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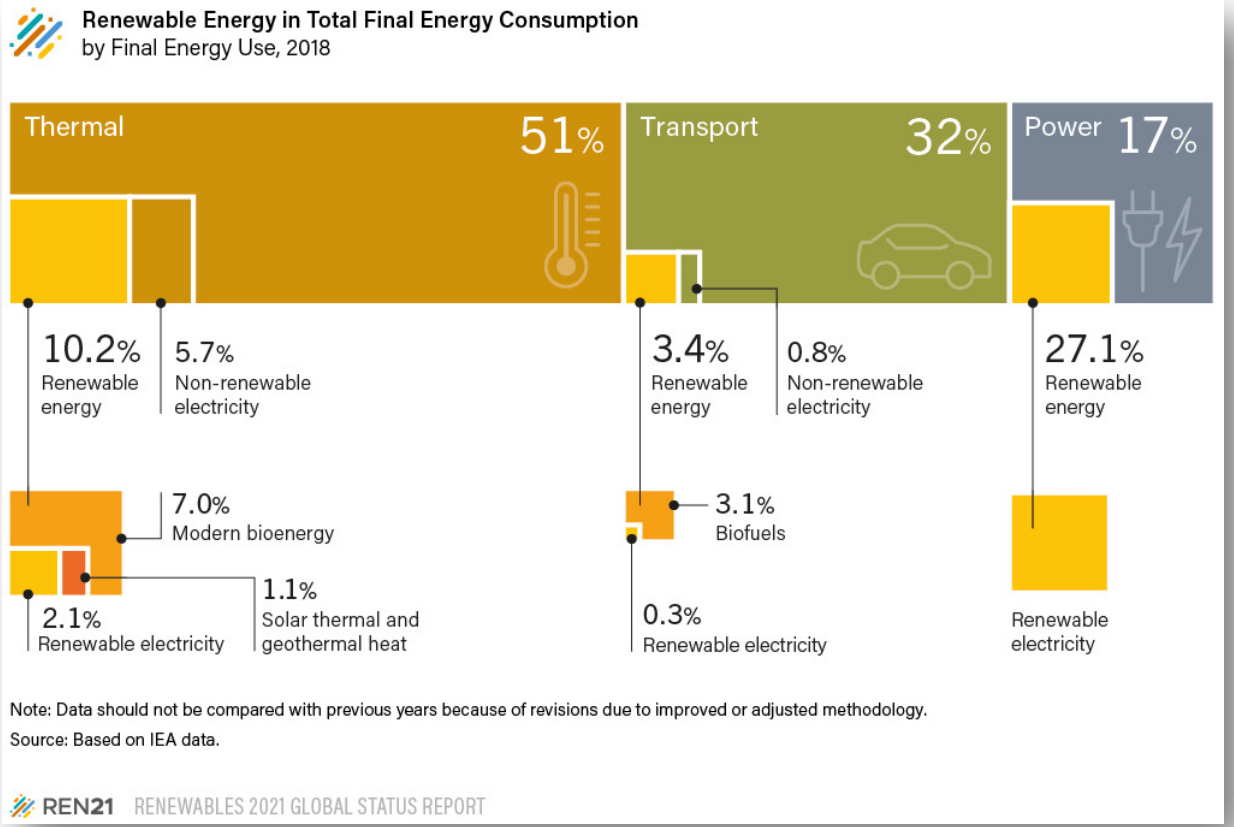
Carbon Neutral District Energy Outlook

Asia Clean Energy Forum 2023

Peter Lundberg, Executive Director
Asia Pacific Urban Energy Association (APUEA)

Manila, June 14th, 2023

Total Final Energy Consumption



Integrated Urban Energy Systems

- Energy Conservation
- Energy Efficiency
- Energy Recovery

- Renewable Energy
- Co- and Tri-generation
- District Energy

- System integration and Energy symbiosis
  - Electricity
  - Heating
  - Cooling
  - Gas – Hydrogen
  - Energy Storage
  - Municipal Wastewater

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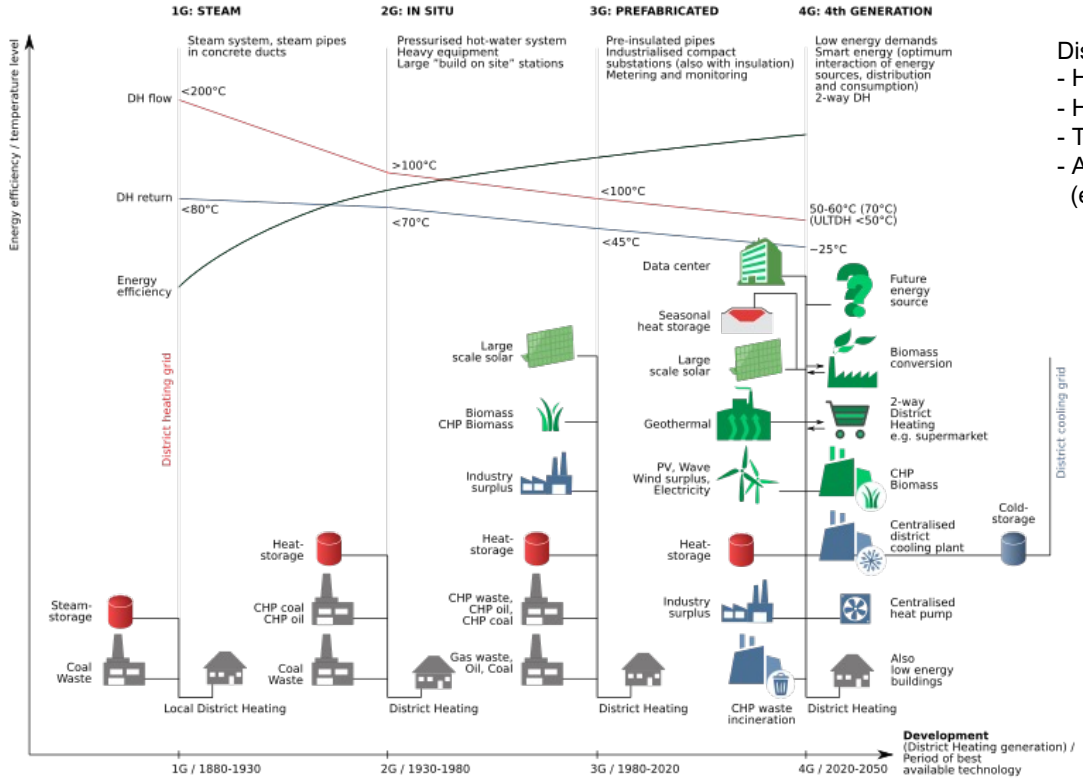
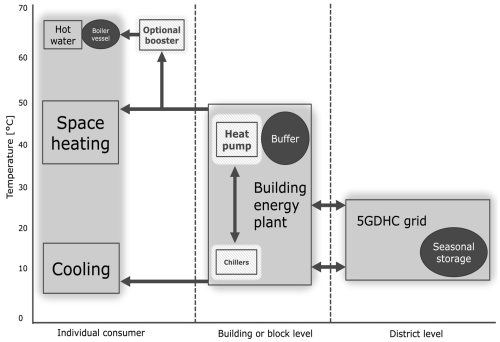
District Energy Developments



