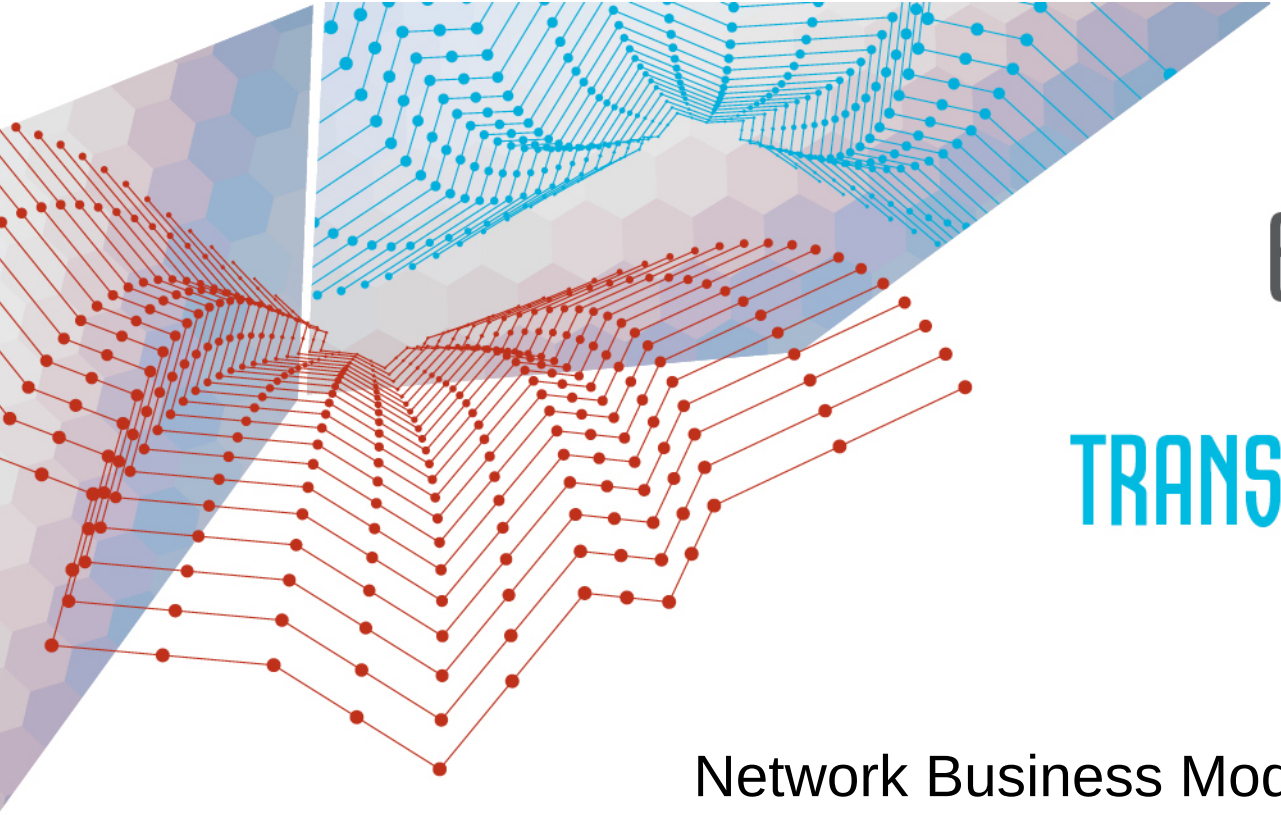


ELECTRICITY NETWORK TRANSFORMATION ROADMAP

2015-25

Network Business Models: Introduction

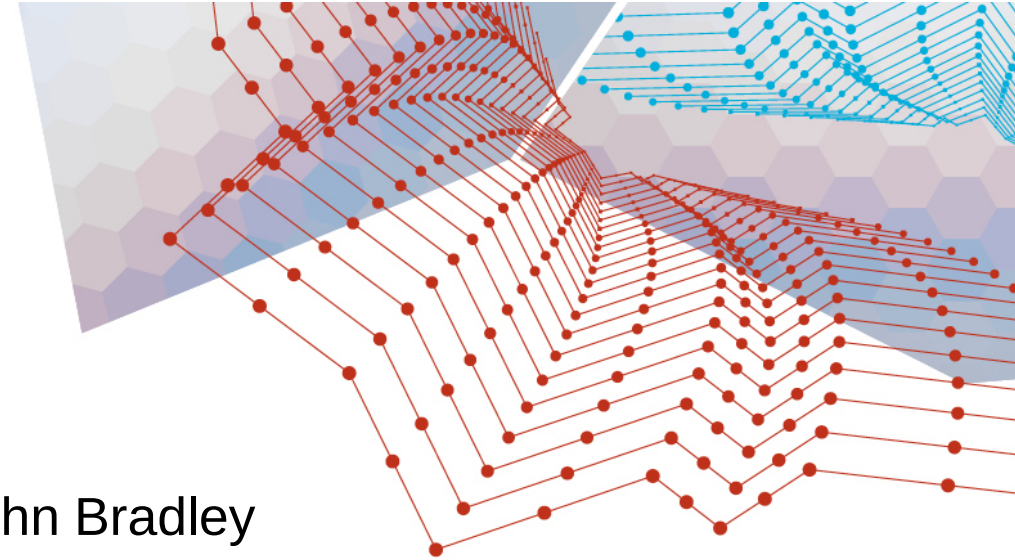
John Bradley, CEO ENA

9 September 2015

ena energy networks association

CSIRO

Outline of Webinar

