iGrid
intelligent grid
an Australian research collaboration

UNIVERSITY OF TECHNOLOGY SYDNEY
Institute for Sustainable Futures

Distributed Energy and the I-Grid Program: Prospects for a Distributed Energy Future

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National Research FLAGSHIPS Energy Transformed | CSIRO | Australian Technology Network of Universities | Curtin University of Technology | QUT Queensland University of Technology Brisbane Australia | The University Of Queensland Australia | UniSA | Institute for Sustainable Futures | University of Technology Sydney

Summary

> The Intelligent Grid Research Program
> Towards a Distributed Energy Future
  – The Challenge
  – The Context
  – The Opportunities
  – Putting it together
> A DE Future Case Study: New South Wales
  or: *“why we do not need a new coal fired power station”*

1. CSIRO Intelligent Grid Research Program:

- 3-Year Collaborative Research Project: July ‘08- June 2011
- 5 universities
  - 1.University of Technology Sydney & ISF
  - 2.University of Queensland (UQ)
  - 3.Queensland University of Technology (QUT)
  - 4.Uni South Australia (UniSA)
  - 5.Curtin University (Curtin)

CSIRO National Research Flagships

> The CSIRO Intelligent Grid Project is funded by

The Flagship Collaboration Fund

> A$114.5 million to 2011 to reinforce the development of collaborative partnerships.

> The CSIRO Intelligent Grid project fits into

> **CSIRO's Energy Transformed Flagship**

> Funding: $9.5 million ($3.4m from CSIRO)

CSIRO Energy Transformed Flagship

BHAG

(Big Hairy Audacious Goal)

"…focusing on research to halve GHG emissions and double the efficiency of Australia's new energy generation technologies"

Four Themes:

- Energy Futures
- Low Emission Electricity
- Low Emission Transport
- **Distributed Energy**

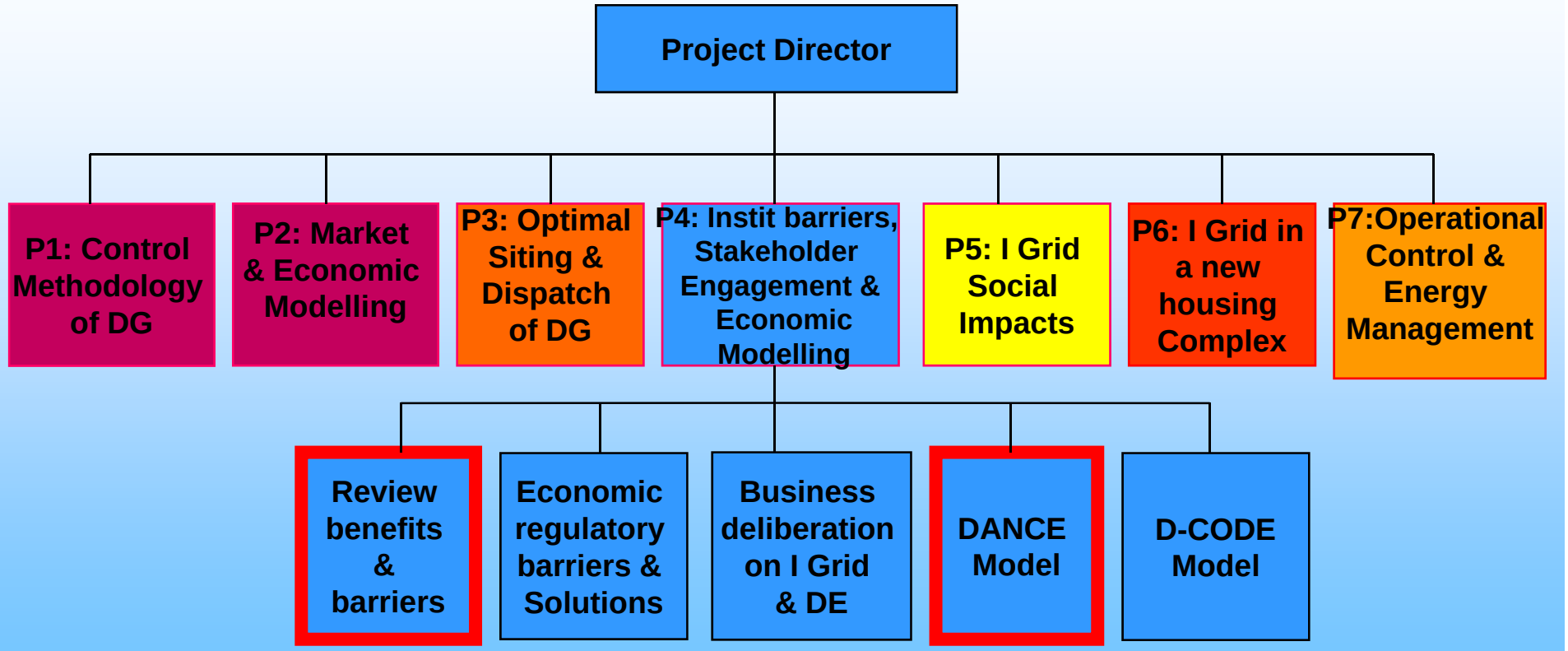
“Intelligent Grid” and “Distributed Energy”

