Revolutionising Our Renewables

Team 6: Names

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01
Question at Issue

In Singapore, non-renewable energy sources are unsustainable

Why is this an issue?

Non-renewables harm the environment

Large emissions

50 metric tons CO_2-equivalent

High CO_2 emissions per capita

(Department of Statistics Singapore, 2022)

Climate change

1°C in the past 40 years

Another 1°C by 2050

(National Climate Change Secretariat, n.d.)

Vulnerable to more extreme weather events

Increased rainfall by 67mm per decade → Torrential downpours, flooding

Rising sea levels threaten our low elevation

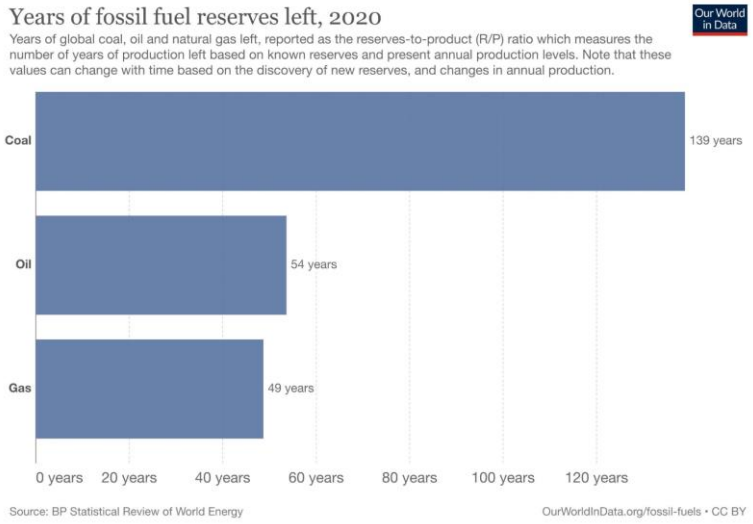
(National Climate Change Secretariat, n.d.)

Information

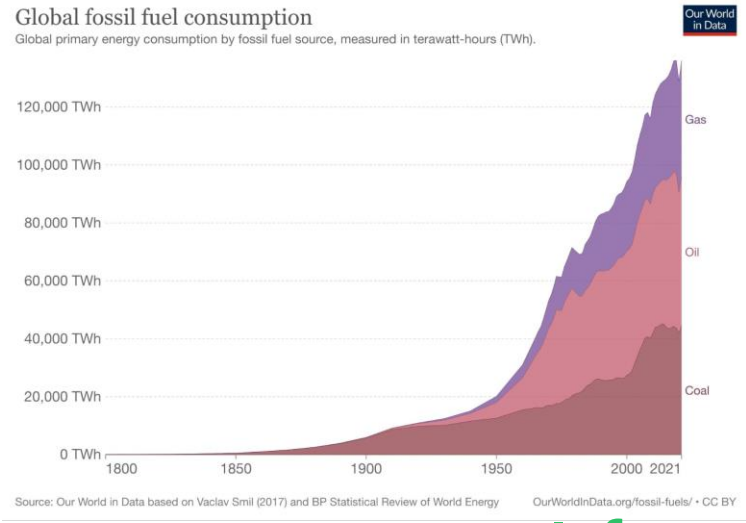
Why is this an issue?

Non-renewables will run out (Ritchie et al., 2022)

- 200 years of remaining reserves
- Rate of consumption increases 1% yearly
- Energy demand will outpace supply



(*Years of fossil fuel reserves left*, Ritchie et al., 2022)



(*Global fossil fuel consumption*, Ritchie et al., 2022)

Information

Why is this an issue?

