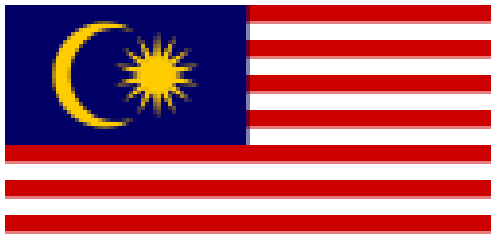

ASSESSING THE FINANCIAL VIABILITY OF SMR AND LARGE REACTOR IN MALAYSIA ELECTRICITY MARKET BY USING IAEA FINPLAN MODEL: MALAYSIA CASE STUDY

Presented by:

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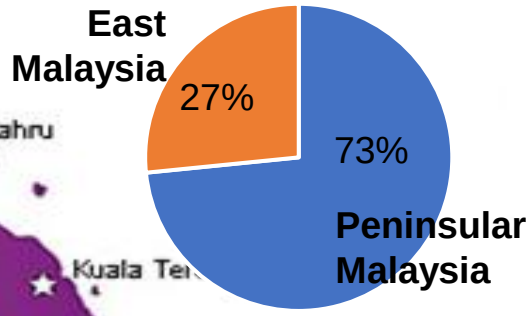
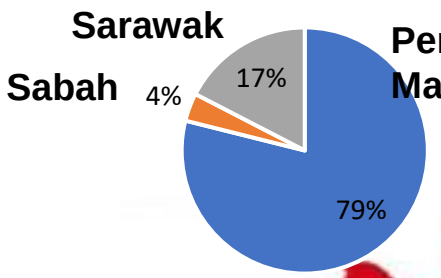
Outline of presentation:

- Introduction to Malaysia
- Malaysia energy transition plan
- Case Study: SMRs Deployment in Malaysia Electricity Market
- Results & Discussions
- Conclusions

Introduction to Malaysia:

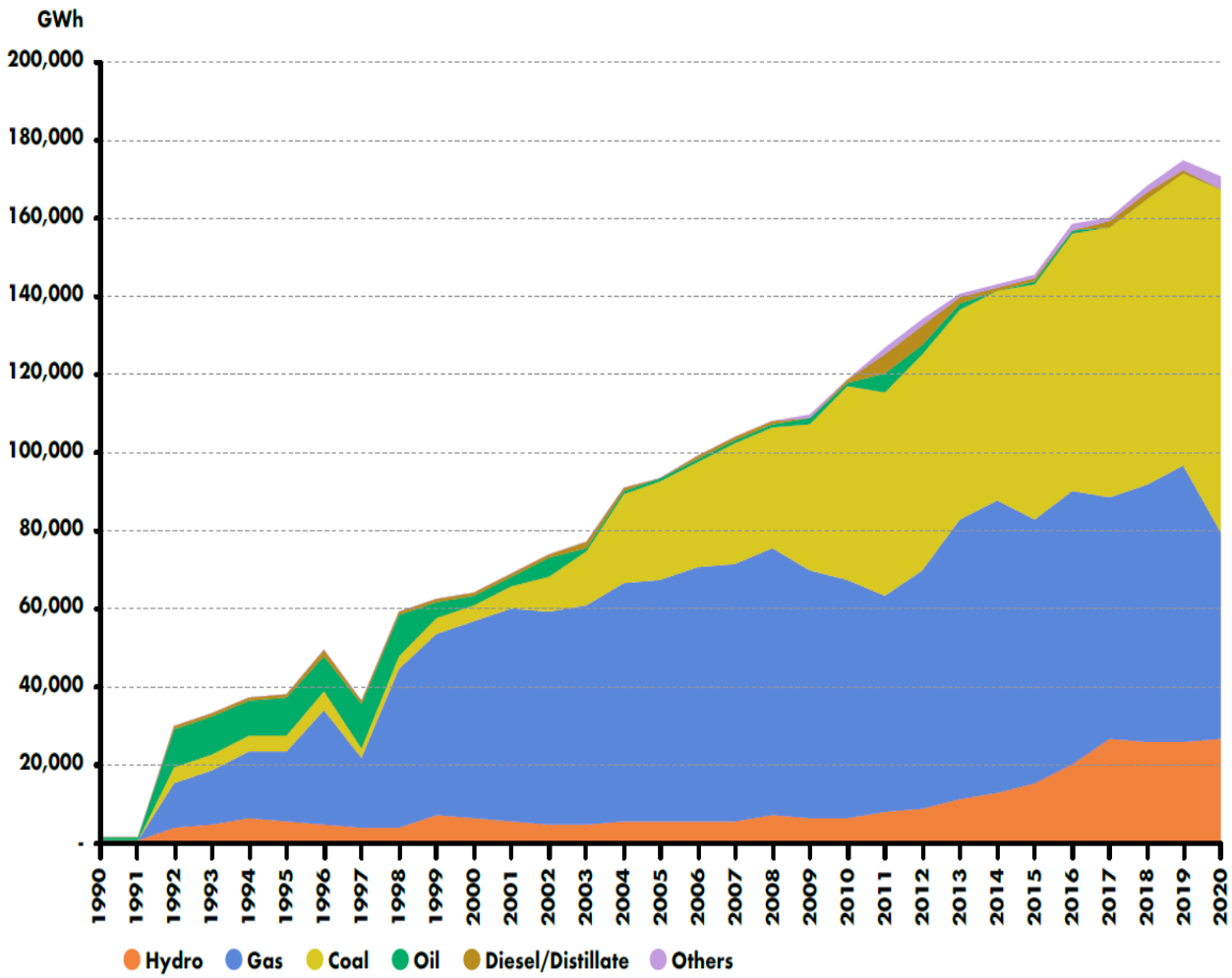


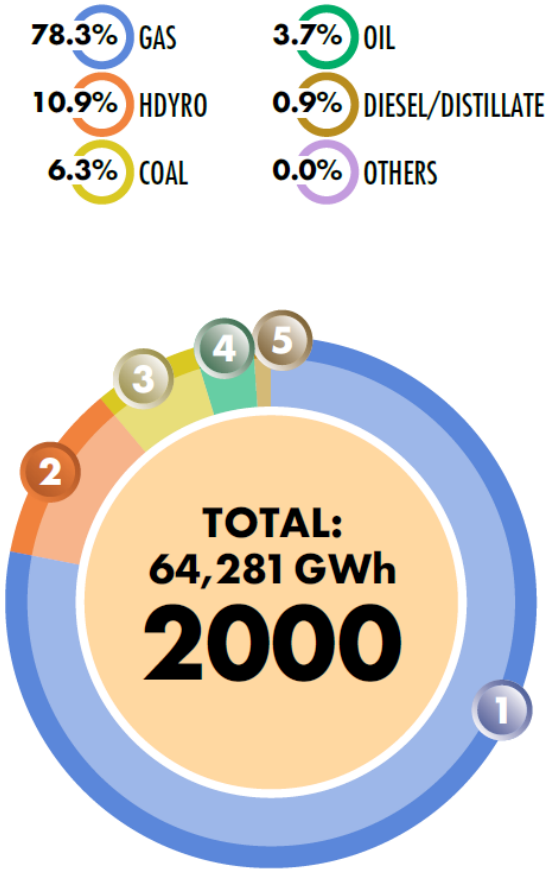


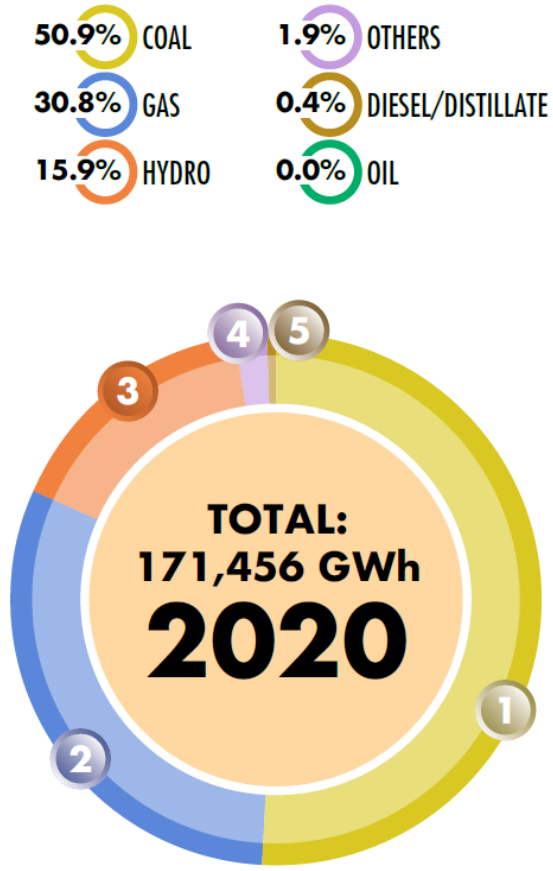
- Total population: 33.2 million (2023)
- Total landmass: 329,847 km^2

