

extra notes

Nuclear Power

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While nations around the world have revised their nuclear power policies subsequent to the accident at Fukushima Daiichi Nuclear Power Station, Tokyo Electric Power Company, Incorporated, there is demand for the construction of new nuclear power plants in emerging economies and elsewhere. Based around its alliance with GE, Hitachi works with a variety of partners to deliver the best possible solutions to suit the needs of different nations. Energy security, environmental protection, and economic performance are challenges that many nations have in common. Hitachi seeks to meet the demand for nuclear power generation capable of overcoming these challenges.

CIRCUMSTANCES SURROUNDING OVERSEAS NUCLEAR POWER BUSINESS

THE Nuclear Regulation Authority, Japan was established as an independent committee in response to the accident at the Fukushima Daiichi Nuclear Power Station, Tokyo Electric Power Company, Incorporated caused by the Great East Japan Earthquake on March 11, 2011. Also, new safety regulations were introduced in July 2013. Overseas, meanwhile, while some nations have turned away from nuclear power,

there remain a large number of countries, particularly emerging economies that have a need for Japanese nuclear power technology (see Fig. 1).

To meet the world's need for nuclear energy, Hitachi entered into an alliance with the General Electric Company (GE) of the USA, establishing GE-Hitachi Nuclear Energy Americas LLC in the USA in June 2007 and Hitachi-GE Nuclear Energy, Ltd. in Japan in July 2007. From these platforms, Hitachi and GE are jointly proceeding with global operations

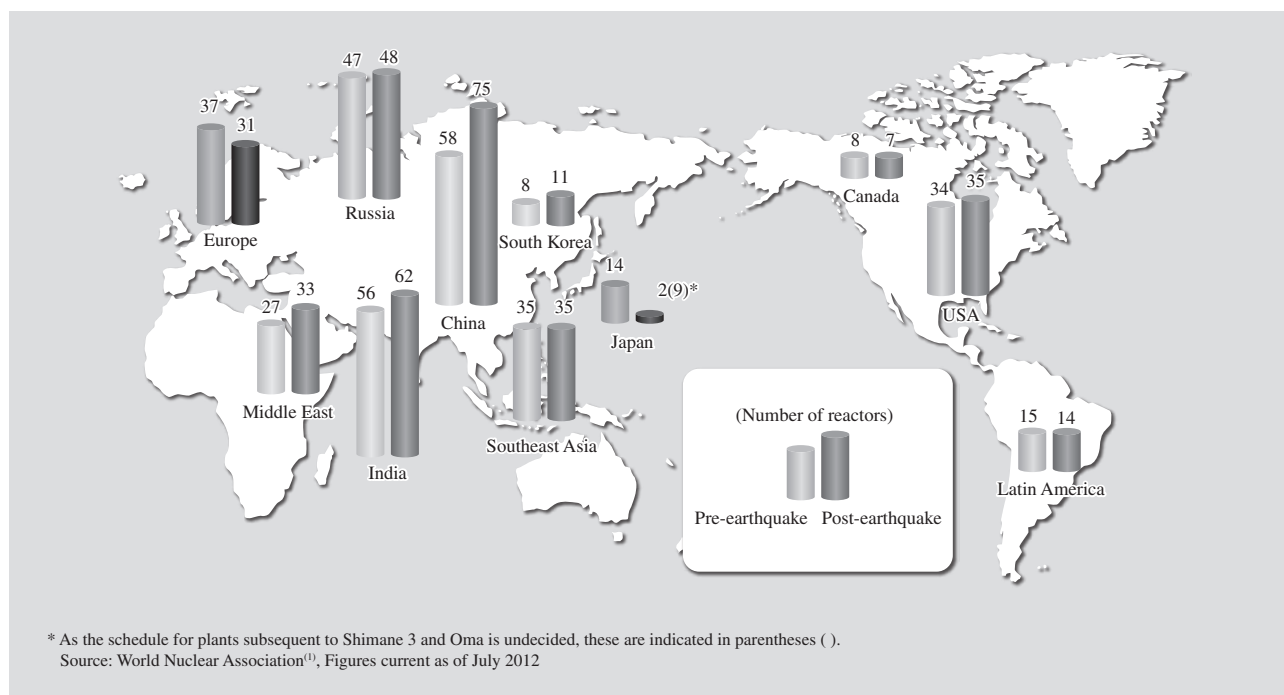


Fig. 1—New Plans for Nuclear Power in Key Regions.

A comparison of plans for new nuclear power plants before and after the Great East Japan Earthquake shows notable increases in emerging economies such as China and India, but little change in other parts of the world.

