



Keppel Infrastructure

Cooling as a Service

19 January 2022

Overview of Keppel Group

One integrated business providing sustainable urbanisation solutions

Strengths & Differentiators



Focus Areas



Keppel Capital • Eco-system of private funds and listed REITs & Trust

Keppel Infrastructure

Established May 2013 from the integration of Keppel Energy and Keppel Integrated Engineering
Invest in, develop, own and operate competitive energy and environmental infrastructure solutions and services

Power and Renewables



- Experienced international developer, owner and operator of power plants
- Vertical integrated gas-to-power business in Singapore
 - Gas Retail
 - Electricity Retail
- Pipenet: Owner and operator of pipe rack network and utilities on Jurong Island

Environment



- Global player in environmental technology and solutions
 - Waste Treatment
 - Water and Wastewater Treatment
- 100% owned Keppel Seghers provides in-house technology, design and engineering expertise
- Track record of over 100 projects in 25 countries

New Energy



- District Heating and Cooling provider in Singapore and in China
- Distributed Energy Services
 - EV Charging
 - Energy Storage System
 - Smart Microgrids
- Green Hydrogen
- Carbon Capture and Storage

Keppel Infrastructure Service Offerings

With the wider adoption of sustainable and higher efficiency energy systems, Keppel Infrastructure offers a one-stop shop fulfilling customer's needs for all energy related services and solutions including electricity retail, solar, RECs, EV charging and cooling.



Cooling Services

Keppel DHCS is the first and largest district cooling system (DCS) developer and service provider in Singapore with a combined plant capacity exceeding 65,000RT



Our Value

Keppel DHCS has a comprehensive portfolio of districting heating and cooling assets, delivering outstanding services to all our customers

Proven Track Records

- More than 20 years of track records in delivering high quality cooling solutions
- More than 65,000RT of plant cooling capacity globally



Strong Execution Capabilities

- Best-in-class project execution and operational know how
- Design, development and integration of next generation IOT devices and cooling service



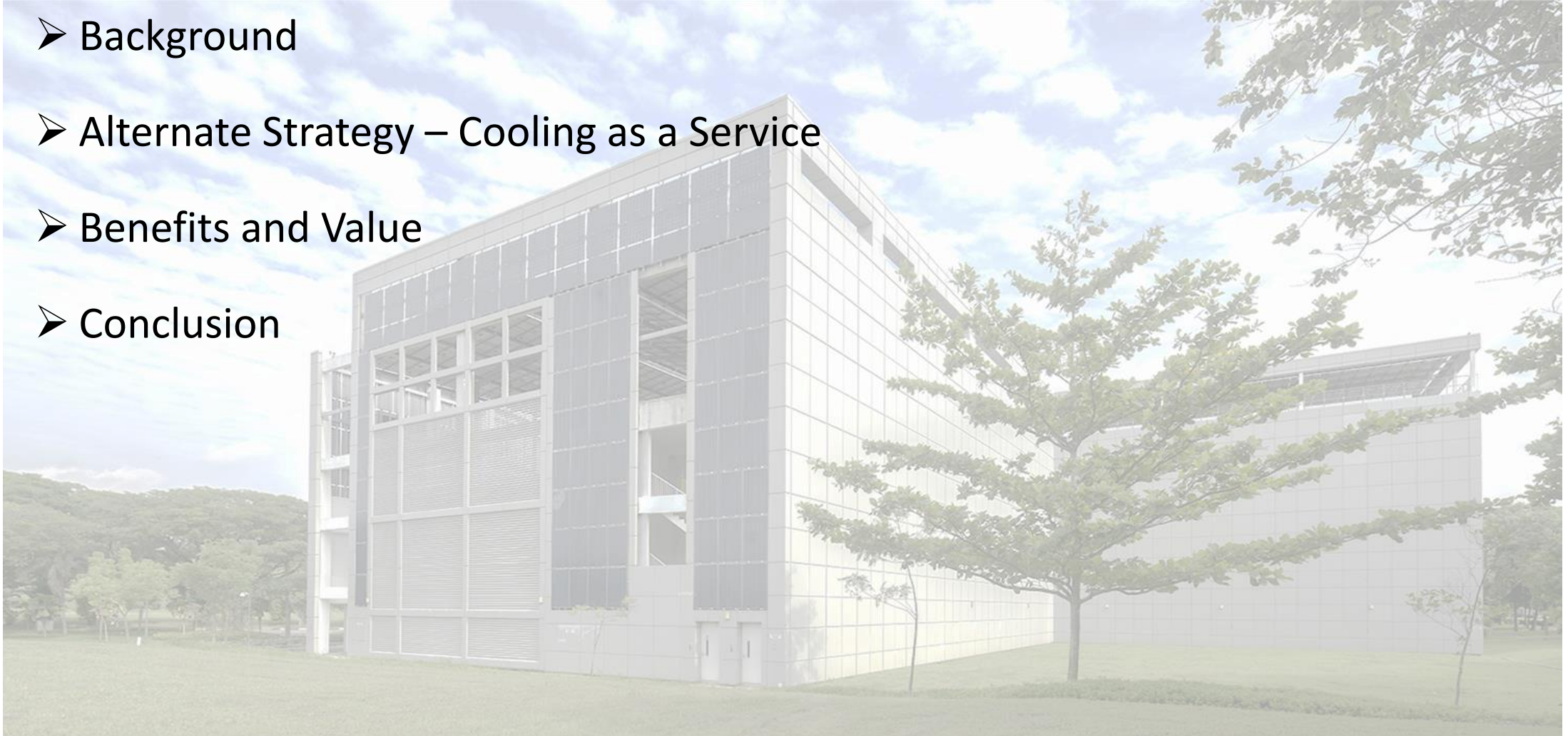
World Class Services

- Robust maintenance managed by our team of dedicated trained professionals
- Round the clock, one stop service technical support to our clients



Topic

- Background
- Alternate Strategy – Cooling as a Service
- Benefits and Value
- Conclusion



United Nations Climate Change Conference - COP26

CLIMATE CRISIS

What are the goals at COP26?

