The reliable transition to renewables in Remote Energy

6th Annual Offgrid and Standalone Power Conference

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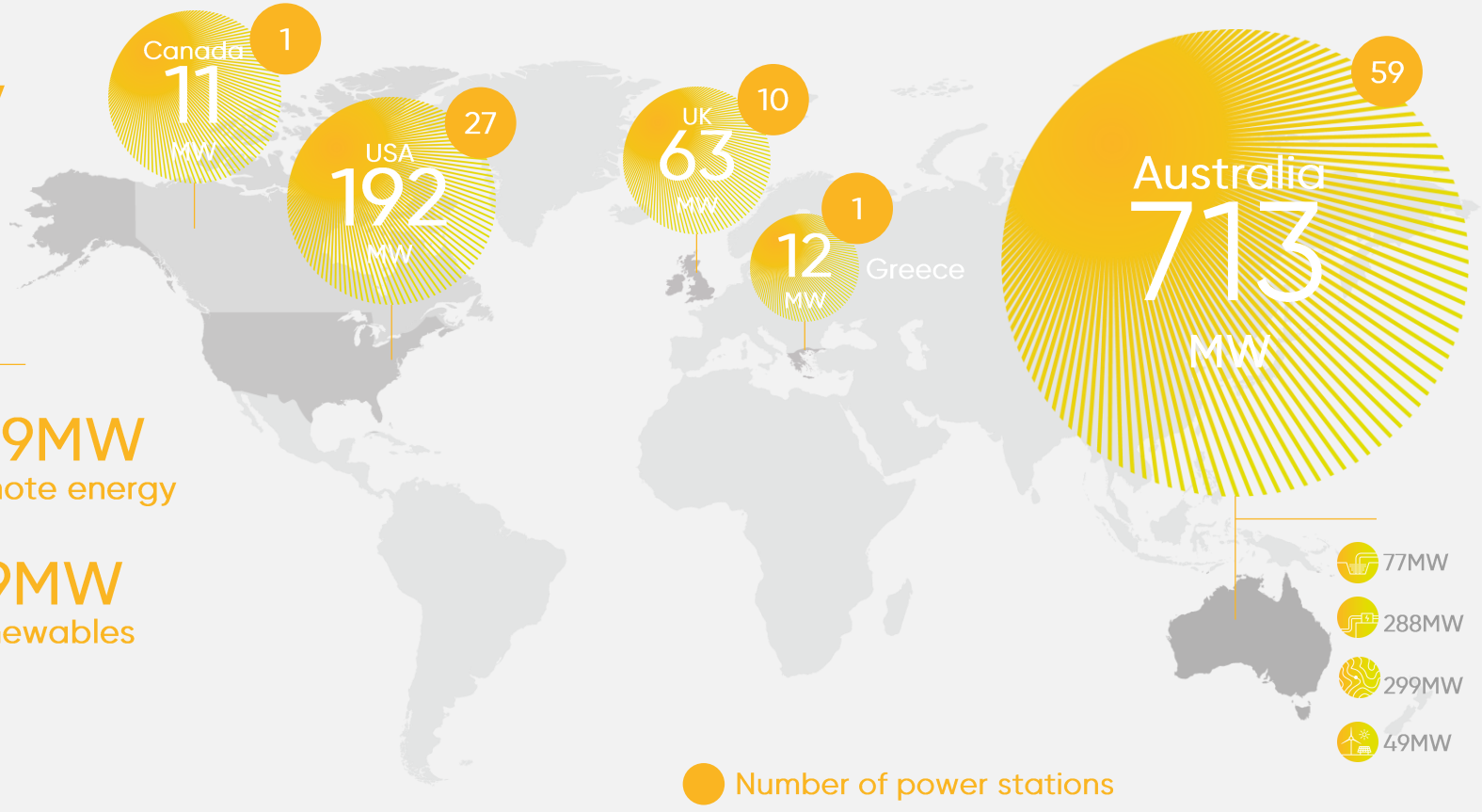
EDL: An overview

A leading global producer of sustainable distributed energy

991MW | 98 power stations | 5 countries



Diversified asset portfolio

- 355MW Landfill gas
- 299MW Remote energy
- 288MW Waste coal mine gas
- 49MW Renewables
- 21.8 TJ/day Gas delivery (LNG/CNG/LFG)

Australia

Key

- Waste coal mine gas
- Remote energy
- LNG / CNG
- Landfill gas
- Renewables
- Office