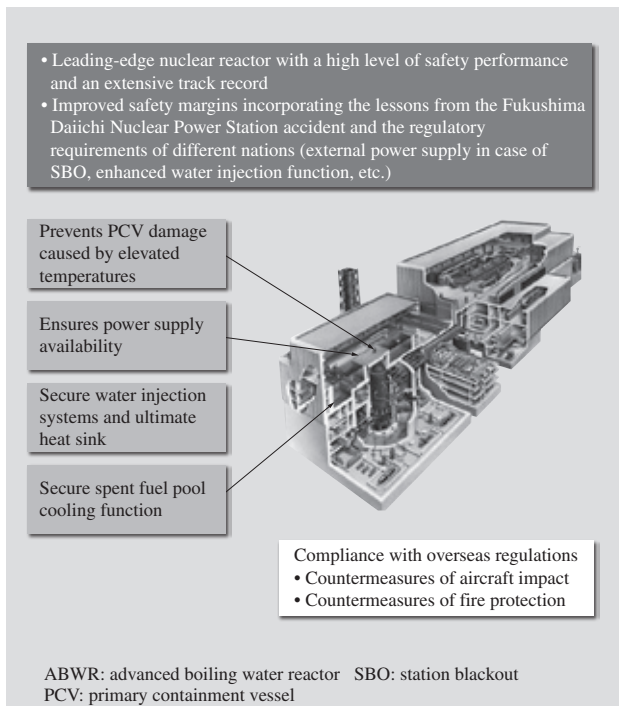


Fig. 2—Safety Enhanced ABWR.
 The Safety Enhanced ABWR is a leading-edge nuclear reactor with a high level of safety performance and an extensive track record. It incorporates the lessons from the Fukushima Daiichi Nuclear Power Station accident and the regulatory requirements of different nations to improve safety margins.

as the world’s largest manufacturer of boiling water reactors (BWR) with products that extend from supply of nuclear fuel through to plant construction and maintenance services.

GENERATION SYSTEM PRODUCT RANGE

Hitachi can supply the following generation systems to meet demand from around the world (see Figs. 2, 3, and 4).

- (1) Safety Enhanced ABWR (Advanced BWR)
 To improve safety margins, Hitachi has incorporated the lessons from the Fukushima Daiichi Nuclear Power Station accident and the regulatory requirements of different nations into the ABWR, which has excellent safety performance and an extensive track record.
- (2) ESBWR (Economic Simplified BWR)
 Along with improved safety margins achieved through the use of passive safety systems, the ESBWR also features easier maintenance. Acquisition of design approval in the USA is planned in the near future.
- (3) Small or medium-sized reactors
 These are based on the modular simplified & medium small reactor (DMS) developed under contract to The Japan Atomic Power Company. An agreement

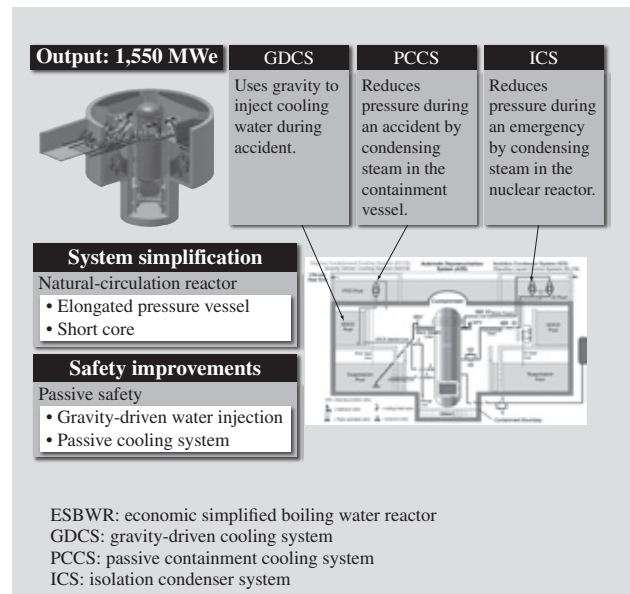


Fig. 3—ESBWR.
 The main features of the ESBWR are its use of a natural-circulation reactor to simplify system design and its use of passive safety to improve safety.

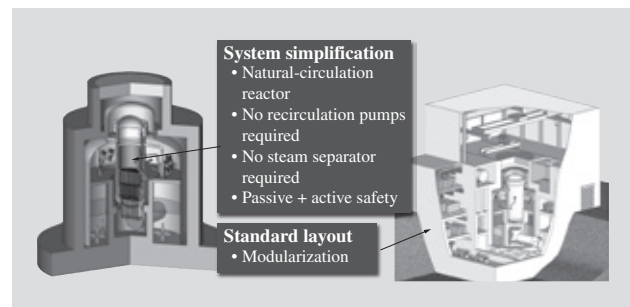


Fig. 4—Small or Medium-sized Reactors.
 These small or medium-sized reactors feature modularization to provide a standard equipment layout and a simplified system design.

to conduct joint development was signed with the Saskatchewan Power Corporation (SaskPower) of Canada in 2011.