- **Intelligent Grid:**
  - *Using information, communications and control technologies to integrate the electricity network with “distributed energy” resources*
- **Distributed Energy:**
  - *Decentralised generation and use of energy -e.g, solar panels, micro turbines, fuel cells, cogeneration, demand management, smart meters, dynamic pricing*

I Grid Research Projects

	Univ	*Focus*	*Project*
P1	*UQ*	*Technol*	***Control methodologies*** *of Distributed Generation for enhanced network stability and control*
P2	*UQ*	*Econ*	*Market and* ***Economic modelling*** *of the impacts of Distributed Generation and Local Co-operating agent based Demand Side Management*
P3	*QUT*	*Technol*	***Optimal Siting*** *and Dispatch of Distributed Generators*
P7	*QUT*	*Technol*	*The operation of* ***DG in a mini grid***
P4	***UTS***	*Econ*	***Institutional Barriers,*** *Stakeholder Engagement and Economic Modelling*
P5	*Curtin*	*Social*	*Intelligent Grid* ***Social Impacts***
P6	*UniSA*	*Social*	*The Intelligent Grid in New* ***Housing estates***

I Grid Research Program Structure

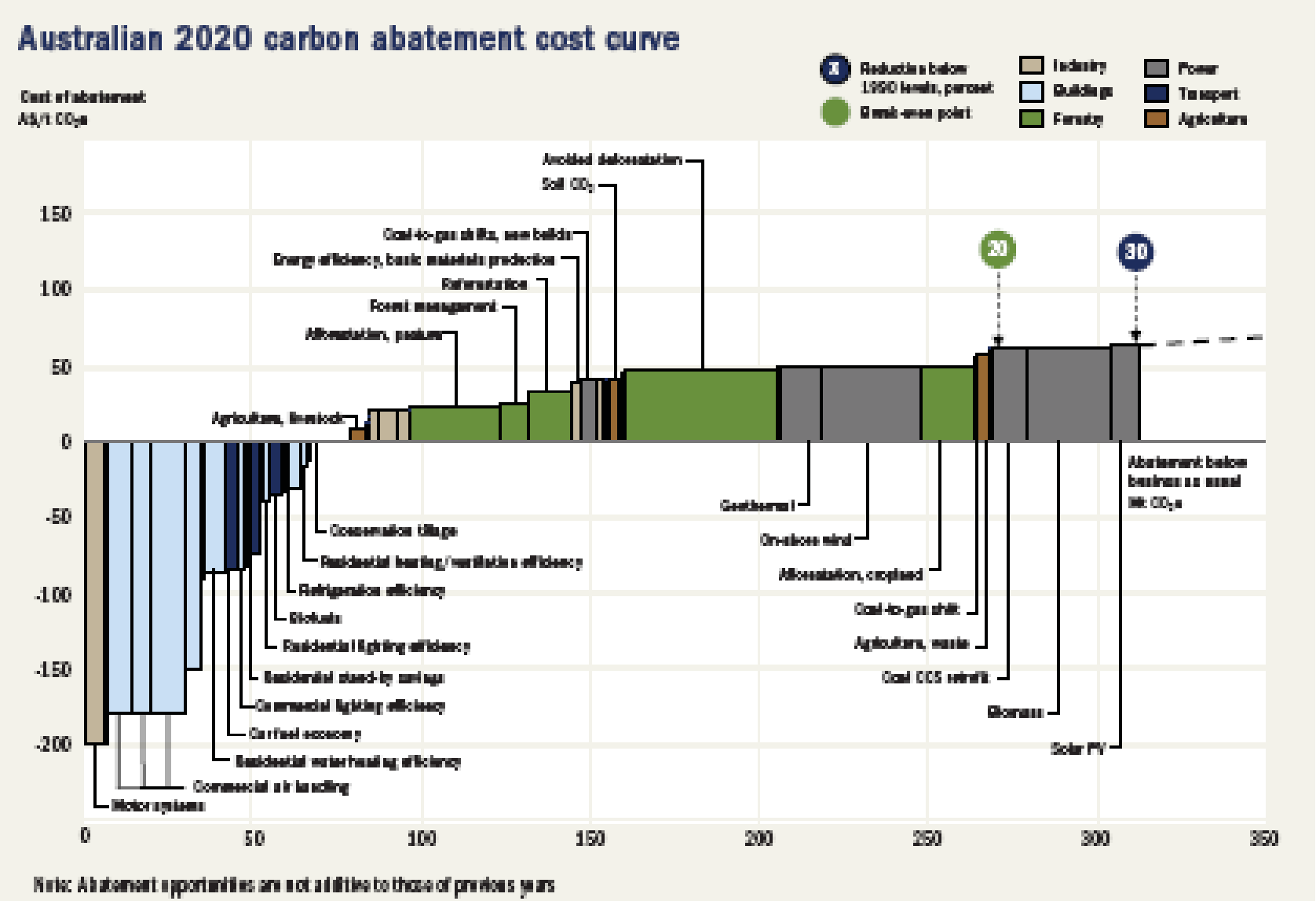


2. Towards a Distributed Energy Future

The Challenge

- Community strongly believes in the need to change our energy choices, but…
- Many of our institutions are oriented to continuing existing choices e.g. coal fired power stations, major new network investment, etc