5G: 5th GENERATION

District Energy system simultaneously applied as;

- Heat source for Heating supply
- Heat sink for Cooling supply
- Thermal Storage for the Electricity Grid, and
- An integrted part of Multi-Energy Systems (electricity, gas, cooling, heating and storage)



The history of District Cooling

- The first district cooling system in **North America** was established in **1962** in Hartford, Connecticut. Today nearly 400 district cooling systems serve cities and campuses in North America
- The first district cooling system in **Europe** was put into operation in **1967** in Paris, France, supplying cooling (and heating) to the La Défense commercial district. Today about 150 district cooling systems are in operation in Europe.
- The first district cooling (and heating) system in **Asia-Pacific** was set up on the site of the Osaka Expo in **1970**. Today nearly 150 DHCS systems are in operation in Japan alone. In China, more than 100 District Cooling systems are in operation.
- In **Southeast Asia**, more than 40 district cooling systems are in operation, and more than 10 district cooling systems are under development

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District Energy Developments

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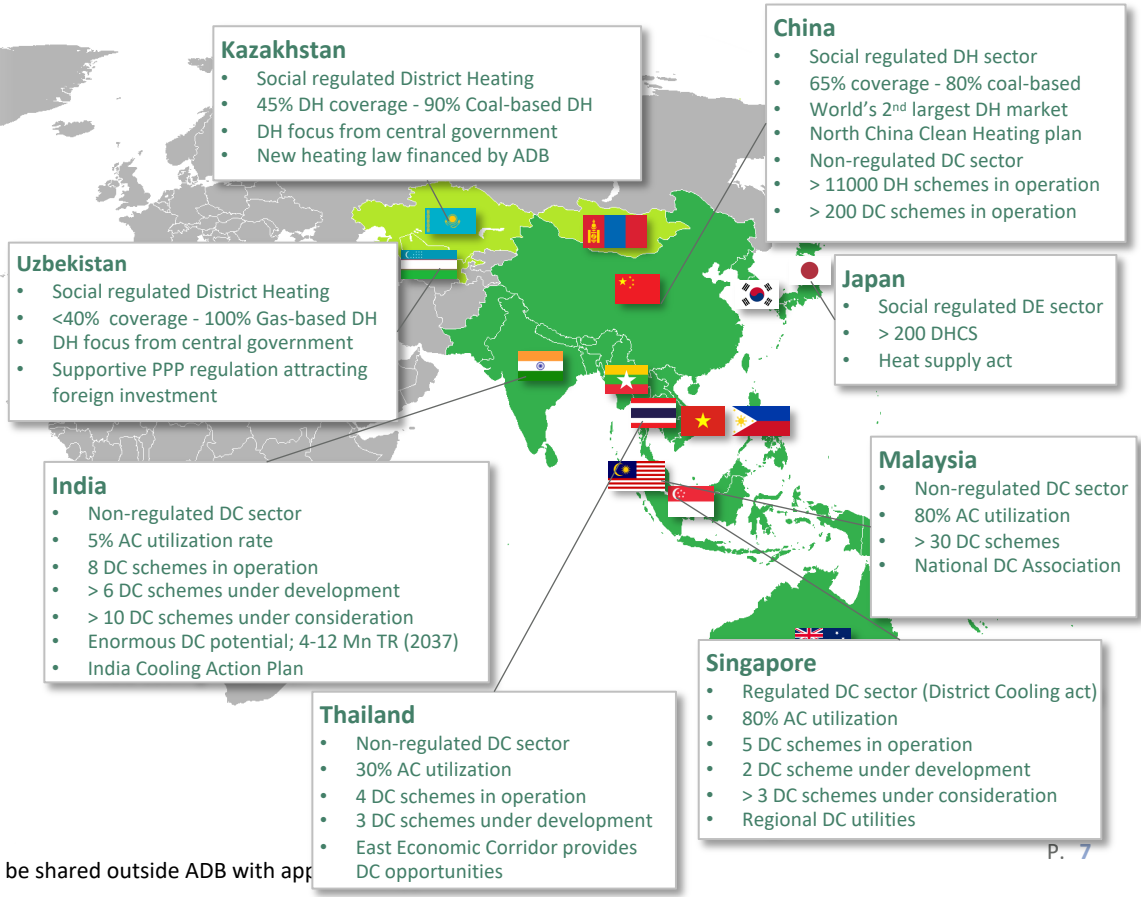
Overview of District Energy in Asia Pacific

- Largest growing heating sector
- Largest growing cooling sector
- >60 years history of District Heating
- >20 years history of District Cooling
- DE sector associations in China, Korea, Japan and Malaysia (India, Thailand and Kazakhstan under consideration)
- Diverse markets – economy, climate, user behavior, political environment, …
- Presence of international DE utilities
- Regional District Cooling utilities emerge
- New innovative DE technologies available in the region
- Regional MDBs (i.e. ADB and AIIB) have a District Energy focus



