NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

Energy Research Institute @ NTU

ERI@N

Living Labs: Empowering Research Translation

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ECO Campus initiative

1 Green Building Systems

Innovative tropical cooling

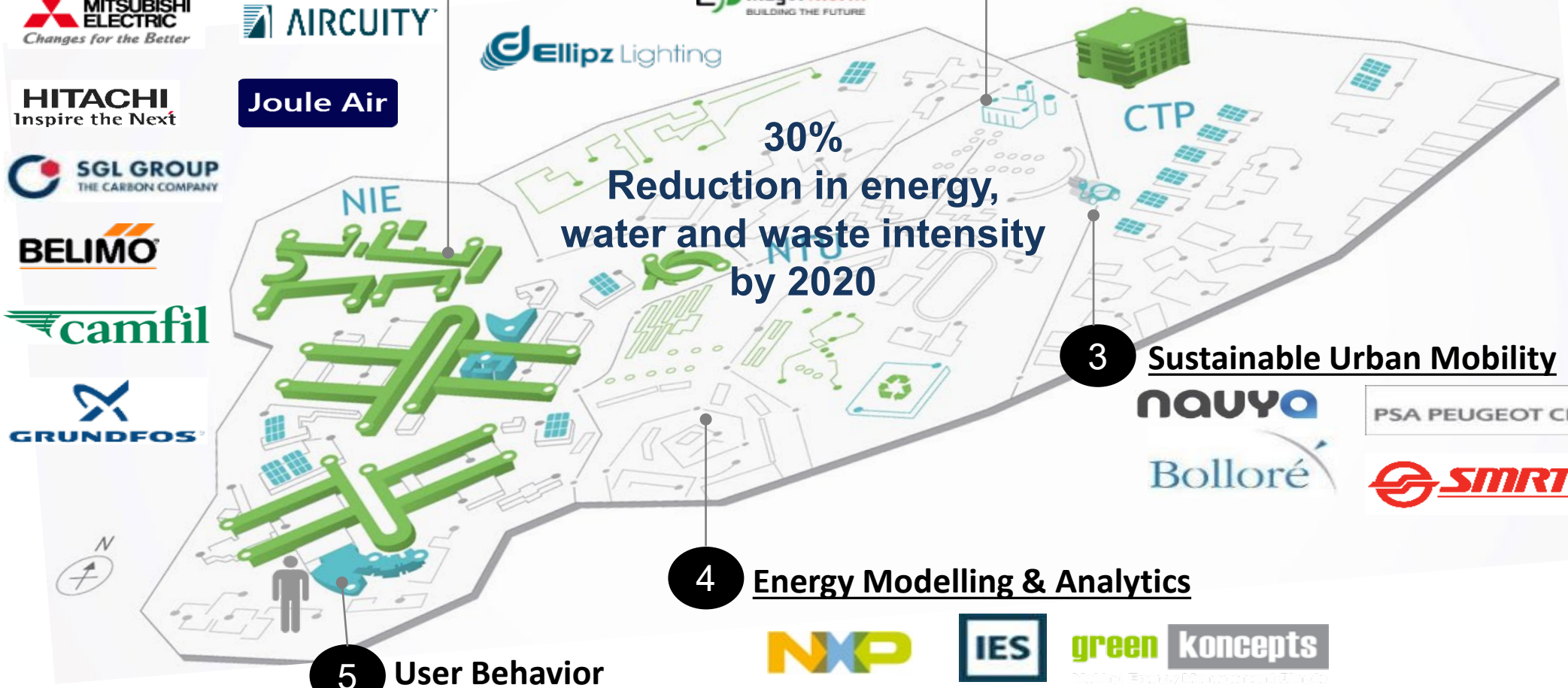
SIEMENS
ALFATECH
MITSUBISHI ELECTRIC Changes for the Better
AIRCUITY
HITACHI Inspire the Next
Joule Air
SGL GROUP THE CARBON COMPANY
BELIMO
camfil
GRUNDFOS

Envelope, Facades & Lighting

3M
PHILIPS
Nitto
MagorTherm BUILDING THE FUTURE
Ellipz Lighting

2 RE Integration & Smart Grids

muRata INNOVATOR IN ELECTRONICS
GE ALSTOM
DNV·GL
GILDEMEISTER energy solutions
GREENSYNC
BeeBryte



