Opportunity and Challenge of SMR Implementation in Indonesia: Techno-economic and Social Aspect

Tulis Jojok Suryono, PhD

Research Center for Nuclear Reactor Technology
RESEARCH ORGANIZATION FOR NUCLEAR ENERGY (BATAN)
NATIONAL RESEARCH AND INNOVATION AGENCY OF INDONESIA

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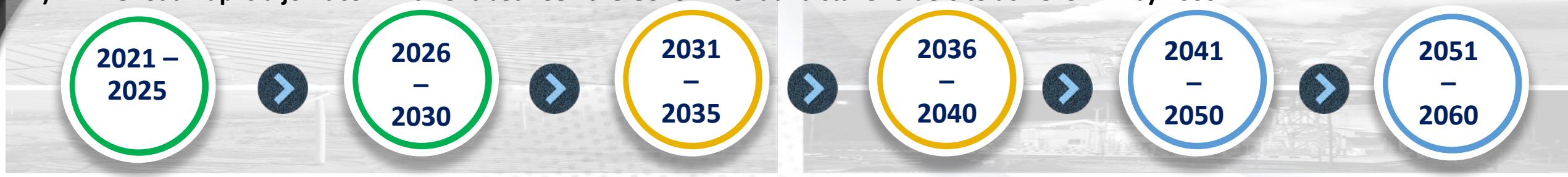
OUTLINE

- ENERGY TRANSITION ROADMAP
- SMR DEPLOYMENT ROADMAP
- OPPORTUNITIES
- CHALLENGES
- CONCLUSION

ENERGY TRANSITIONS ROADMAP TOWARDS NET ZERO EMISSION

1) The timeline for strategic achievement towards net zero emission on energy sector
2) The roadmap is a joint commitment between the Government and stakeholders to achieve NZE by 2060



2025: Emission reduction 198 Million ton CO_2

Supply:

- NRE PP Development in capacity of 10,6 GW.
- Diesel PP conversion to NRE PP.

2030: Emission reduction 314 Million ton CO_2

Supply:

NRE PP development for 10,3 GW to replace CFPP.

2035: Emission reduction 475 Million ton CO_2

Supply:

- Retirement of CFPP 6 GW*).
- No more Diesel PP.
- Hydrogen utilization 328 MW.

2040: Emission reduction 796 Million ton CO_2

Supply:

- *Retirement of CFPP 3 GW*)*
- *Hydrogen utilization 332 MW*
- ***COD of Nuclear***

2050: Emission reduction 956 Million ton CO_2

Supply:

- *Retirement of CFPP 31 GW*)*
- ***Nuclear 5 GW***
- *Hydrogen utilization 9 GW*

2060: Emission reduction1.526 Million ton CO_2

Supply:

- ***Nuclear 30 GW***
- *Hydrogen utilization 52 GW*

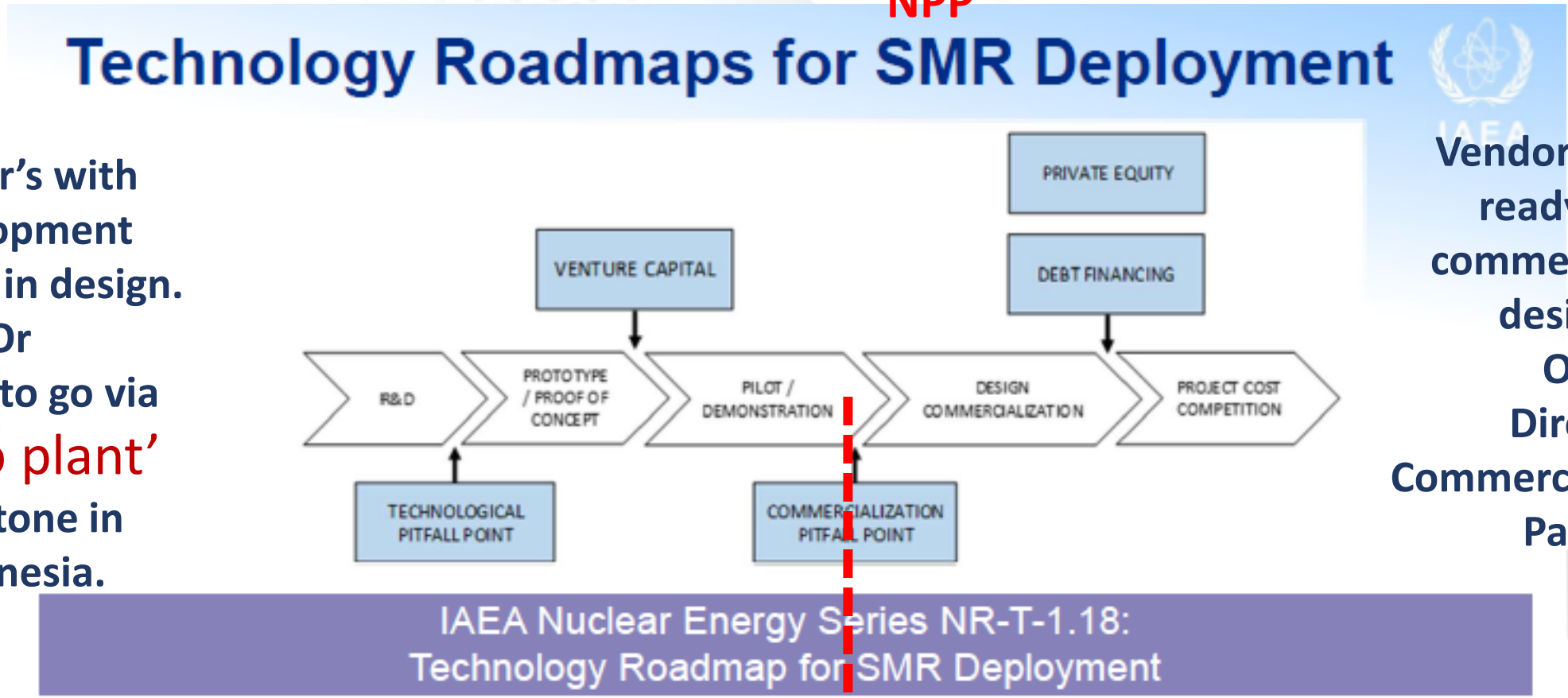
Nuclear Energy Solve ENERGY SECURITY (SDG#7) and CLIMATE CHANGE (SDG#13) Problems.

*) CFPP age of PLN & PPU maximum 30 years dan IPP 25-30 years (based on PPA)

SMR DEPLOYMENT ROADMAP

Source: IAEA Presentation by S.Monti for the Tech. Roadmaps for SMR Deployments

NPP



Vendor's with development progress in design. Or Willing to go via 'demo plant' milestone in Indonesia.

Vendor's with ready-to-commercialize design. Or Direct Commercialization Path

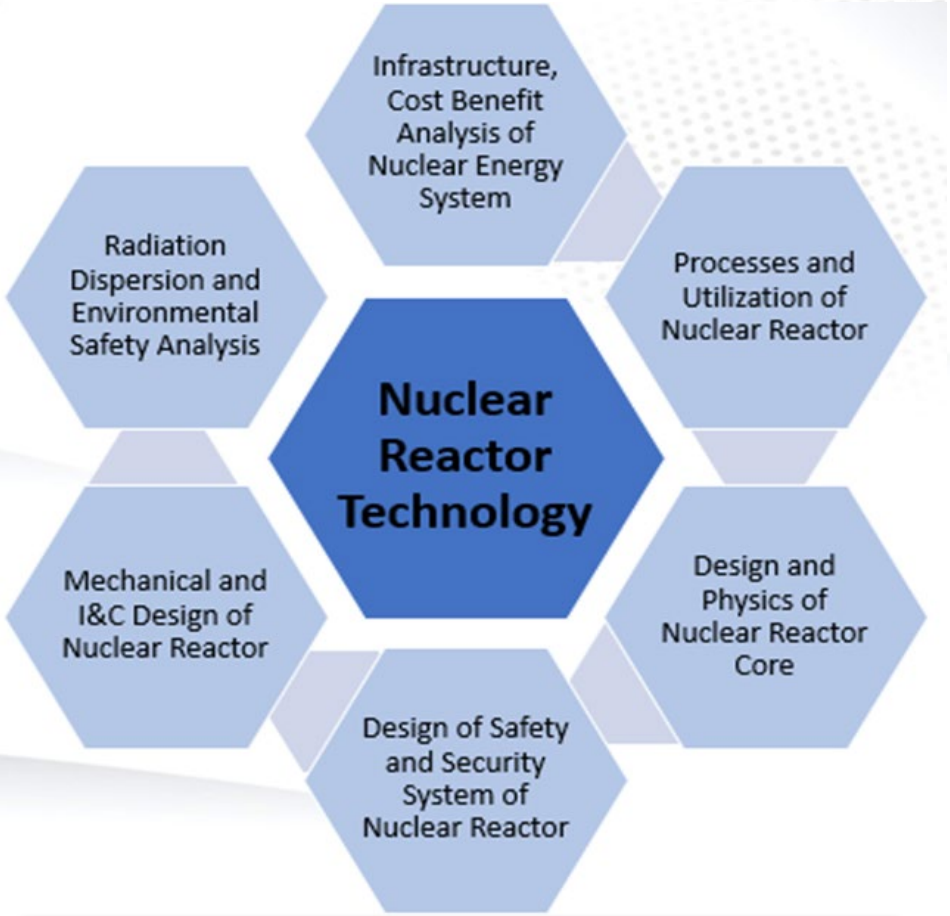
BRIN's Role: Technology Co-developer, and License Holder