2. Towards a Distributed Energy Future

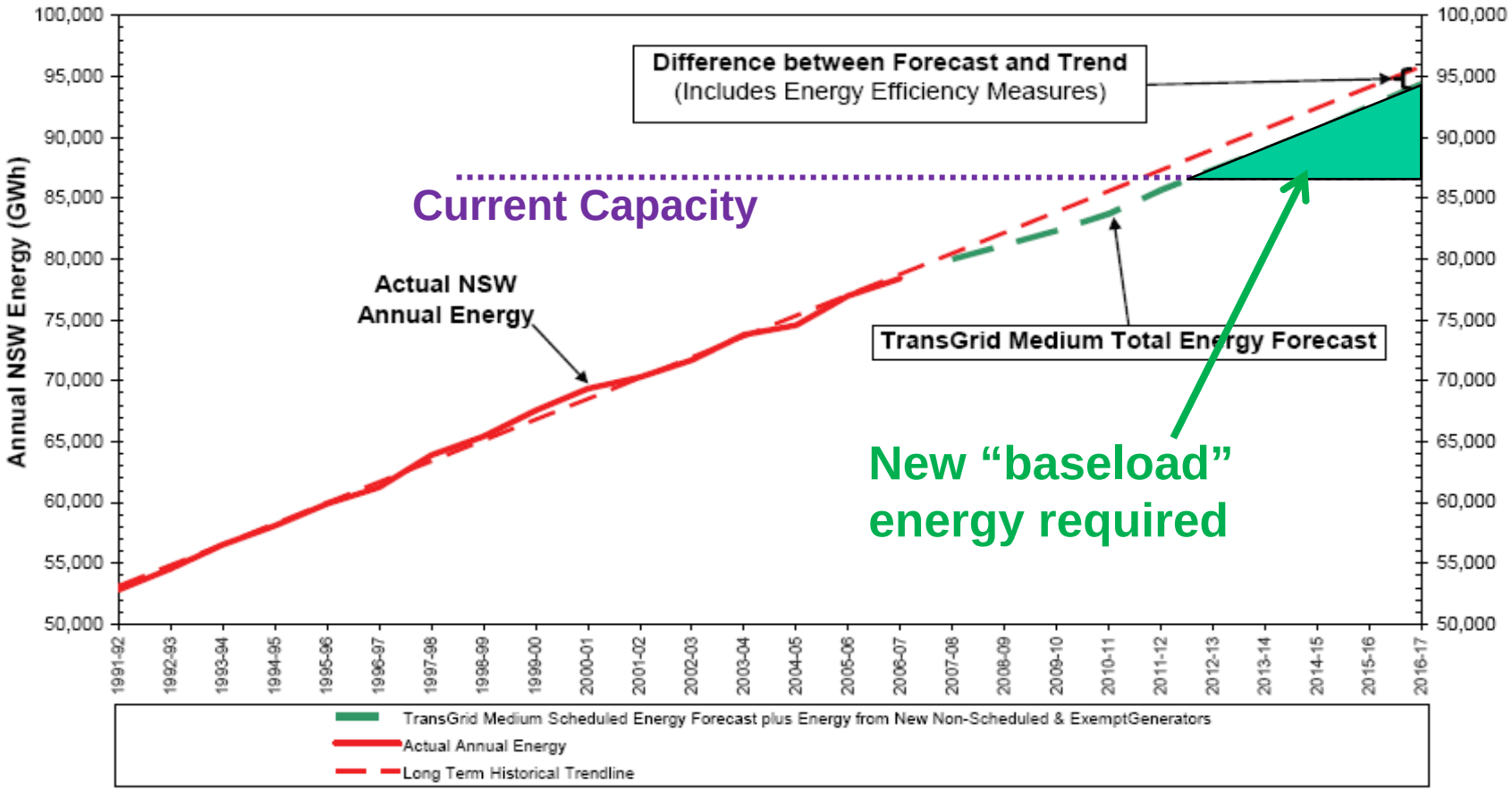


> Let’s look at DE not from a GH point of view but from an electricity system planning point of view

2. Towards a Distributed Energy Future

The Context

