

**MONASH
NET ZERO
INITIATIVE**

Leading the way to a 100% renewable future
A2EP Innovation X-Change
8 April, Sydney 2019

A. Prof Ariel Liebman,
Faculty of Information Technology,
Deputy Director, MEMSI





“These activities shine a light on scalable climate action around the world. They are proof that climate action isn’t only possible, it’s innovative, it’s exciting and it makes a difference”.

Patricia Espinosa
Executive Secretary of
UN Climate Change

NET ZERO INITIATIVE

United Nations 2018
Momentum for Change
Award winner.



We are Australia's largest university,
and we have committed to achieve
Net Zero emissions by 2030

Treating our campuses as small cities

- Australia's **largest** university
- Four Campuses in Australia
- >150 Buildings
- Annual energy consumption: 682,000GJ





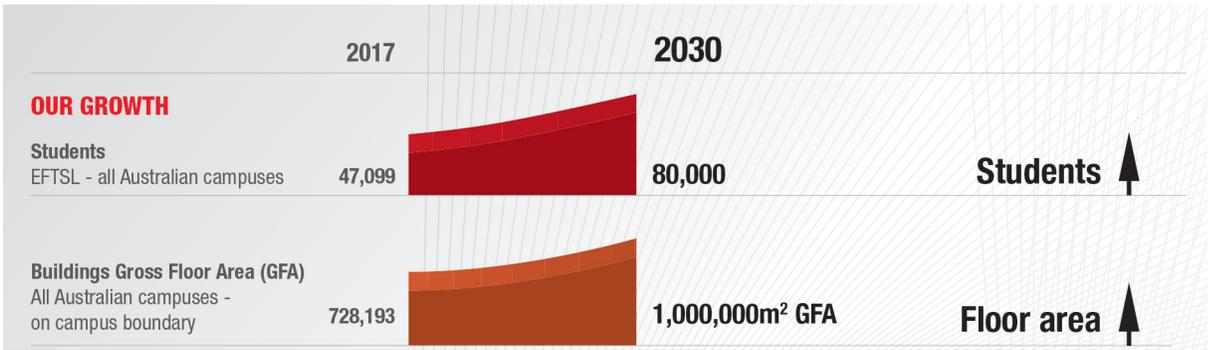
We are building the Net Zero cities of the future, developing solutions which will enable others to do the same



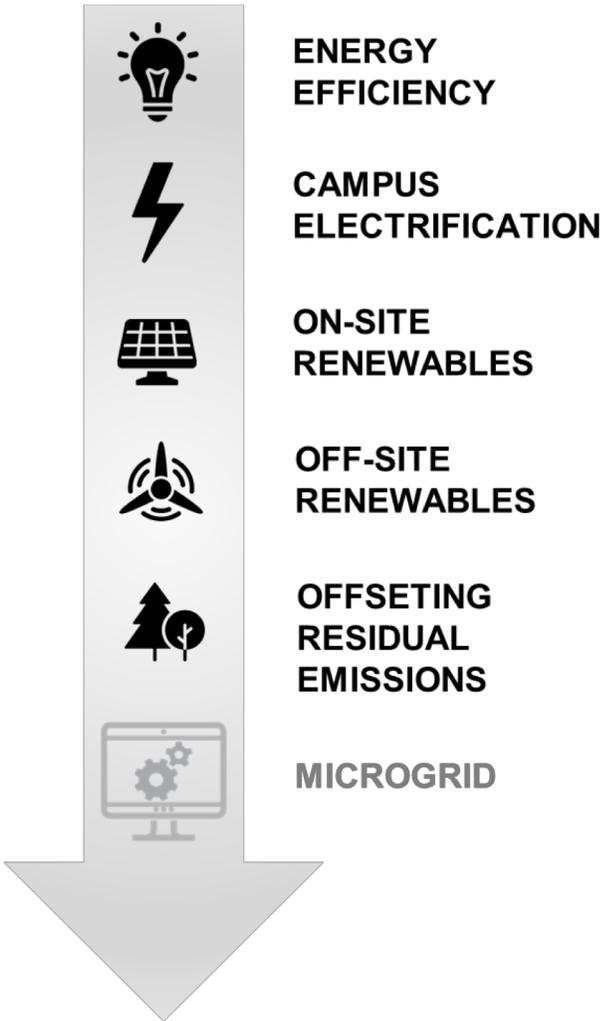
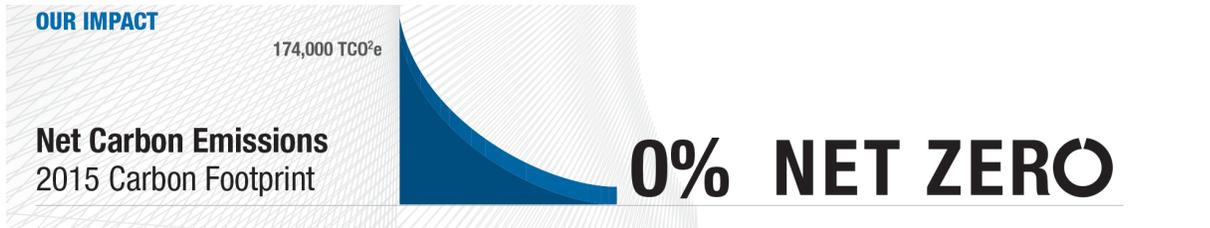
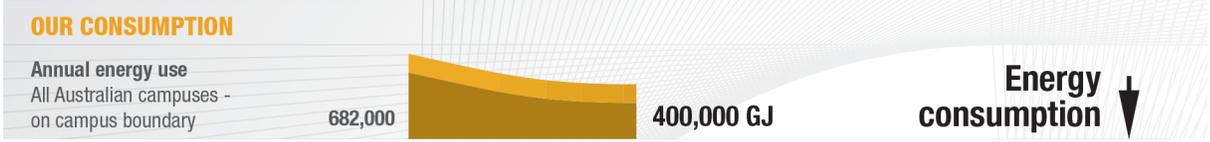
We are implementing the pillars of decarbonisation to reach Net Zero by 2030

