South Australia's Energy Transition

CEEC Mineral Processing and Innovation workshop

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Presentation overview

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- Electricity generation trends in SA
- Opportunities and challenges from the Energy Transition
- Implications for miners

Electricity Generation Trends in SA

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Megatrends driving change in the global energy system

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Rapid urbanisation

Climate change and resource scarcity

Shift in global economic power

Demographic and social change

Technological breakthroughs

SA's Electricity Grid in Transition

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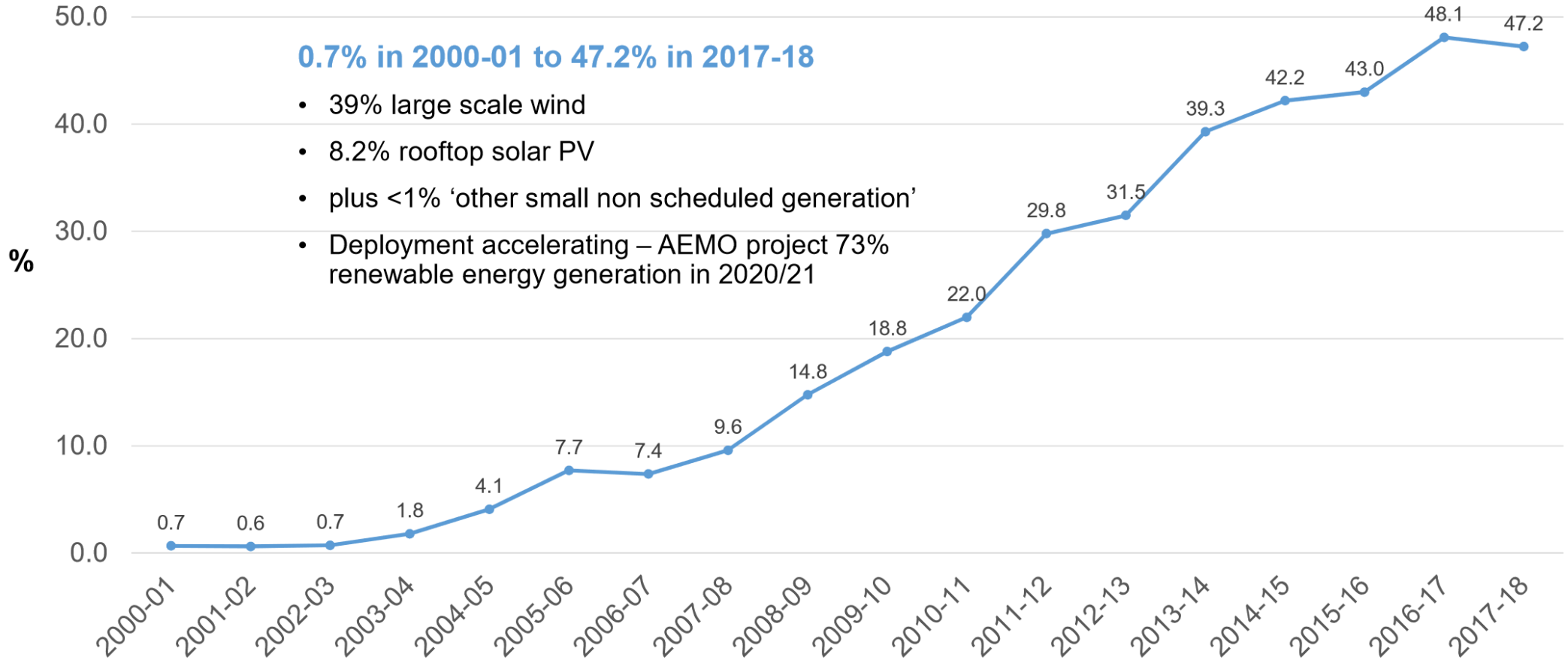