Remote Energy

Changes in Remote Energy

We are already in transition …momentum is building

- Today only two projects in our 299MW Remote Energy portfolio have renewables installed
  - Coober Pedy and Cannington
  - Both required ARENA support
- ARENA has played an important role in stimulating development *BUT* increasingly less support is needed to make hybrid projects competitive
- Renewables are becoming more competitive with fuelled solutions
- We are currently constructing a 22MW thermal generation and 4MW PV solar power station with **no** ARENA support – an Australian first

Remote energy and hybrids

Cannington, QLD

40MW natural gas power station
Constructed 1998

3MW PV solar farm
Commissioned Nov 2018
and operating reliably

Next on the horizon:
Energy storage

Remote energy and hybrids

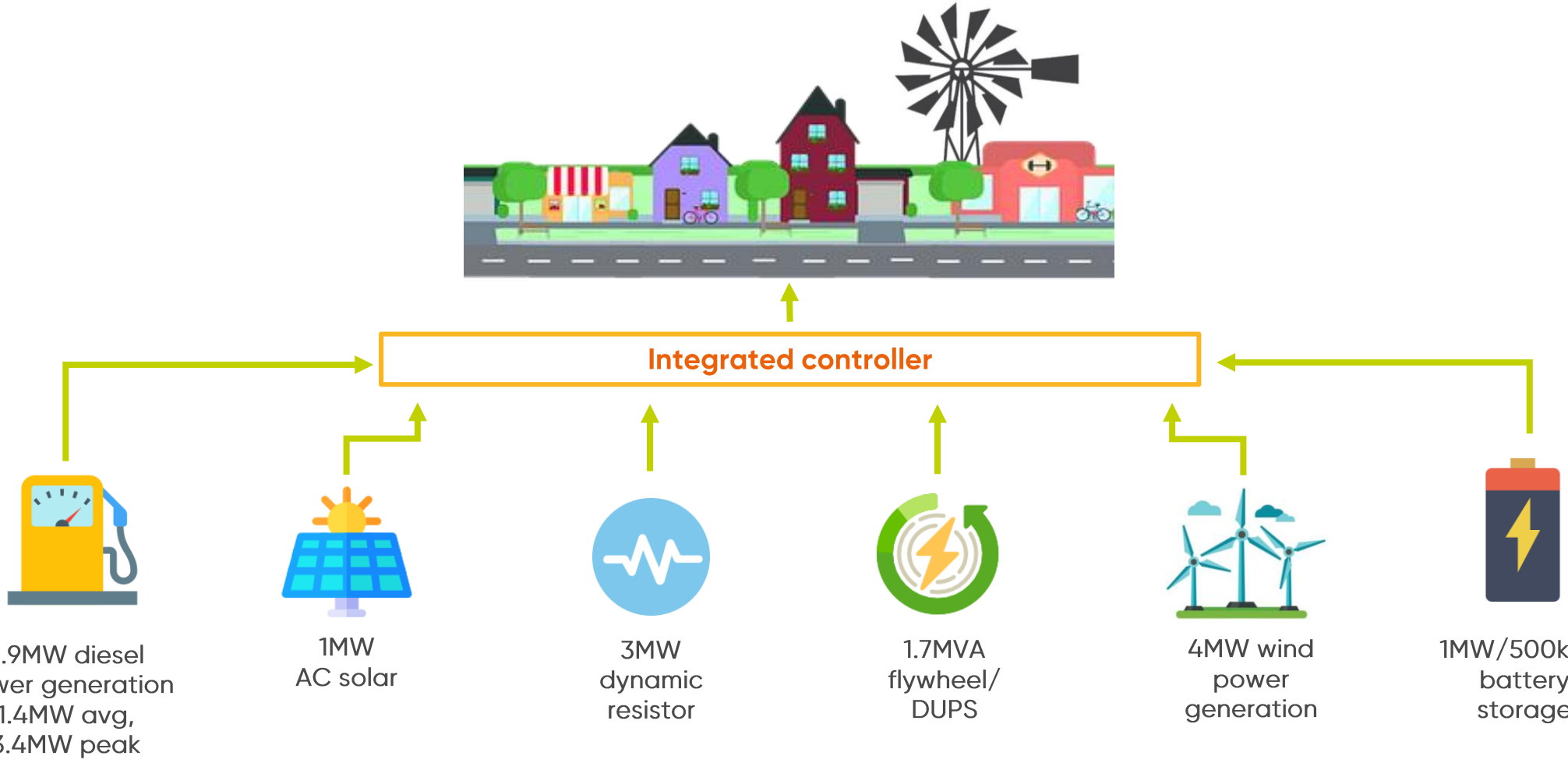
McArthur River Mine, NT
Remote power station

