

# **TOSHIBA**

**Leading Innovation >>>**

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# **TOSHIBA in Fusion Development**

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**Monaco ITER International Fusion Energy Days  
Session on Industry Views on the ITER Project**



**Toshiba Group contributes to  
the sustainable future of planet Earth.**

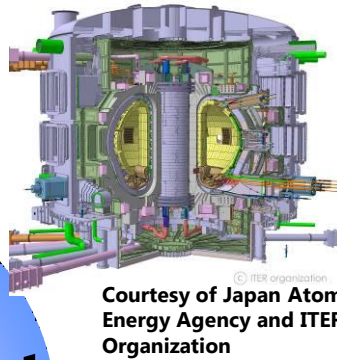
# Personal Introduction

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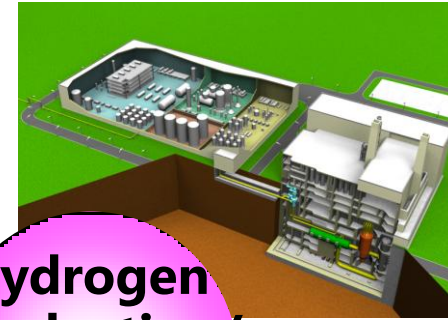
- ◆ **Senior Fellow of Nuclear Division since 2009.**
- ◆ **Supervises Toshiba's Advanced Energy Technology.**
- ◆ **Engaged in nuclear fusion system development in Toshiba since 1979.**
- ◆ **Worked in fusion projects including:**
  - **JT-60, JT-60U, JT-60SA**
  - **LHD**
  - **ITER-CSMD**

# Toshiba's Nuclear Activities

Uranium/  
Fuel  
Manufacturing



Nuclear  
Fusion



Hydrogen  
Production/  
Accelerator  
applications

Nuclear Plants  
Construction

BWR: ABWR



PWR: AP1000™











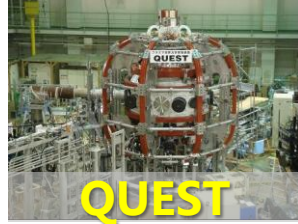
Maintenance  
& Services

Nuclear  
Fuel Cycle

Fast Reactor /  
Next Generation  
Reactor

Developing Fusion as Energy System in Future

# Records of Contribution to Fusion

1970	1980	1990	2000	2010
<p><b>R&amp;D toward ITER</b></p>	<p><b>INTOR/FER</b></p>  <p><b>DPC-TJ</b></p>	<p><b>CDA</b></p>	<p><b>EDA</b></p>  <p><b>CSMC</b></p>	<p><b>Construction</b></p>  <p><b>TF R&amp;D</b> <b>Gyrotron R&amp;D</b></p>
	<p><b>JT-60</b></p>  <p><b>TF coils</b> <b>MG set</b></p>		<p><b>JT-60U</b></p> <p><b>ICRF up grade</b> <b>Neutron Monitor</b> <b>N-NBI PS</b> <b>etc</b></p>	<p><b>-SA</b></p>  <p><b>VV sector</b></p>
<p><b>LHD &amp; other devices</b></p>	 <p><b>DIII-D VV</b></p>	<p><b>LHD</b></p>		
		 <p><b>LHD PF Coils</b></p>	 <p><b>LHD NBI</b></p>	 <p><b>QUEST</b></p>

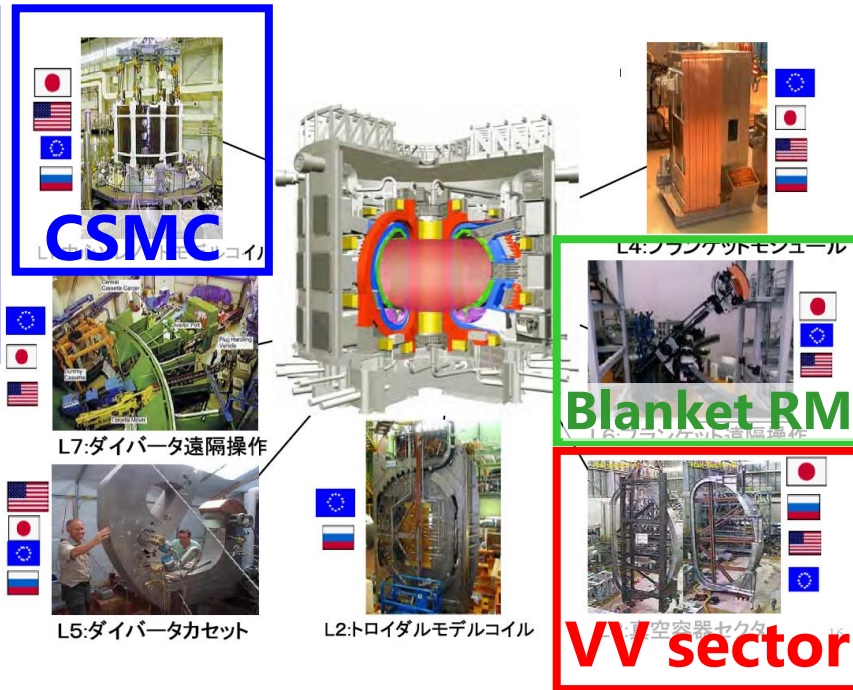
Images: Courtesy of Japan Atomic Energy Agency, National Institute for Fusion Science and Kyushu University

## Domestic/international contribution since '70s

# Activities in ITER CDA/EDA

- ◆ Dispatched 50 man-years of engineers to the Central Team and JAEA
- ◆ Contributed to major R&D's in EDA.