Grid Renewables and Storage
0 to 2700MW in 15 years

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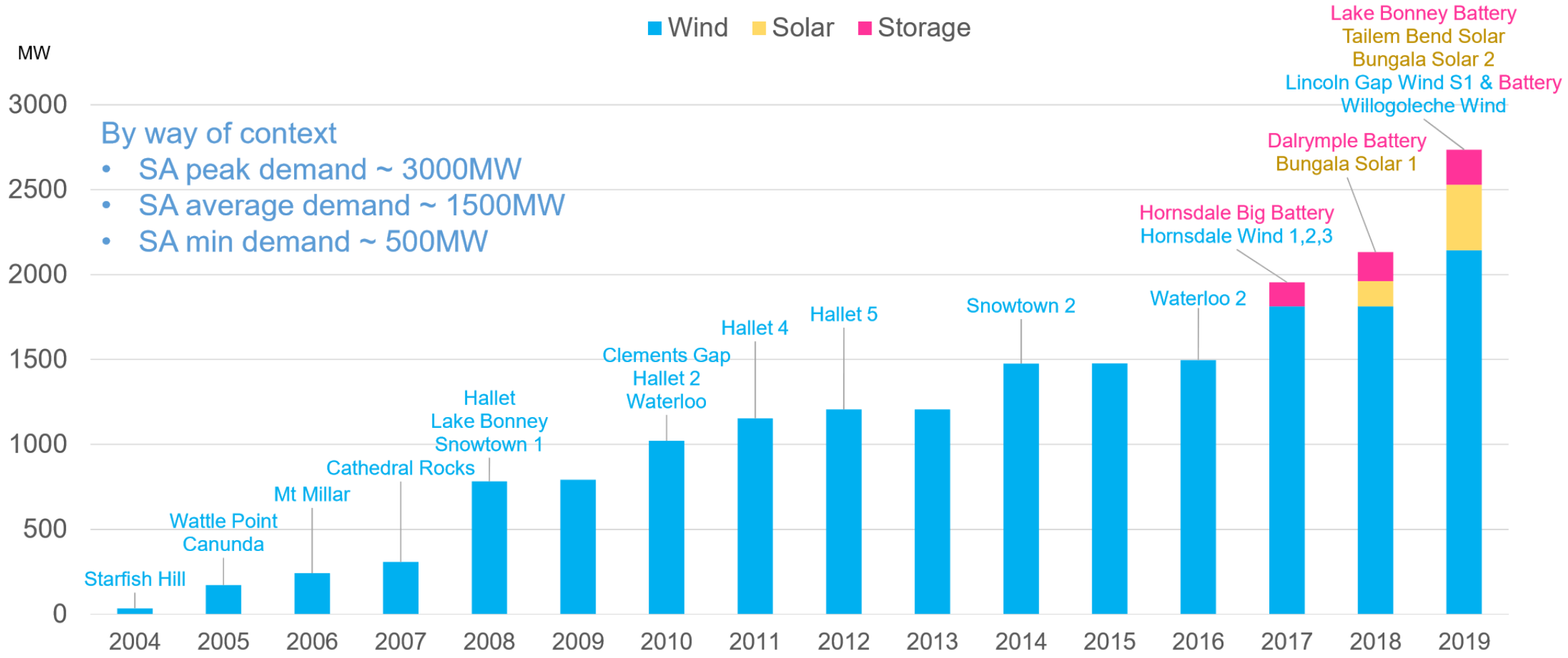