Figure 2.1: Actual and Forecast Energy Consumption in NSW, 1991-92 to 2016-17



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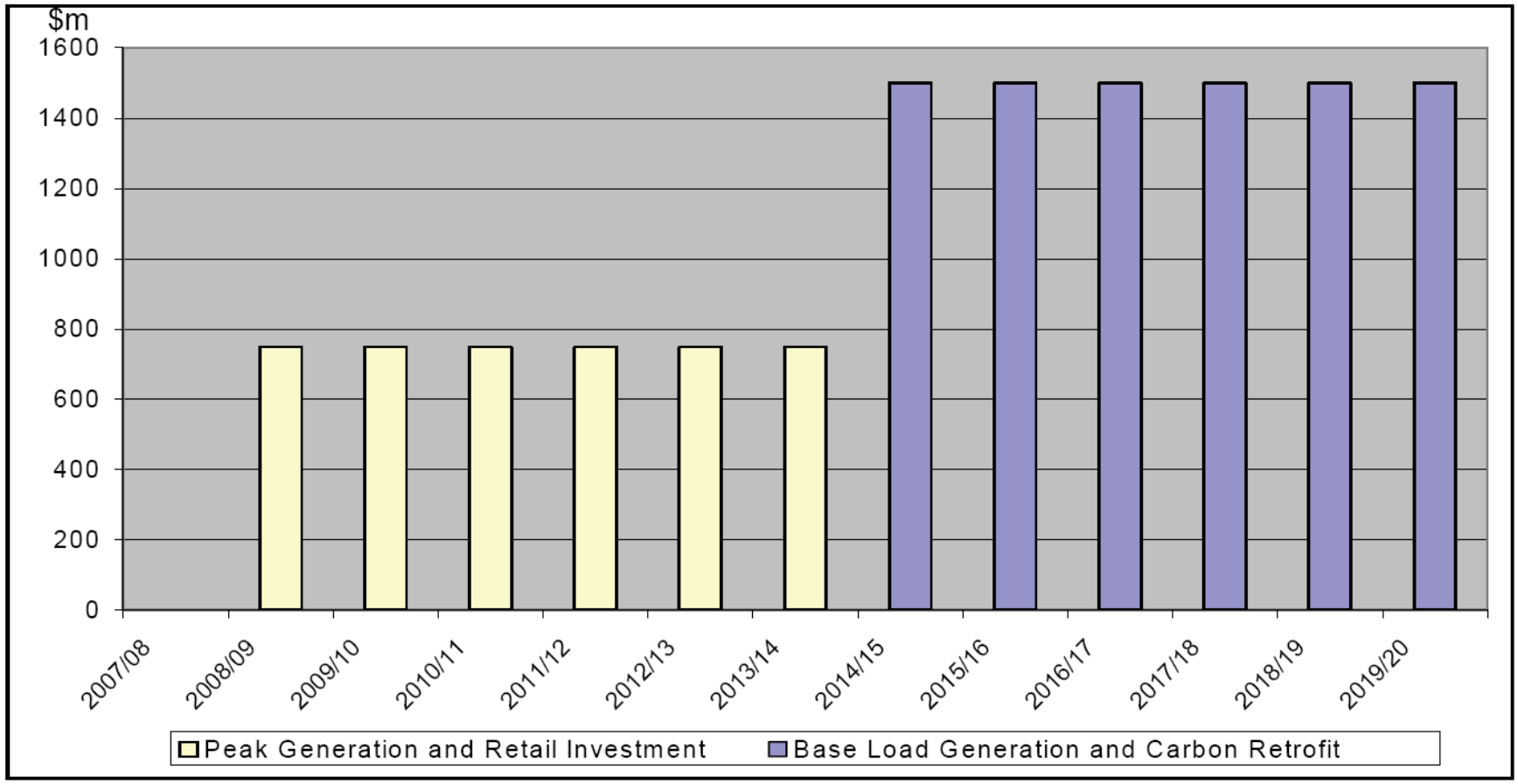
New NSW Generation and Retail Costs to 2020: $12-15 Billion

