Deakin Waurn Ponds Microgrid

Research, sustainability and energy cost objectives

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Deakin University – Challenge of Growth

Campuses in Geelong (Waterfront and Waurn Ponds) Burwood, Warrnambool (Victoria, Australia) and the Cloud

International offices in South Asia, China, Indonesia, Sri Lanka and Latin America

Research collaborations with over 200 institutions

400 courses – the arts, science, architecture, business, law, medicine, engineering and education

In 2017:

57,595 students

11,878 international students

14,081 study solely in the cloud

4,692 staff

Ranked 211 in the Academic Ranking of World Universities (ARWU)

Top 1% of the world's universities.

Quacquarelli Symonds (QS); QS Stars University Ratings 2019

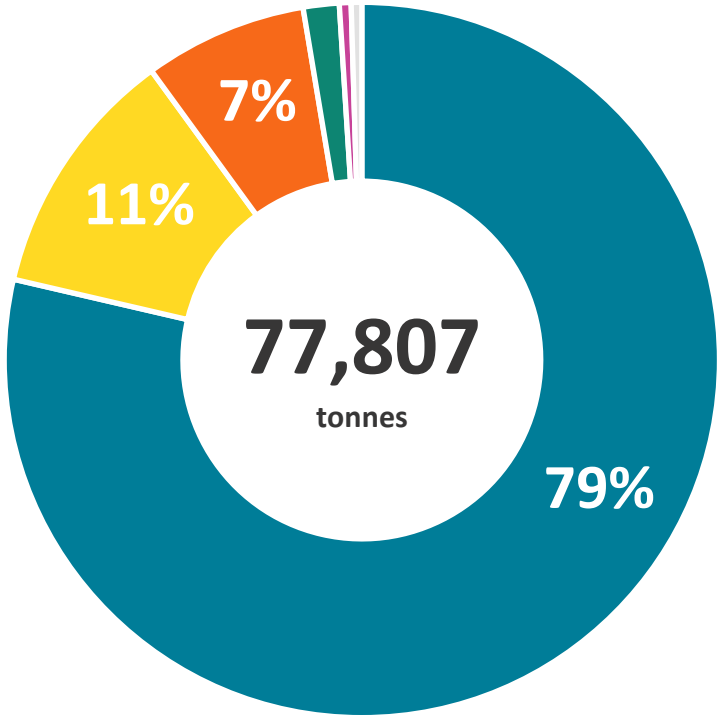
ARWU Rankings 2018

In 2019:

62,000 students

6th largest of Australia's 39 universities

Energy and Emissions: 2019 profile



- Electricity
- Natural Gas
- Flights
- Waste
- Water
- Fuel

Note: 2019 emissions data contains some estimates due to a lag in billing data from energy providers

Figure 1: Deakin's 2019 carbon emissions profile (scope 1, 2, 3)