SA rooftop solar PV: 0 to 1000MW in a decade

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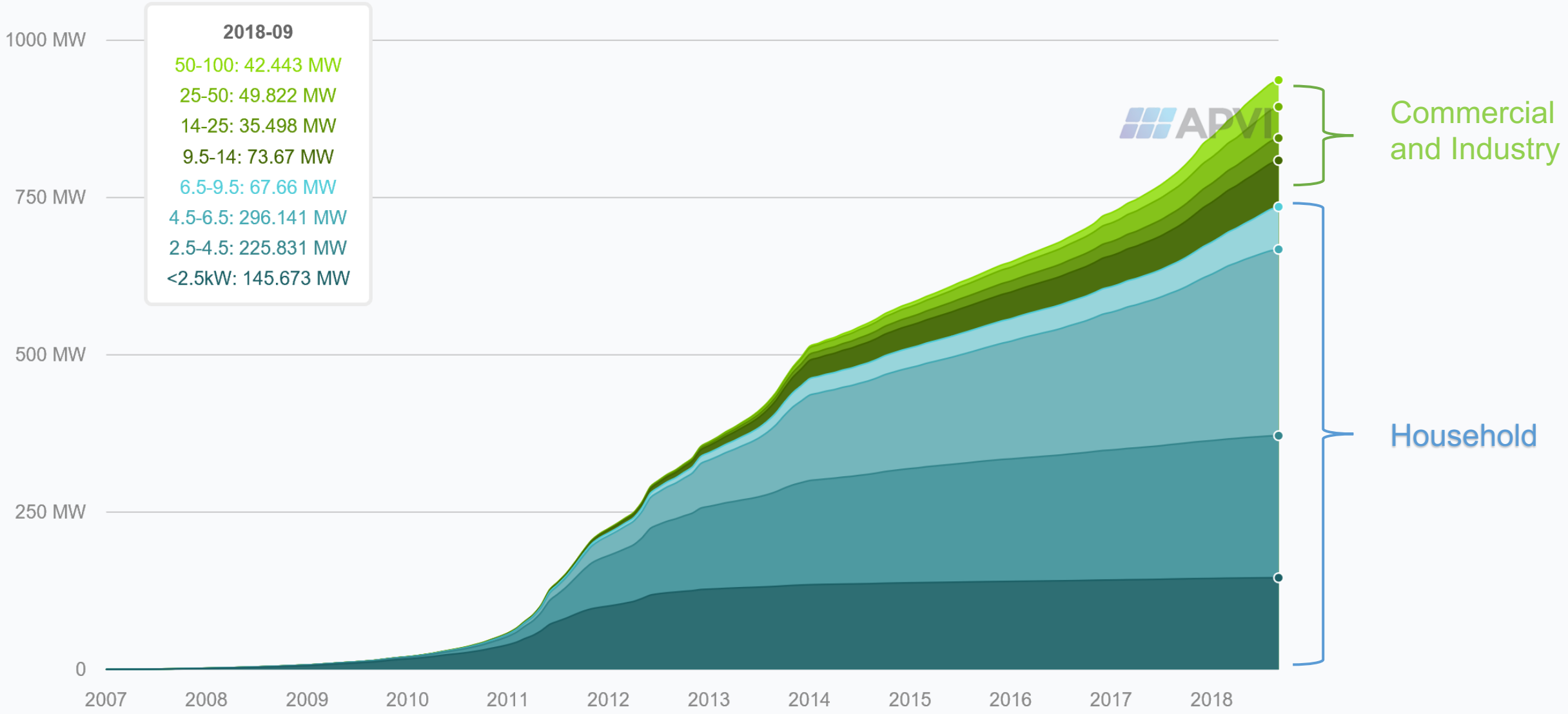

