"Electric power systems embody the physical, intellectual, and symbolic resources of the society that constructs them...electric power systems, like so much other technology, are both causes and effects of social change.” (Hughes, 1983, p2)

“Many fundamental technical choices – such as choices about system design and programmatic development – have significant and inseparable political dimensions” (Hecht, 2009, p338)
Big data and decision making in the electricity sector

“Data will play a dominant role in the future energy value chain” (PWC, 2014, Utility of the Future, p2)

Fixing the grid

THE PROBLEMS:
- Electric grid is outdated
- Small fluctuations become big outages
- Political and economical challenges

THE SOLUTIONS:
- Real-time monitoring
- Smart, self-healing technology
- Sensors and two-way communication
- Data analysis

Changes underway in Australia’s electricity sector

1. Demand from the grid
2. Pricing & tariffs
3. Household rooftop solar
4. Technological innovation

Big data viewed as helping to manage change

BUT.....*its not all big data*: exploring a case of scarce data

What I will cover
1. the *Death Spiral*
2. Scarce Data
3. Off grid households in Tasmania
4. Implications for decision making

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1. The death spiral

Households leaving the electricity grid in Australia using rooftop solar and battery storage
2. Scarce Data?

Lack of data identified as an issue in off-grid policy & research reports

- shortage of data on who is already off grid
- future scenarios not based on actual data

“Data on the number of installed battery storage systems is hard to find”
(CEC, 2015: 6)
"We assume that domestic scale battery systems are available in 0% of detached dwellings in 2015" (CSIRO & Roam Consulting, 2013: 28)

“Practically no households have yet taken up domestic storage technology independently.” (Marchment Hill, 2012: 38).
Scarce data is a barrier to effective decision making.

“A common pattern is that outsiders and entrepreneurs nurture and develop radical innovations... ‘below the surface’ of incumbent regime[s].” (Geels, 2010: 498)
3. Off grid households in Tasmania

Several different research approaches used to source off grid data for Tasmania

**Whole of market data**

- *TasNetworks* data on cancelled new connection applications (2012+)
- Phone survey of specialist installers & architects in Tasmania [9]
- Clean Energy Regulator, Clean Energy Council, Department of State Growth, OTTER, Sustainable Living Tasmania, Living Off Grid Tasmania

**‘Bottom up’ survey of householders**

- online survey [c20], & follow up phone interviews and home energy tours [10]
New electricity connection applications
TasNetworks % of applications cancelled

365 cancelled out of 4484 total applications
Evidence from specialist installer survey

- Some households making the choice for financial reasons
- Generous sizing of systems so provide reliable electricity supply without behavioural changes
- Not necessarily technical enthusiasts nor environmentally motivated
- But diversity of motivations remain

“Mostly they want to reduce their bill, because it costs so much to connect the grid to the building site.” [Installer #1]

“People are choosing to go off grid because it is financially better than connecting.” [Installer #2]

“People are off grid mainly because of the cost of connection to TasNetworks” [Installer #3]

“There is increasing interest in adding battery storage to grid connected systems” [Installer #5]
Online survey of Off Grid Households

https://www.surveymonkey.com/r/28PNGLN
Home energy tours
“The cost of going off grid with my new build was the same as having the power connected. I am living exactly as I had been in my previous houses, except when the weather's a bit dull... I don't turn off any stand-by on my appliances, lights are on whenever I want, I watch TV whenever, I boil the jug for tea often and all appliances are standard. My system is state of the art and cost less than $20,000.” [survey respondent #11]

“I have a very simple lifestyle (e.g. no fridge) - maybe it would not suit many people” [survey respondent #10]

“It simply wouldn't suit some peoples’ lifestyle if they are used to lots of modern appliances of high wattage. However if someone was thinking about it I would be happy to recommend it if they were looking at simplifying their life.” [survey respondent #6]

“housework that requires power e.g. washing machine, dishwasher, vacuuming and ironing is done during the day not at night.” [survey respondent #4]
How many households are currently off grid in Tasmania?

200 to 10,000 households
4. Implications for decision making

- Focus on big data can blind us to situations of scarce data
- Scarce data increases uncertainty and risk
- Exploratory data gathering a worthwhile activity
  - helps avoid policy crises
  - qualitative and quantitative data equally important

There are known knowns. These are things we know that we know. There are known unknowns. That is to say, there are things that we know we don't know. But there are also unknown unknowns. There are things we don’t know we don’t know.

— Donald Rumsfeld —
Thank you

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Tasmania off-grid household survey:
https://www.surveymonkey.com/r/28PNGLN