The **UK is hosting the 26th Conference of the Parties**, with four goals to be discussed during the annual climate change summit in Glasgow.



Net zero and 1.5 degrees

Countries are called on to reach **net-zero carbon emissions by 2050** and to keep global temperatures **below 1.5C**



Protect ecosystems and habitats

States are encouraged to **protect and restore ecosystems** and build resilient infrastructures to withstand climate change



Mobilise finance

Developed nations are asked to mobilise **\$100bn in climate finance** per year for poorer nations to tackle climate change



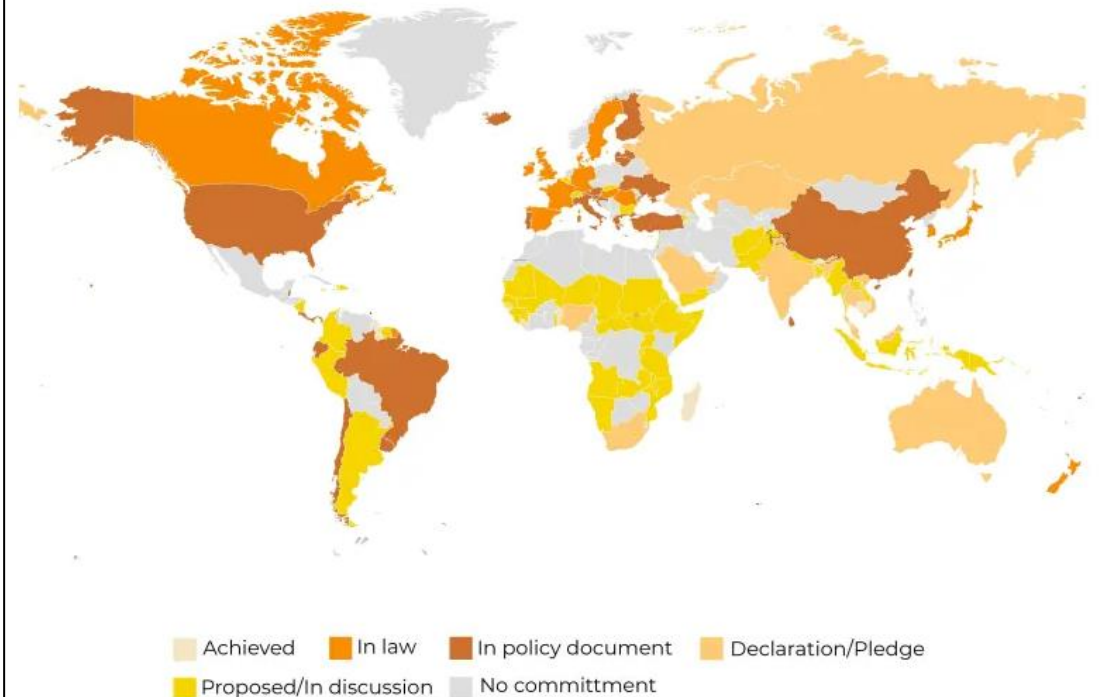
Collaboration

Parties at COP26 will need to **collaborate** to finalise the **Paris Rulebook**, which sets out the rules of the Paris Agreement

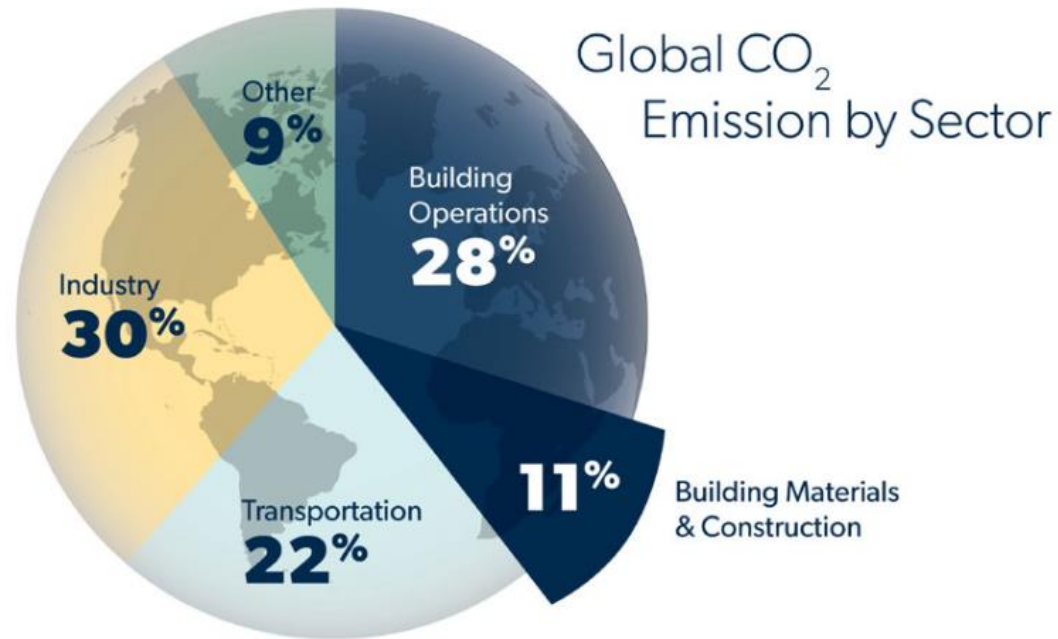
CLIMATE CRISIS

Who has committed to net zero?

138 countries have committed to net zero, carbon neutrality or being climate neutral. India is one of the latest country to make a net zero pledge at the COP26 summit.



How do buildings contribute?