BRIN's Role: Technical Supporting Organization

Research Center for Nuclear Reactor Technology

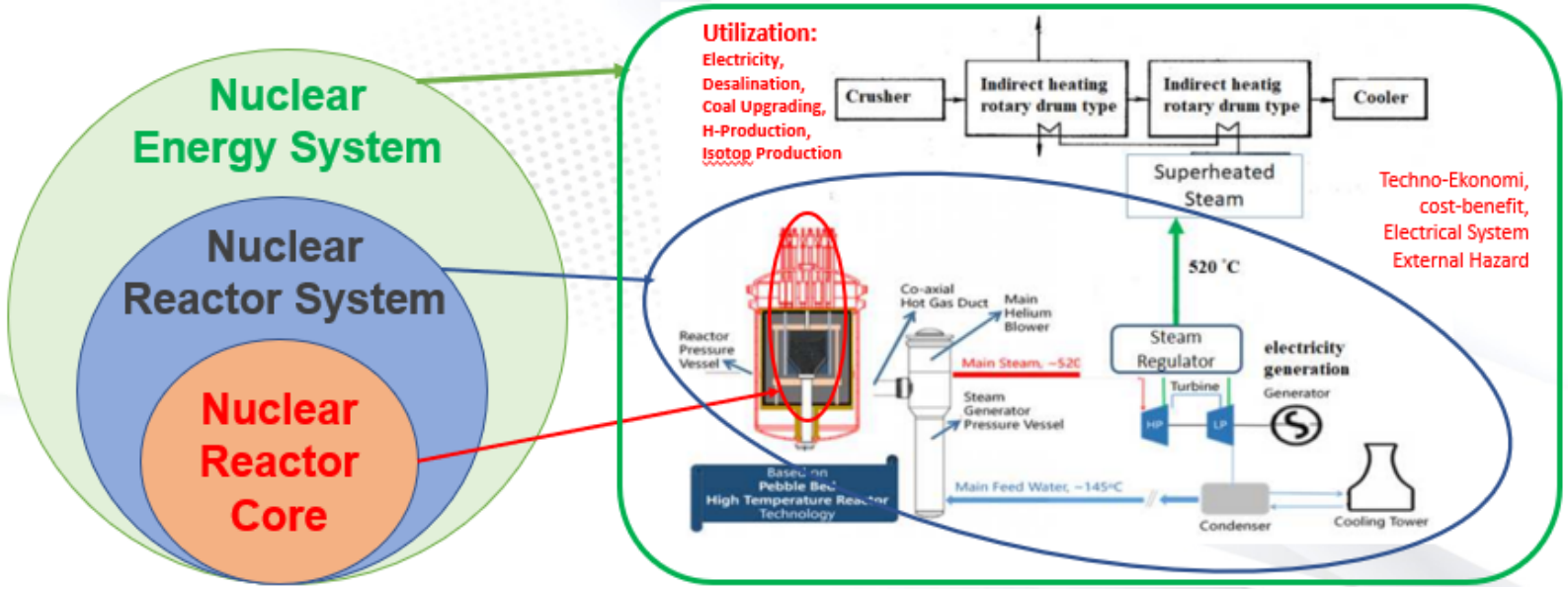
Main Task

Develop key and enabling technologies of nuclear reactor for energy and non-energy applications.