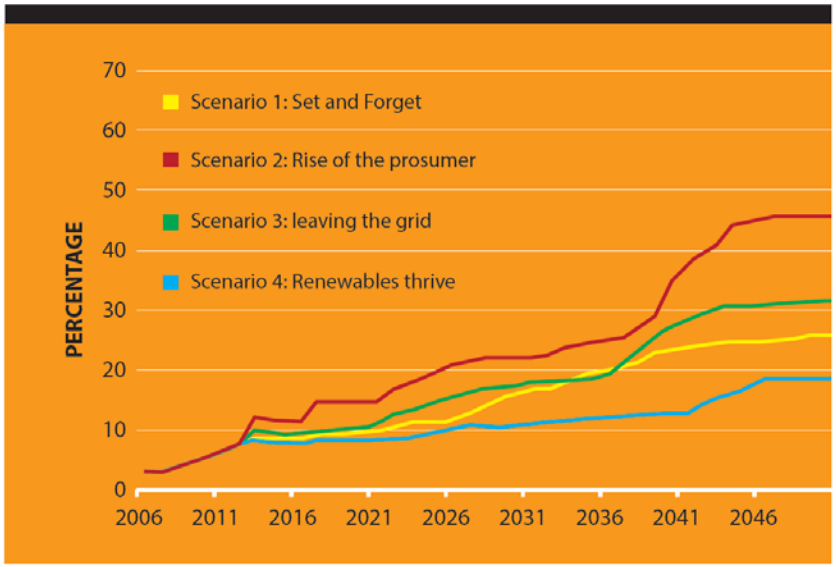


- Introduction and welcome, John Bradley
- Background to the ENA/CSIRO Network Transformation Roadmap
  - Why?
  - What?
- Presentation by Ann Burns, Accenture on their Business model review
- Q&A session
- What happens next? John Bradley