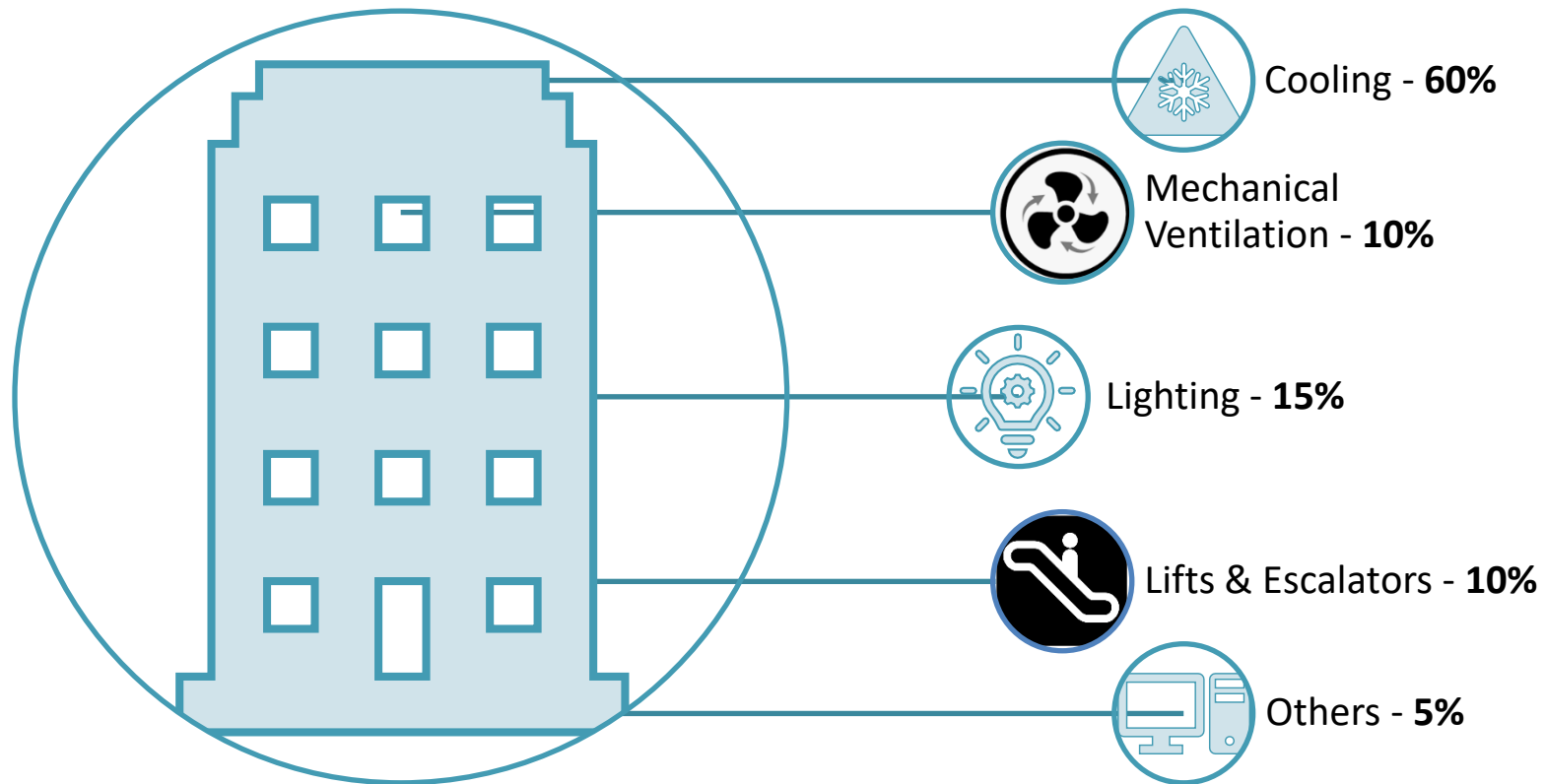


By Chris Magwood

- Buildings contribute 38% of annual global emissions
 - Building Operations – 28%
 - Building Materials & Construction – 11%

Building Energy Usage

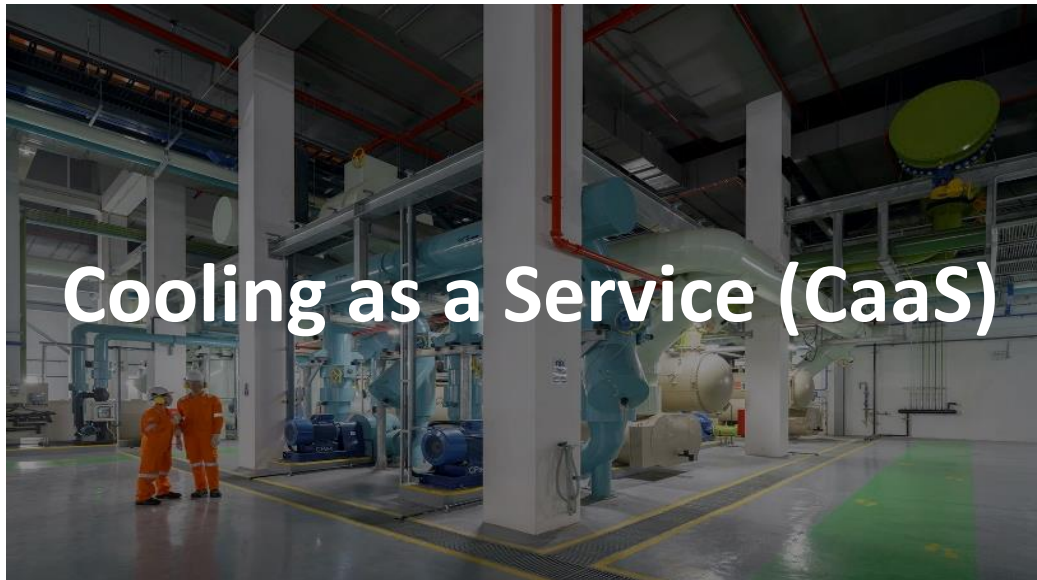
- Typical breakdown of non-residential building electricity consumption:



Challenges

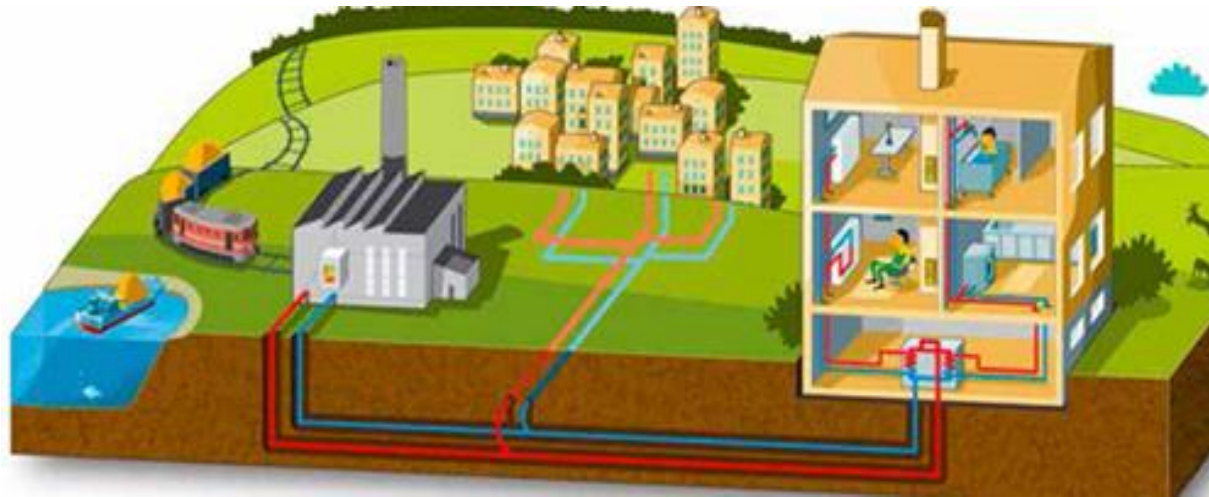
- ☐ How or where to start the retrofitting process
- ☐ Does the building have sufficient space to hold energy-efficient equipment?
- ☐ Will it affect existing building operations and tenants?
- ☐ High upfront investment cost to retrofit or adopt better solutions for cooling
- ☐ Multiple building owner – Management Corporation Strata Title (MCST)

Alternate Strategy – Cooling as a Service (CaaS)

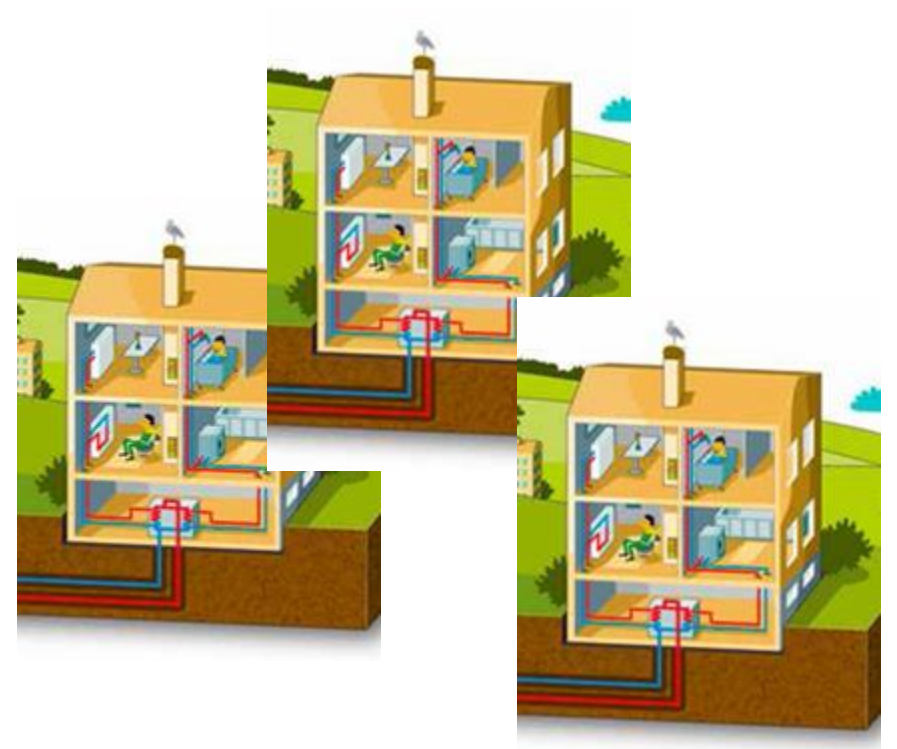


- **Pay-per-service model for cooling systems**, which eliminates upfront investment in cooling technology for customers who instead pay per unit of cooling they consume, strengthening incentives for efficient consumption
- Accelerates deployment of cooling technology at scale in emerging markets, by lowering upfront equipment costs and aligning incentives for the most efficient operations and maintenance.