Introduction to Malaysia:

Electricity Generation Mix in Malaysia:







Malaysia energy transition plan:

- Malaysia is committed towards **transition to a low-carbon and climate-resilient economy**. The **12th Malaysia Plan** has outlined Malaysia's path to net zero emissions, including **achieving carbon neutrality by 2050**.

- **Malaysia's energy transition plans until 2040** will focuses on power generation plan.
  - Phased-out the current 7000 MW of **coal-fired power plant** in 2033
  - **Renewable energy** - 31% by 2025, 40% by 2035, 70% by 2050 (Solar PV)
  - 5000 MW **battery energystorage system** (BESS)
  - Current installed RE capacity 2020: 7,995 MW (20%)

- However, **renewable energy (solar PV) sources facing issues** such as **vulnerability & intermittent** in nature, require **large land area**, and also dependent on **geographic positions and climatic conditions**. Solar PV needs **battery storage system** and currently still **low efficiency** of capacity factors.

Malaysia energy transition plan:

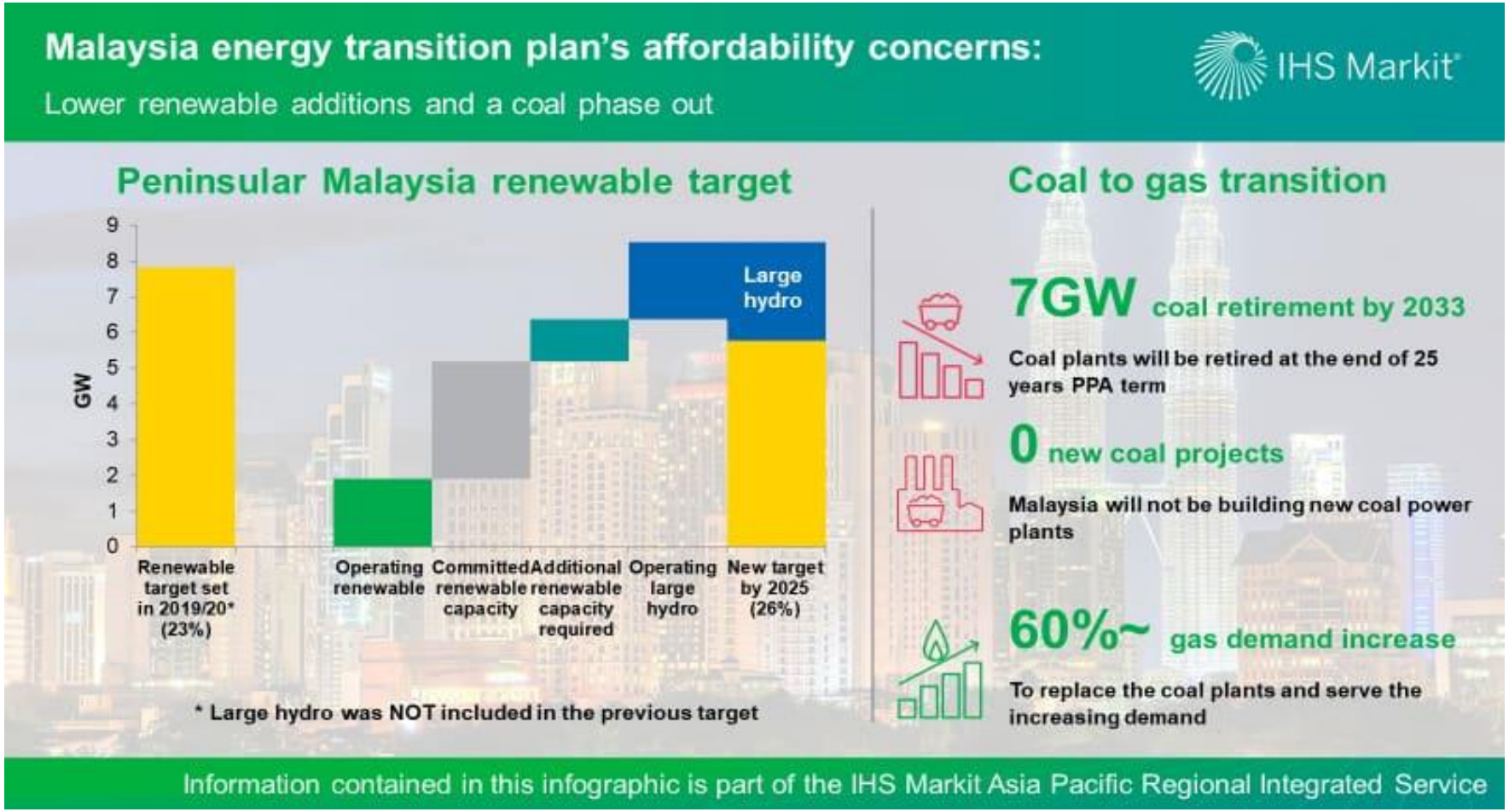
- There is a need to **support variable renewables (VRE) with long term energy storage or alternative**, flexible power sources because of the variability in the generation of renewable energy sources such as solar and the electricity demand.