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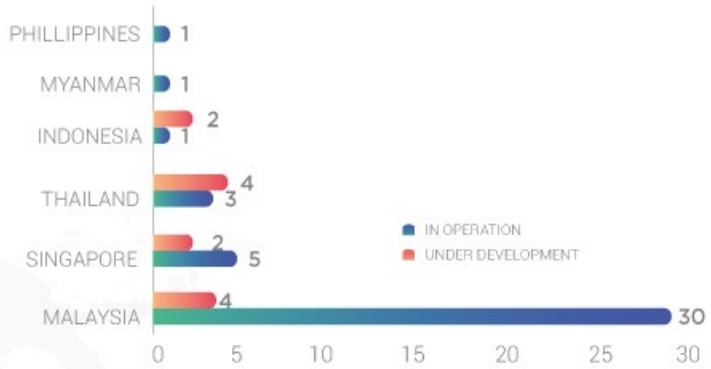
DISTRICT COOLING SYSTEMS IN SOUTHEAST ASIA



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infographics

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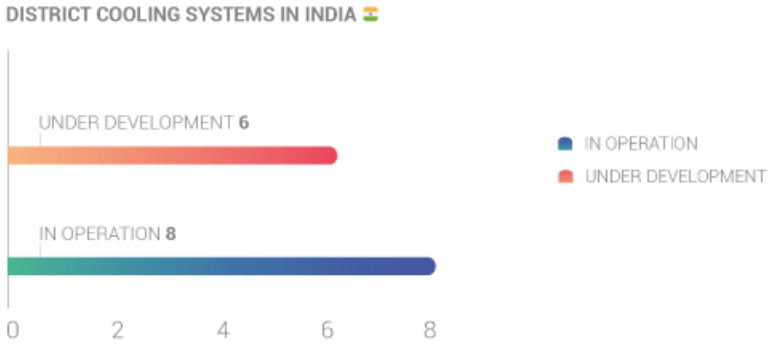
DISTRICT COOLING SYSTEMS IN INDIA

POPULATION (MILLION)	GDP (PPP) (INT$ BILLION)	COOLING DEGREE DAYS (IN CAPITAL CITY)	UTILLIZATION RATE OF AC
1,380	9,560	2,881	8%



infographics

District Cooling activities and opportunities

AC utilization: 8%
GDP (PPP)/capita (Int$): 6 997

India

In India there is a great potential for both Public and Private sector District Cooling developments. There are several government initiatives promoting energy efficient cooling. India is the largest District Cooling market in terms of installed capacity, yet an immature market.

AC utilization: 9%
GDP (PPP)/capita (Int$): 12 335

Indonesia

Indonesia has no District Cooling systems in operation at present. Private District Cooling developments has the highest potential, but in a 5-year period it is likely for District Cooling awareness to be raised in the Public sector.

AC utilization: 79%
GDP (PPP)/capita (Int$): 29 620

Malaysia

Malaysia is the country with most District Cooling systems. Far majority of them are Private District Cooling. However, both Iskandar and Penang are planning for new District Cooling systems, looking for capacity building and financing support.

AC utilization: 4%
GDP (PPP)/capita (Int$): 5 370

Myanmar

Myanmar is the country with lowest District Cooling potential. However, ADB has financed Myanmar's only District Cooling project in Yangon "47913-001: MYA: Yangon Urban Renewal and District Cooling project".

AC utilization: 8%
GDP (PPP)/capita (Int$): 9 302

Philippines

Private District Cooling developments has the highest potential in the Philippines. In general, the District Cooling potential is relatively low at present. However, the Philippines has one District Cooling projects in the Northgate Cyberzone in Muntinlupa City.

AC utilization: 90%
GDP (PPP)/capita (Int$): 101 649

Singapore

Singapore is the most mature District Cooling market, and the only one with a District Cooling regulation. There are both Public and Private District Cooling developments in Singapore, and several projects are under development.

AC utilization: 30%
GDP (PPP)/capita (Int$): 19 227

Thailand

Thailand has several Private District Cooling projects in operation and under development. The Eastern Economic Corridor development provides DC opportunities at new TOD-areas, Airport and new mixed-used developments.

AC utilization: 17%
GDP (PPP)/capita (Int$): 8 397

Vietnam

Vietnam has no District Cooling systems in operation. However, recently three cities are piloted to conduct Urban Cooling Action Plans where District Cooling is recognized as an energy efficient cooling technology.

- Singapore's District Cooling Act in combination with mature urban planning practices favor district cooling developments.
- In India and Vietnam, district cooling developments benefit from Cooling Action Plans.
- Malaysia has a mature private district cooling sector, and the Thai private district cooling sector is emerging.