New NSW *Network* Capex Costs *to 2014*: >$15 Billion

Figure 6.1.1: Cost of NSW Emerging Generation Needs[7]

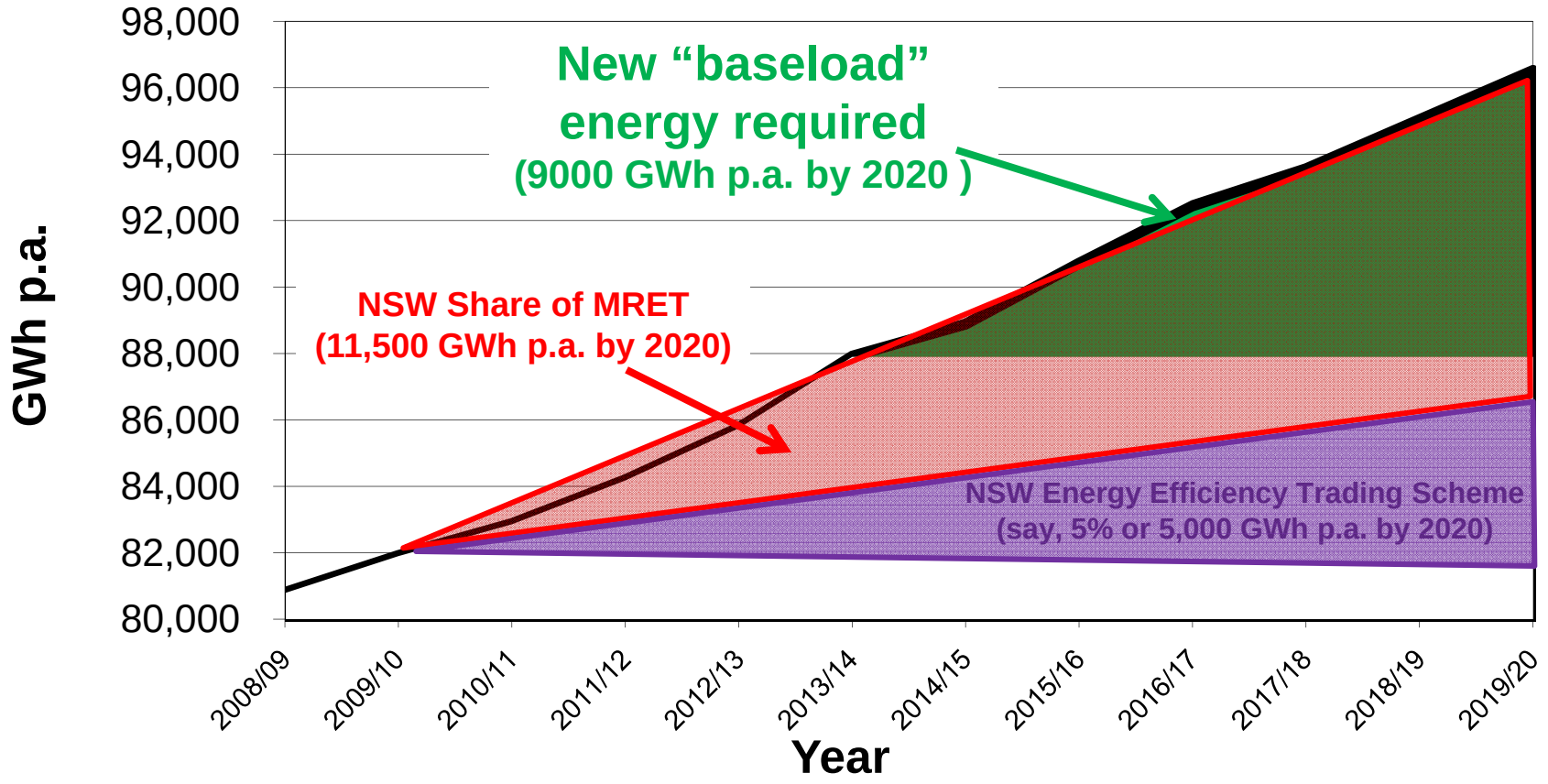


Source : Owen Inquiry