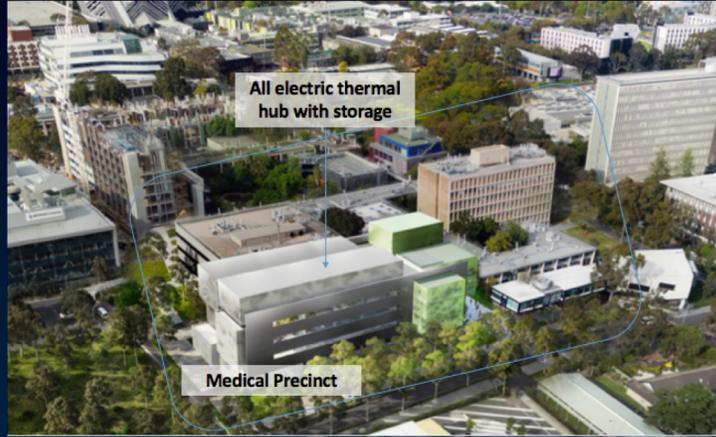
Net Zero emissions by 2030

How?



Monash University's commitment





500kWp SOLAR CARPARK CANOPY
 HYDROGEN REFUELLING STATIONS
 CHARGING STATIONS

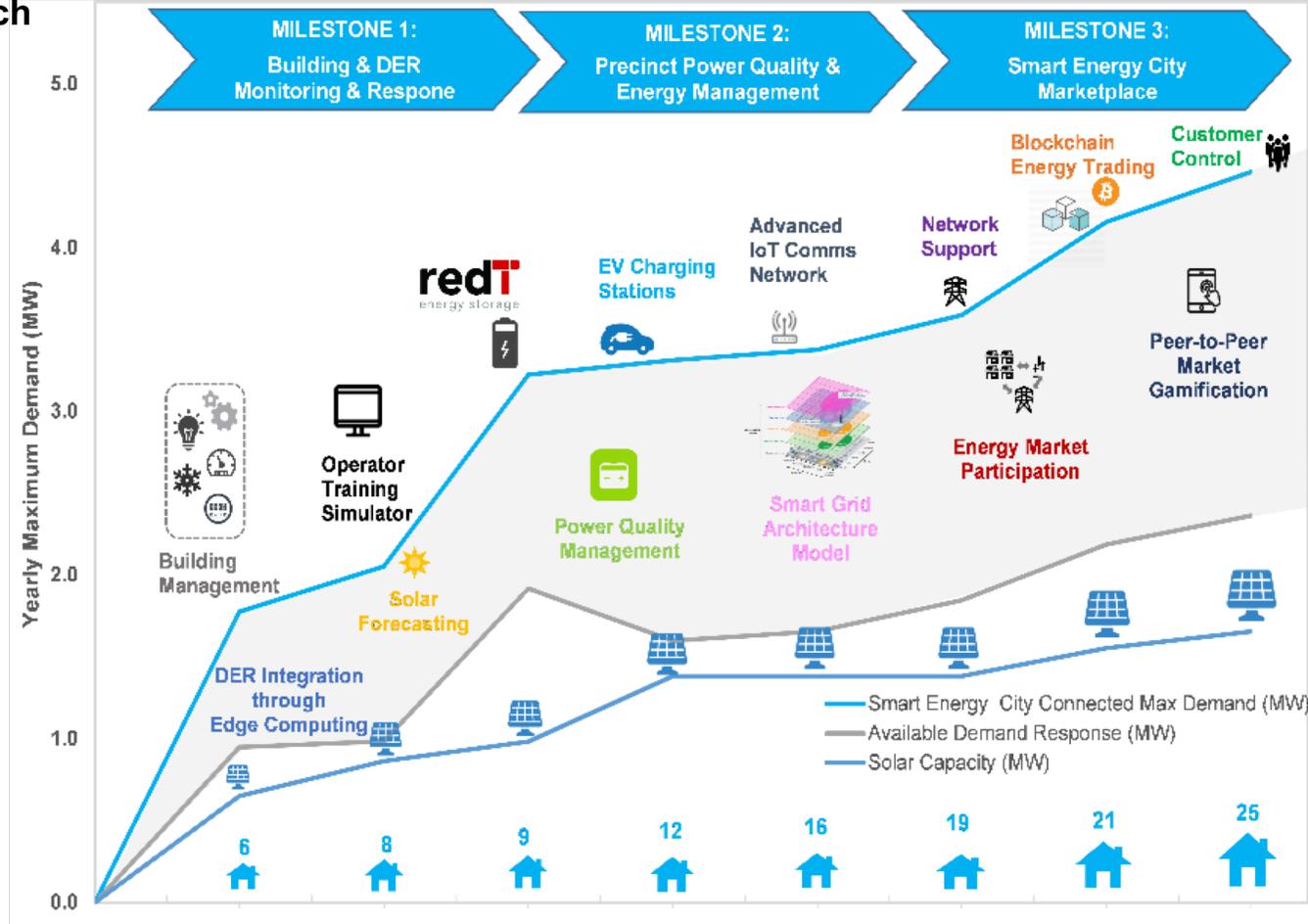
AN ENERGY INNOVATION ECOSYSTEM
 ENABLED BY THE MONASH MICROGRID

Microgrid Phase 1

- Private embedded network
- ~20 Buildings with diverse energy load profiles
 - Commercial
 - Offices
 - Teaching
 - Residential Appts
 - Retail
 - Net Zero Smart Building
- 1.5 MW solar
- EV charging
- 1MWh battery