Capital Investment in SA Renewables 2004 - 2017

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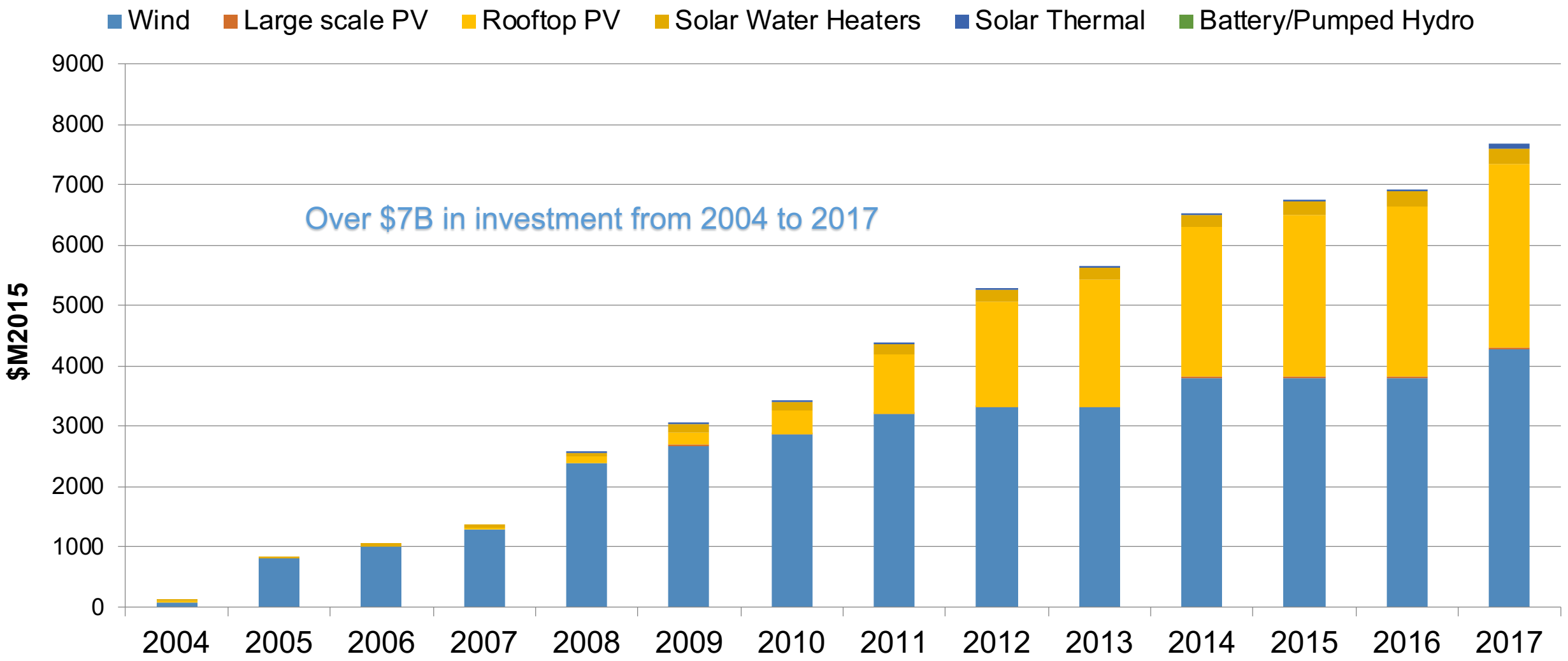

Source: Jacobs 2017

Large scale renewable and energy storage pipeline in SA

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Under construction or development

- 2,700MW wind
- 4,700MW utility solar PV
- 1,500MW battery
- 1,400MW pumped hydro

Circa $15Bn worth of investment

Electricity generation costs turned on its head < 10yrs

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86% decrease in the cost of Solar from 2009 to 2017

And 66% decrease in the cost of wind

Summary Findings of Lazard's 2017 Levelized Cost of Energy Analysis(1)

Selected Historical Mean LCOE Values(2)

Source: Lazard estimates.

Note: Reflects average of unsubsidized high and low LCOE range for given version of LCOE study.

(1) Primarily relates to North American alternative energy landscape, but reflects broader/global cost declines.

(2) Reflects total decrease in mean LCOE since the later of Lazard's LCOE—Version 3.0 or the first year Lazard has tracked the relevant technology.

(3) Reflects mean of fixed-tilt (high end) and single-axis tracking (low end) crystalline PV installations.

Opportunities and Challenges from the Energy Transition

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Challenges for SA of a high renewables grid