Low energy security due to over-reliance

98%

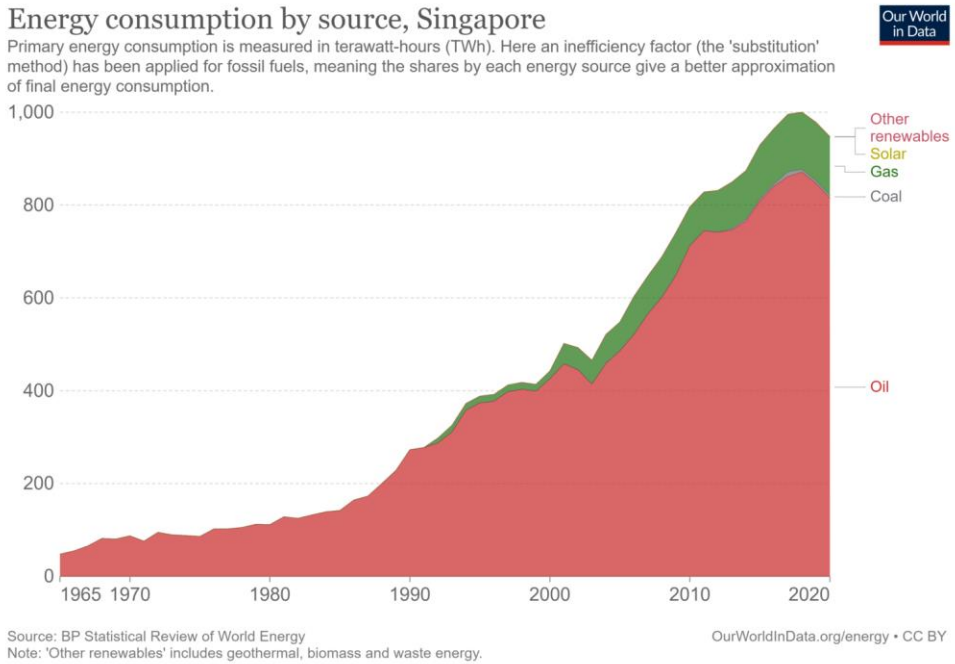
From non-renewables

(Koons, 2023)

Disruptions cripple energy supply

↓

Diversify energy mix



(*Energy consumption by source, Singapore*, Koons, 2023)

Information

02

Purpose

To implement **viable renewable energy sources** into Singapore's energy mix

Purpose

Leverage on **advancements** in renewable energy technology to fit **Singapore**

Double renewables in our energy mix

2% → 4%

Purpose

What is viability to us?

Produce **considerable** amounts of energy

↓

Make up for the construction and operational **costs** + **safety**

Integrated into our urban design

(*Solar panels on HDBs*, Lim, 2022)

- Weather
- Land scarcity
- High population density

Purpose

03

Points of View

Government

MPs support the switch to renewable energy (Goh, 2023)

"We expect climate-related spending to go up significantly in the medium term..."

DPM Lawrence Wong, Budget 2023

"...vulnerability due to our over-reliance on natural gas and oil for our energy needs. I suggest we need to urgently explore more ways to expand and ramp up our adoption of solar energy."

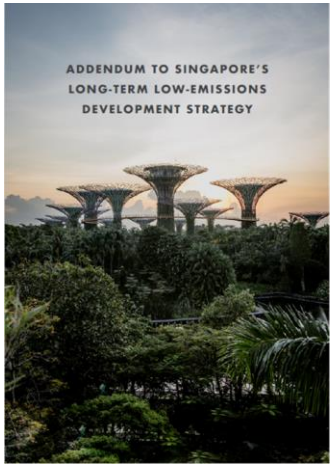
Dr Lim Wee Kiak (Sembawang GRC)

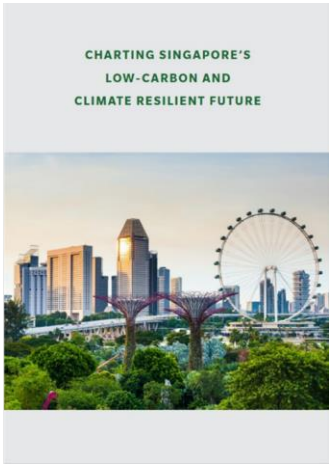
Government

Complementary initiatives

SG GREEN PLAN

(Singapore Green Plan 2030, n.d.)





(National Climate Change Secretariat, n.d.)