Type of Cooling as a Service



District Heating and Cooling



Retail Cooling

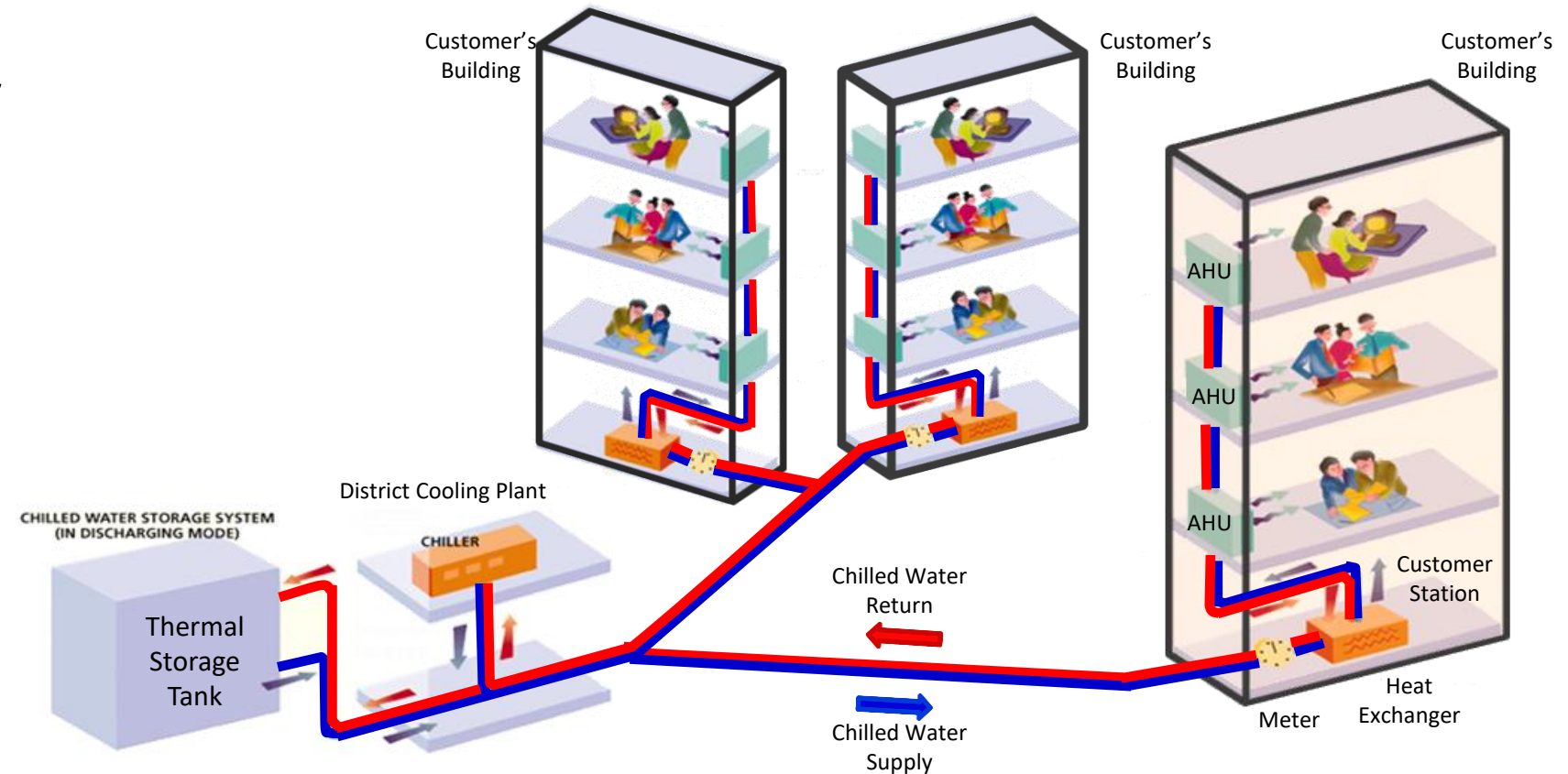
District Cooling System

What is District Cooling?

- Centralised Chiller Plant located in business park/district
- Provides chilled water to multiple buildings

Key Benefits

- Better efficiency
- Energy and cost savings
- Reduce carbon footprint
- Enhanced reliability
- Space savings