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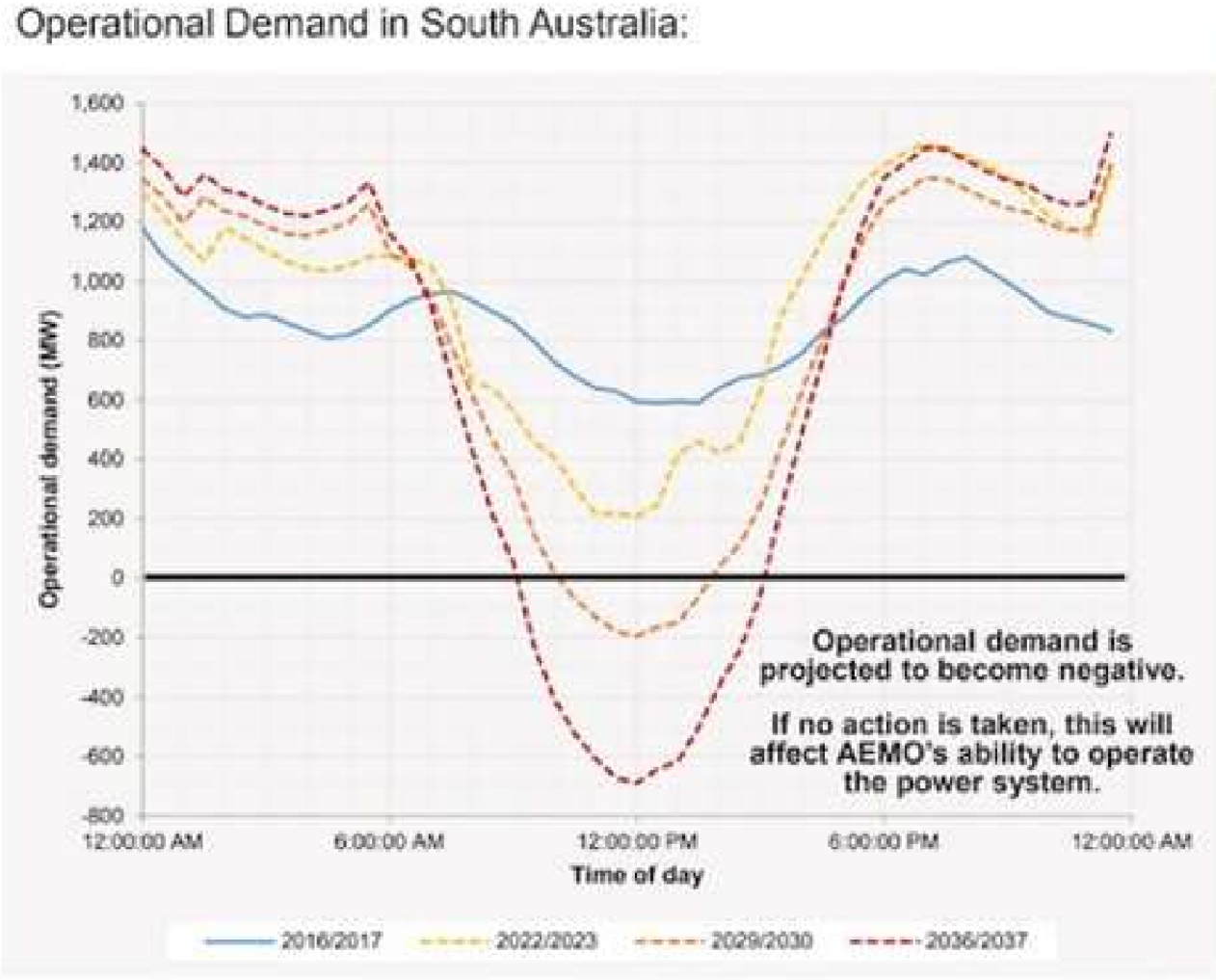
- Intermittency
- Managing peaky demand
- Technical constraints
- Affordable power



SA has World Class Wind and Solar

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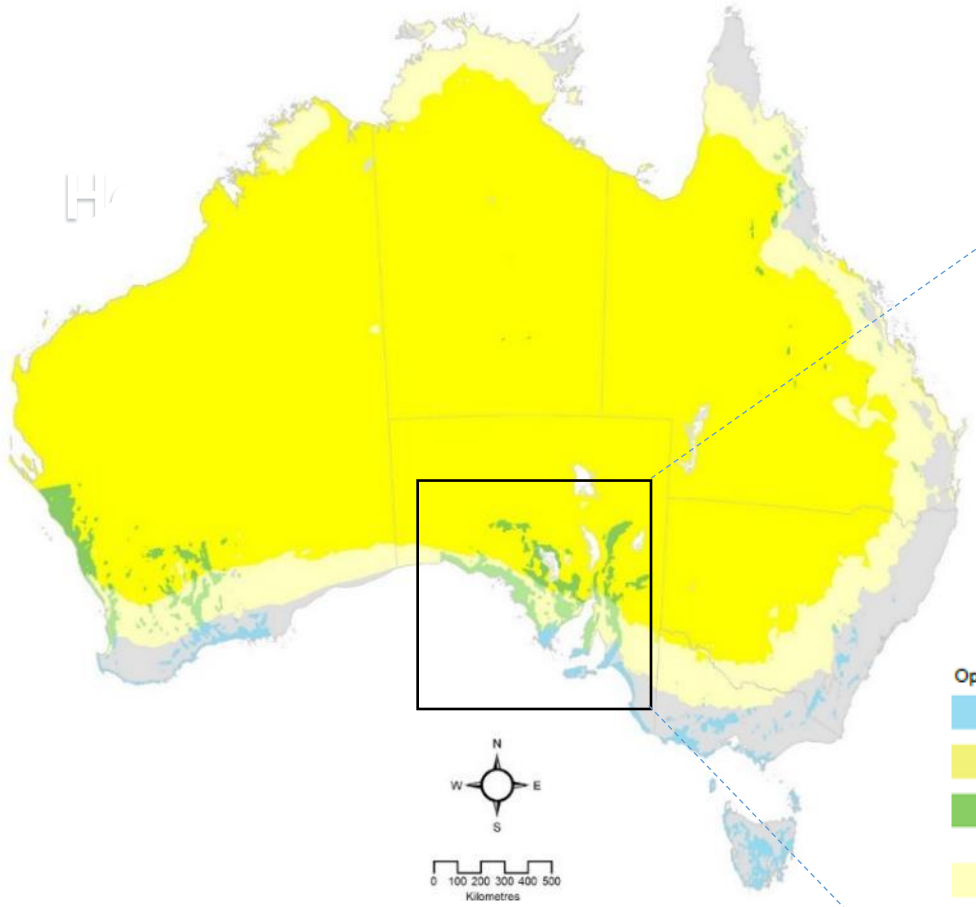