POVs

Energy companies

Non-renewables

Top oil firms spending millions lobbying to block climate change policies, says report

Ad campaigns hide investment in a huge expansion of oil and gas extraction, says InfluenceMap

ExxonMobil leads the oil firms in spending on branding campaigns suggesting they support action against climate change. Photograph: Matt Slocum/AP

(Laville, 2019)

Renewables

From 2020 to 2022,

S$1.75 bn

Invested into renewable energy sector

(Ang, 2023)

POVs

Citizens

Increasingly environmentally conscious population prefer renewables

78%

Support the adoption of renewables

(Schneider Electric Singapore, 2023)

Willing to pay increased costs

Prefer providers using renewables

Stability and efficiency concerns

Land scarcity, erratic weather

POVs

Non-governmental Organisations

Sustainable Energy Association of Singapore

Support R&D and implementation of renewables
(Sustainable Energy Association of Singapore, 2023)

Local and international NGOs
urged local banks to cease financing coal power

(Ha, 2018)

(Hicks, 2018)

POVs

04

Existing Solutions

Renewable Energy in other countries

(*The Three Gorges Dam on the Yangtze River, China.* 2009)

(*A small portion of Alta Wind Energy Center wind farm looking from Oak Creek Road,* 2013)

(*Aerial view of the tidal barrage on the Rance and of Saint Malo,* 2007)

Solar Power

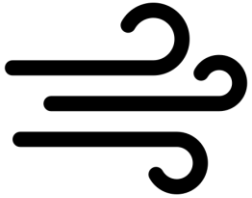
(*Fotoflug Barnim*, 2017)

(*Solar panels at Marina Barrage.* 2023)

05

Brainstormed Solutions

Limited land



Insufficient wind speeds

No river system with fast flowing water

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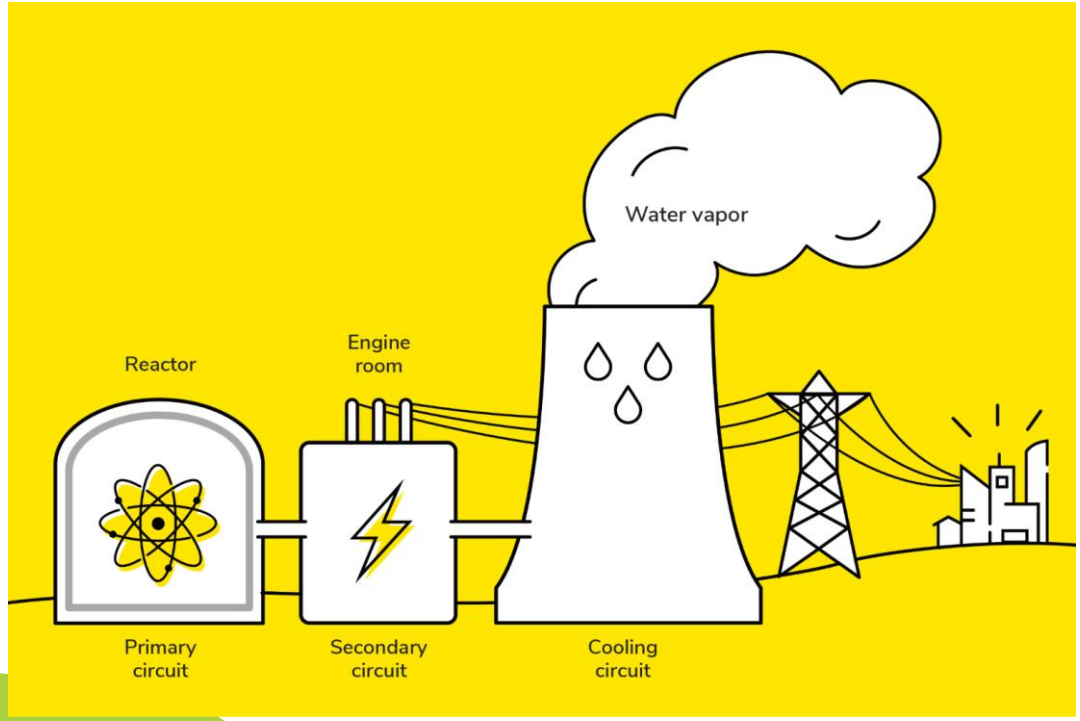
Limited options for renewable energy