Slide packs and the Accenture report will be provided to participants

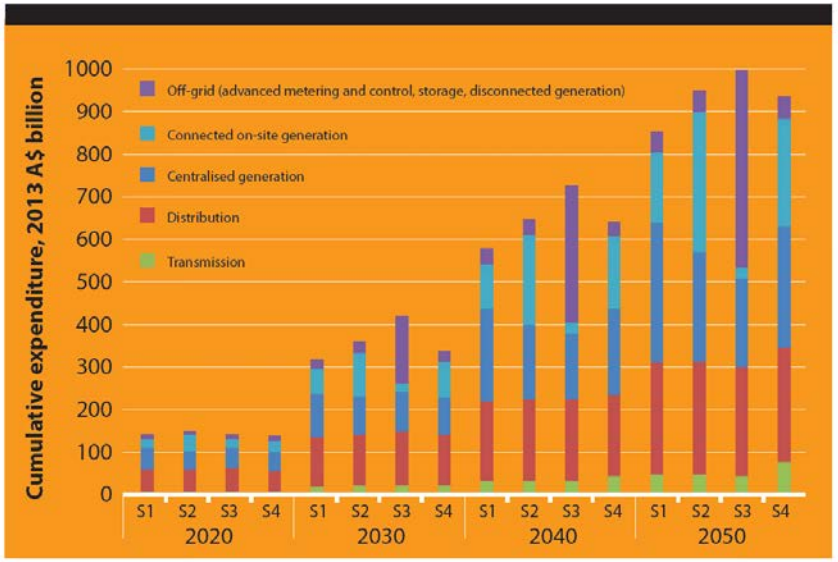
Australia's Great Energy Disruption

FIGURE 1: PROJECTED SHARE OF ELECTRICITY DELIVERED FROM ONSITE GENERATION



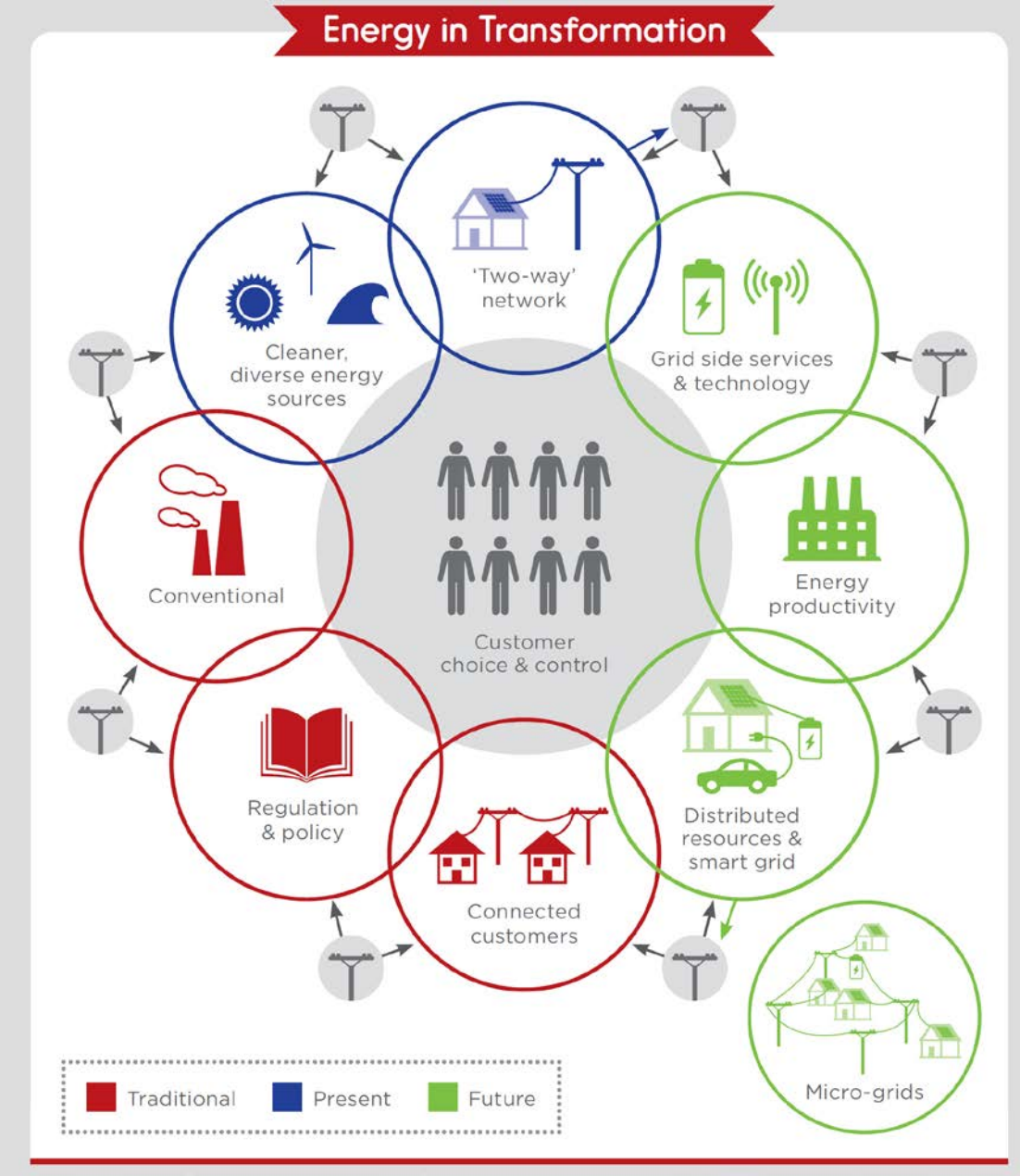
Data sourced from 'Change and Choice' Figure 16, p. 34