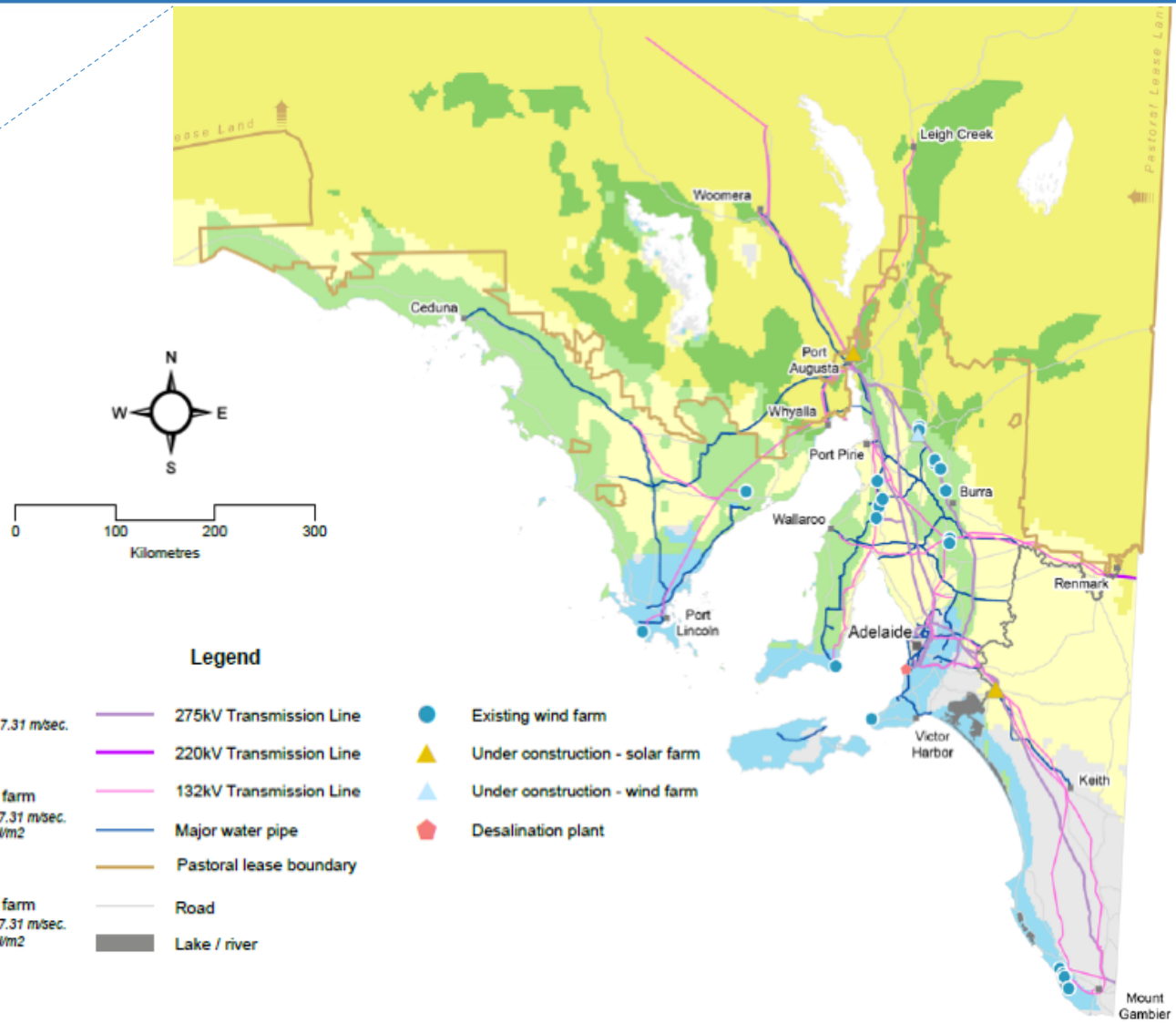

Low Carbon Business and Export Opportunities for SA

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- Further develop an energy storage industry
- Grow and attract energy intensive industries
  - Hydrogen, ammonia, chlorine (i.e. green chemicals)
  - Mining and minerals processing (i.e. green minerals)
  - Data centres (i.e. green ICT)
- Electrify transport (battery or fuel cell EV)
- Export power interstate
- Export renewable energy overseas as hydrogen
- Grow supply chains including research and innovation capacity in relation to all of the above

Implications for Mining