30%
Reduction in energy, water and waste intensity by 2020

3 Sustainable Urban Mobility

nauya
PSA PEUGEOT CITROËN
Bolloré
SMRT

4 Energy Modelling & Analytics

NXP
IES
green koncepts

5 User Behavior

ENGIE
azbil
SIEMENS
VEOLIA

EcoLabs: Translator + Accelerator

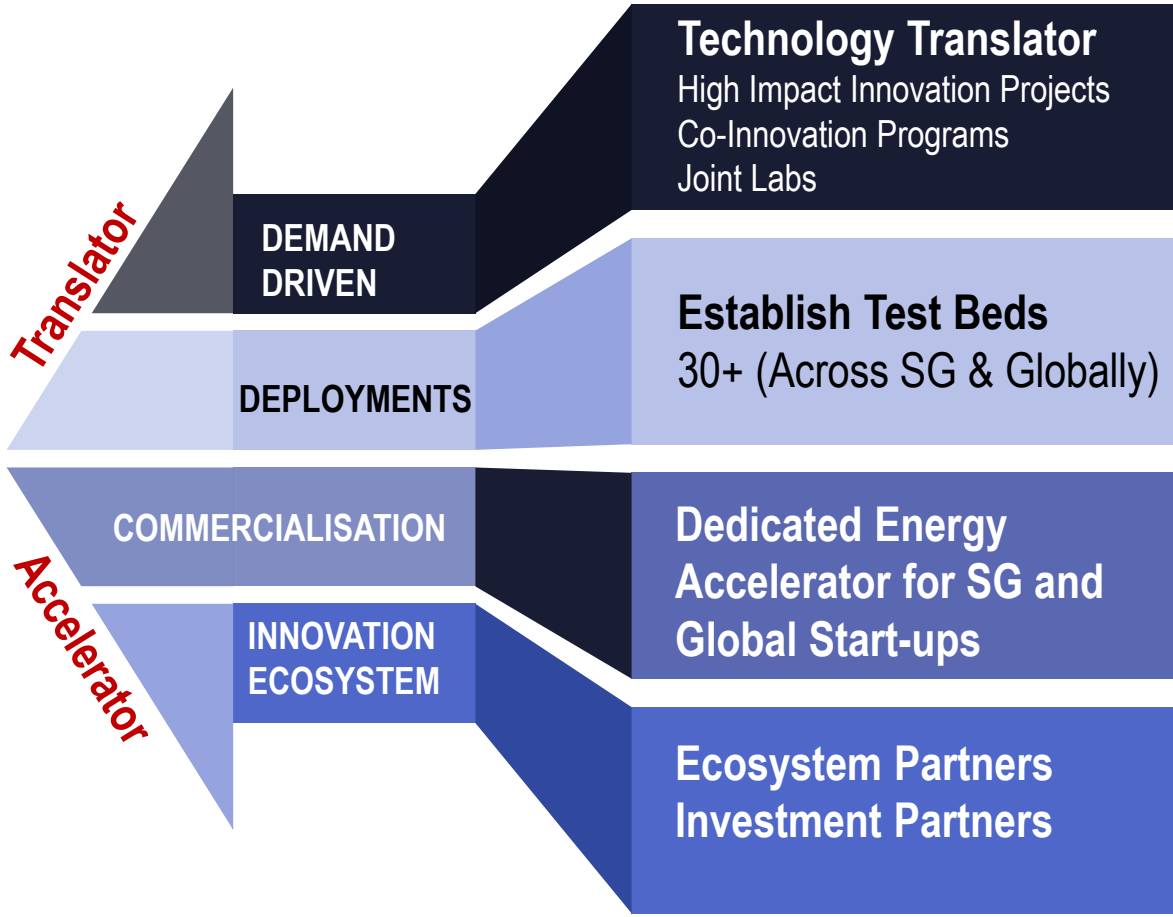
AIM

- Accelerate adoption of future energy solutions through corporate partners, SME's, & Start-ups'
- Attract **Valuable Creative Class** & become the preferred **Clean Tech Innovator's Destination**

Key Goals

- Host 12-15 Start-ups/yr, Engage 50+ SMEs/yr
- Establish 30+ Test-bed sites across SG
- Building dep-tech capability for Energy Transition & Sustainability

E-Mobility EV/AVs	Energy Storage	Wireless / Smart Charging	Unmanned Aerial System	Mobility Services	Data Security / Block Chain	Smart City, Big Data IoT, AI
BOTSYNC	FLOW TECH	Xnergy	General Aeronautics	mobility	DATAKREW	Vigti
SCOOTEE	amperics	TFI TRANSFERFI	ALT	Zipster	T-RECs.ai	KYKOO
A-Fahren	anzene	RESYNC	AiQuon	RUSHOWL	PYLON CITY	TEALE