Business Park with District Cooling



Ultro



UE BizHub East



Invensys



Eightrium



Honeywell



Rohde & Schwarz



Xilinx



DBS Asia Hub



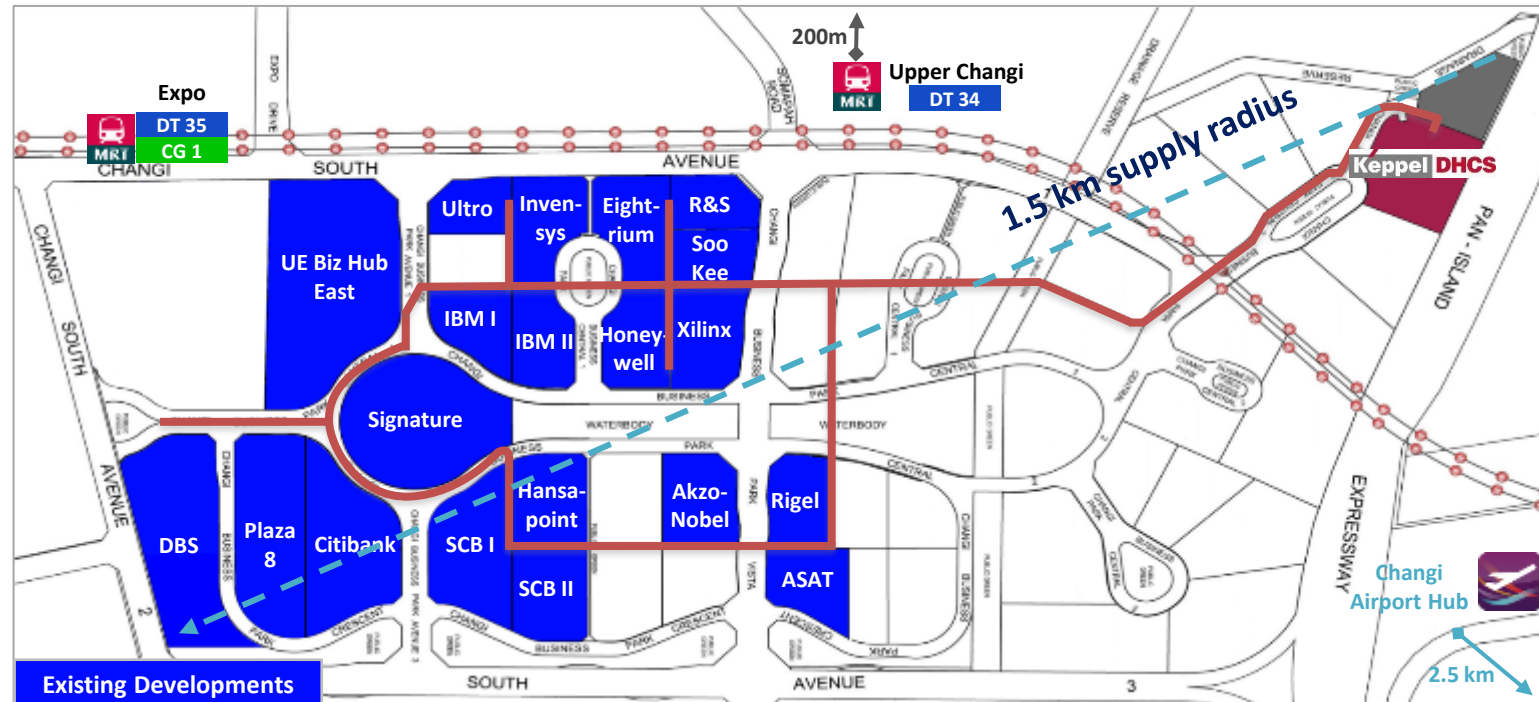
Plaza 8



Citibank



Standard Chartered Bank I & II



IBM I & II



AkzoNobel



Hansapoint



Signature



Soo Kee



Rigel

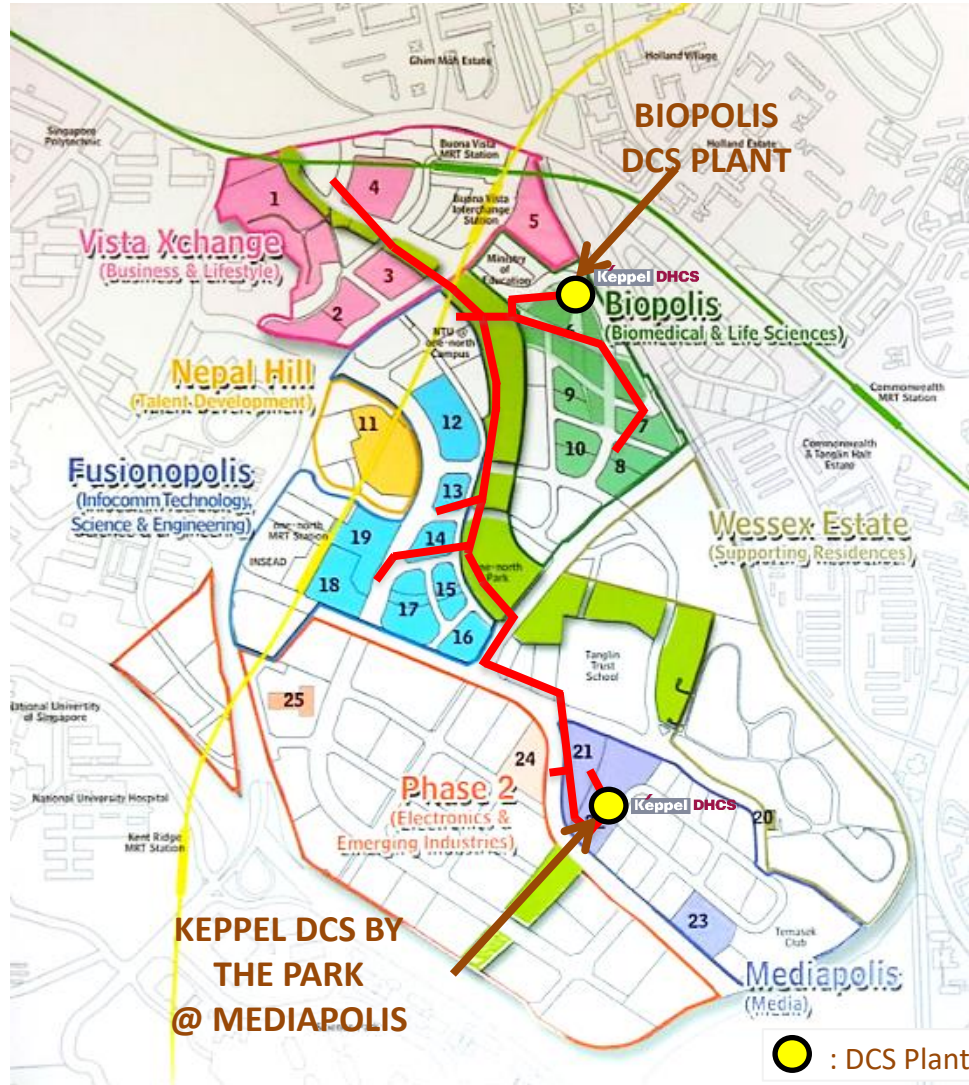


ASAT

Changi Business Park DCS