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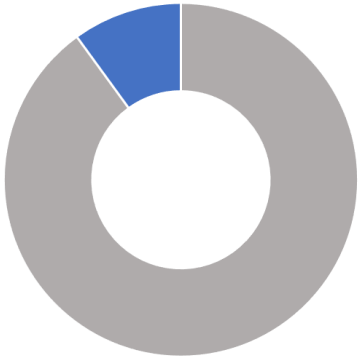
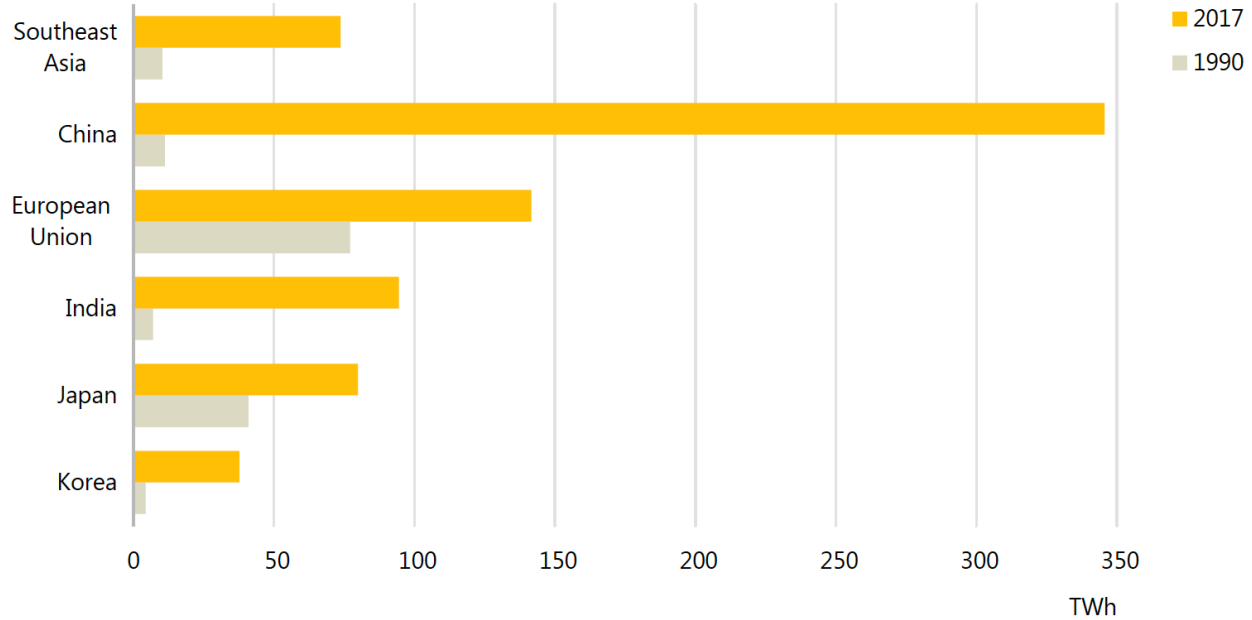
The rising cooling demand



Cooling produces approx. **10%** of the worlds greenhouse gas emissions.

Electricity consumption of air conditioning systems in residential and commercial buildings by country and region.



Source: IEA 2017

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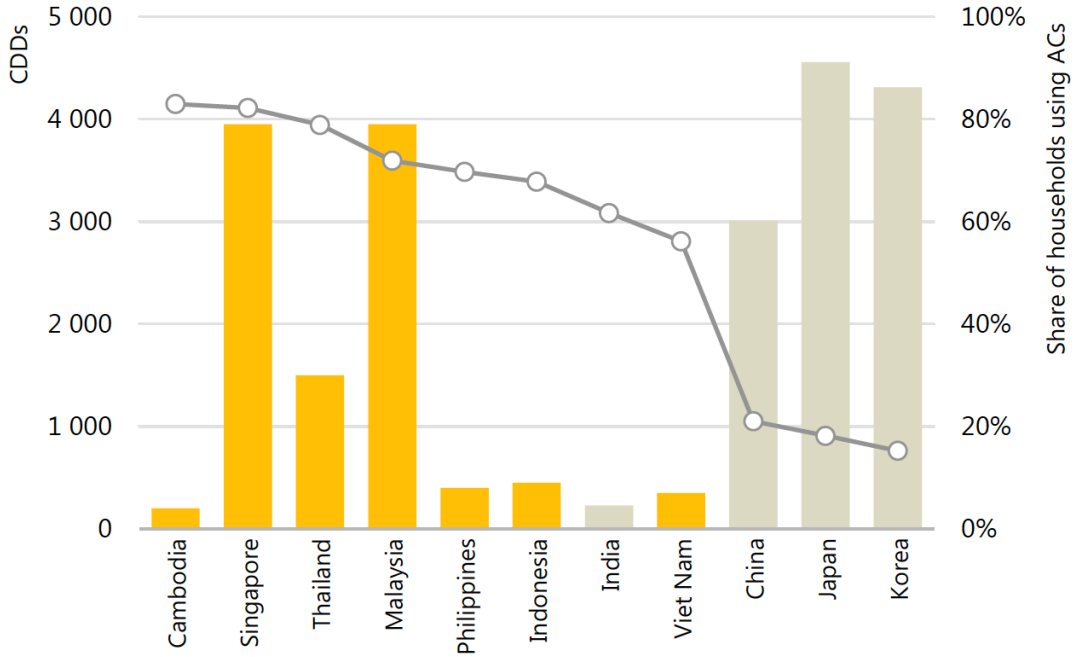
The rising cooling demand

- CDD's in Thailand is around 4,000.
- AC utilization rate in Thailand is around 30%.
- Cooling demand in ASEAN will grow as and follow economic and population development.

Cooling Degree Days and share of households using air conditioning systems by country, 2017



Source: IEA 2017

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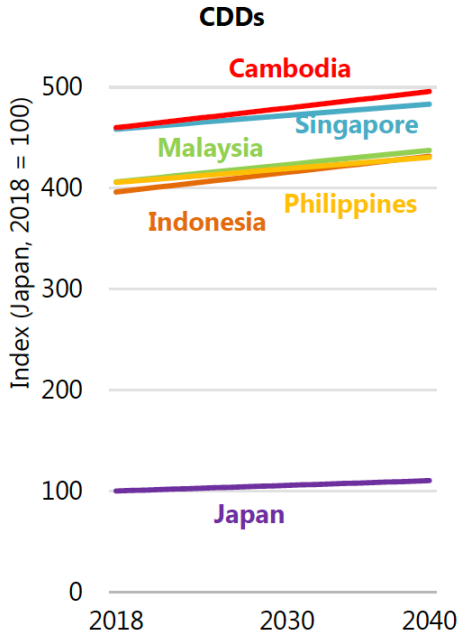
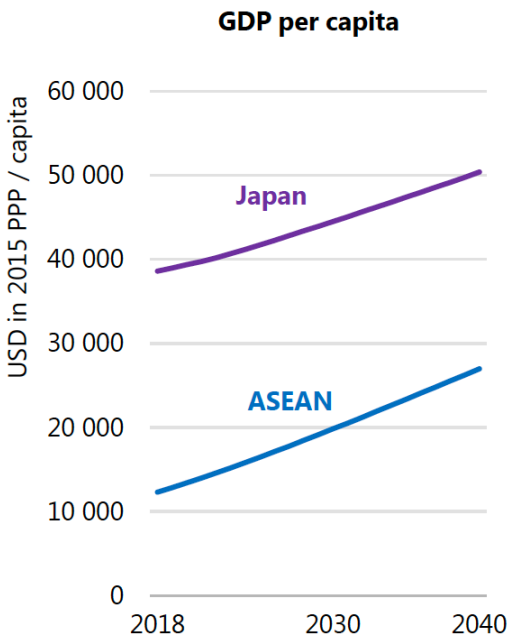
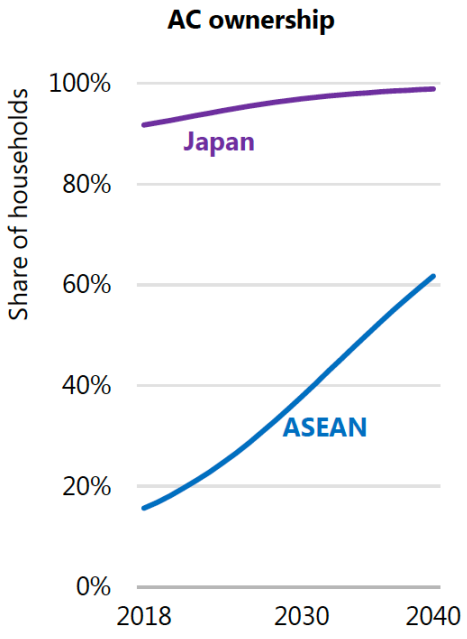
The rising cooling demand