2. Towards a Distributed Energy Future

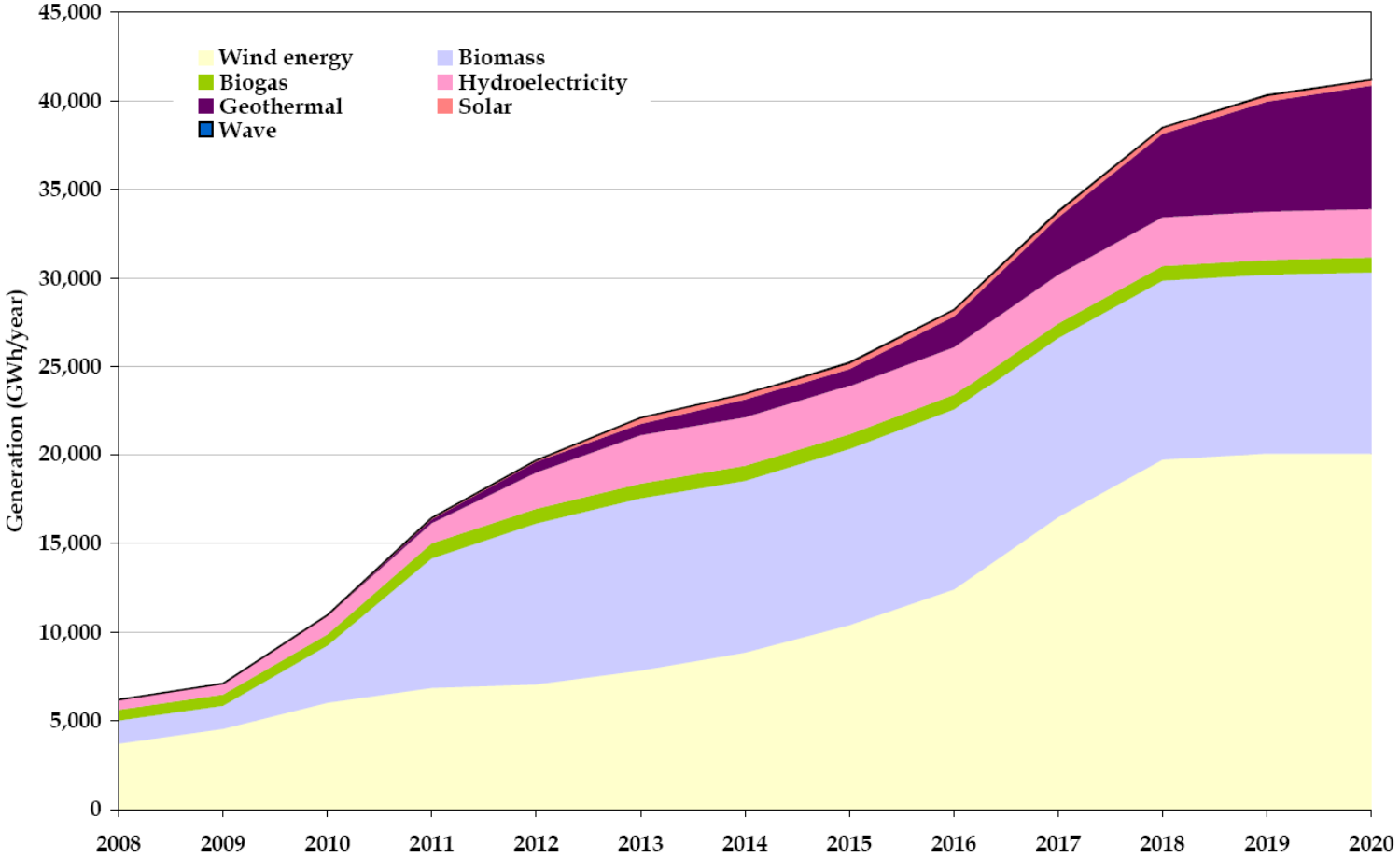
The Context

If policy is implemented-
There is no Energy Gap



Meeting the New MRET Target (45.000 GWh p.a by 2020)