Scalable to Support Growth



Biopolis



Mediapolis

Retail Cooling

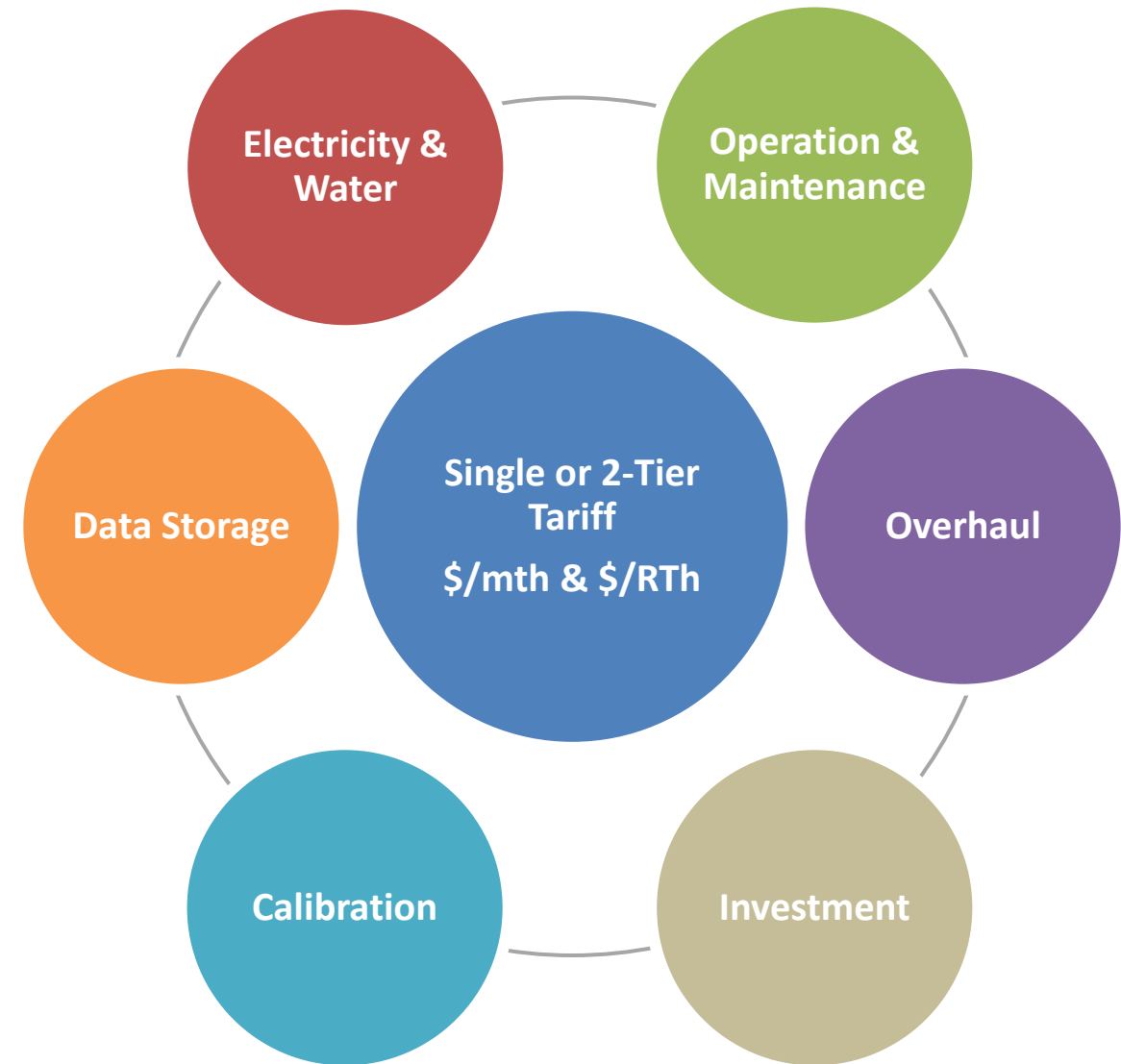


Chilled water as **Utility**
In a single or 2-tier tariff structure

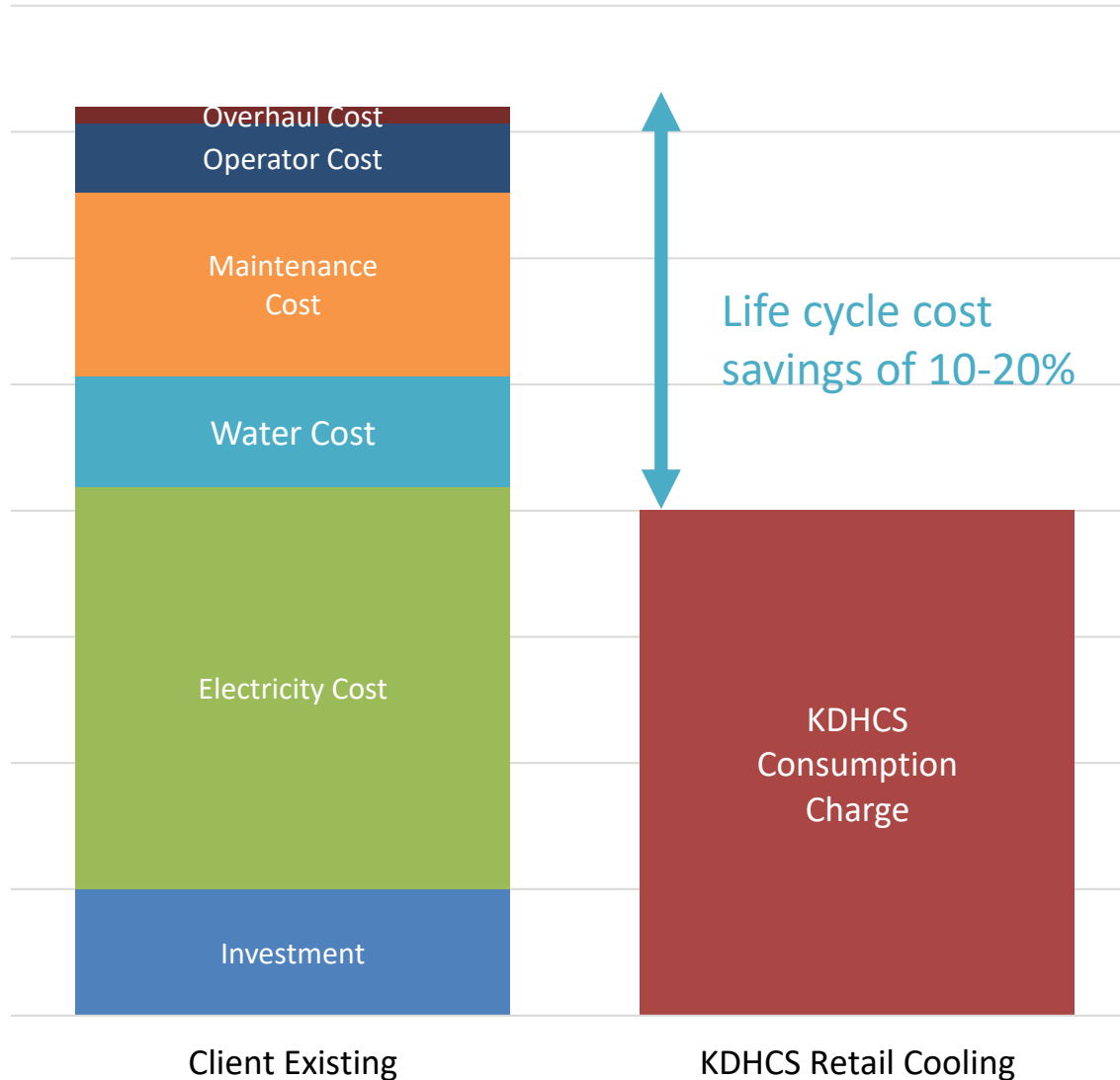


Provides **Chilled Water Plant** with

- Investment
- Design
- Construction / Retrofit
- Ownership
- Operation
- Reliability Improvement
- System Efficiency Improvement