Smart Energy City Vision & Implementation

A staged approach



*Proof-of-Concept Building – Completed in Dec 2017

2018-19



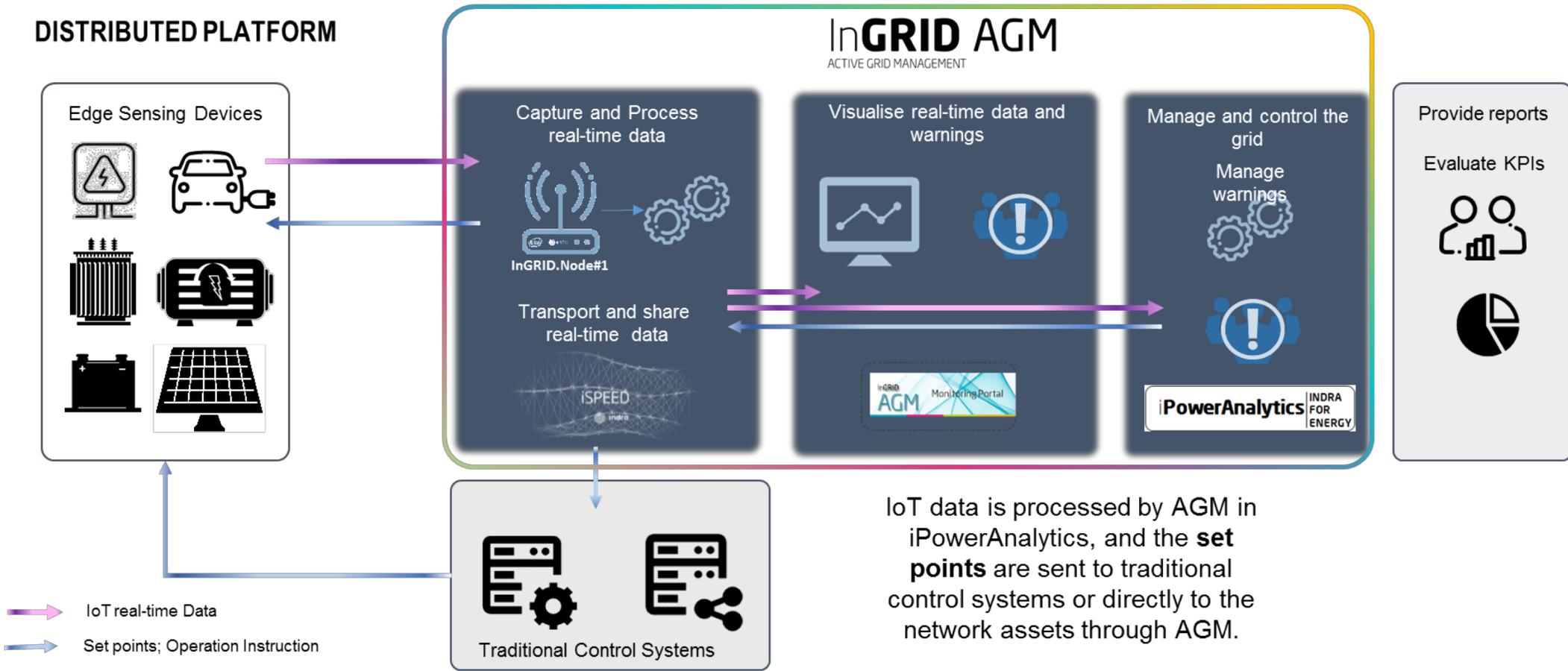
Australian Government
Australian Renewable
Energy Agency

ARENA

Towards a model that unlocks new value streams for customers and market participants.