Broome, WA
Remote power station

Sunrise Dam, WA
Remote power station

Coober Pedy

Flagship hybrid project >70% renewable energy supply



Coober Pedy Renewable Hybrid Project

Setting global benchmarks for renewables in MW scale isolated grids

99.9%
reliability

<1 hour
unplanned outage in first year of operation

73.5% average
51% of time on 100% renewables (Oct 2018)

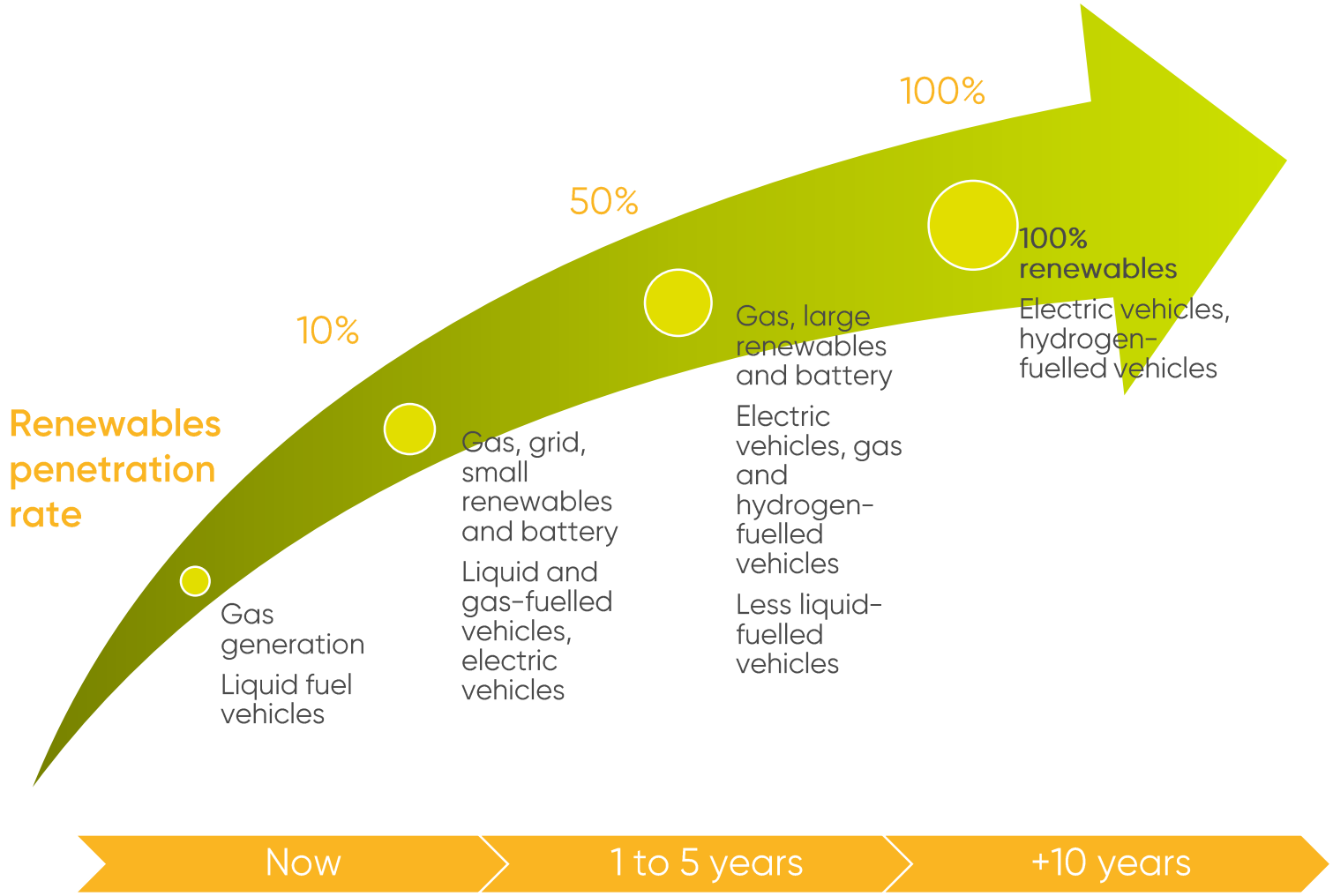
81 hours
longest uninterrupted period at 100% renewable supply (Dec 2018)