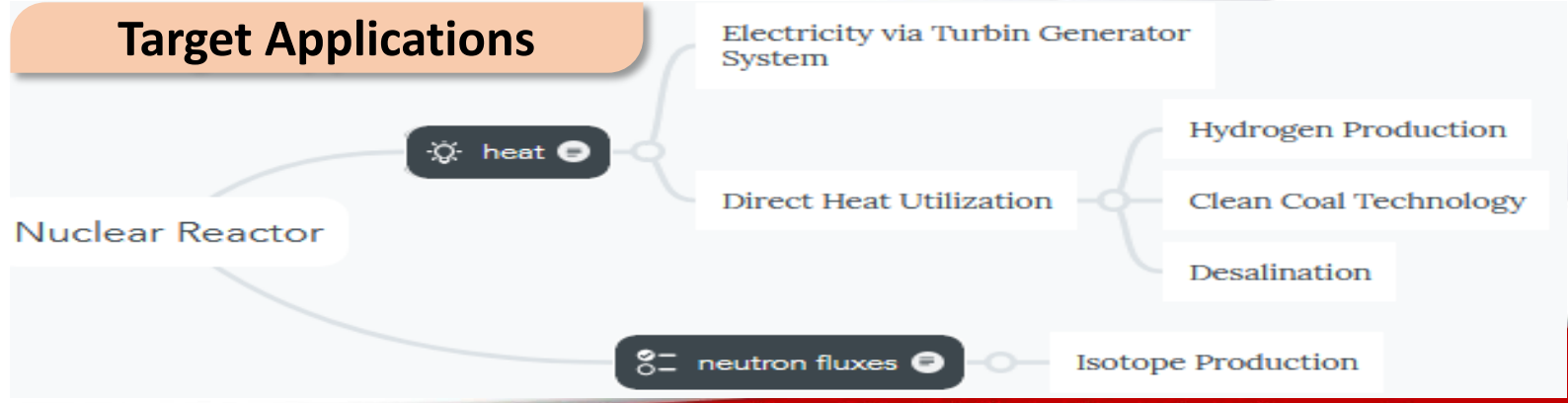


Detail Technology Development Aspects

General Activity Scope



Target Applications



PRTKRN ORTN BRIN, Building 80
PUSPIPTEK Campus, Setu, Tangerang Selatan 15314 BANTEN