Strategic Framework

University Signatory

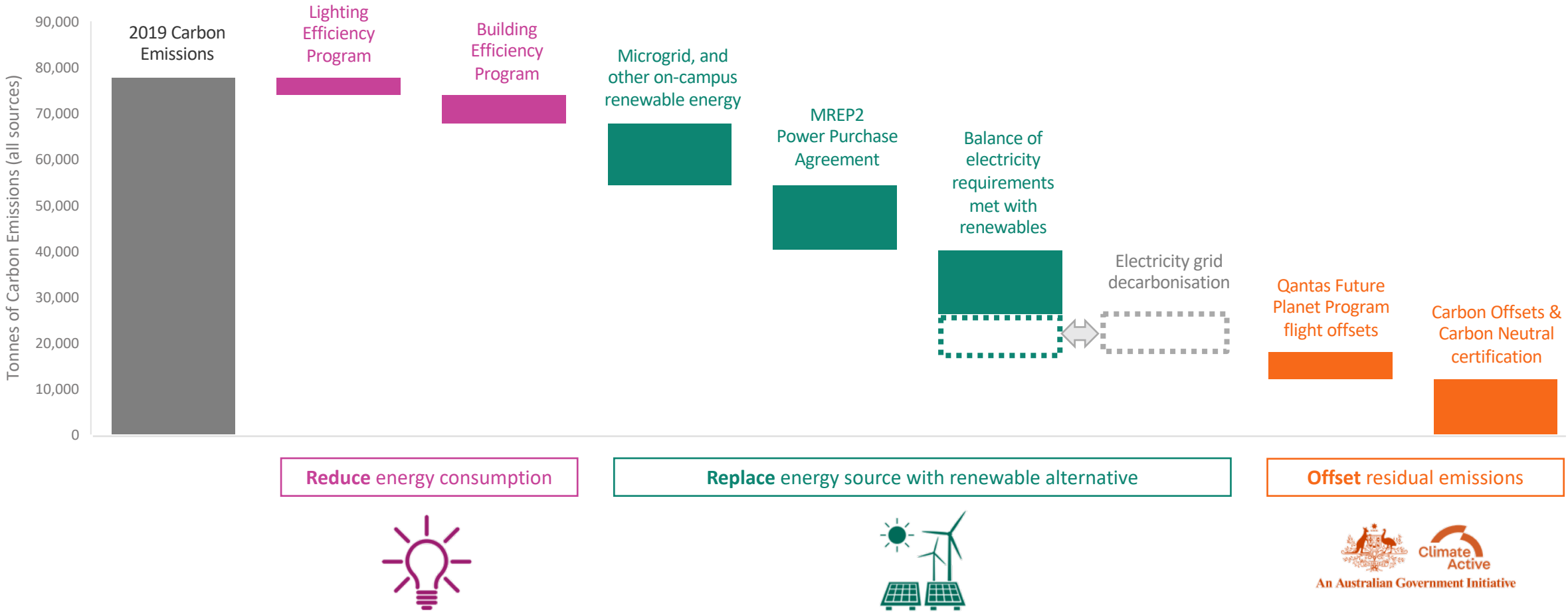
1 Commitment to Carbon Neutrality

2 Energy security, reliability and resilience

3 Financial benefit and certainty

AVOID ENERGY REQUIRED	REDUCE ENERGY CONSUMPTION	REPLACE ENERGY SOURCE	OFFSET RESIDUAL EMISSIONS
Sustainable development	Energy efficiency	100% Renewable electricity	Carbon offsetting
Maintains baseline	↓15%	↓ 60%	↓ 25%

Pathway to Carbon Neutral



Climate Active
An Australian Government Initiative

Waurn Ponds Campus

70km west of Melbourne

325 hectares

- Engineering
- Materials science
- Advanced manufacturing
- Health Sciences & Medicine
- Life Sciences

Specialist capabilities in energy storage, carbon fibre, automotive design, corrosion science and microgrids

21 GWh/y electricity consumption

Microgrid Infrastructure Requirements - Options

Goal 7:
Ensure access to affordable, reliable, sustainable and modern energy for all.

DEAKIN UNIVERSITY

High Level Objectives

Building global excellence in research and education

Strategic partnerships to leverage capacity, influence and funding

Creating a sustainable and efficient future for Deakin and the broader community - half of the electricity consumption of the campus and 60% of the 2020 emissions reduction target.

Substantial scale to enable research that is relevant to utilities, industry and communities