Ongoing trends to follow!



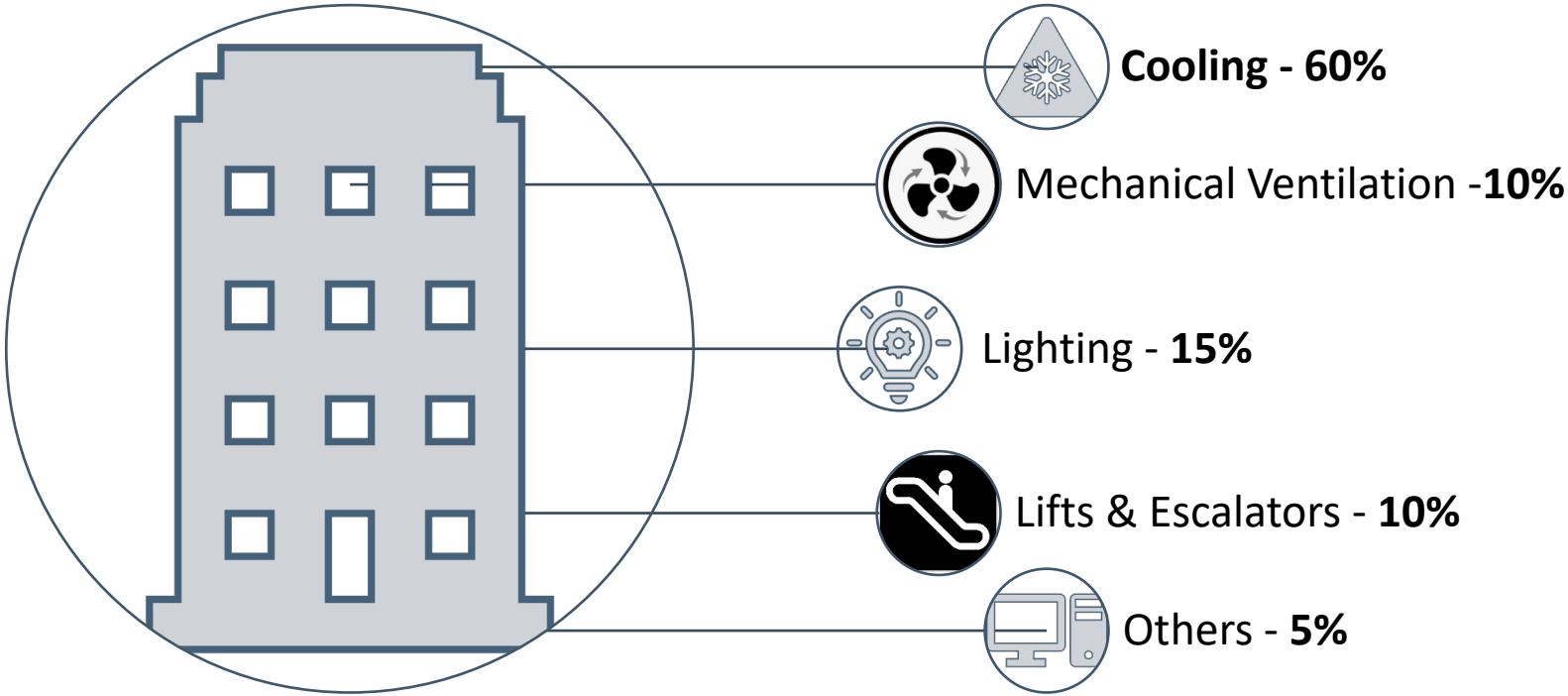




Source: IEA 2017

Energy Consumption in Buildings

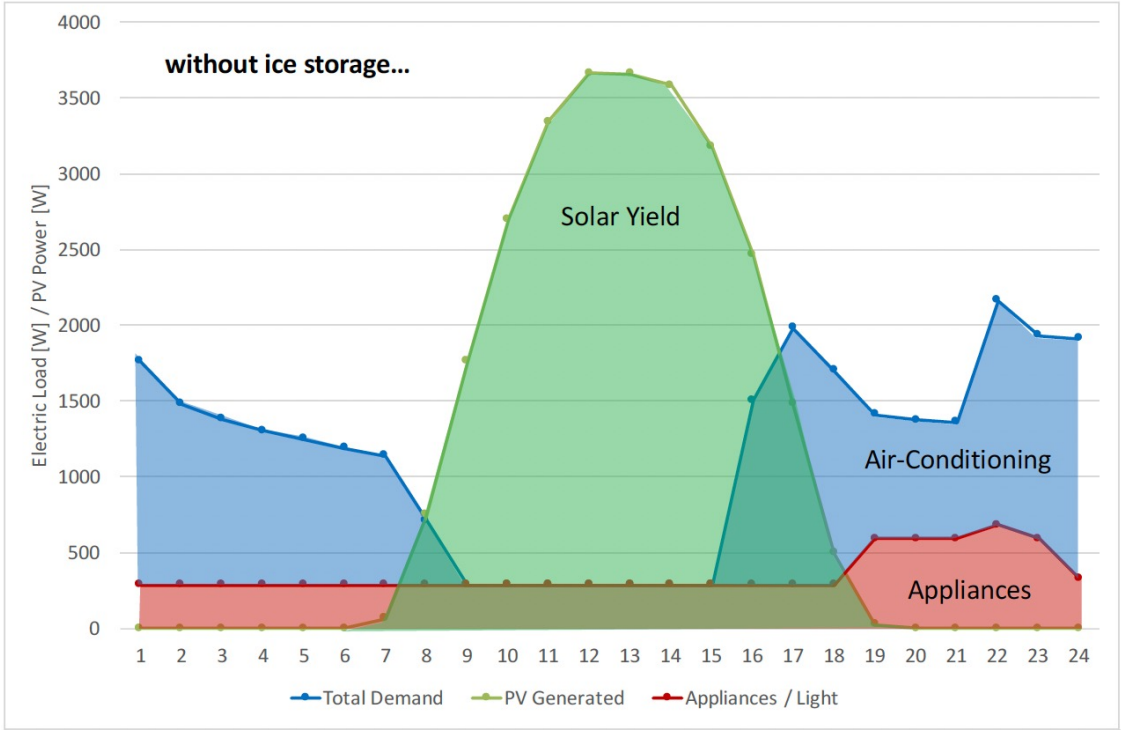
- Typical breakdown of non-residential building electricity consumption:



Source: KEPPEL

Energy Consumption in Buildings

- Typical breakdown of residential building (house) electricity consumption:



Source: EGS-plan (Bangkok) Co., Ltd.

Energy Consumption in Buildings

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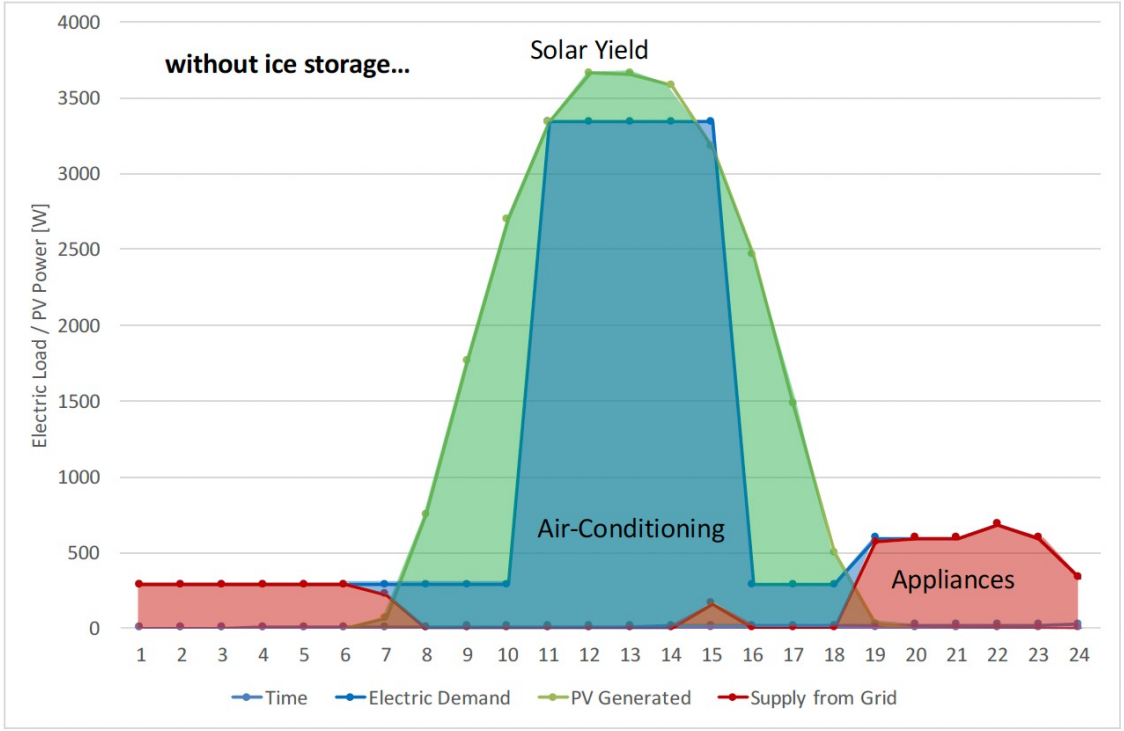