- Since **nuclear energy** is considered as one of the option for **low carbon generating technologies**, there is an increased interest in exploring the potential of replacing coal power plant shut down in order to meet the base-load electricity demand.

- SMR also has a **potential for hydrogen production**, considered as one of the **new source of energy** for Malaysia in the future.

- However, nuclear energy is also having some limitations including **government policies, environmental issues and public apprehensions**.

Malaysia energy transition plan:



The Low Carbon Nation Aspiration 2040

- A higher level of RE penetration in the installed capacity and total primary energy supply (TPES), with no new coal power plant

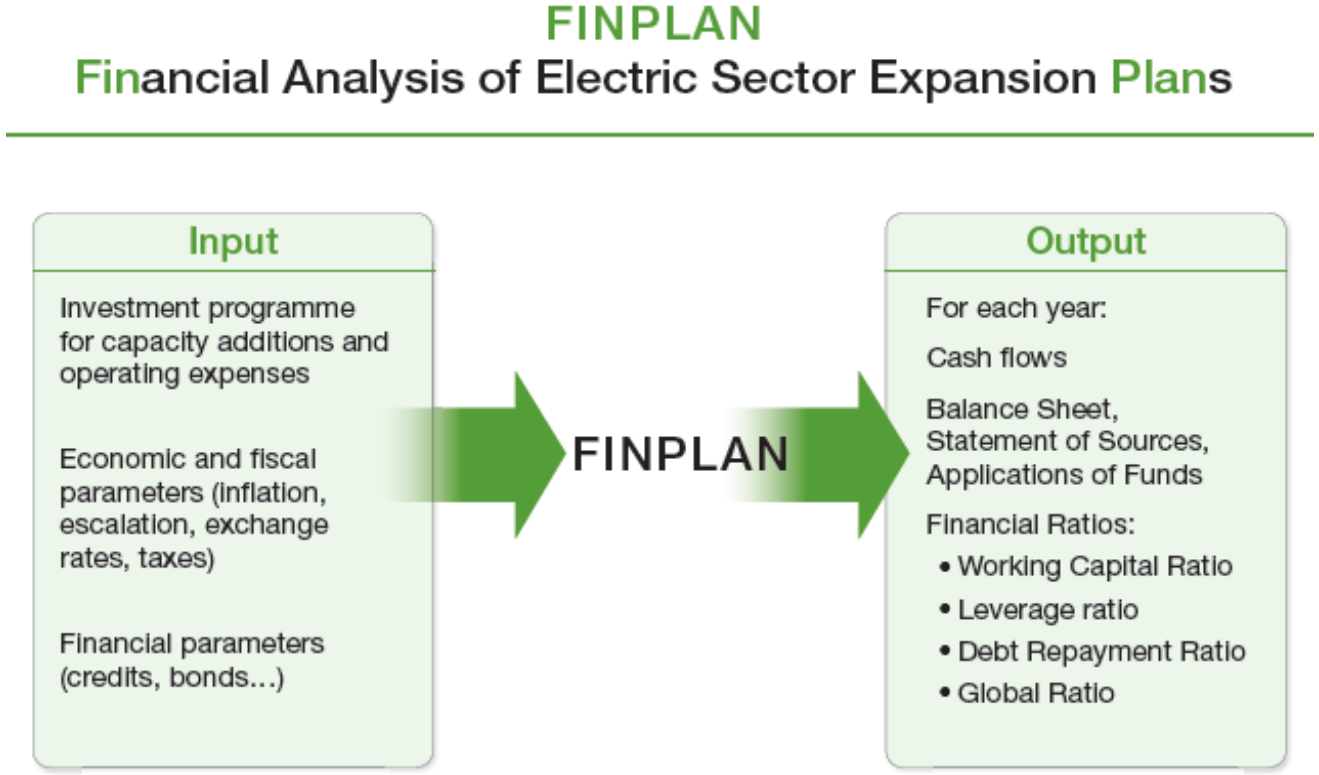
The National Energy Policy 2022-2040 (DTN)