Platform to build on; leverage renewable energy and storage expertise

Research

Current capability

Planned new work

Applicability to stakeholders

Criticality of option

Existing alternatives

Allow for wind generation, additional storage and Phase 2 development

Sustainability

Maximum output

Responsible sourcing

Local knowledge

Lifecycle

Minimal landscape impact

Incorporation of existing PV and wind generation

Allowance for EV charging

Cost

Budget impact

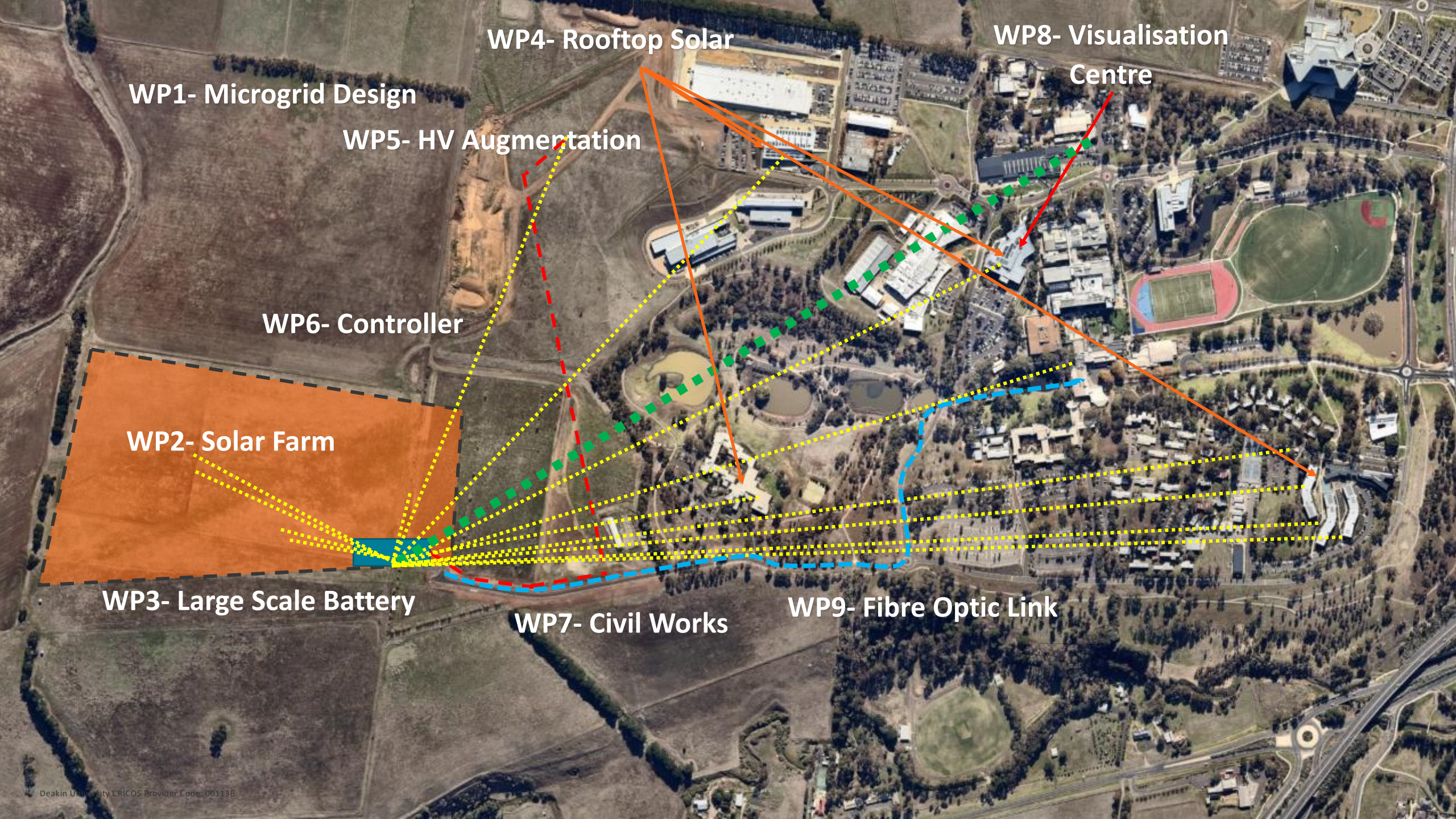
Likely additional research income leveraged by infrastructure element

Impact on energy output (total, instantaneous to reduce Demand Charges, peak billing periods)