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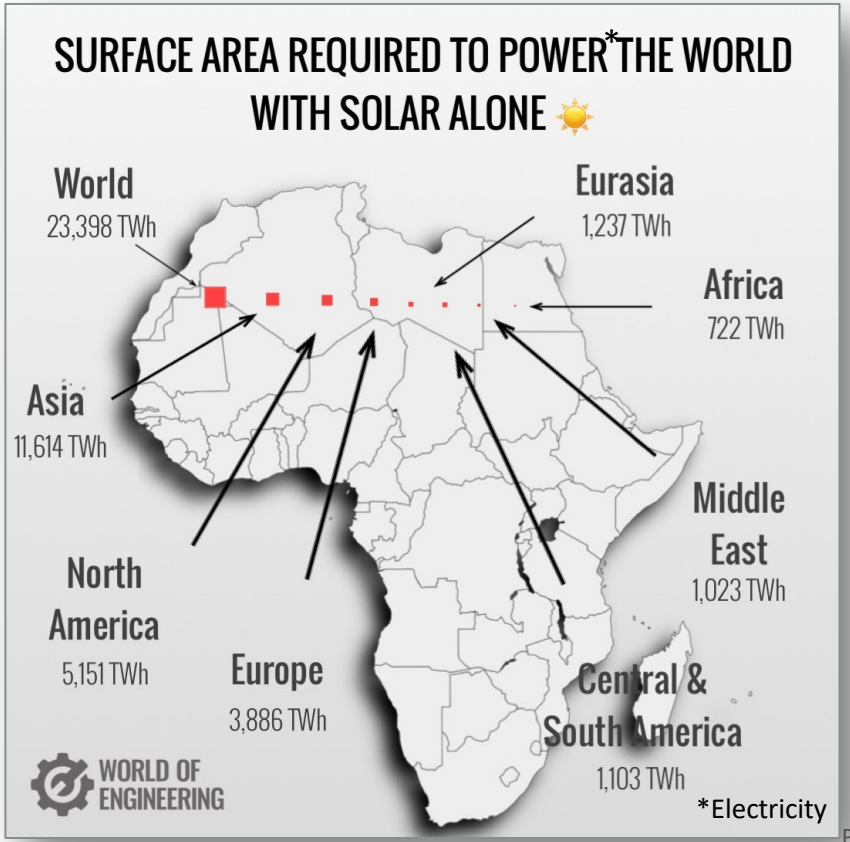
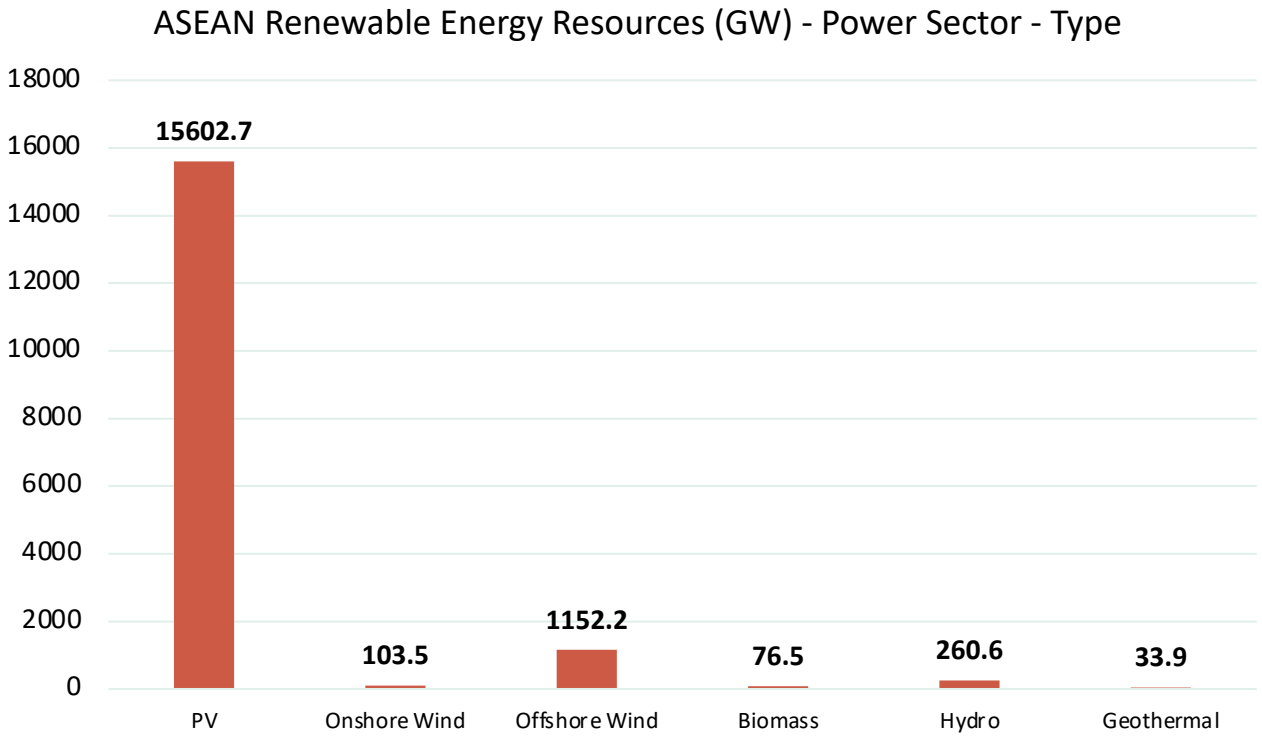
The Potential of Renewable Energy

"Wind farms have the potential to produce