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Better Nuclear Energy Technology, Better Life!

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Lessons Learned From the Public Acceptance of Fission Reactor in China for Fusion Energy Development

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Contributed by FDS Team

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Outline

I. Background

II. Public Acceptance of Fission Energy in China

III. Implications for Fusion Energy Development

IV. Summary
Fusion energy has the potential to provide a more efficient, safe and clean solution to the global energy problem.
## Example: Radioactive Waste

<table>
<thead>
<tr>
<th></th>
<th>PWR</th>
<th>ITER(^{[1-2]})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classification</td>
<td>VLLW, LILW-SL, LILW-LL, HLW</td>
<td>VLLW, LILW-SL, ILW-LL, Purely tritiated waste</td>
</tr>
<tr>
<td>Dismantling Amounts</td>
<td>~5000 t</td>
<td>~30000 t</td>
</tr>
</tbody>
</table>

- No HLW for ITER;
- Huge amount of very low-level and low-level waste in ITER

DEMO radioactive waste activity can increase 20~50 times due to the high neutron fluence of 40-150 dpa\(^{[3]}\).

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[1] ITER GSSR 2004;
Public Acceptance – A Key Issue for Fusion Energy Development

- Bad impression of fission from public
- Little known about fusion
- Large potential hazards from a large amount of radioactive materials
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Nuclear Power in China

- There are now totally 66 NPPs under construction worldwide, among which 24 reactors are located in China.

The scale under construction in China is No.1 in the world.
Public Survey Conducted by INEST for Nuclear Energy

- **Face-to-face** interviews, 2620 valid responses were obtained;
- **Comparison** with the similar research carried out by **OECD** in 2010.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Percent</th>
<th>Variable</th>
<th>Category</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>&lt;20’s</td>
<td>8.3%</td>
<td>Income</td>
<td>0~30,000RMB/y</td>
<td>44.6%</td>
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<td></td>
<td>20’s</td>
<td>56.5%</td>
<td></td>
<td>30,000~60,000RMB/y</td>
<td>34.9%</td>
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<tr>
<td></td>
<td>30’s</td>
<td>21.0%</td>
<td></td>
<td>60,000~300,000RMB/y</td>
<td>18.1%</td>
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<tr>
<td></td>
<td>40’s</td>
<td>8.4%</td>
<td></td>
<td>More than 300,000RMB/y</td>
<td>2.4%</td>
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<tr>
<td></td>
<td>50’s</td>
<td>4.2%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt;60’s</td>
<td>1.6%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Province</td>
<td>Coastal</td>
<td>15.3%</td>
<td>Education</td>
<td>Elementary school</td>
<td>2.0%</td>
</tr>
<tr>
<td></td>
<td>Inland</td>
<td>84.7%</td>
<td></td>
<td>Junior school</td>
<td>6.7%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Senior school</td>
<td>16.4%</td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td>University</td>
<td>54.2%</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Graduate</td>
<td>20.7%</td>
</tr>
</tbody>
</table>
Results (1) - Major social concerns in China

- **Top Three in China:** Housing, Education and Environment,
  While in OECD: Unemployment, Crime and Healthcare;
- **Residents in China** pay a slightly more attention to energy related issues: 25% in China than 14% in OECD.
Results (2) - Public attitude to nuclear energy

Public attitude changes after Fukushima Daiichi Nuclear Accident

- The influence of FDNA on the public attitude has faded out in China after four years.
- Potential reasons: Three FDNA have no direct health damages to Chinese people.
Results (2) - Public attitude to nuclear energy

- The public’s favorable attitude to nuclear energy: 72% in China, 28% in IAEA 18 countries and 20% in OECD;

Potential reasons:
- Chinese participants have less knowledge about nuclear energy than OECD’s counterparts and are excessively optimistic;
- The long-term experience of supervision in nuclear energy gives the public more confidence in the safety of nuclear energy.
Results (3) - Public attitude to inland NPPs

- Opposition to construct NPPs inland: 38% of nuclear energy supporters
- Public perception of “not-in-my-back-yard” (NIMABY) is especially conspicuous.

Potential reasons:

- Demand for energy decreases;
- Wastes of renewable and sustainable energy have appeared in north region of China;
- All selected inland sites are distributed along the world’s third-longest Yangtze River.
Results (4) - Creditable information resources

- **Government** is the most trustworthy source;
- **Scientists** plays a more significant role in OECD than in China;
- **Industry** is widely conceived as a *not* very trustworthy information source in both two surveys.

Trustworthy information source in China and OECD
Results (5) – Public Involvement in China

- Current ‘iron nuclear triangle’ play dominant role in the policy-making;
- Most respondents (66%) felt little or no well-informed about nuclear safety issues.

Current ‘iron nuclear triangle’ in China
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Implications (1) - Ensure the safety of fusion reactors to avoid radioactive leak accident

- Three catastrophic nuclear accidents have left people a bad impression on fission power;
- Fusion reactors must be ensured safety, keeping a good impression.

Fukushima nuclear accident - bad impression
Implications (2) - Popularize the knowledge of fusion energy

- Through various channels, including TV, newspapers, and new media, to popularize the knowledge of fusion energy;
- The advantages and disadvantages of fusion energy should be well informed.
Implications (3) – Enhancing the third-party evaluation

- Third party should have *no direct beneficial relation* with Regulator and Industry.
- To ensure *public involvement* process and to enhance *supervision*.

Proposed a transparent and open system of third-party evaluation in China (State-owned nuclear industry + Research Institute)
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Summary

- Fusion NOT Born to be Safe, and public acceptance will be a key issue;
- Public perception of “not-in-my-back-yard” (NIMABY) is especially conspicuous and the level of public participation is low in China;

Lessons Learned for Fusion Energy Development:

- Ensure the safety of fusion reactors to avoid radioactive leak accident;
- Popularize the knowledge of nuclear fusion through various channels, and establish a comprehensive communication strategy;
- Introduce a third-party evaluation consisting of scientists and non-profit research institutes etc., and strengthen the public participation.
Thanks for Your Attention!

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