Sponsor

Enterprise Singapore

Core Partner

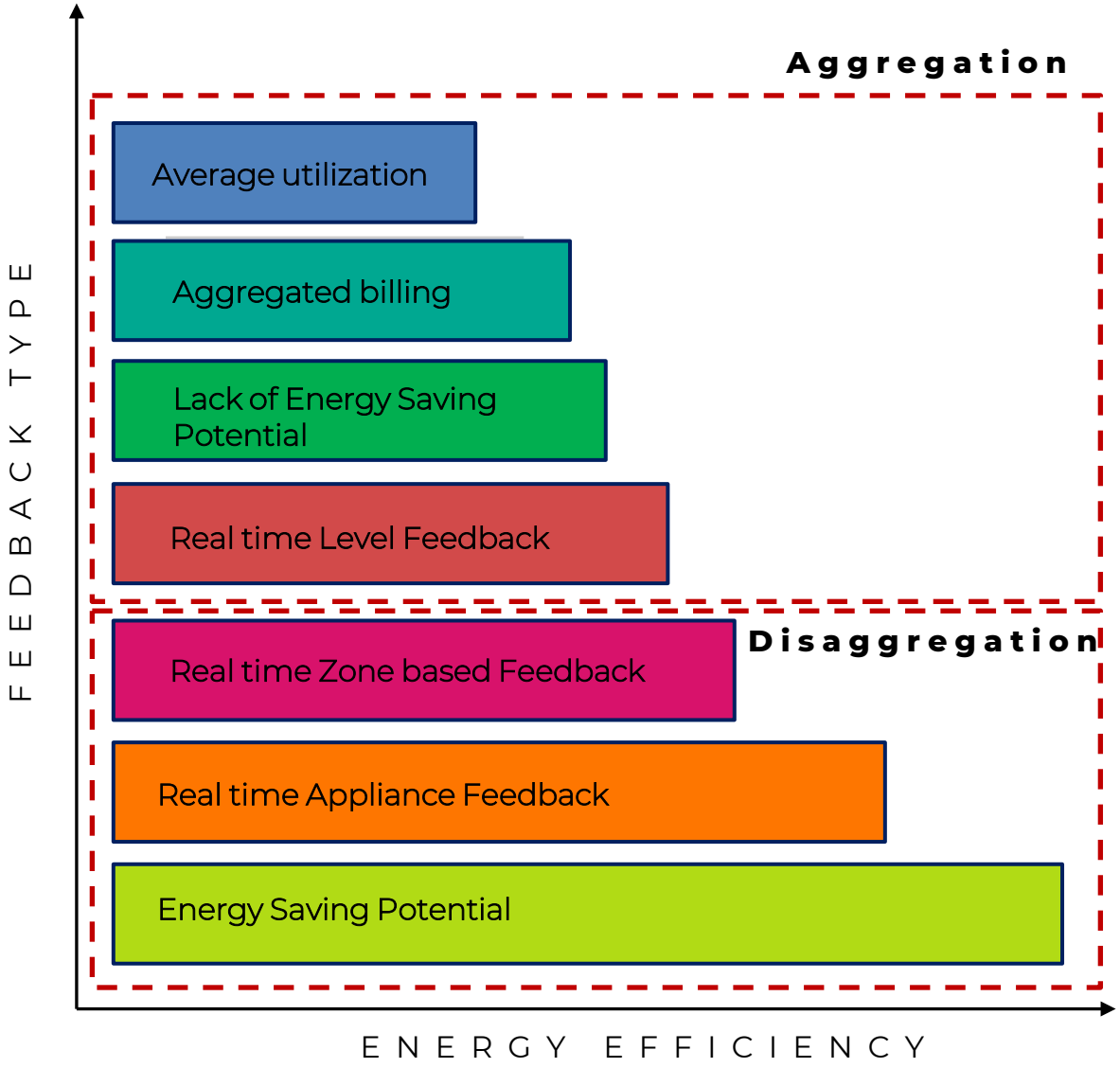
SEAS Sustainable Energy Association of Singapore