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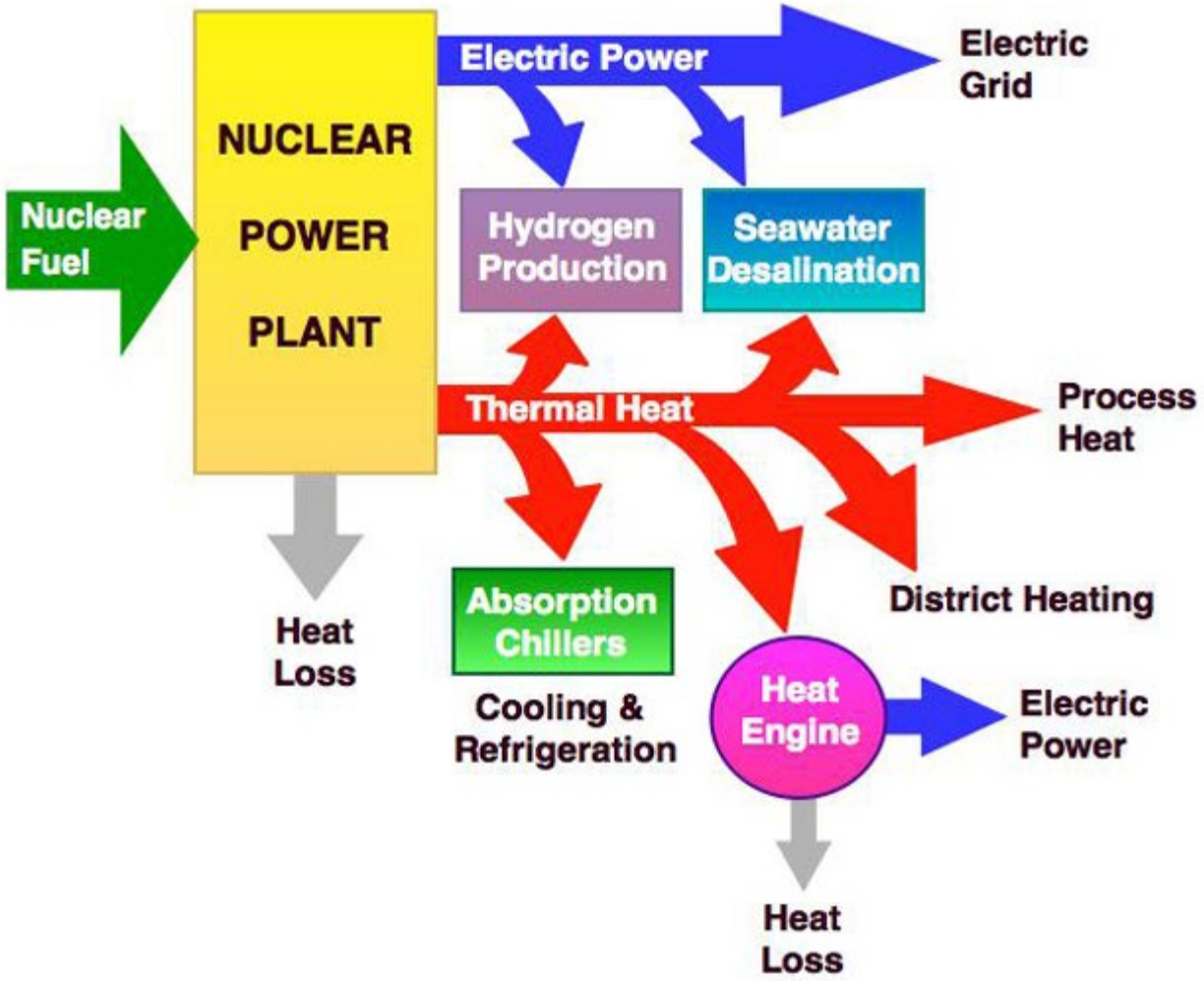
OPPORTUNITIES

- Techno-economics
  - New trend of Small Modular Reactor is appropriate with distributed demand of Indonesian
  - Shorter construction time, lower maintenance costs, and utilization other than traditional NPP → economic competitiveness
  - Technology
    - Safety, security and safeguard
    - The typical power of SMR units perfectly fits the existing grids and infrastructure, making them a viable option for replacement of traditional fossil fueled energy sources
  - Economic (implementation)
    - Electricity → some areas need SMR (remote area, several islands)
    - Non electric
      - Hydrogen production → companies (oil companies)
      - Desalination