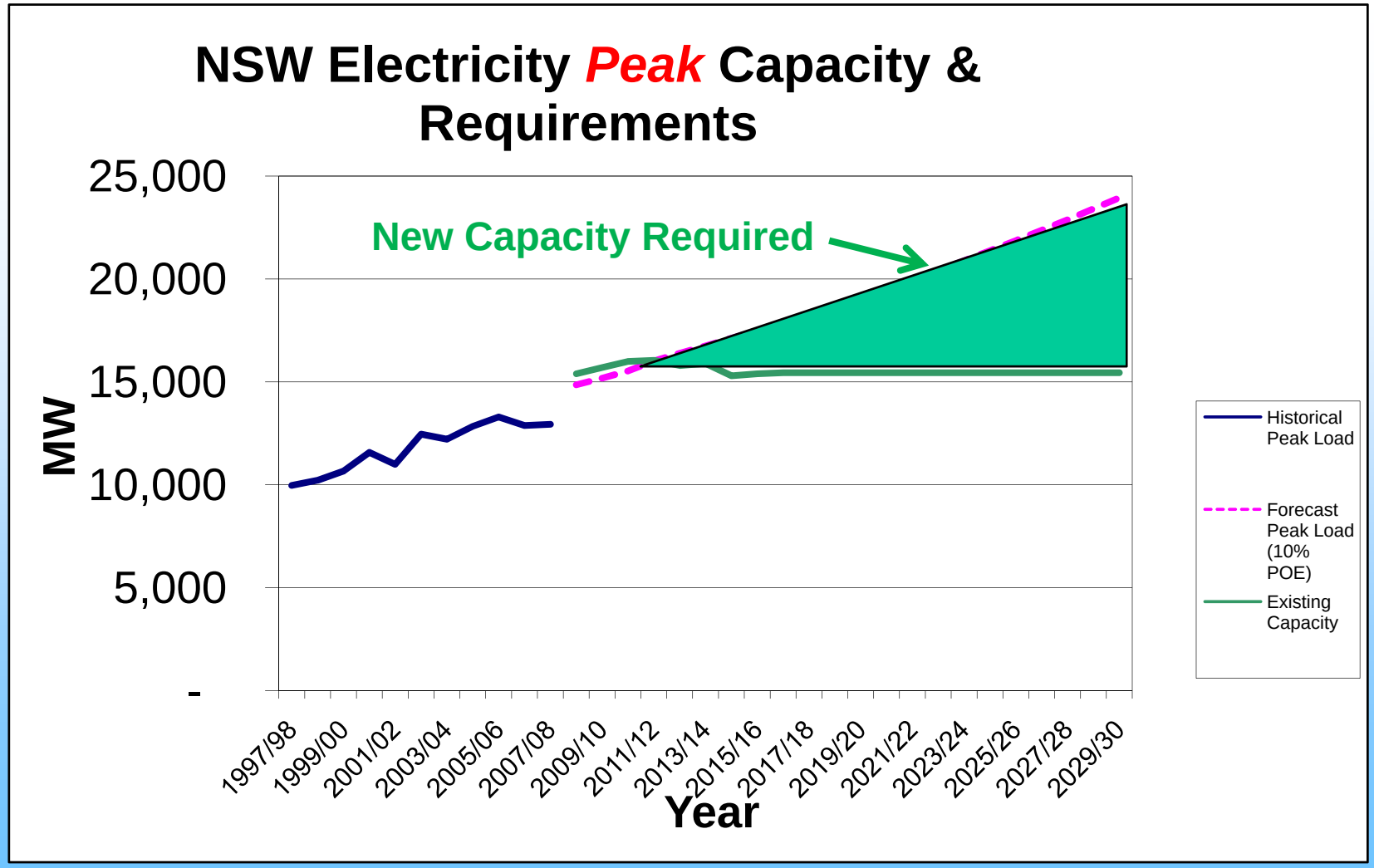
Figure 1-1 Projected generation of renewable generation – BAU (GWh/year)