Supporting Partners

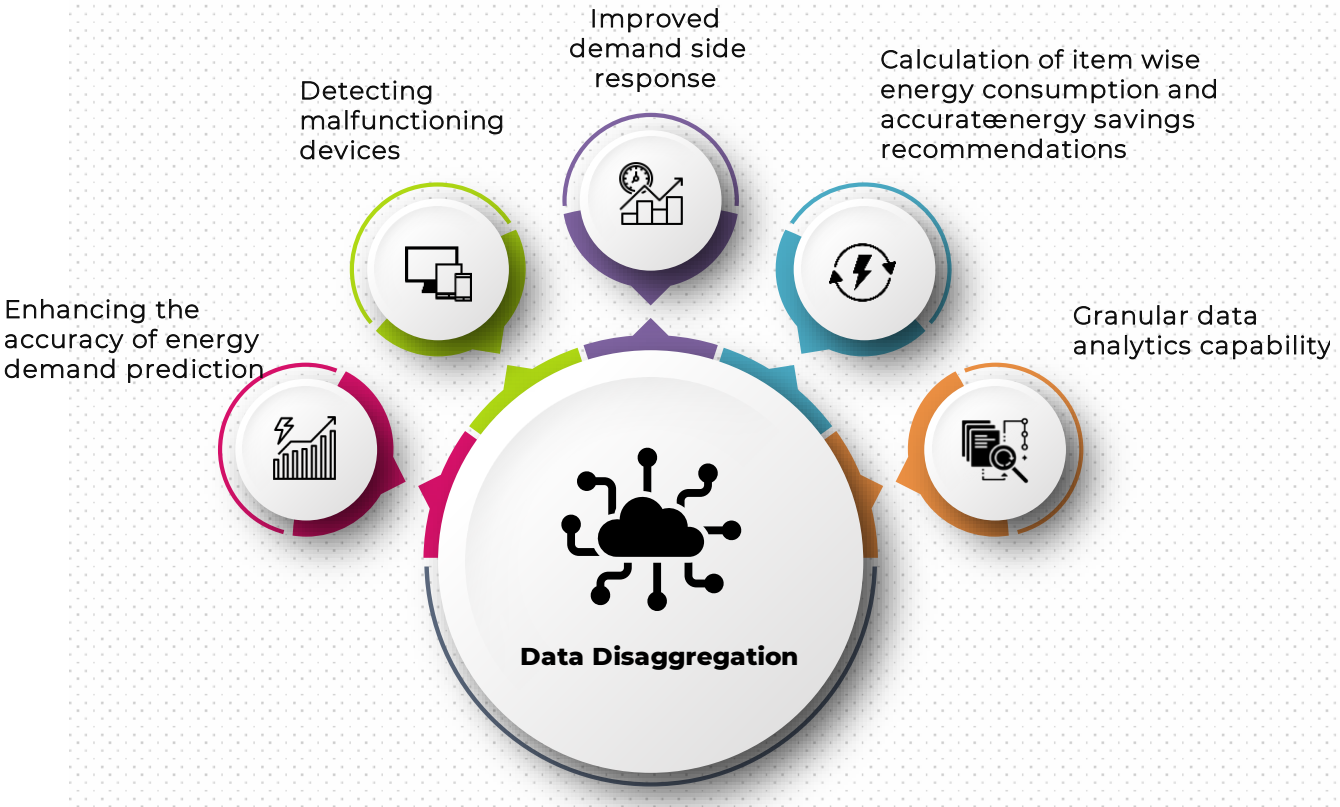
MISTLETOE, jtc, IncuVest, Frost & Sullivan, Supply Chain Angels, LITHAN, SparkLabs Global Ventures, SGInnovate, NTUitive Pte Ltd