FIGURE 2: PROJECTED CUMULATIVE SYSTEM COST BY 2050



Data sourced from 'Change and Choice' Figure 23, p. 44

Australia's Great Energy Disruption




TRANSFORMATION DRIVERS
STRUCTURAL ENERGY EFFICIENCY
ENGAGED CONSUMERS, HOME AUTOMATION, THE INTERNET OF THINGS
MICRO-GRIDS
GHG ABATEMENT
RENEWABLES POLICY
FALLING TECHNOLOGY COSTS
• Embedded Generation
• Storage
• Electric Vehicles
PRO-SUMERS AND DISTRIBUTED ENERGY RESOURCES


KEY PRINCIPLES
ENHANCING LONG TERM ASSET PRODUCTIVITY
CREATING NEW CUSTOMER VALUE
COLLABORATION
INFORMING POLICY & REGULATORY EVOLUTION
EQUIPPING NETWORKS FOR INNOVATION
TRANSFORMATION DRIVERS
STRUCTURAL ENERGY EFFICIENCY
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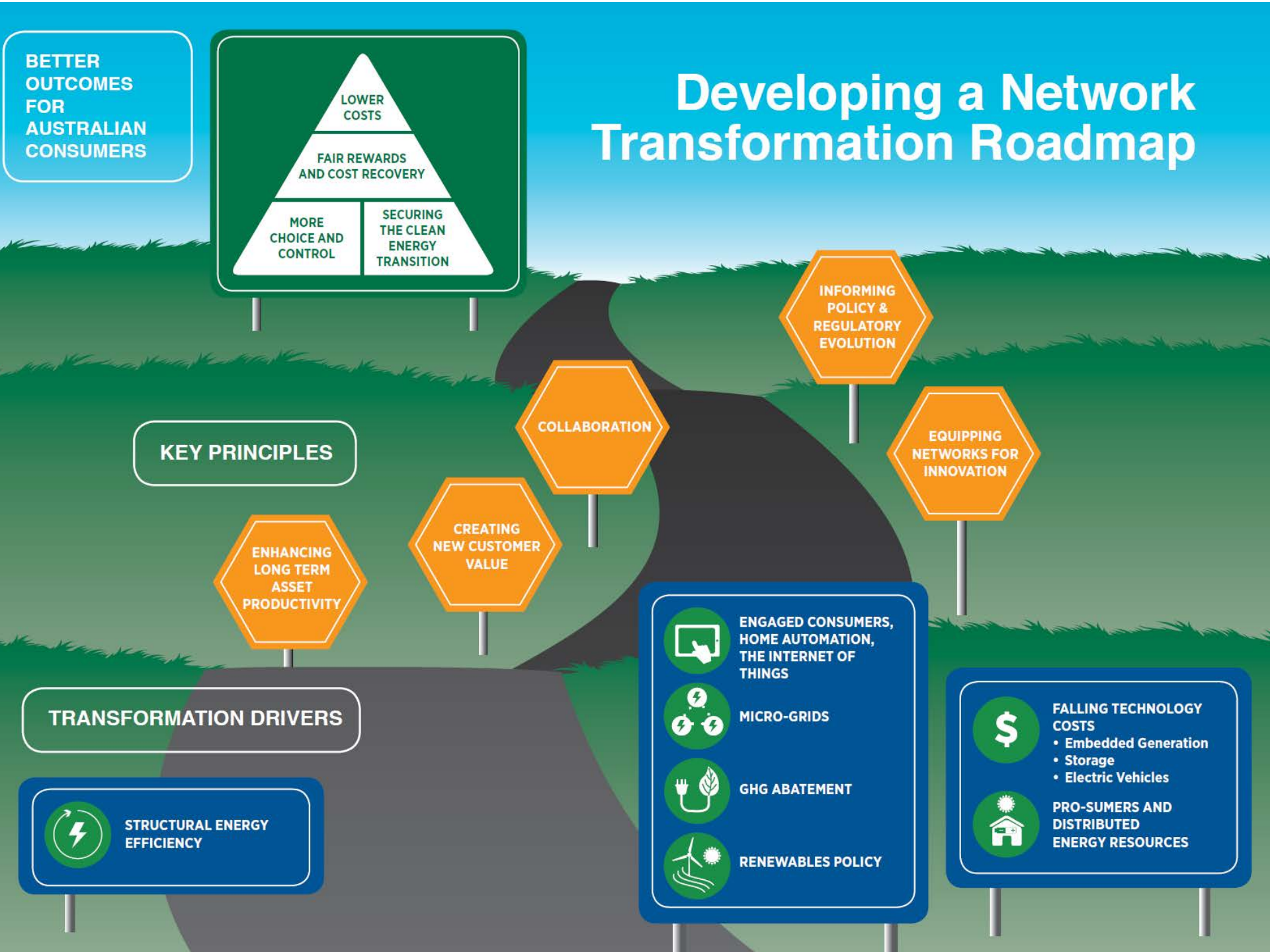
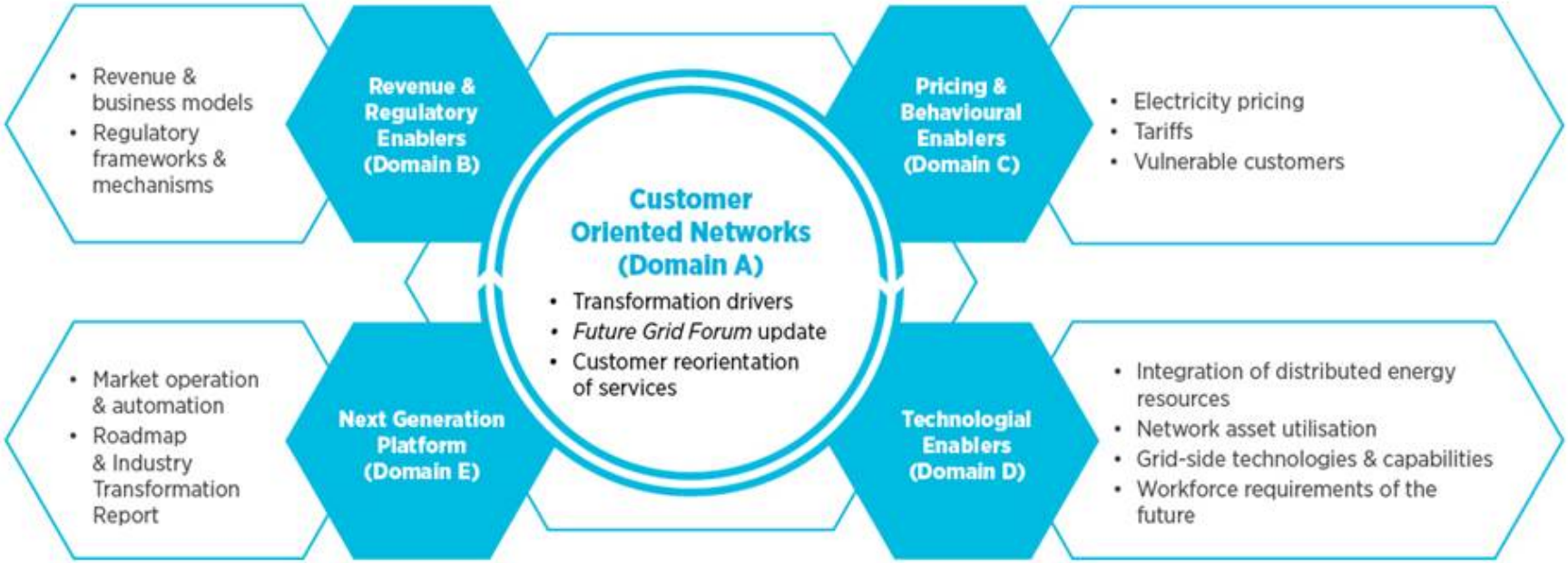
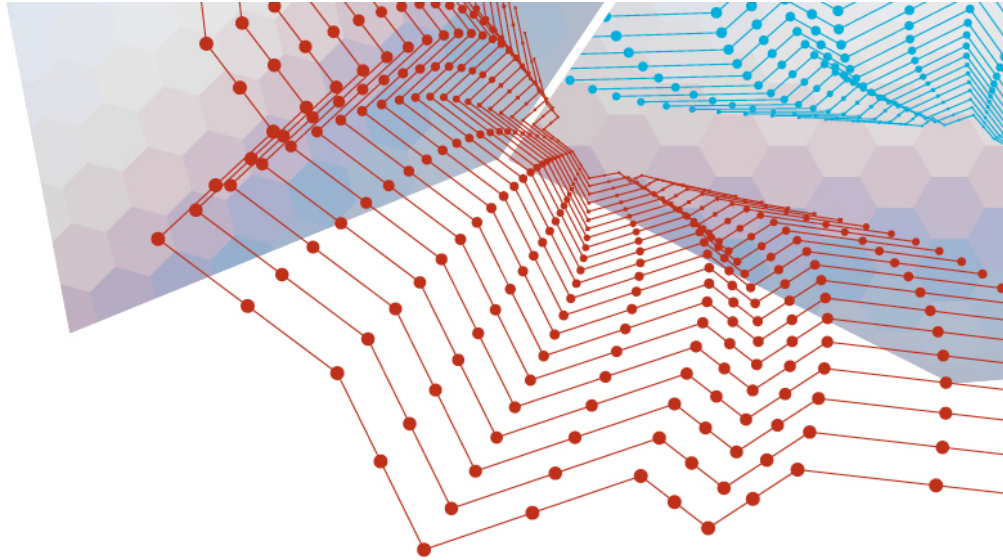
PRO-SUMERS AND DISTRIBUTED ENERGY RESOURCES