- Outer Module fabrication
- Installation of all coils



- Proto type fabrication
- Demonstrate 4.5 t handling capacity

- 9 deg. sector fabrication
- Demonstrated accuracy and welding quality

Images: Courtesy of Japan Atomic Energy Agency

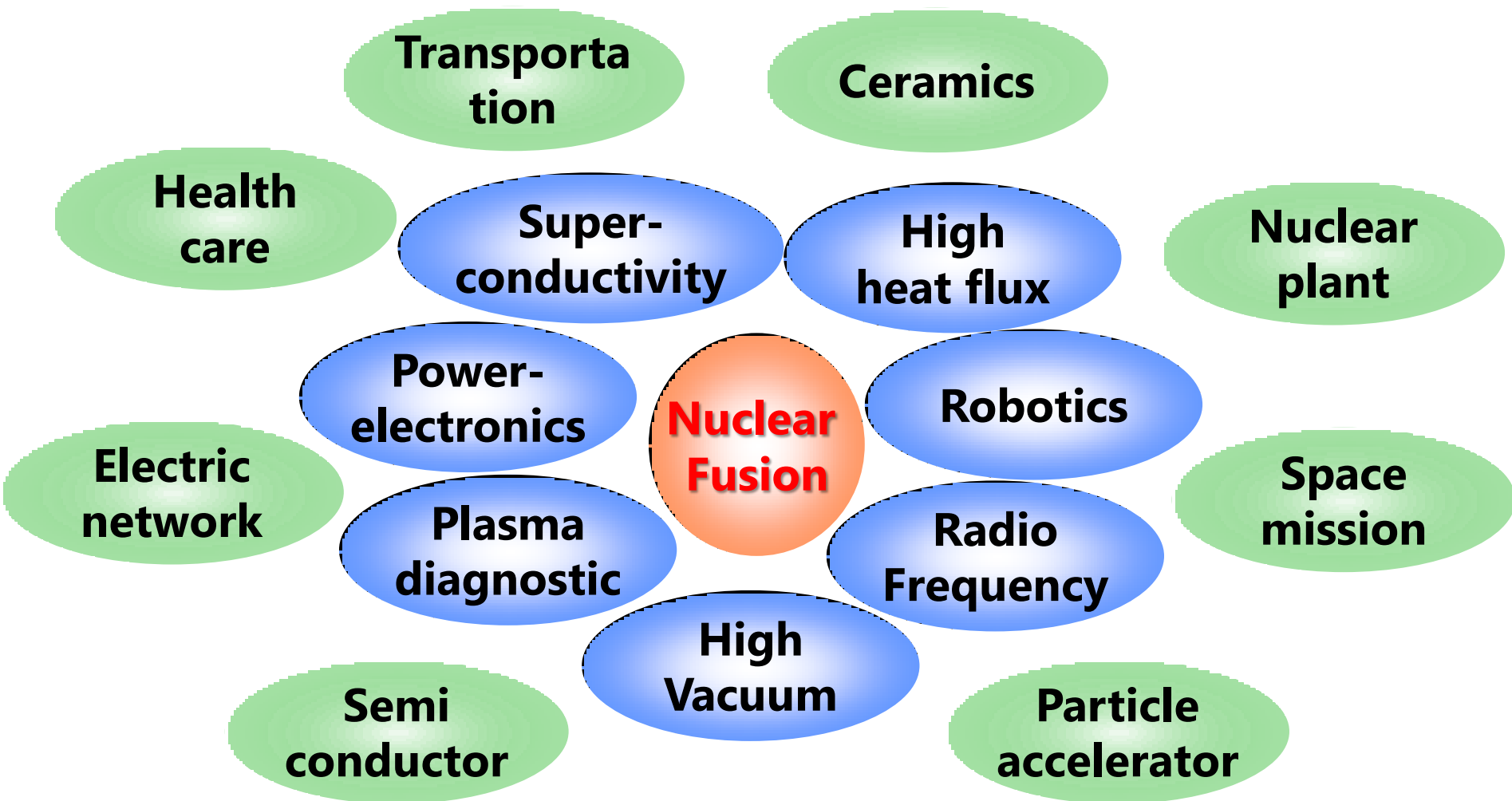


# Activities in ITER Construction

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- ◆ **Conducted Phase II R&D of TFC. Contracted with JAEA to fabricate a part of Japanese contribution.**
- ◆ **Contributed to R&D and design of blanket remote handling system. Expects PDR to be concluded and final design work and fabrication to be commenced.**
- ◆ **Possible further contribution includes: Micro Fission Chambers, Gyrotrons, Test Blanket Module, etc.**

# Technologies not limited for fusion



**Synergy with other fields through technology**

# Issues in industrial involvement

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- ◆ **ITER is a big challenge which will be accomplished successfully. Next DEMO, not quite sure when it will be started. Who will retain the technologies established in ITER and how?**
- ◆ **Nuclear fusion needs Cutting-edge technologies or “more than that”. It could result in uncertainty of cost, schedule, etc.**



**Thank you!**