ECOLABS DIGITAL TWIN
Living Lab

Aggregation Vs Disaggregation To Energy Efficiency

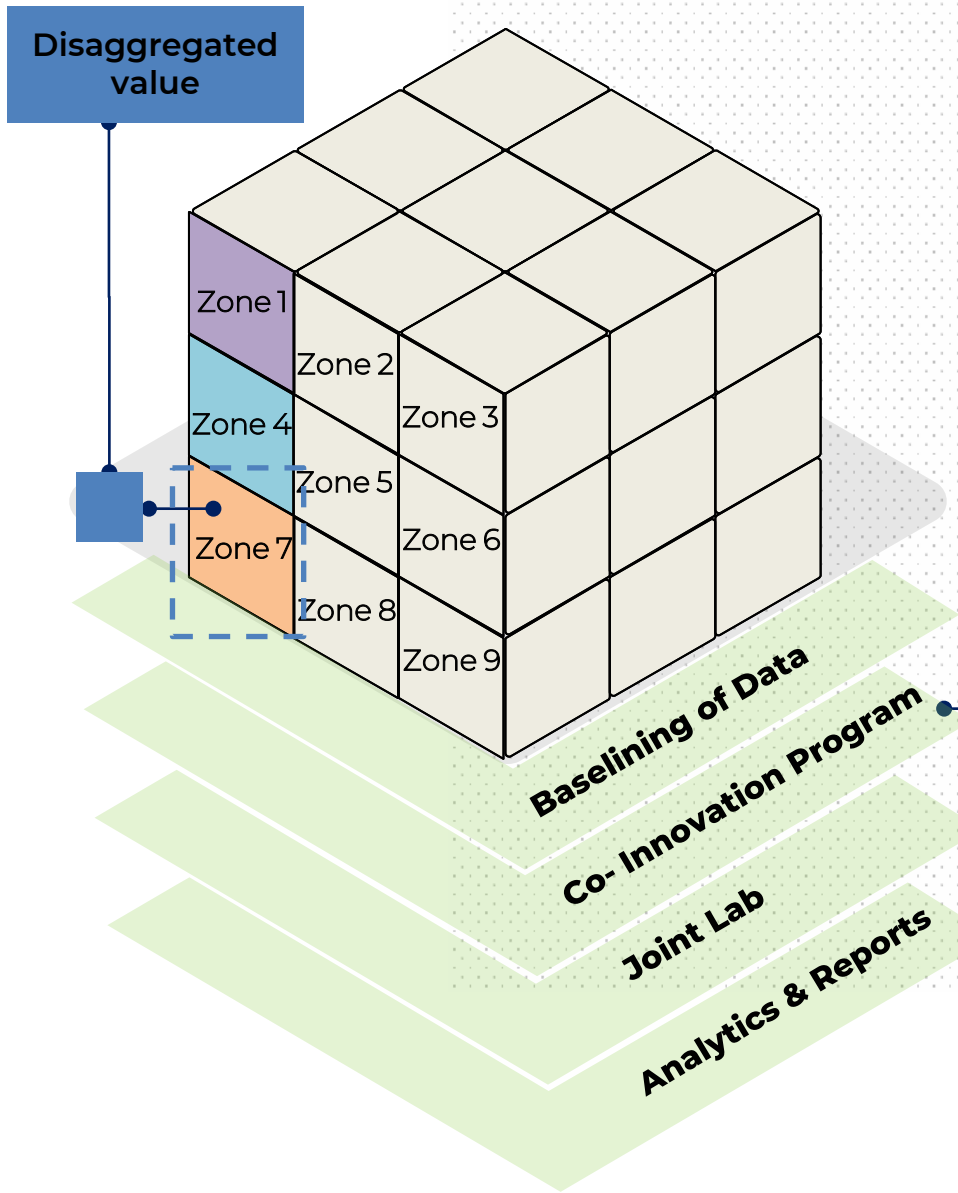


DATA- A Key For Disaggregation

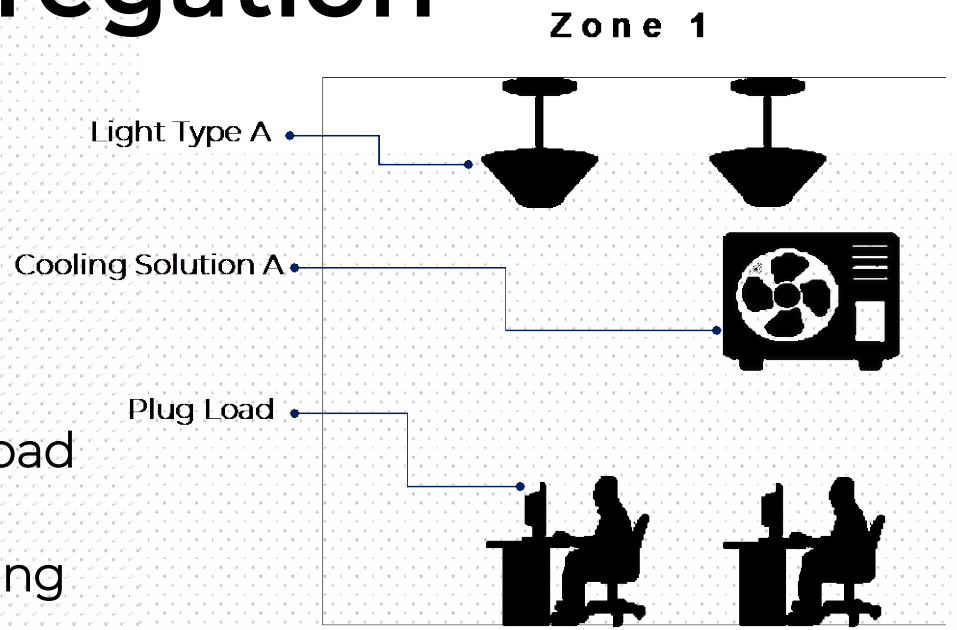


https://web.stanford.edu/group/peec/cgi-bin/docs/events/2011/becc/presentations/3%20Disaggregation%20The%20Holy%20Grail%20-%20Carrie%20Armel.pdf