8GWh pa of
renewable electricity

>2,100,000 litres
pa reduction in diesel consumption

Transition to renewables

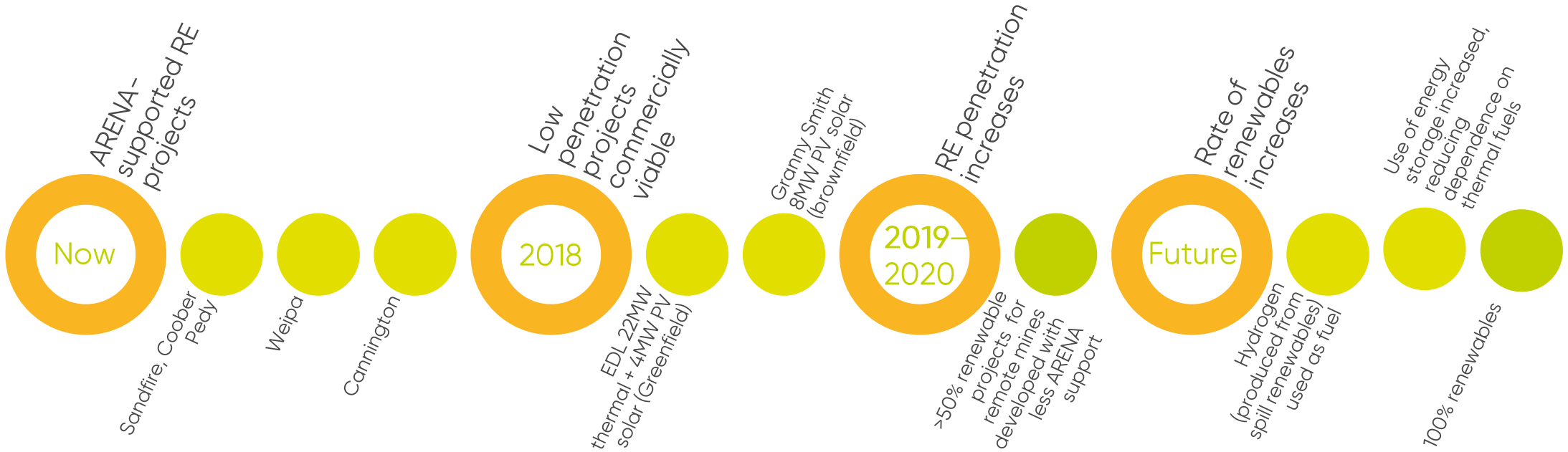
The transition in Remote Energy



Opportunities

- Developing projects without ARENA support
- Energy storage as economics continue to improve
- Diesel displacement in mining equipment
  - CNG, LNG
  - Electrification powered by renewables
- Hydrogen production – diesel or gas displacement

Hybrids enabling transition



Remote hybrid power stations: design considerations

- Design a thermal power station that can progressively integrate with increasing amounts of renewables
  - Modular design
  - Capacity that can be retired when alternative forms of energy become viable
- Demand side management of existing loads
  - Switching demand ON and OFF as required, when renewables are available
  - Spill generation opportunity to supply new power consumers
- Storage to shift renewable generation
  - Expected annual renewable generation >> town or mine load – 100% renewable penetration is possible
  - Challenge: Matching the irregular size and periodicity of renewable excess with the demand shortfall
- Alternative fuels will play an increasing role in the transition
  - Domestic LNG – firm supply is now available in WA
  - Renewable natural gas
  - Hydrogen

Where to from here?