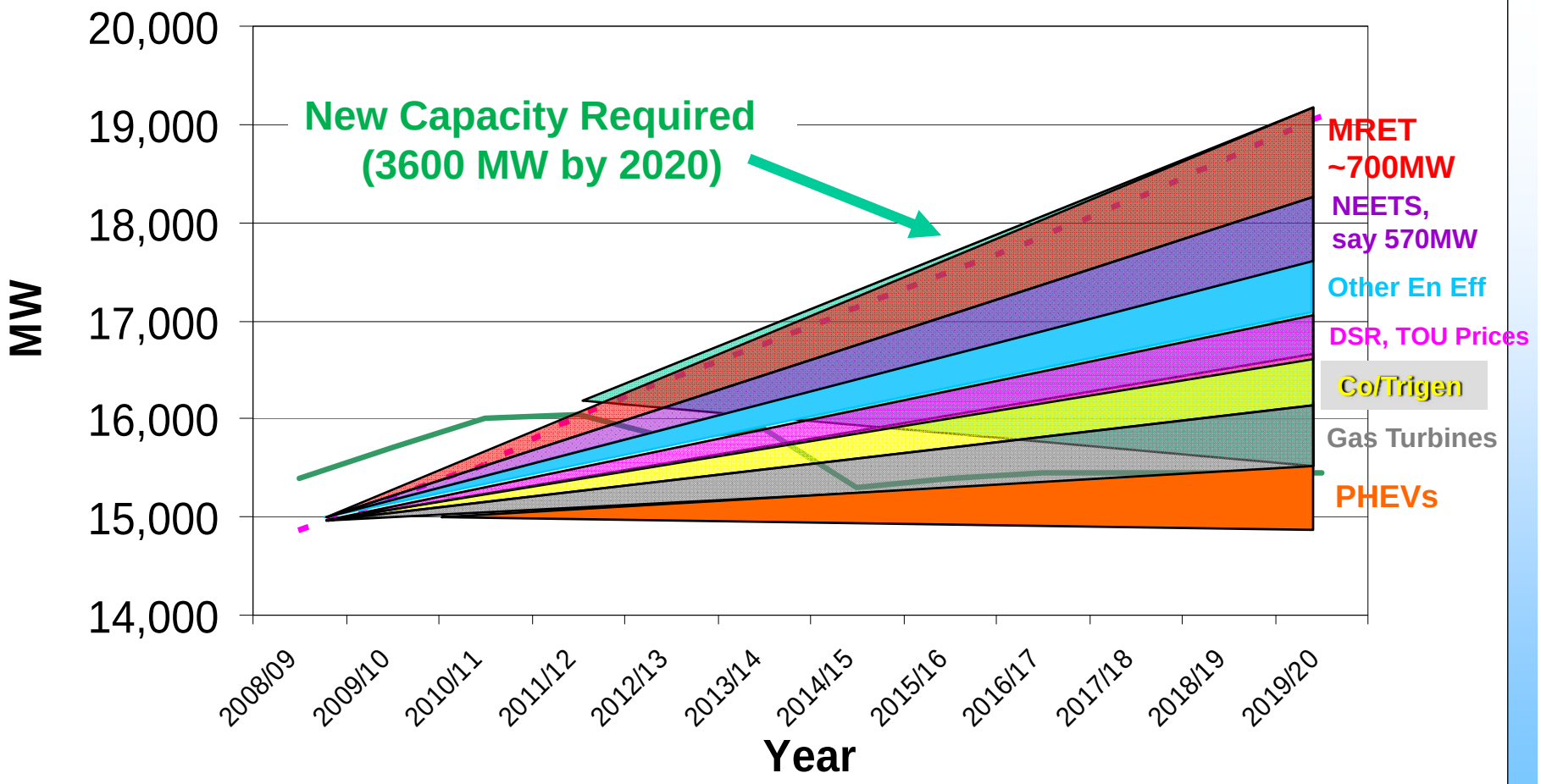
http://www.climateinstitute.org.au/images/Emissions_model/renewableenergymethodology.pdf

2. Towards a Distributed Energy Future

The Context - What about peak capacity?



NSW Electricity *Peak "Indicative Wedges"*



Conclusions

- Cost of continuing centralised power paradigm is likely to be >$40 billion by 2020
- If Federal and State Governments implement MRET and Energy Efficiency policy commitments then there is no need for new (baseload) Coal power stations
- We need to focus more on
  - Peak Capacity and
  - Network Investment
- Cost of a distribute energy future likely to be significantly lower
  - (even before accounting for greenhouse savings!)

Intelligent Grid **a key enabler for…**

Distributed Energy **a key enabler for…**

Greenhouse Gas Emission Reduction

Thank you.

For more information on the I Grid Research program:

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iGrid

CSIRO Intelligent Grid Cluster

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- About us – research program
- Research projects
- Research teams
- Engaging stakeholders/industry

news and events

- First stakeholder process November 2008

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Home

What is an Intelligent Grid?

The Intelligent Grid Research Program is an Australian collaboration between five universities investigating technologies and practices to make our electricity networks smart, greener and more efficient.

The electricity "grid" is a collective name for all wires, transformers and infrastructure that transport electricity from power plants to users. In all networks, some energy is lost as it is travels, making distribution inefficient.

An "intelligent" electricity grid has a minimal amount of waste and a highly efficient use of power. It is an electricity network that uses distributed energy resources and advanced communication and control technologies to deliver electricity more cost-effectively, with lower greenhouse intensity and in response to consumer needs.

Distributed energy means, smaller forms of electricity generation and management of energy use combined to balance out the load of all the users on the system. For example, distributed energy resources could involve heating, cooling and powering a commercial building using a combination of solar panels, micro turbines, fuel cells energy efficiency and load control.

Small generators include wind turbines, solar panels, micro turbines, fuel cells and cogeneration (combined heat and power). These types of energy sources can be closer to the users, rather than one large centralised source a long way away. Some rely on renewable energy with no greenhouse emissions and others make more efficient use of conventional power generated from coal.

Advanced types of control and management technologies for the electricity grid can also make it run more

www.igrid.net.au