INVOLVEMENT IN OVERSEAS NUCLEAR POWER MARKET

Hitachi segments the numerous nations or regions that are considering the installation of new nuclear power plants based on factors such as: How clearly they have defined their plans, whether or not they have regulatory standards in place, and whether financing is required. Collaboration with a variety of partners is necessary when preparing specific proposals for these nations or regions based on this segmentation. In the case of an emerging economy, for example, collaboration with the power company is needed

to provide operational and maintenance support. Collaboration may also be needed with engineering companies, construction companies, or financial partners who are familiar with the circumstances of the nation concerned. Based around its alliance with GE, Hitachi utilizes these collaborations to ensure that services can be provided throughout the life cycle of the nuclear power plant, which comprises approval, design, equipment manufacturing, procurement, construction, operation, and maintenance.

SUMMARY OF EUROPEAN PROJECTS

Republic of Lithuania

The Republic of Lithuania is one of the three Baltic states. When gas imports from the Russia are included, approximately 80% of the nation's domestic energy consumption is reliant on the Russia. With the aim of resolving this energy security problem, the Republic of Latvia, Republic of Estonia, and Lithuania agreed in 2006 to the construction of the Visaginas Nuclear Power Plant at a nearby site with a view to future energy market integration (see Figs. 5 and 6).

In 2009, the Visaginas Nuclear Power Plant was incorporated into the Baltic Energy Market Interconnection Plan (BEMIP), an energy market integration plan agreed by eight nations abutting the Baltic Sea.

When tendering to be appointed as a strategic investor (SI) in 2011, Hitachi proposed a 1,300-MW ABWR with additional safety features incorporating countermeasures to the accident at the Fukushima Daiichi Nuclear Power Station and was awarded preferred bidder status. Subsequent developments included the government of the Lithuania and Hitachi concluding a concession agreement (in March 2012), followed in June 2012 by approval of the related laws and the conclusion of parliamentary debate. However, following a change of government in October 2012 and the results of a referendum, a review of energy strategy by a special committee of the Lithuanian parliament was requested.

The current status of the Visaginas Nuclear Power Plant construction project is that a report submitted at the end of April 2013 by a government working group (WG) set up to look at comprehensive energy strategies (and approved by parliament) has proposed that the project proceed subject to conditions. In the future, the Lithuanian government intends to debate the project further in a joint committee established with the governments of the Estonia and the Latvia.

As an SI, Hitachi has been involved along with

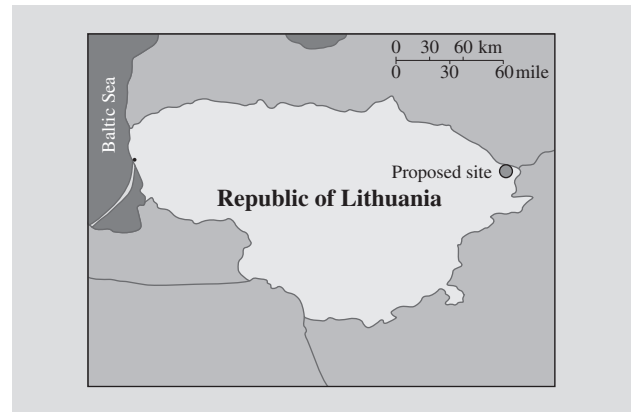


Fig. 5—Proposed Site of Visaginas Nuclear Power Plant. Construction of the Visaginas Nuclear Power Plant is planned for a site in the northeast of the Lithuania, one of the three Baltic states.

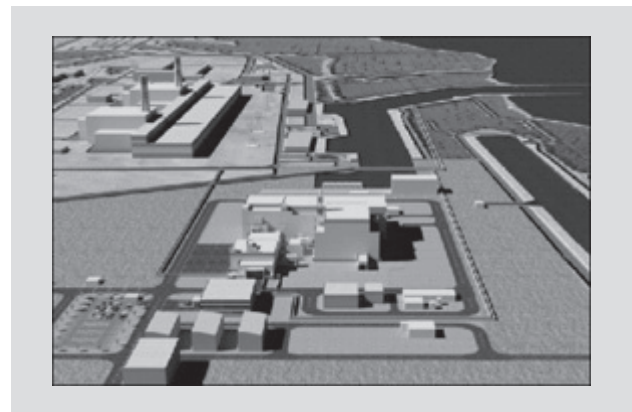


Fig. 6—Artist's Impression of Completed Visaginas Nuclear Power Plant. This artist's impression shows the completed Visaginas Nuclear Power Plant.

investment partners in the Baltic region in debate about how to proceed with the project, with agreement having been reached on a joint position paper at the end of September.