Changes in Remote Energy

What we need to do to be ready for the transition

Ongoing evaluation of technologies and costs

Continually explore new technologies

Install generation equipment that can be progressively phased out

Factors considered in RE design

- ☑ Location to alternative fuel sources
- ☑ Renewable resources (wind, solar resources)
- ☑ Reliability
- ☑ Levelised cost of electricity
- ☑ Split between fixed and variable costs

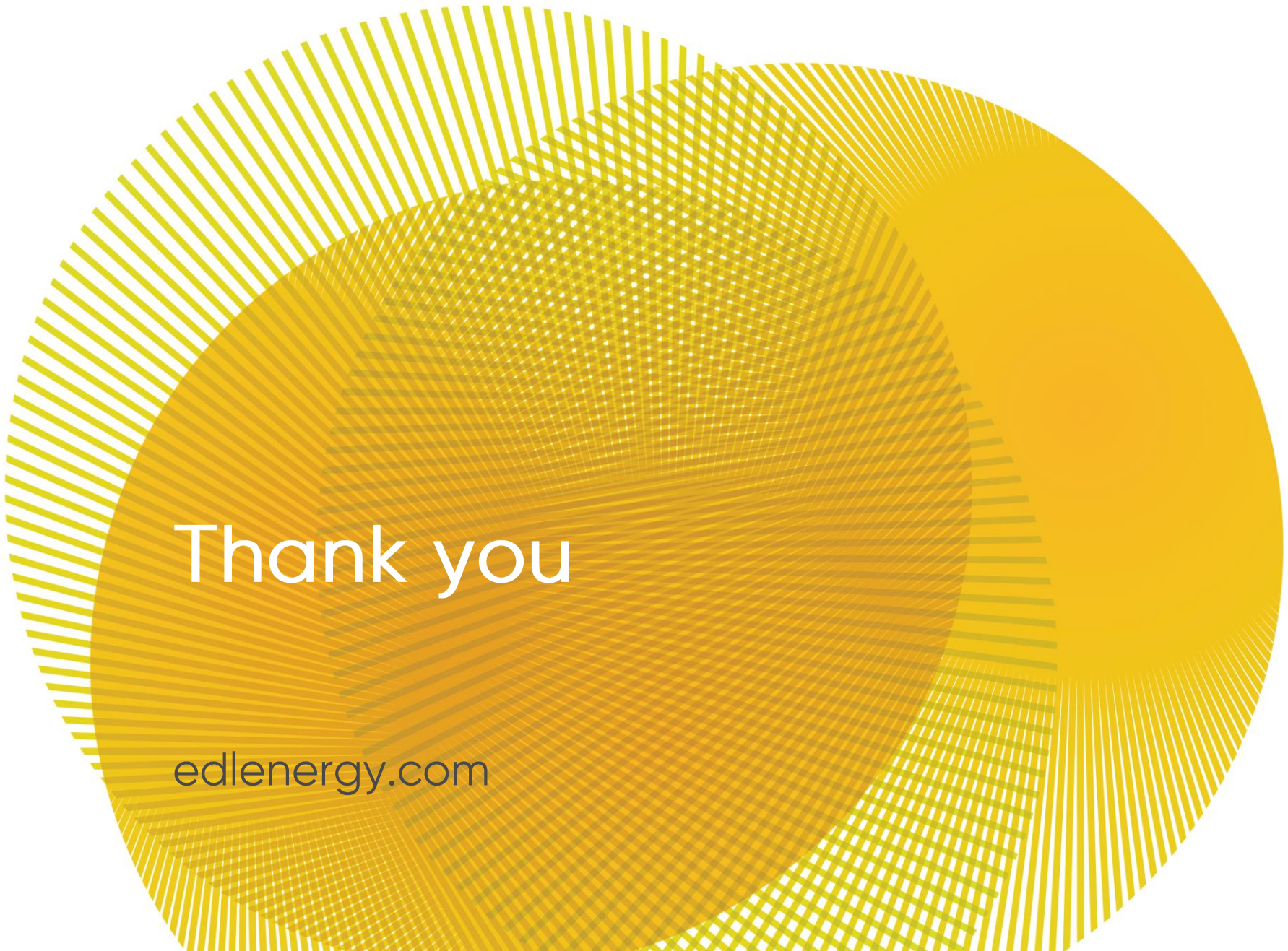
Plan for redundant generation resulting from the increase in renewables

Collaboration and communication between customer and energy supplier to ensure delivery of fit-for-purpose solution

Summary

- Renewables are now part of the solution and will continue to grow
- Energy storage will play an increasing role
- In the near term – more RE hybrid projects constructed with minimal ARENA support
- Emerging fuels such as LNG, renewable natural gas and hydrogen will be part of the solution
- Solutions need to be future-proofed during their design to take advantage of evolving renewable technologies
- To succeed, energy suppliers and customers need to collaborate – no longer such a thing as a ''standard solution"

An exciting time for Remote Energy



Thank you

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