Microgrid Architecture – Active Grid Management

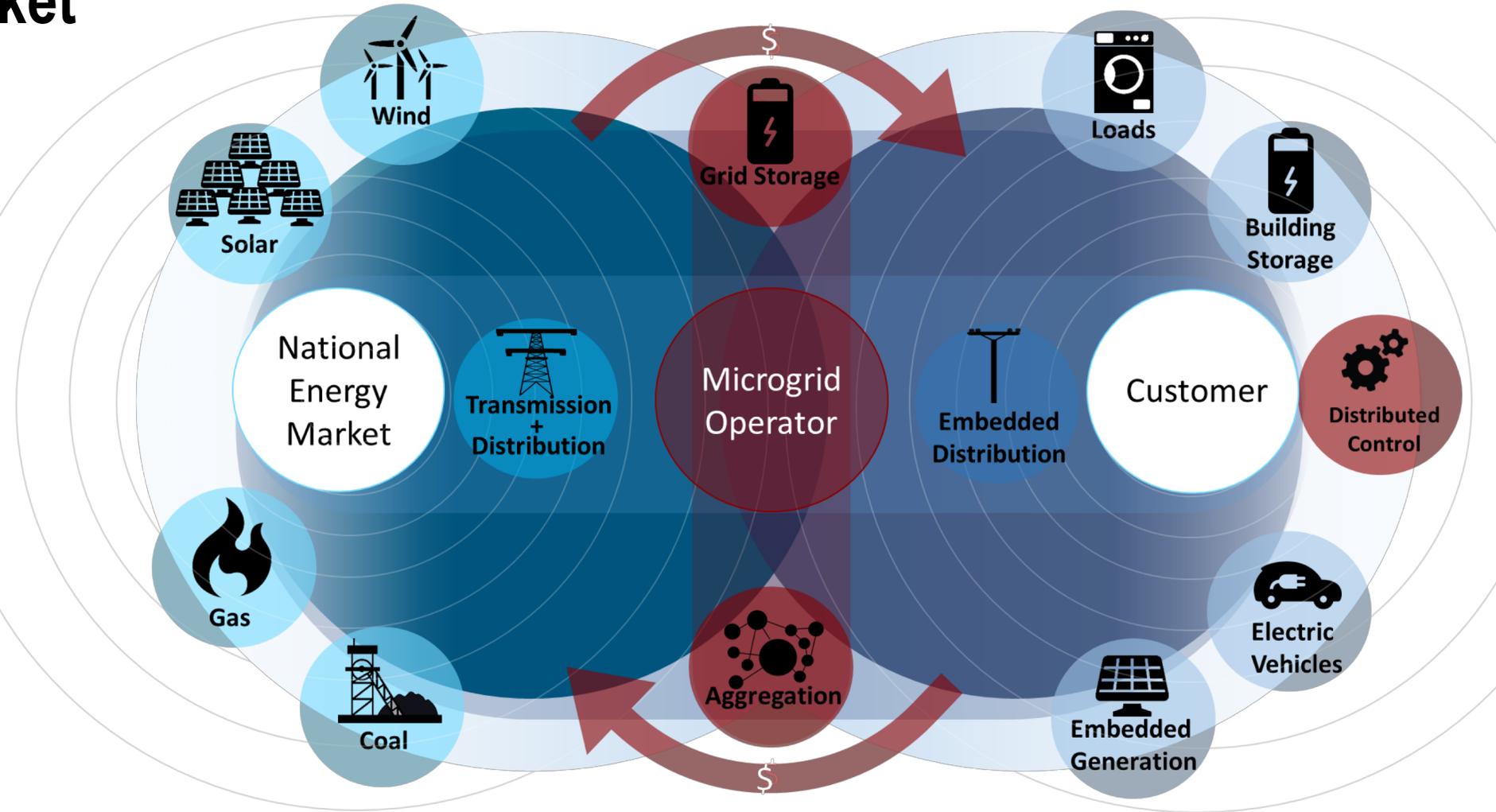
Orchestration of DERs through Indra's Active Grid Management solution (real-time monitoring, improved network visibility, speed of response through edge computing, energy management through control of DERs, open protocols, use cases to unlock value for customers and new players).



Microgrid Operator in the Electricity Market

Project for Victorian DELWP: 2018-19

MONASH IS INVESTIGATING THE BUSINESS CASE FOR THE ESTABLISHMENT OF A MICROGRID OPERATOR TO FACILITATE THE TRANSITION TO 100% RENEWABLE POWER, BY PROVIDING VALUE TO NETWORK, MARKET AND CUSTOMERS, ACROSS MULTIPLE SITES.



SCOPE OF THE WHITE PAPER

TO UNDERSTAND AND QUANTIFY THE VALUE PROPOSITION PRESENTED BY MICROGRIDS IN THE CONTEXT OF THE CURRENT VICTORIAN REGULATIONS AND CONSTRAINTS; AND PROVIDE INITIAL REGULATORY, POLICY, AND MARKET REFORM RECOMMENDATIONS.