SMR UTILIZATION IN INDONESIA



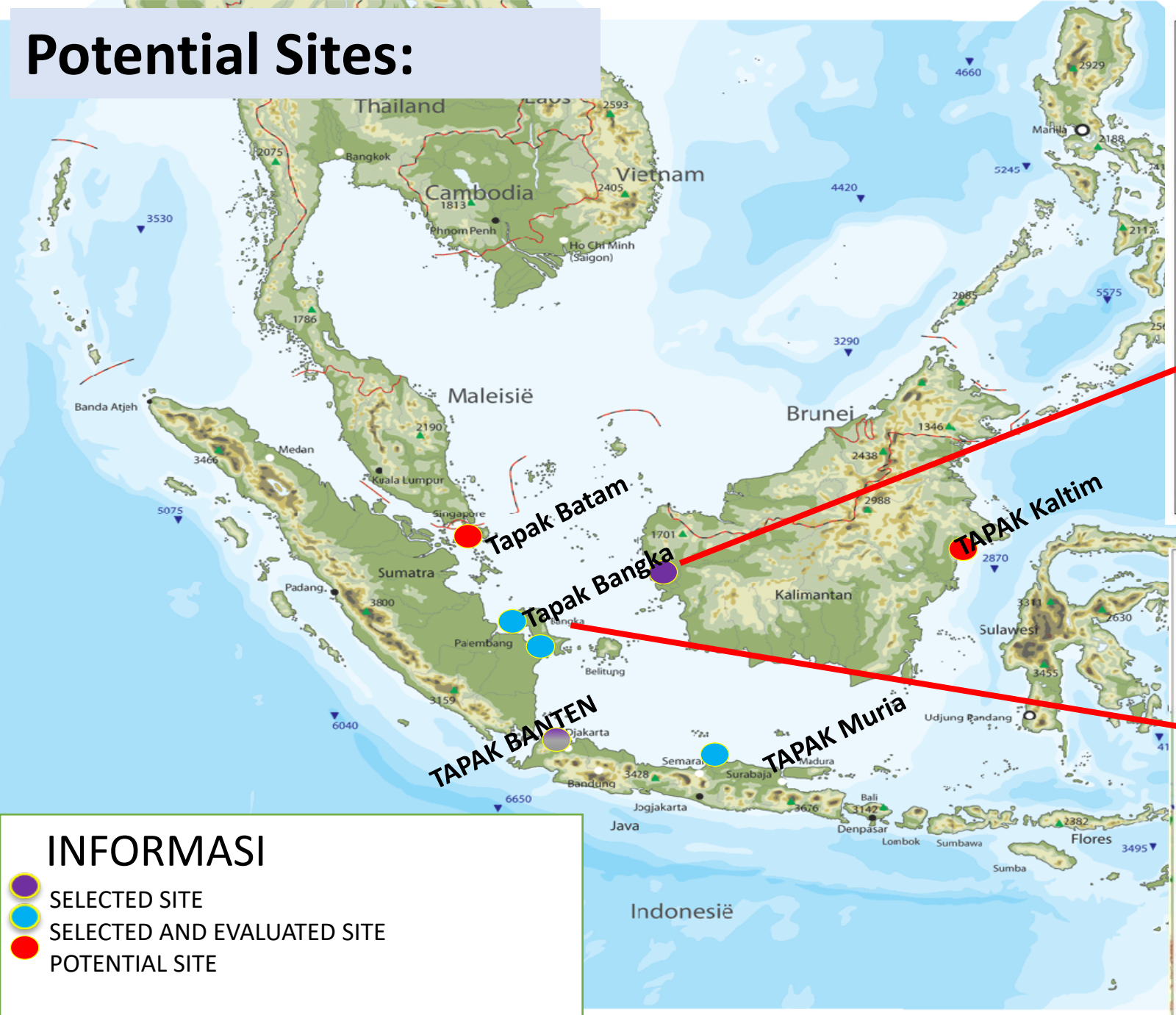
- NPP is a reliable and low-carbon energy provider. Nuclear power contributes about 6% of all world energy needs, and 13-14% of the world's electricity needs.
- Nuclear energy has the potential to improve the security of energy and clean water supplies around the world through non-electrical applications, such as seawater desalination, hydrogen production, thermal energy provision, and various industrial applications.
- Apart from being used for desalination and hydrogen production, the heat generated by an NPP can be used for other purposes, such as cooling, heating and process heat.
- Nuclear energy has long been used as an energy source in submarines and icebreakers.
- Small Modular Reactor technology makes NPP more flexible in its utilization.

