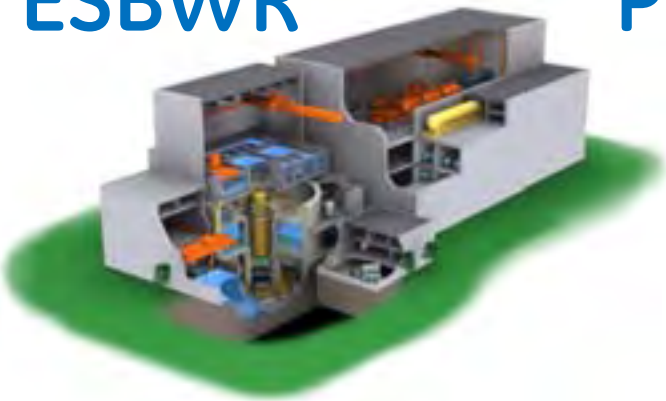
…. And set to continue in the future

- Exciting times for nuclear now and in the future.
- Industry is well placed to meet future requirements.
- The future is advanced technology based on safety, simplicity and predictability.

ABWR

HITACHI

ESBWR



PRISM


Thank You