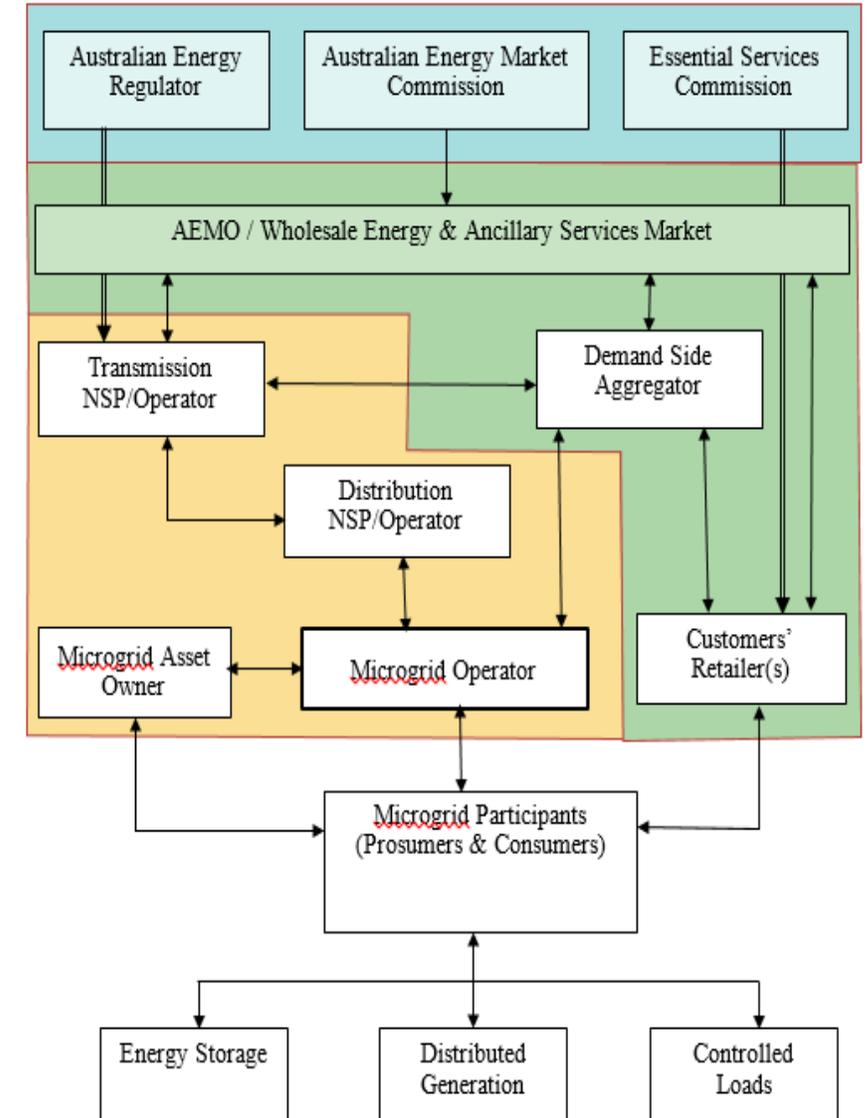
A MICROGRID?

A system for managing the electricity supply and demand of customers, in a way that efficiently integrates local sources of generation and storage of electricity ('local supply') with electricity supplied from or exported to the grid ('network supply').

- Grid connected, but capable of islanding ('islandable') – Original Definition
- A site within a private distribution network ('embedded network') or a public distribution network ('microgrid zone')
- one or more sources of electricity generation connected to the embedded network ('embedded generation')
- On-site electricity storage ('battery storage')
- Supply of electricity to multiple third-parties ('supply')
- A dynamic supply and demand control system ('control system')
- A single connection point to the distribution system ('connection point')
- A third party microgrid system operator ('microgrid operator')

THE MICROGRID OPERATOR

- The microgrid operator intends to facilitate the transition to 100% renewable power, by providing value to network, market & customers, across multiple sites.
- Its principal objective is to empower its customers to reduce energy costs, increase the efficiency of on-site DER, reduce emissions whilst maintaining a service standard equivalent to or better than that offered by the main grid.
- The positive flow on effect to the microgrid customers, network and market will depend on the ability of the microgrid operator to access and stack the benefits of the value streams outlined in this paper.



MICROGRID VALUE STREAMS

Private Benefits

- Lower electricity purchase costs from the shifting of load from high price to lower priced periods
- Efficient management of distributed storage, other connected assets