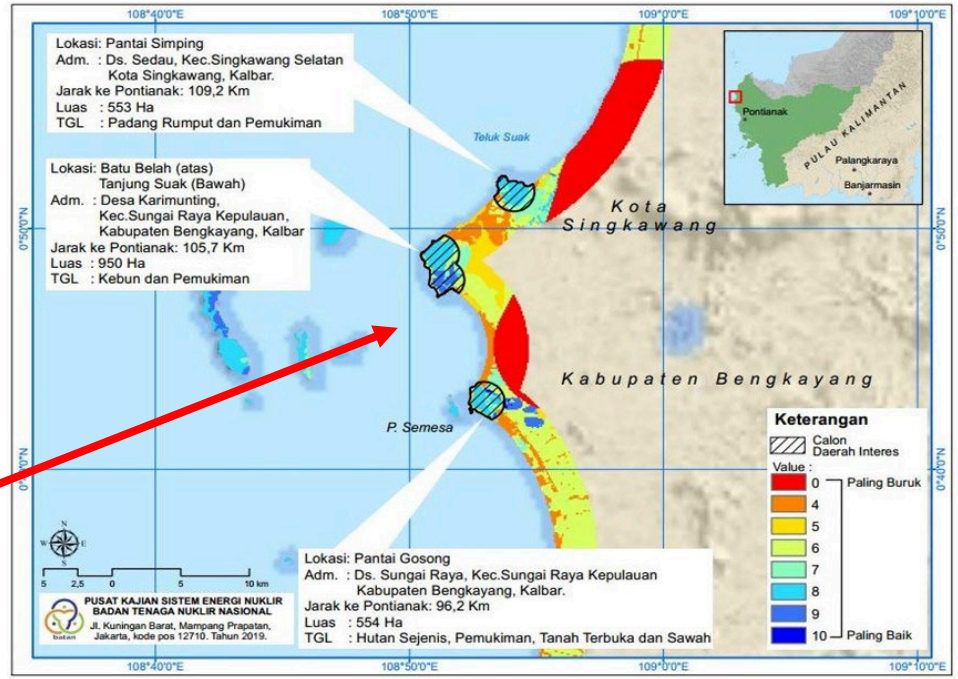
Source: https://www.iaea.org/topics/non-electric-applications

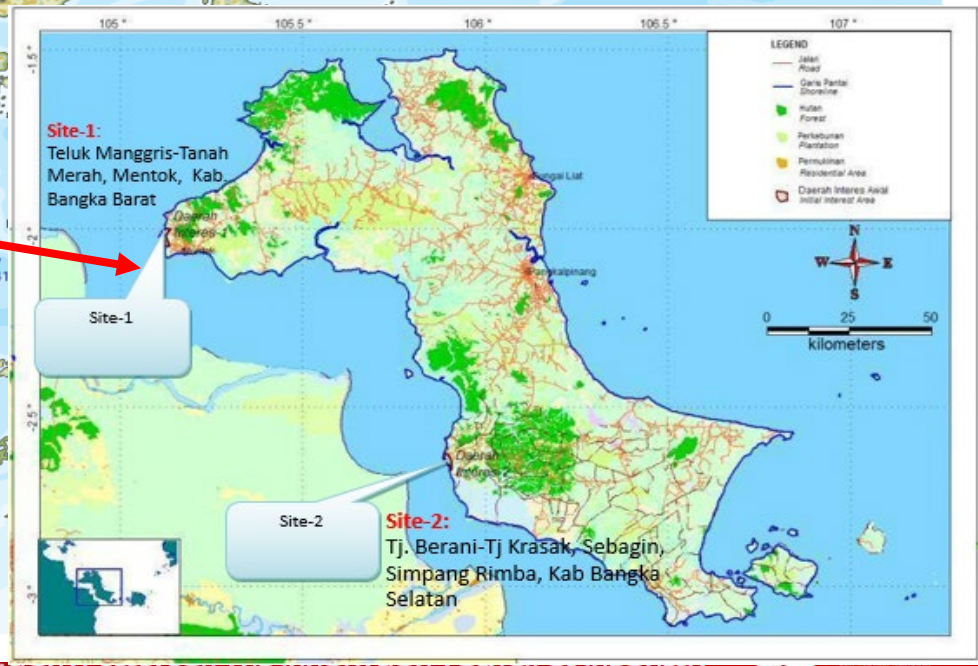
OPPORTUNITIES

- Social aspects
  - Energy accessibility
    - Remote areas that are not connected to main power grid
  - Flexible siting
    - Land-based SMR
    - Floating NPP

Potential Sites:







INFORMASI

- SELECTED SITE
- SELECTED AND EVALUATED SITE
- POTENTIAL SITE

Challenges

- Techno-economics
  - The problem of technology choice
  - Infrastructure for deployment
  - Licensing
  - Demonstration of new technology → demo plant

Challenges

- Social aspects
  - Regulations frameworks → not ready
  - Policy → NPP is the last option (Gov. Reg. 79/14)
  - Politics → not in my election territory
  - Public perception and acceptance
  - not enough public consensus on nuclear energy

Conclusions

- SMR is potentially to be deployed in Indonesia for electricity and non-electricity production such as desalination, hydrogen production especially in remote area
- Need to choose the suitable SMR technology with affordable cost
- Need the commitment and consensus from government to built SMR

Thank you
ありがとうございます