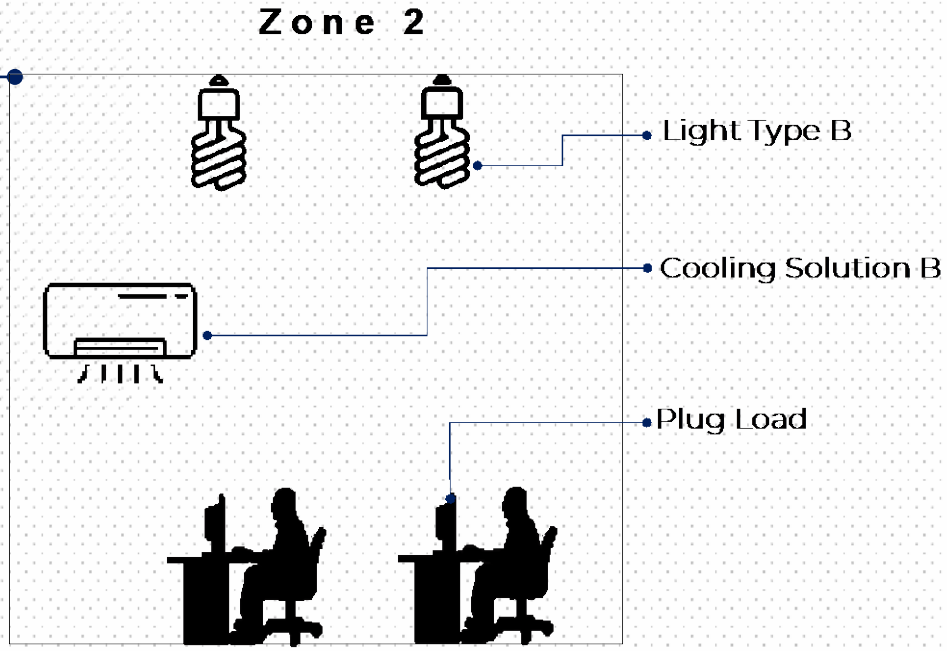
Lowest Order of Disaggregation



- Comparative study of cooling solution A & B
- Zone wise Plug Load monitoring
- Plug Load & Lighting Load comparative analysis
- Realtime Data Monitoring



- Benchmarking
- Baselining
- System integration and solutioning
- Lowest order carbon footprint



Decarbonization projects with local SME/Startups in progress

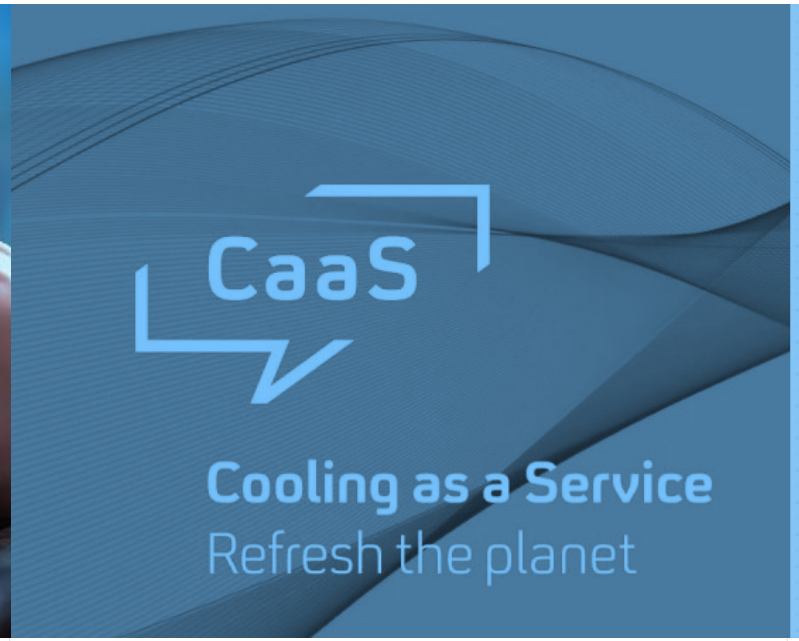
Energy & Plug load Monitoring

Pylon City, Allocate Space and Ampotech have deployed energy metering and load monitoring at the lab, for detailed and intricate monitoring of all connected devices and appliances of the space.

PYLON CITY

ALLOCATE SPACE

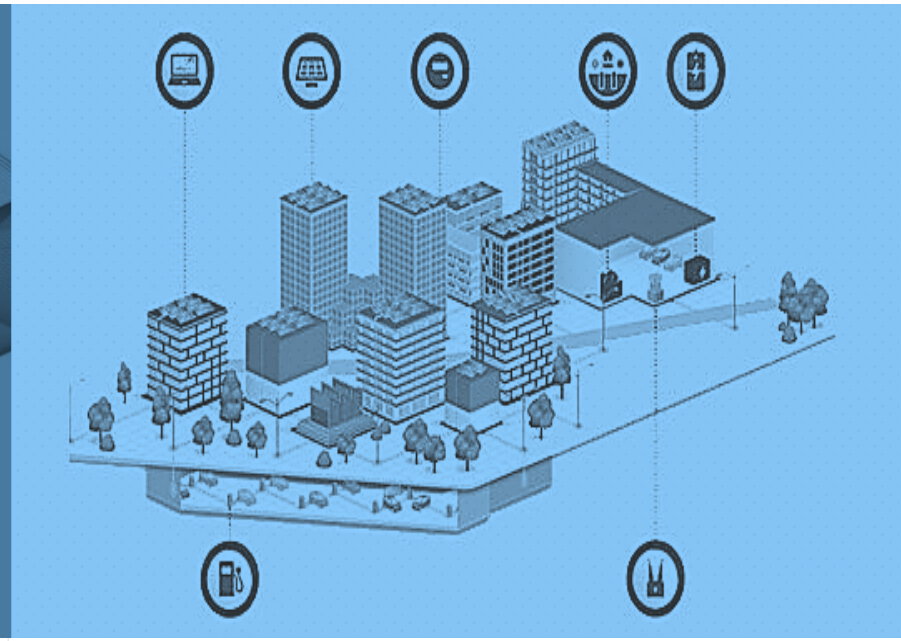
AMPOTECH



Novel Cooling Solution- Cooling as a service

G Energy collaborated with EcoLabs COI to deploy innovative cooling solutions using Solar and Thermal VRF systems, which could achieve energy savings of at least 20%.