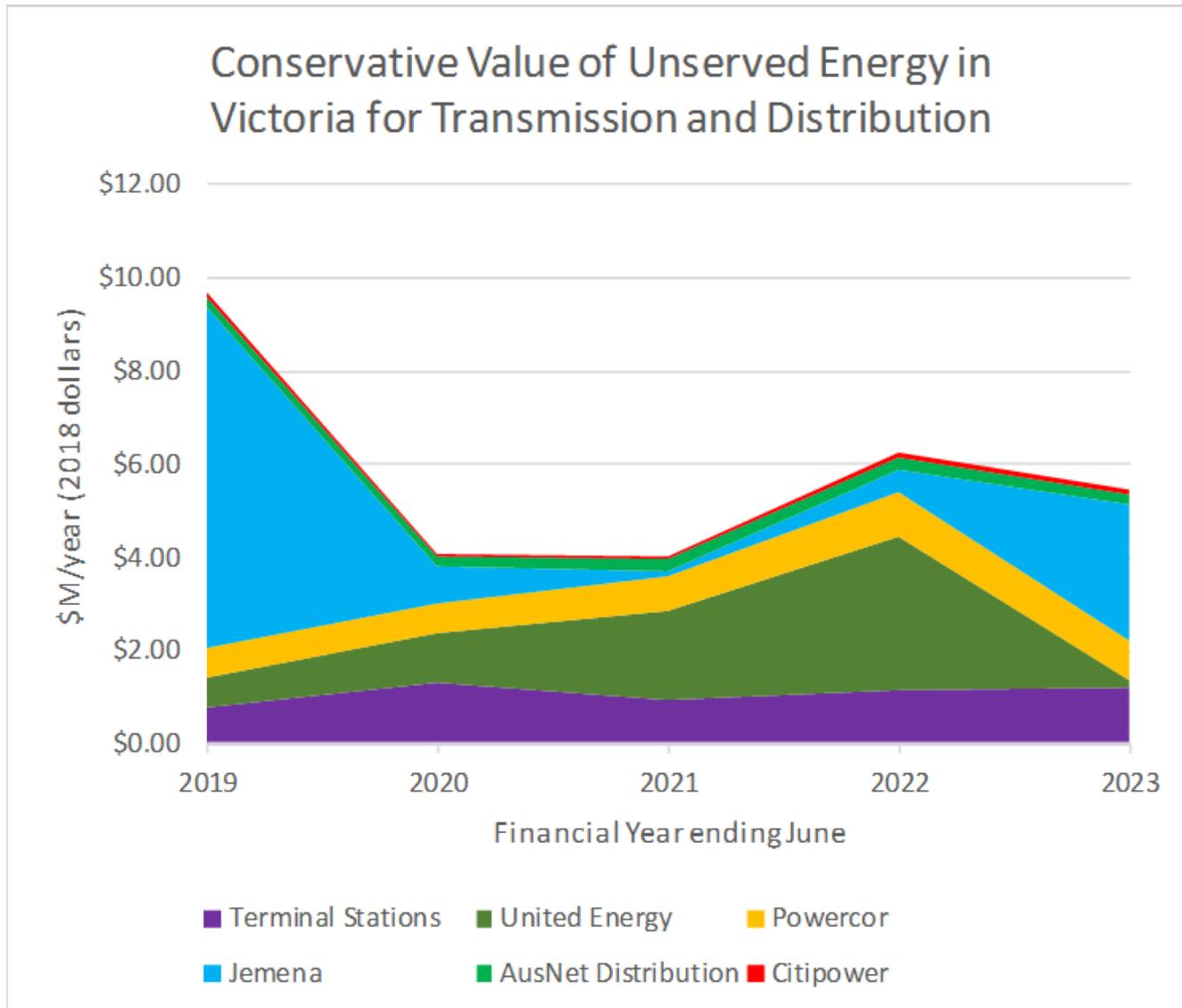
Public Benefits

- Local voltage control from distributed resources
- Demand side response for network load control following contingencies or under extreme load conditions
- Reduced energy losses due to lower distances for power flow in the network
- Under-frequency load shedding scheme to be integrated with MO.
- Connection and utilisation of emergency generation capacity
- Local distribution of renewable energy surplus to microgrid participants' instantaneous requirements
- Lower carbon emissions from additional renewable energy

Revenues from Market Participation

- Demand side response for network load control
 - Peak demand management in the network (transmission and distribution)
 - Provision of frequency control services to the power system AS (ancillary services)
 - Sale of electricity into wholesale, retail markets
 - Sale of voltage control services to the local network as a network ancillary service.
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Value of Unserved Energy accessible to Microgrids – with Regulatory reforms



Expect Final White Paper in Q2 2019

Questions?

Living Laboratory for Research and Knowledge Sharing

Focus areas



MONASH
ENERGY MATERIALS
AND SYSTEMS
INSTITUTE (MEMSI)

Grid Innovation Hub

The GIH has been developed in partnership with industry to provide a collaborative framework for electricity industry leaders and world-leading researchers. The GIH will help develop new technologies, understand consumer behaviour, make policy, regulatory and market recommendations, accelerate innovation and educate and train the next generation of energy professionals.

Future Control Room



State-of-the-art future electricity network control room simulator.