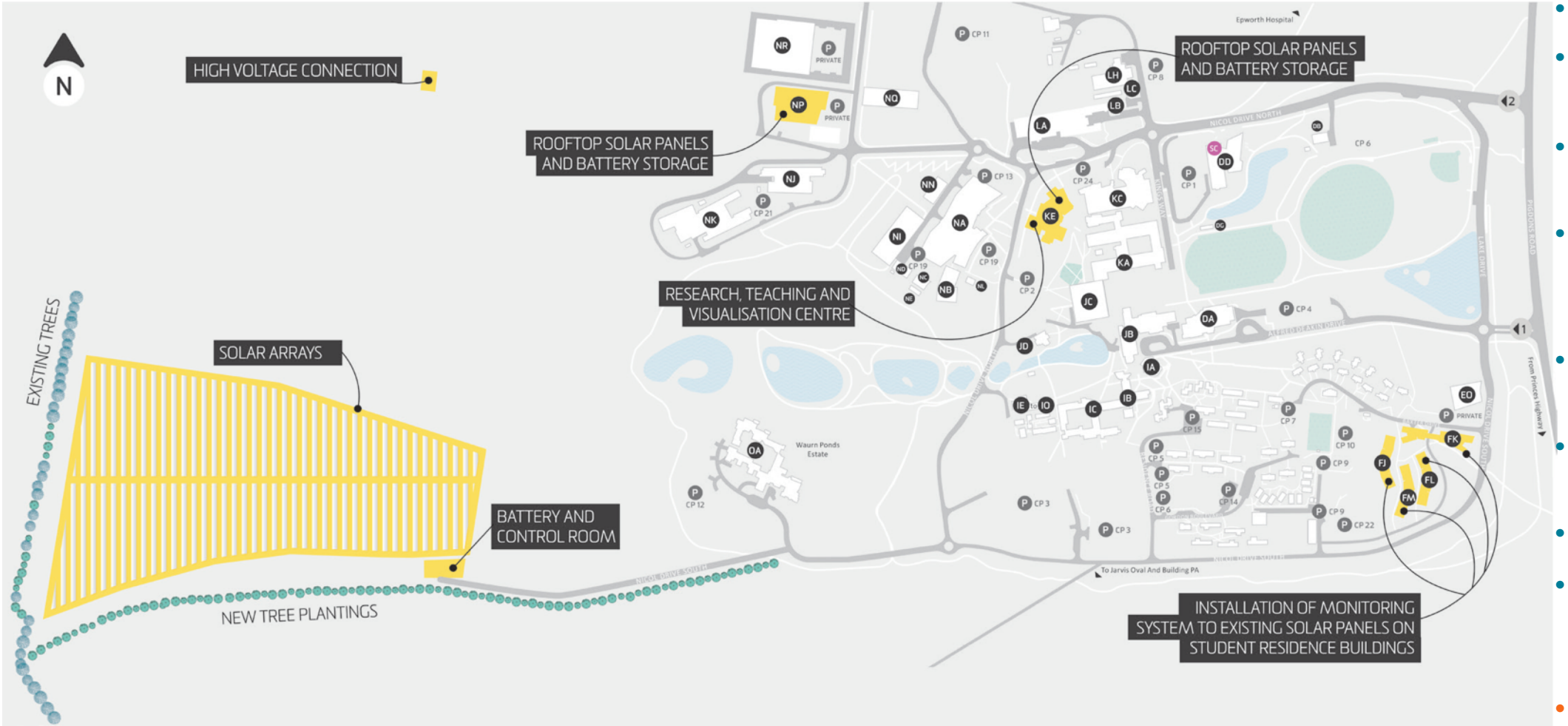
Additional maintenance

Obsolescence

Impact on construction program (total time and critical path)



Waurn Ponds Microgrid



- 7MW solar farm
- 1MW/1MWh storage
- 250kW + batteries distributed
- Research, teaching and visualisation centre
- AUD20m capital in the initial phase
- AUD10m research projected
- 14GWh per year
- 12,000 tonnes greenhouse gas reduction
- Potential growth in generation, storage and transport

Procurement and Operation Informed by Deakin Research
Grid-scale Battery example

Objectives of Storage

- Capture excess generation output
- Minimise Demand Charges
- Control power quality within and beyond campus
- Research