G-ENERGY
IMAGINE . INSPIRE . INNOVATE

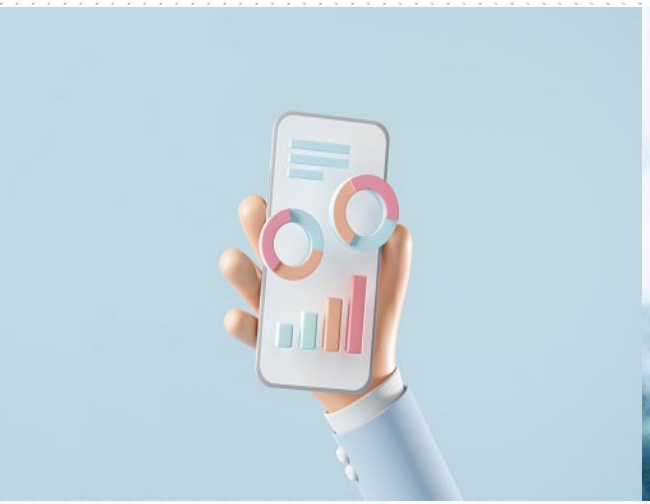


Load Disaggregation: Non-Intrusive Load Monitoring

NILM estimates the power consumption of individual devices given their aggregate consumption. Resync is implementing its proprietary deep-tech AI enhanced Energy Management and Load Disaggregation solution to optimize energy utilization through energy efficiency.

RESYNC

Call for decarbonization projects with companies



Product Benchmarking

Consumption data collected from the lab, will be validated and used to quantify the energy efficiency rating of energy star appliances and devices, against Singapore current standards for energy efficiency.

Carbon Mapping

Real time consumption data from the lab, will be converted into carbon emissions, which could track individual employee carbon footprint and carbon mapping of individual zones.

Energy Test Data Open Repository

Energy data will be stored, which can serve as an important data repository for commercial buildings in Singapore and the tropics. This will align to Singapore Green Building Masterplan Initiative.

Advanced Microgrid with Battery solutions

Microgrid solutions could tap on various energy sources, coupled with innovative battery solutions.

Smart Grid & Power Electronics Consortium Singapore

AIM

- To catalyse IP translation and create a networking platform to connect commercial companies and institutes of Higher Learning (IHLs) / Research Institutes (RIs).
- To co-develop commercialisation projects in Smart grid & Power electronics technologies.

Mission

Supported by

National Research Foundation, Prime Minister's Office Singapore
Energy Market Authority
EDB Singapore
Enterprise Singapore
Agency for Science, Technology and Research, Singapore

SPECS IS AN ECOSYSTEM TO ADOPT **RESEARCH INNOVATION.**

MEMBERS

LLE

CHANGI airport group · PSA · Jurong Port · SMRT · SBS Transit · sembcorp · SPgroup · Keppel Infrastructure

MNC

ENGINEERING TOMORROW · Danfoss · ROHM SEMICONDUCTOR · BOSCH · ROLLS ROYCE · ENEDIS L'ELECTRICITE EN RESEAU

SME / Start-up

APECUS Power solutions for all · SUNSEAP · AIR T&D Engineering the Indoor Climate · Whitspace · IES · T-RECs.ai · VORTEC · FLOW TECH · TBC Critical Power Solutions · OYIKA the way to go · EVERCOMM · Quasset · SmartMesh · enetek POWER · EPI · durapower · AMPOTECH BETTER METERING. BETTER INSIGHT. · Amega Precess · ENWAE ENGINEERING PTE LTD · ROTARY · GENNAL · MEGAWATTS ENGINEERING SERVICES PTE LTD · Landis Gyr · SWITCHING BATTERY · Amplitude CONSULTANTS

40+ on-board

Associate partners

SWA Singapore Water Association · SFA Singapore Fintech Association · Blockchain Association Singapore · think SMARTGRIDS · Innovation Norway

SEAS Sustainable Energy Association of Singapore · Singapore Green Building Council Member · A*STAR Collaborative Commerce Marketplace ACCM · COOLEST SG · Singapore Battery Consortium