Nuclear Energy

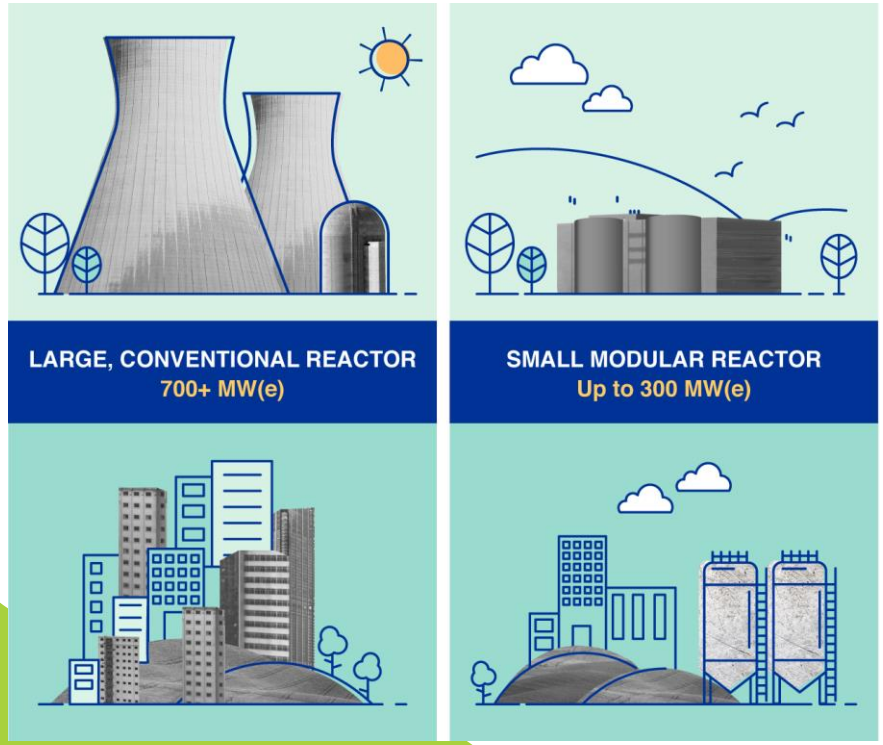
(*Nuclear power plants*, Ministry of Trade and Industry Singapore, 2023)

Nuclear Energy



(*How nuclear power plants work,* orano, n.d.)

Small Modular Reactors (SMRs)



(*Comparison between conventional reactors and SMRs,* Liou, 2023)

- **Smaller**
- **Modular**
- **Faster-to-construct**
- **Easier-to-maintain**

?

Why has Singapore **hesitated** for years to adopt **nuclear energy**?

Public perception → **80%**

Against nuclear energy
(Nanyang Technological University, 2021)

06

Our Chosen Solution

Our Solution

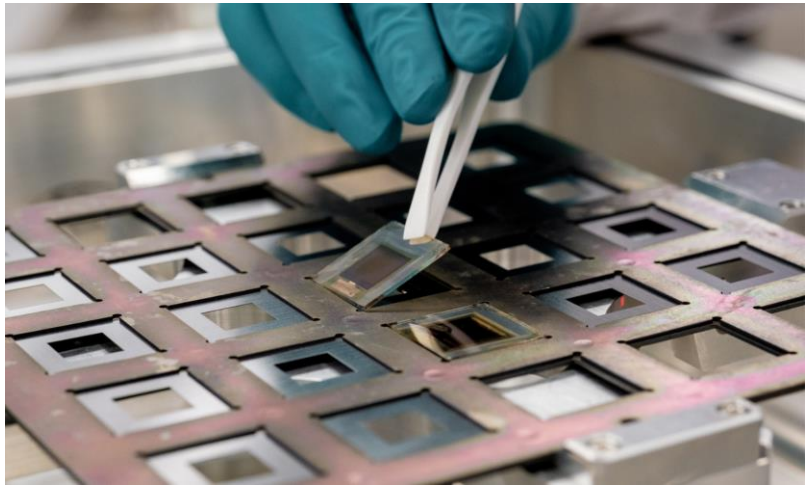
"With lots of sunshine in Singapore, solar energy is our most promising renewable energy source."