- Government's commitment towards energy transition.

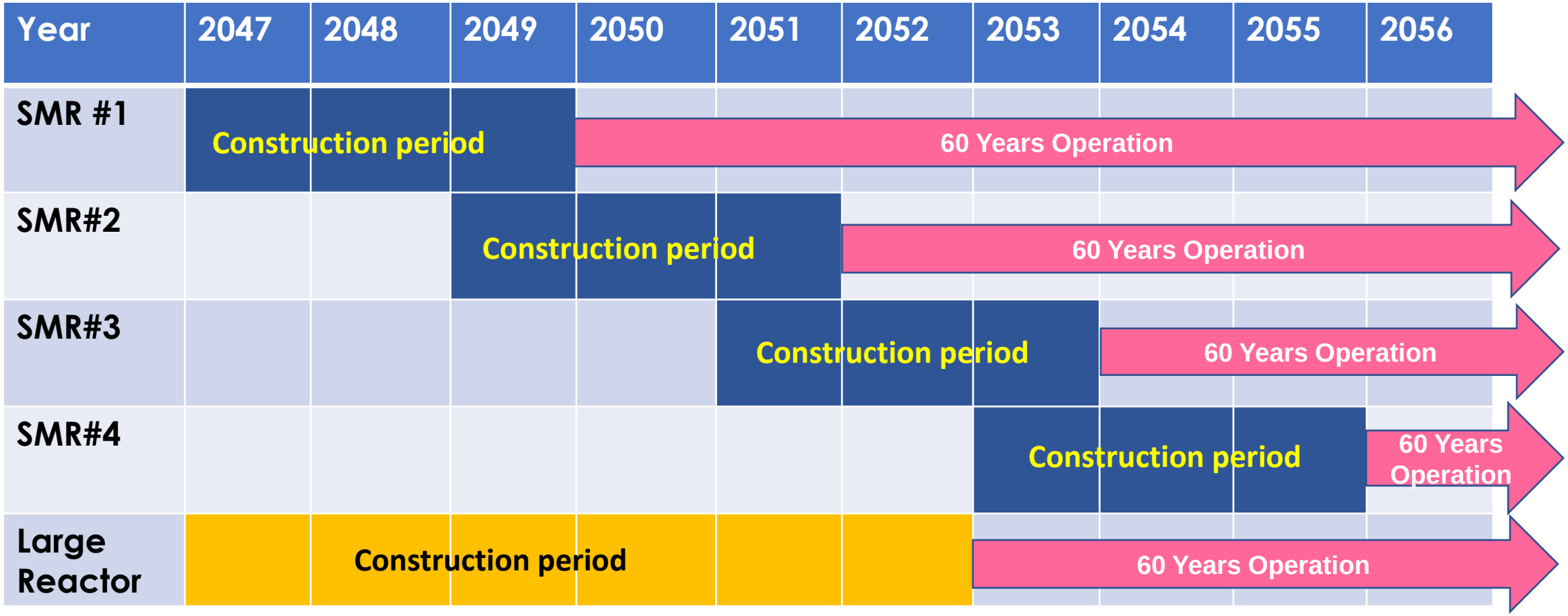
Case Study: SMRs Deployment in Malaysia Electricity Market

- The case study focuses on the financial viability of **4 units of SMR and 1 large reactors** in the Malaysia electricity market using the IAEA FINPLAN model.

- To **support Malaysia's interest** in exploring the possibility of nuclear energy for electricity generation in the future, probably for the **clean energy transition**.