IHLs / RIs engaged

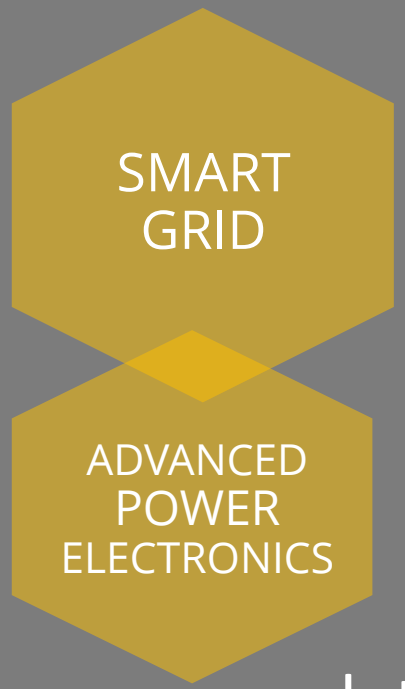
Nanyang Technological University Singapore · NUS National University of Singapore · SIT Singapore Institute of Technology · SUTD Singapore University of Technology and Design · ERI@N · A*STAR Agency for Science, Technology and Research Singapore · SERIS · Singapore Polytechnic SP · Ngee Ann Polytechnic · NYP Nanyang The Innovative Polytechnic · ITE · Temasek Polytechnic

SPECS
Smart Grid + Power Electronics
Consortium Singapore

CAPSTONE

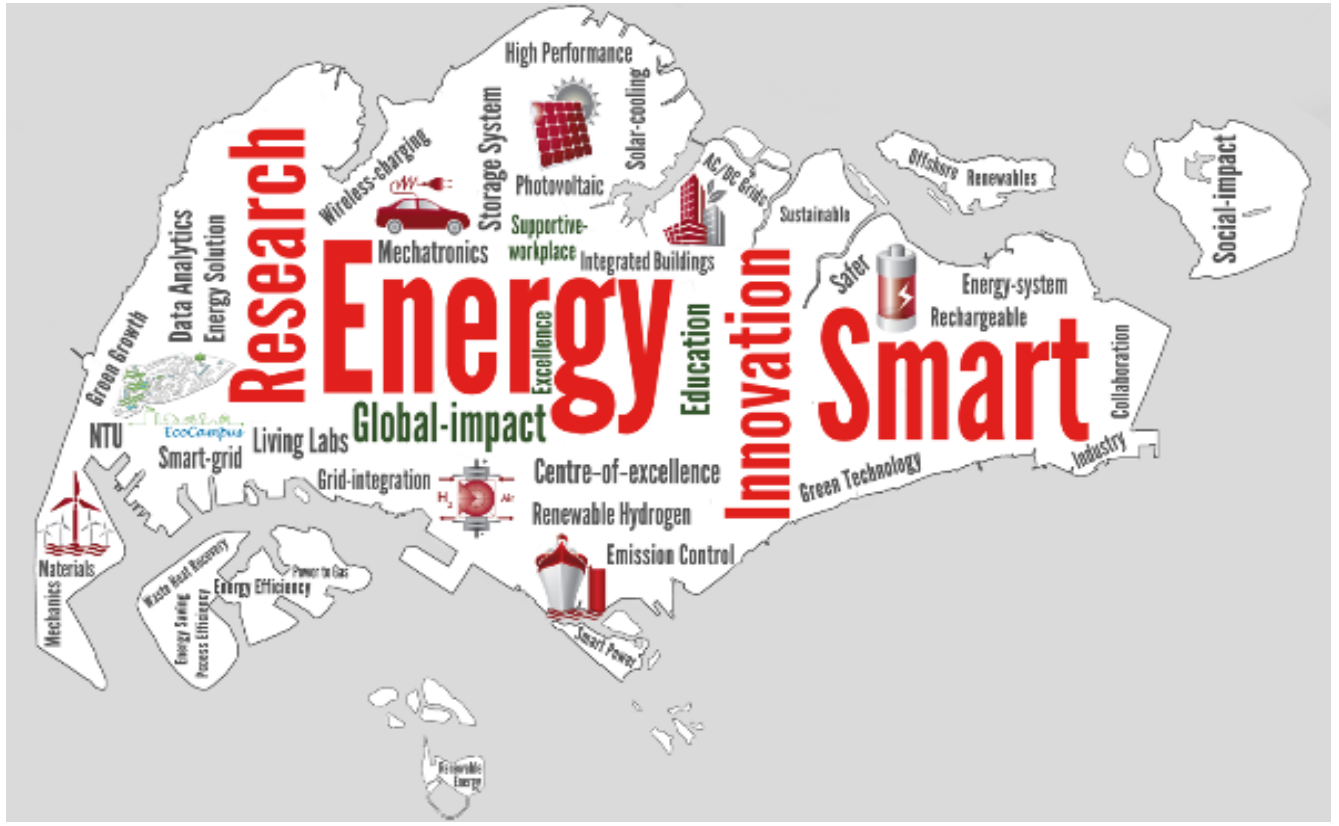
your TECH iNNOVATION
with a
FORE-RUNNER advantage

in



solutions for
GRID-LEVEL deployments

- Access IPs from IHLs
- Build an IP venture
- get Tech-support & insights
- align stakeholders to stage ideas
- Market-fit & Scale globally



Thank you!

https://erian.ntu.edu.sg

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