Life Cycle Cost Analysis



Retail Cooling

- ✓ Zero capital
- ✓ Zero maintenance
- ✓ Zero repair
- ✓ Improved reliability
- ✓ GreenRE requirements
- ✓ Long term savings

Values Proposition

Financial

- ✓ Free-up initial investment capital
- ✓ Life cycle cost savings
- ✓ Transfer of Asset back to Customer upon expiry of contract

Operations and Maintenance

- ✓ Free up resources for operation and maintenance
- ✓ Simplified vendor management with single point of contact
- ✓ Avoidance of unexpected repair cost



System Performance

- ✓ Avoidance of up-keeping cost to maintain efficiency
- ✓ Retrofit of existing system to improve efficiency, reliability and O&M management

Risk Management

- ✓ Enhanced reliability through 24/7 remote control and optimization
- ✓ Transfer of risk to a quality and reliable service provider

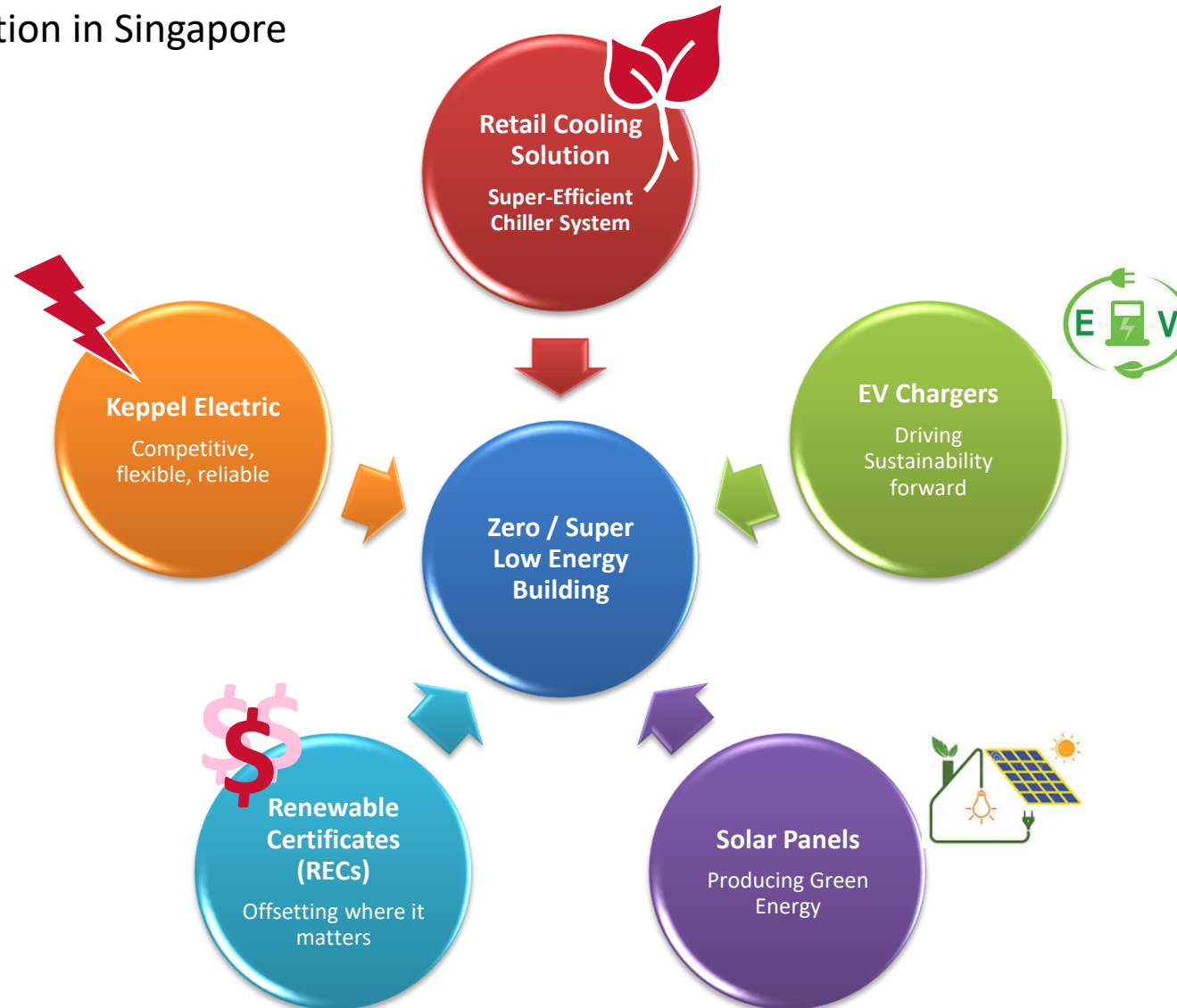


Recap

- ✓ COP26 and global commitment towards net zero
- ✓ Buildings are essential to reduce carbon emissions
- ✓ Cooling as a service as an alternate strategy for building owners
- ✓ District Cooling and Retail Cooling
- ✓ Value created: long term savings, free up resources, improve reliability, etc

Keppel Infrastructure's Energy-as-a-Service (Eaas)

Roll out of the First Sustainable Energy-as-a-Service concept which provides one-stop energy solution in Singapore



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