Construction Timeline of SMR and Large Reactor (LR):



80% Foreign Investment, 20 % Local Investment

Results & Discussion:

- This study focuses on the two key financial indicators of project investment, the Net Present Value (NPV) and Internal Rate of Return (IRR) of 4 SMRs and 1 large reactor projects.
- **A positive NPV** for 4 units of SMR and 1 unit of large reactor show that **both projects are profitable** at **7%** annual discounted rate.

	SMR 4 Units 250MW	**Large Reactor Single 1000MW**
Investment case	NPV: 19,465.48	NPV: 16,252.99
	IRR: 28.7 %	IRR: 16.99 %

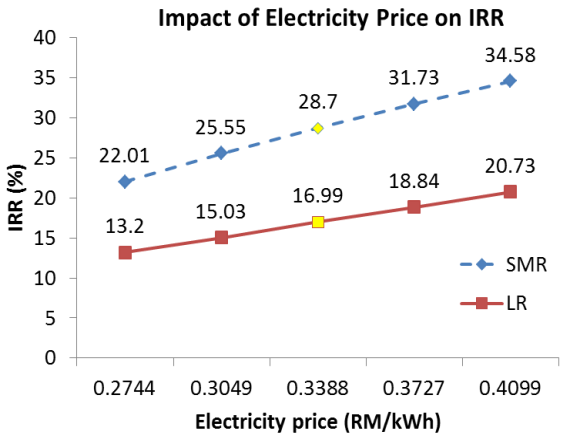
Results & Discussion:

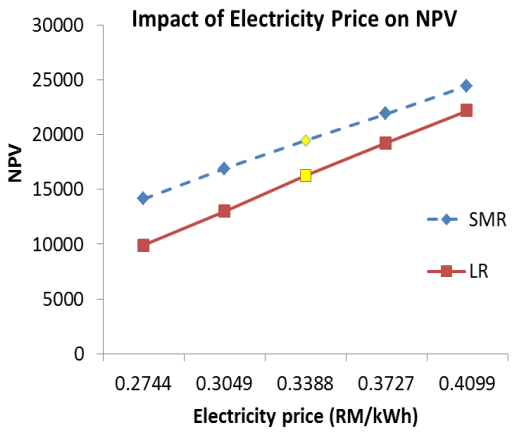
Impact on Electricity Price:

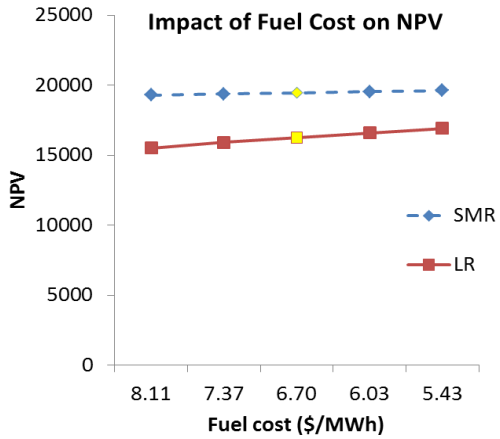
- As the **electricity price increased**, the **IRR & NPV increased**, and **revenue for SMR & LR also increased**.

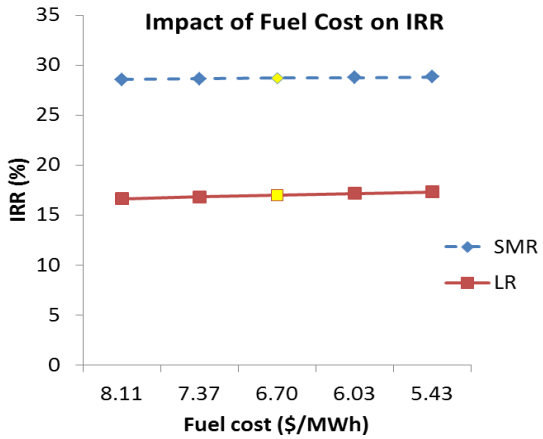
Impact on Fuel cost:

- The **increase of fuel cost has a low impact on both SMR and LR**. This is due to the low share of fuel cost in the total project cost.





