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Microgrids blockchain and peer to peer

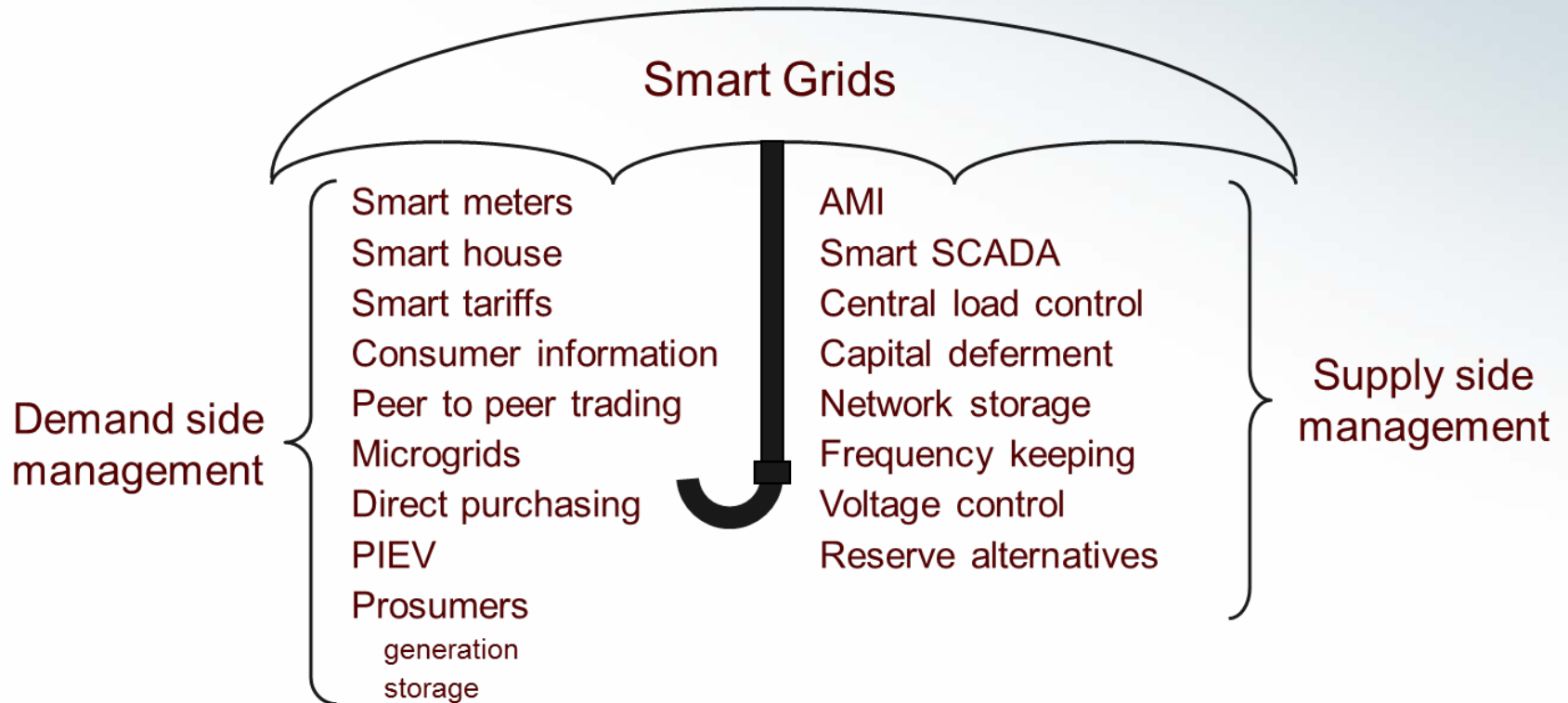
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COMPETITION • RELIABILITY • EFFICIENCY

NEW TECHNOLOGY

- Digitalisation has already had a huge impact on the energy sector
 - we are only at the start of a technology revolution that will rip apart any business that is too slow to embrace it
 - the revolution is driven by a combination of technologies from cloud, analytics, mobile, to cheap sensors.
 - technologies are putting data and intelligence at the centre of new business models
- Smart.....

NEW TECHNOLOGY



- Microgrids, blockchain/peer to peer are just some of the new technology concepts surfacing
- However the concepts are not that new

MICROGRIDS

- Microgrids can be defined as an electricity network or electricity installation that acts as a single controllable entity and that
 - contain a system of conductors conveying electricity that is not directly connected to the grid
 - may have connection to other networks or microgrids or may be islanded
 - may contain any form, number and capacity of embedded generation
 - may contain any type and number of consumers
 - may or may not have competitive retail activity
 - may contain energy storage
 - may have its own centralised or distributed load control systems to optimise internal generation/storage aka “smart grids”
 - may have a variety of ownership models including private, community, institution etc
- Growing interest worldwide in microgrids as community groups seek to become more self sufficient

MICROGRIDS

- New Zealand defined secondary networks are then microgrids
 - current regulation allows secondary networks to operate
- But there are new types possible – notional microgrids
 - collective group that may be disparate where members elect to join or leave
 - lot of similarities between notional microgrids and peer to peer trading
- There are, as at 30 November 2016
 - 196 POCs and for 47 embedded network owners
 - an unknown number of network extension owners
 - an unknown number of customer network owners

BLOCKCHAIN

- Blockchain technology is complex, but the idea is simple. At a high level, it
 - is a decentralised ledger, or list, of all transactions across a peer-to-peer network, running on millions of devices and open to anyone
 - is secure due to the number of copies running on devices
 - enables smart contracts, immediate settlement using “cryptocurrency”
 - enables buyers and sellers to interact directly without needing a third-party intermediary (banks and financial institutions)
 - could be used for many purposes such as consumer or agent paid access to metering data or services, access to medical records etc
 - is radical rethinking of how we pay for things
- The hurdle - users must be willing and able to change business processes and collaborate with customers, suppliers, and competitors in ways they never have before

PEER TO PEER (P2P)

- P2P energy trading may use blockchain technology to allow consumers to trade surplus energy from solar panels and batteries directly with each other, rather than through a retailer
- P2P enables consumers and purchasers to negotiate directly with each other and determine a value (which could even be \$0)
- Concept not new, similar to MARIA trades between 1 April 1999 to 29 Feb 2004
- However, there are certain challenges with this concept in the way the New Zealand Electricity Market clears physical and financial trades

PEER TO PEER (P2P)

- NZEM has a gross pool model (clauses 14.5 to 14.7 of Part 14)
 - true peer to peer requires a net pool model which existed in NZ until 29 February 2004 (MARIA trades)
- Fast access to metering information is required
 - the non-availability of timely metering information may delay P2P settlement
 - holding metering information in a blockchain may cause privacy concerns
- P2P can work in two ways
 - **physical transaction**
 - kWhs are calculated through the NZEM taking into account transmission and network losses, UFE etc
 - requires a intermediary retailer in the gross pool model, change is expensive
 - **financial transaction**
 - can operate outside of the NZEM as contract for difference on retailer pricing



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