up to 40 times the electricity the world consumes"



ASEAN Renewable Energy Potential



Source: IRENA 2022

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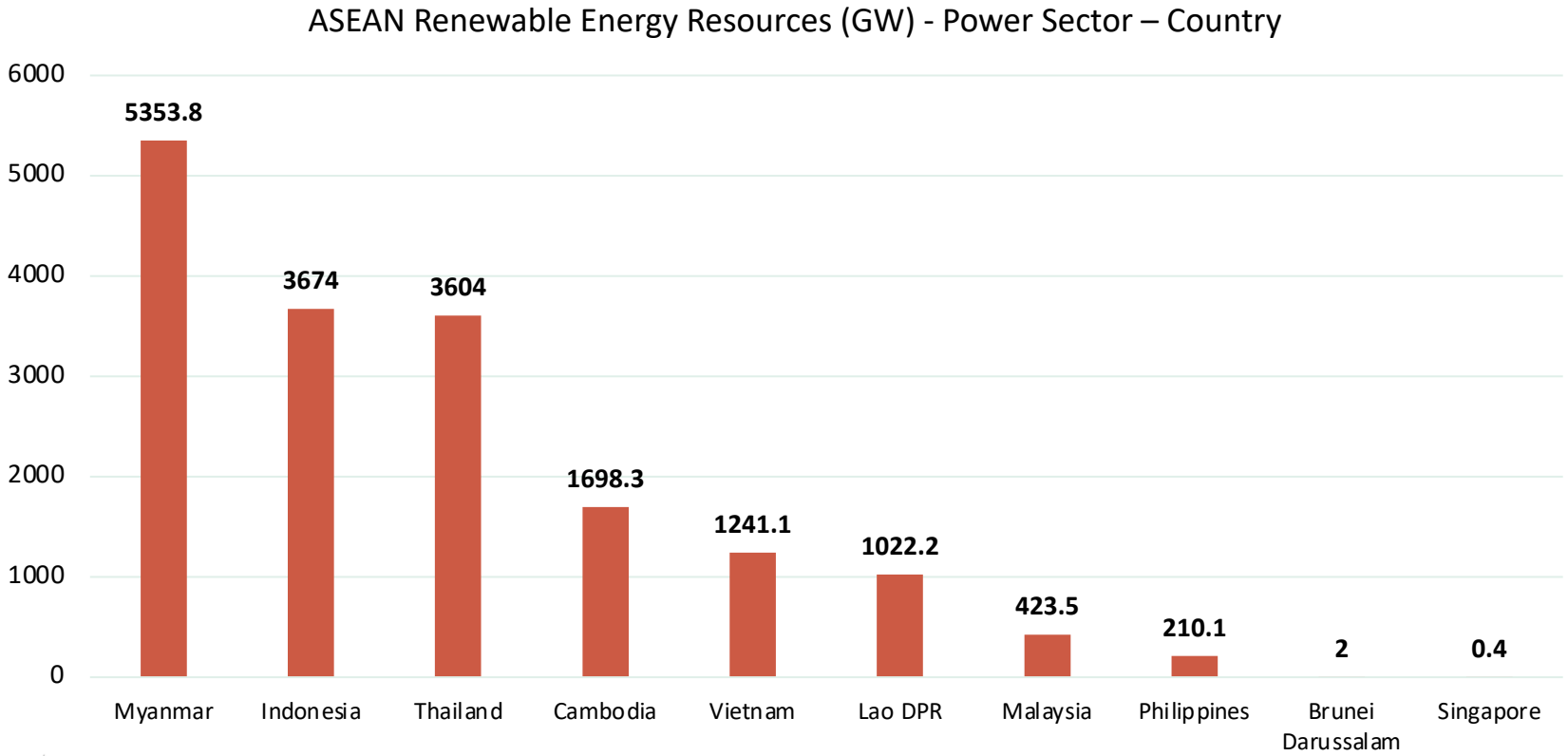