Procurement detail

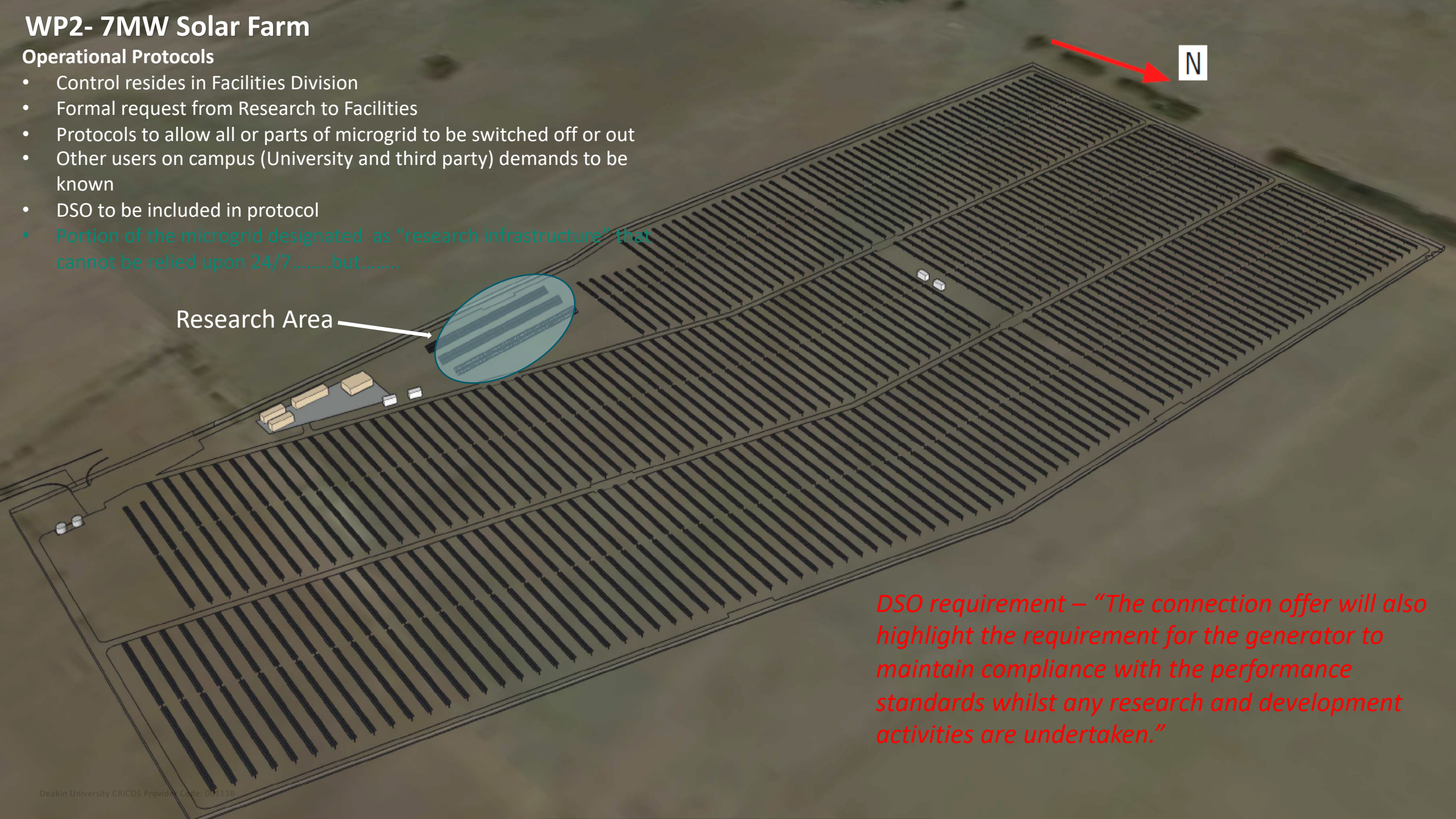
- Technical performance
- Warranty
- Availability
- Delivery
- Ethics

5.6.2 The Contractor shall demonstrate implemented policies for ethical and sustainable supply chain management and manufacturing to avoid social, environmental, human rights, and health and safety risks across the supply chain. This may include detailed due diligence regarding procurement and use of 'conflict minerals' and 'critical materials' (e.g. cobalt, lithium) and application of international standards (e.g. the OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas). Demonstration of development towards circular economy practices (e.g. develop substitutes; design products to facilitate recycling, reuse or remanufacturing) is preferable. Safety systems, fire suppression, non-PFAS, and aesthetic considerations should be outlined and the prevailing certification/standard referenced. The Contractor will demonstrate alignment with Deakin University's Procurement Policy, Sustainability Policy, and 2030 Challenge.

WP2- 7MW Solar Farm

Operational Protocols

- Control resides in Facilities Division
- Formal request from Research to Facilities
- Protocols to allow all or parts of microgrid to be switched off or out
- Other users on campus (University and third party) demands to be known
- DSO to be included in protocol
- Portion of the microgrid designated as "research infrastructure" that cannot be relied upon 24/7……..but……..



DSO requirement – "The connection offer will also highlight the requirement for the generator to maintain compliance with the performance standards whilst any research and development activities are undertaken."

WP8- Visualisation Centre

Deakin ManuFutures Building – energy positive

System Capacity : 158 kW of Solar PV, 30 kWh of Battery Storage

WP4- 75KW Rooftop Solar - KE

WP4- 39KW Rooftop Solar - OA

Clear Objectives, Strong Governance, Planning and Competence

Clear Objectives, Strong Governance, Planning and Competence

Clear Objectives, Strong Governance, Planning and Competence

Research Benefits

- Test bed for innovation (within and external to Deakin)
- Other generation and storage e.g. small wind & hydrogen
- More sophisticated use cases e.g. FCAS
- Circular Economy platform
- Apply experience internationally

Many options to meet objectives

Be Bold – Learn – Repeat

Worth the effort!