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Grid Connected Mines

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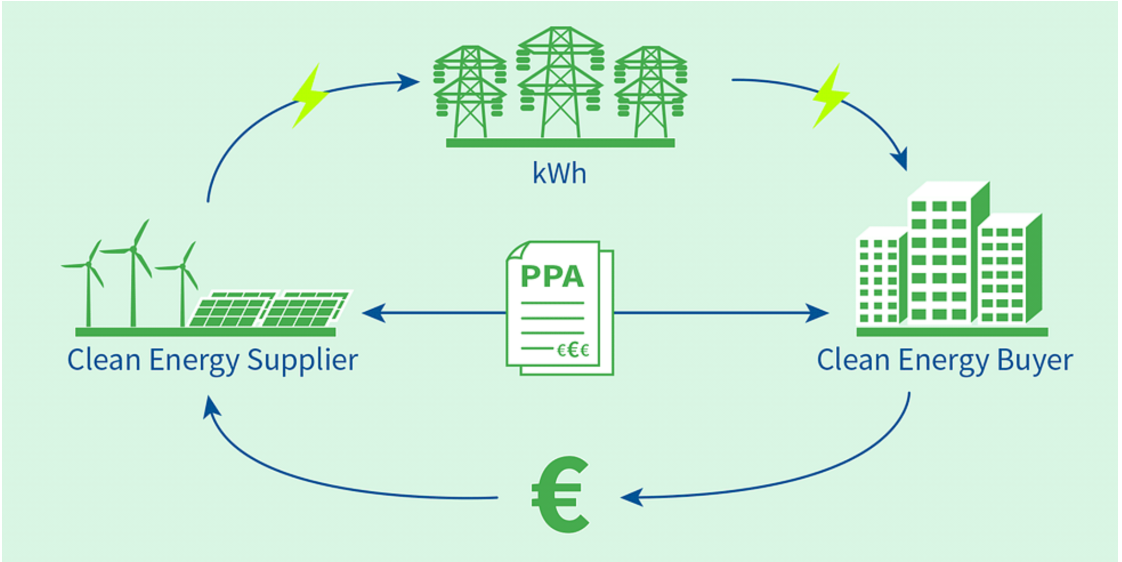
- Factors affecting electricity **Affordability**
  - Greater competition
  - Greater availability of PPAs
  - Supply/demand Volatility
  - Baseload retirements
  - Increased Interconnection



- Reliability
- Security

Off grid Mines

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Incorporating renewables and storage

- Falling cost of renewables vs diesel
- Mine life
- Logistics
- Running a hybrid power system
- Changing mindsets
- Reducing emissions

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