(Energy Market Authority, n.d.)

Our Solution

(*Solar panels*, Energy Market Authority, n.d.)

Silicon

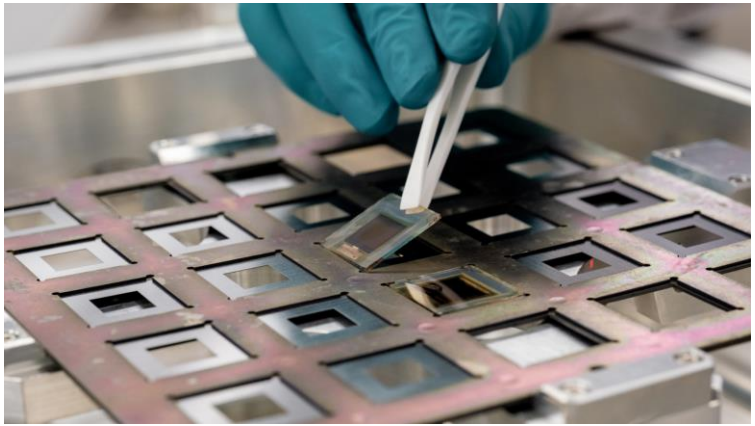


(*Solar cells made from perovskite crystals*, Lyon, 2022)

Perovskite crystals

Information

Our Solution



Perovskite crystals

More efficient

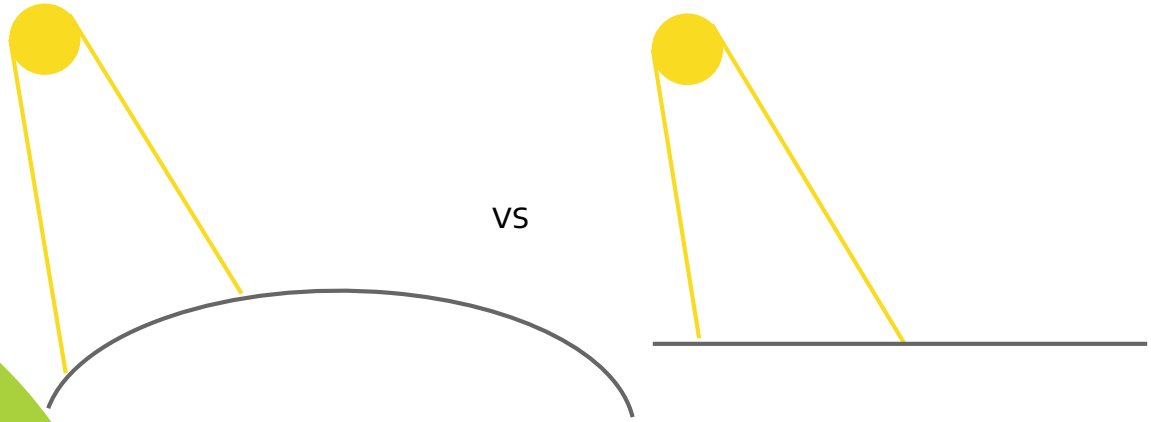
Cheaper

More flexible

(Materials Today, 2015)

Information

Our Solution



Optimal angle for sunlight absorption

Same position but larger surface area → more energy dissipation

Information

Assumptions

Enough capacity of power grids

(*Power grids*, Teh, 2021)

Implications

Reduce emissions

Less reliant on non-renewable energy

Increase electricity supply

Grow green sector

Thank you!

Any questions?

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