UK

In 2011, the UK government demonstrated its support for commercially based nuclear power plant construction by selecting eight sites for new plants (see Fig. 7). The UK government recognizes nuclear power as a low-carbon source of energy and is proceeding with legislation for a feed-in tariff scheme for low-carbon energy as part of its electric power market reform policies. The first round of laws for the electric power market reform was passed in December 2013.

In November 2012, Hitachi purchased all shares in Horizon Nuclear Power Limited, a nuclear power business development company in the UK. Established

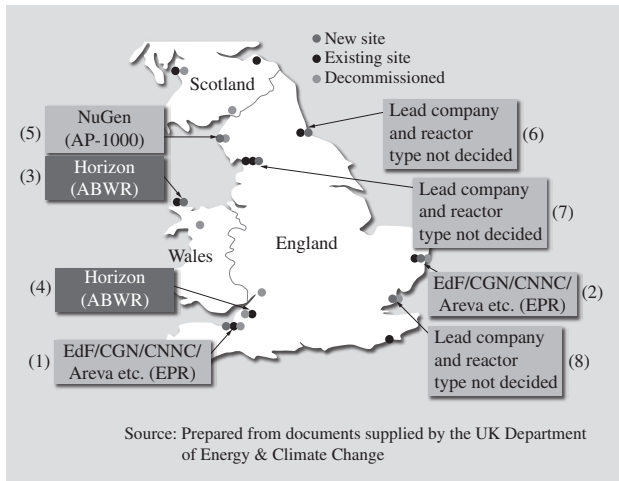


Fig. 7—Plans for Construction of New Nuclear Power Plants in UK.

Two of the planned new plants for the UK, (3) Wylfa and (4) Oldbury, are projects of Horizon.

in January 2009 by the UK subsidiaries of German power companies E.ON SE and RWE AG (E.ON UK plc and RWE Npower plc, respectively), Horizon is planning the construction of nuclear power plants at two sites in the UK (Wylfa and Oldbury). The subsequent decision by E.ON and RWE in March 2012 to sell their stakes in Horizon came as a result of Germany adopting a policy of shutting down nuclear power generation. Horizon was then purchased by Hitachi.

Horizon intends to obtain all licenses and approvals needed from the UK government for the initial project at Wylfa Newydd by 2018, and to have the first nuclear reactor operating by the first half of the 2020s (see Fig. 8). To proceed with the engineering, procurement, and construction (EPC) plan for the Wylfa site, Horizon and Hitachi-GE Nuclear Energy, Ltd. signed a front end engineering and design (FEED) contract in May 2013.

ABOUT THE AUTHORS



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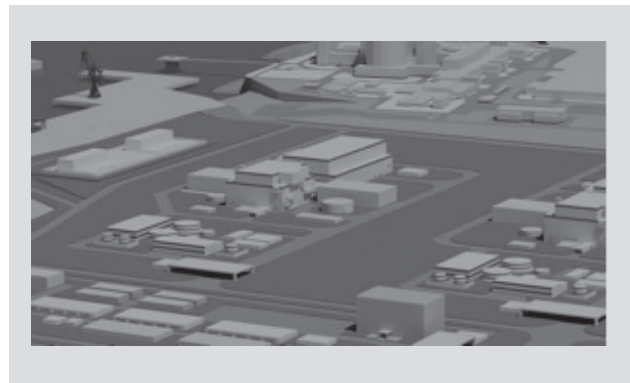


Fig. 8—Artist's Impression of Completed Wylfa Newydd Nuclear Power Station.

This artist's impression shows the planned Wylfa Newydd Nuclear Power Station. The aim is for operation to commence in the first half of the 2020s.

In December 2013, Her Majesty's Treasury, Horizon, and Hitachi agreed to cooperate in future on obtaining external financing for the Wylfa Newydd project. This allows the project to consider utilizing the UK government's infrastructure guarantee scheme that supports the securing of external financing for social infrastructure projects.

Along with the railway business that it already operates in the UK, Hitachi believes that the nuclear power business will provide an opportunity to make an even greater contribution to the development of that nation's social infrastructure, including job creation.

REFERENCES

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- (2) T. Noda et al., "Overseas Trends in Nuclear Power," NOZENGAKU(Maintenance), Vol. 11, No. 4, pp. 36 – 39 (2013) in Japanese.