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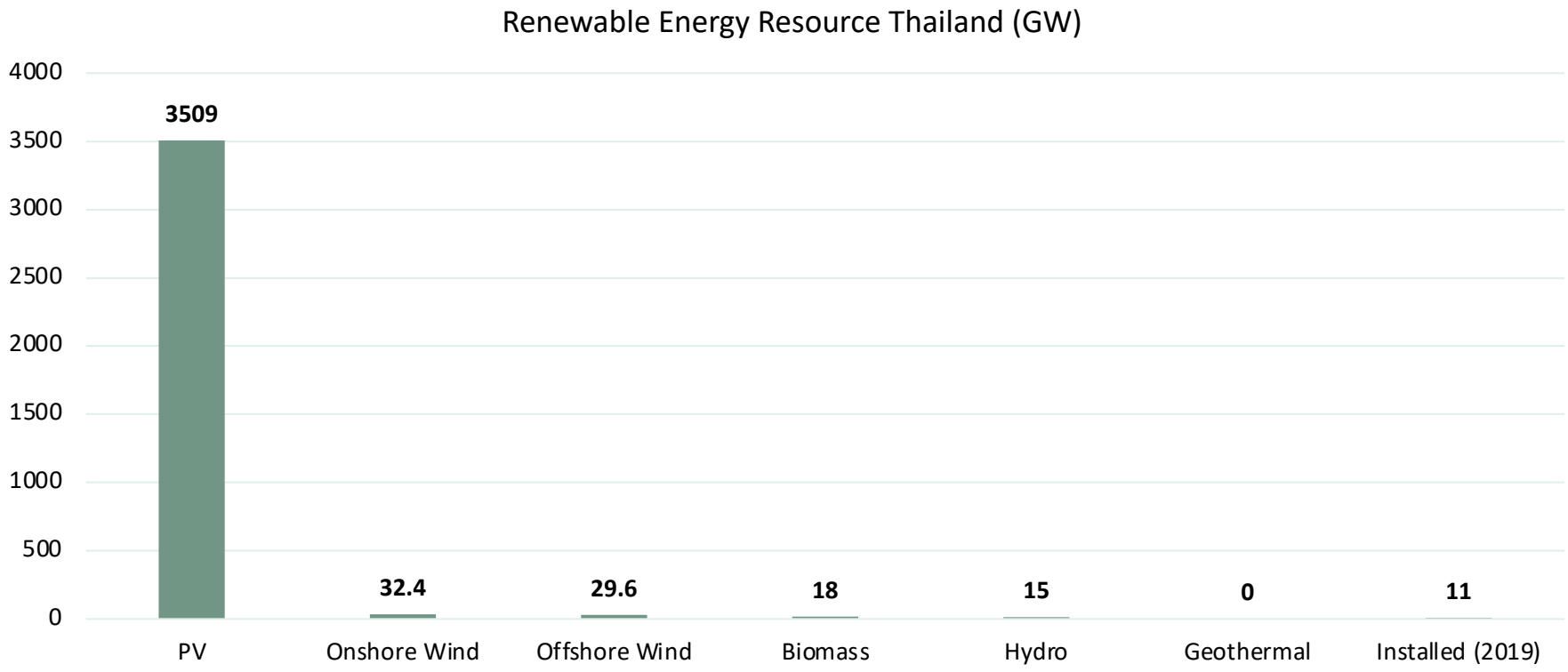

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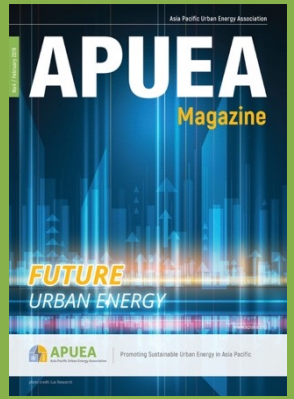

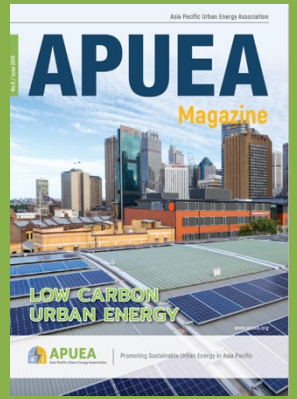

THANK YOU

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