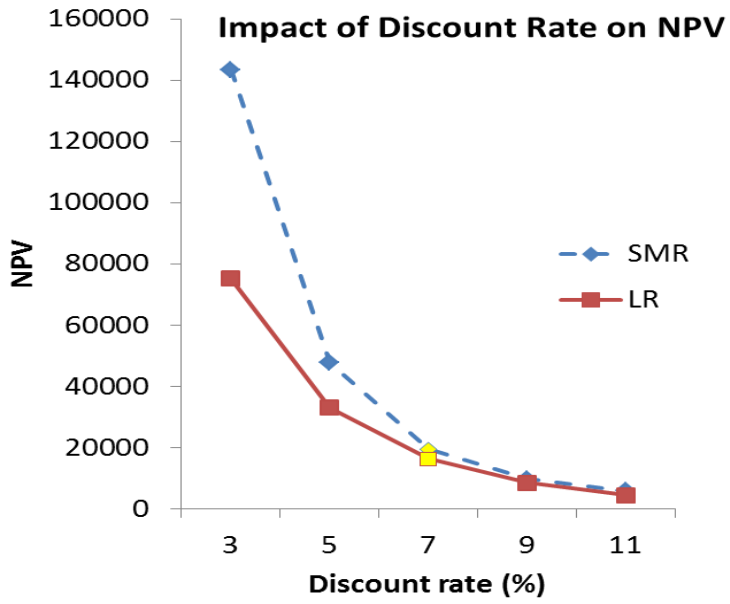




Results & Discussion:

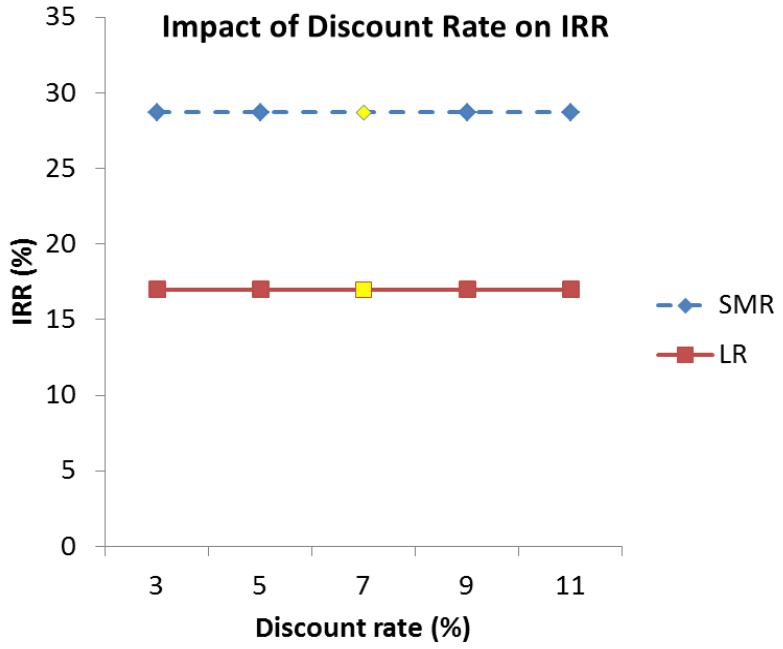
Impact of Discount Rate on NPV:

- **Discount rate has a significant impact on NPV for SMR and LR** since both projects are classified as capital-intensive projects.
- At **a low discount rate (3-5%), SMR recorded a higher NPV than LR.**
- However, as the **discount rate increased**, **SMR recorded a higher depreciation rate of NPV than LR**.



Impact of Discount Rate on IRR:

- The IRR for SMR remain constant at 28.7% and for LR at 16.99%.
- If the **discount rate for SMR and LR is increased above the IRR rate**, the project will definitely record a **negative NPV**.



Conclusions:

- **Small modular reactors (SMR)** has potential in supporting **United Nations Sustainable Development Goals (SDG)** and **Malaysia Aspiration towards Net Zero Emission by 2050**, as one of the option under the **low-carbon dispatchable technologies (LCD) for electricity generation**.

- SMR also has a **potential for hydrogen production**, considered as one of the **new source of energy** for Malaysia in the future.

- However, **Malaysia continues to keep its 'no nuclear policy' stance when it comes to power generation**. The **government recognised the potential of SMR** but did not plan to explore nuclear power generation anytime soon following concerns over **environmental issues and public acceptance**.

- The government request to **convince the public** before exploring nuclear energy.

Thank you.

Any questions? Please contact:

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