Grid Innovation Founding Partners:

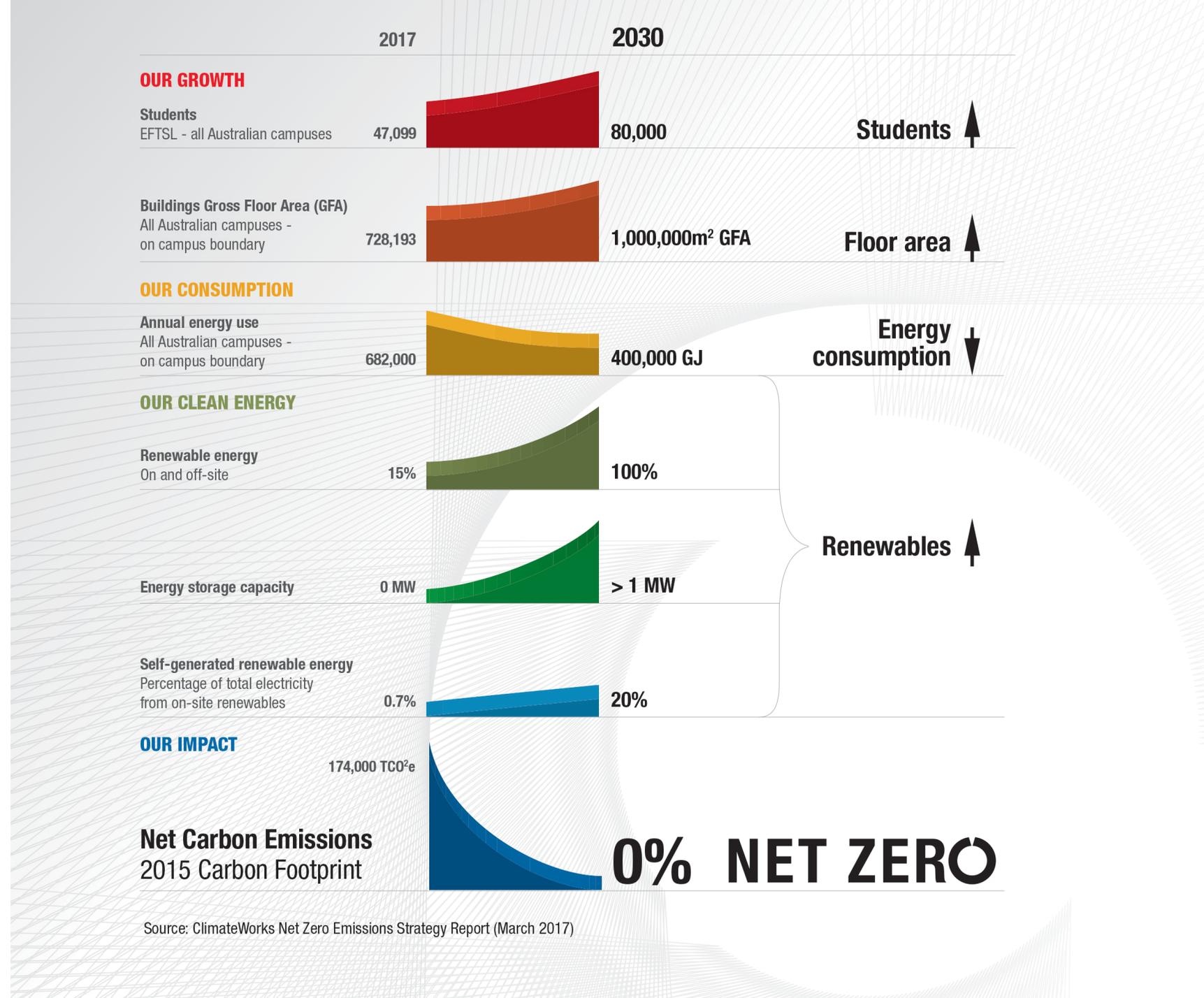
Indra, AusNet Services, Advisian, redT, Energy Exemplar, Senvion, GE

Real Climate Action

“Leadership in sustainability of the kind to which Monash aspires requires **much more than being carbon neutral** by offsetting emissions through carbon credits or similar mechanisms.

The University strives to completely eliminate its dependence on fossil fuels.”

Vice-Chancellor Professor Margaret Gardner, October 2017



Source: ClimateWorks Net Zero Emissions Strategy Report (March 2017)