Developing a Network Transformation Roadmap



Five Domains to Enable the Transition…





NTR Domain B: revenue and business models

ENA asked Accenture to:

- review potential network business model options;
- identify enablers and barriers to operation of innovative network business models; and
- advise on relevant international experience

Network Business Model Evolution

An investigation of the impact of current trends on DNSP business model planning

High performance. Delivered.

Report

2015

accenturestrategy

Strategy | Digital | Technology | Operations

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Background

The ‘Exam’ Questions:

- **Which utilities globally are experiencing similar issues to the Australian utilities industry?**
- **What can Australian utilities learn from the responses of international utilities?**
- **What Business Models should we consider and explore?**
- **What capabilities do we need for the future?**

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Lessons for Australian Network Operators

1

Partnerships

– **Scan for potential partners:** Australian network operators would benefit from sourcing technology partners who are more experienced in network data analytics as well as developing, deploying and integrating distributed energy resources and technologies. Honda and BMW to pursue electric vehicle technology whilst Alliander and Siemens have signed a agreement to encourage smart grid innovation.

2

- **Planning**

– **Develop a Pricing Strategy**: A clear pricing strategy not only complements future renewables products and services but also can help to identify locational (customer) sensitivity to incentives. This strategy development can help to determine favourable pricing structures that can be advocated for in policy forums.

– **Restructure Planning Process**: In a five year planning and investment cycle which has the potential to limit focus more towards traditional grid enhancements. This has the potential to put them at risk from more nimble entrants and disrupt the industry mid-cycle. Planning should take a longer view and seriously consider potential regulatory changes including asset write-downs. Planning should be focussed on a future state that is characterised by intelligent networks, integrated DERs and increased diversity of revenue.

- **Customer**

3

– **Understand the Maturity of the DER Market to Align Incentives:** To build an initial base of DER penetration, tariffs such as the FiT can be effective. FiTs provide incentives for adoption due to significant price differential between the traditional grid consumer connection and producer-consumer (prosumer). As DER take up increases and enabling technologies (such as battery storage) become more economically viable, a reduced FiT may actually incentivize prosumers to use their own power instead of feeding the grid.

Lessons for Australian Network Operators

4

Policy

- **Be an active participant in policy forums**: Policy responses that focus on protecting the regulated asset base will provide only short term relief for distributors. Distributers should take a more active role in encouraging openness of participation in energy market products and services. PG&E for example have been supportive of community solar legislature as well as tariff reform.
- **Learn from First Movers**: In Europe, E.ON, Vattenfall and Alliander are pushing the envelope in the advancement of DER technology and adoption under their highly progressive business models. Con Edison will aim to offset $1 billion in investments by deploying a $200 million program that leverages microgrid technology, battery storage and demand management.

5

IT/OT Investment

- **Invest in deploying a truly an intelligent grid**: Future business model iterations and related revenue opportunities are dependent upon an interconnected, data-rich environment. From early stage trials by PG&E to the large scale pilots run by Vattenfall and Alliander, investing in an intelligent grid not only enables a robust grid but supports the integration of DERs and Beyond the Meter products and services.

6

Competition / Disruptors

- **Prepare for and Anticipate Competition**: Small and nimble entrants can create a disruptive influence on distributors by impacting location-based demand and supply of the grid. Distributors must not only be vigilant in identifying these competitors but also ensure their own competitiveness through targeted development of new products and services.

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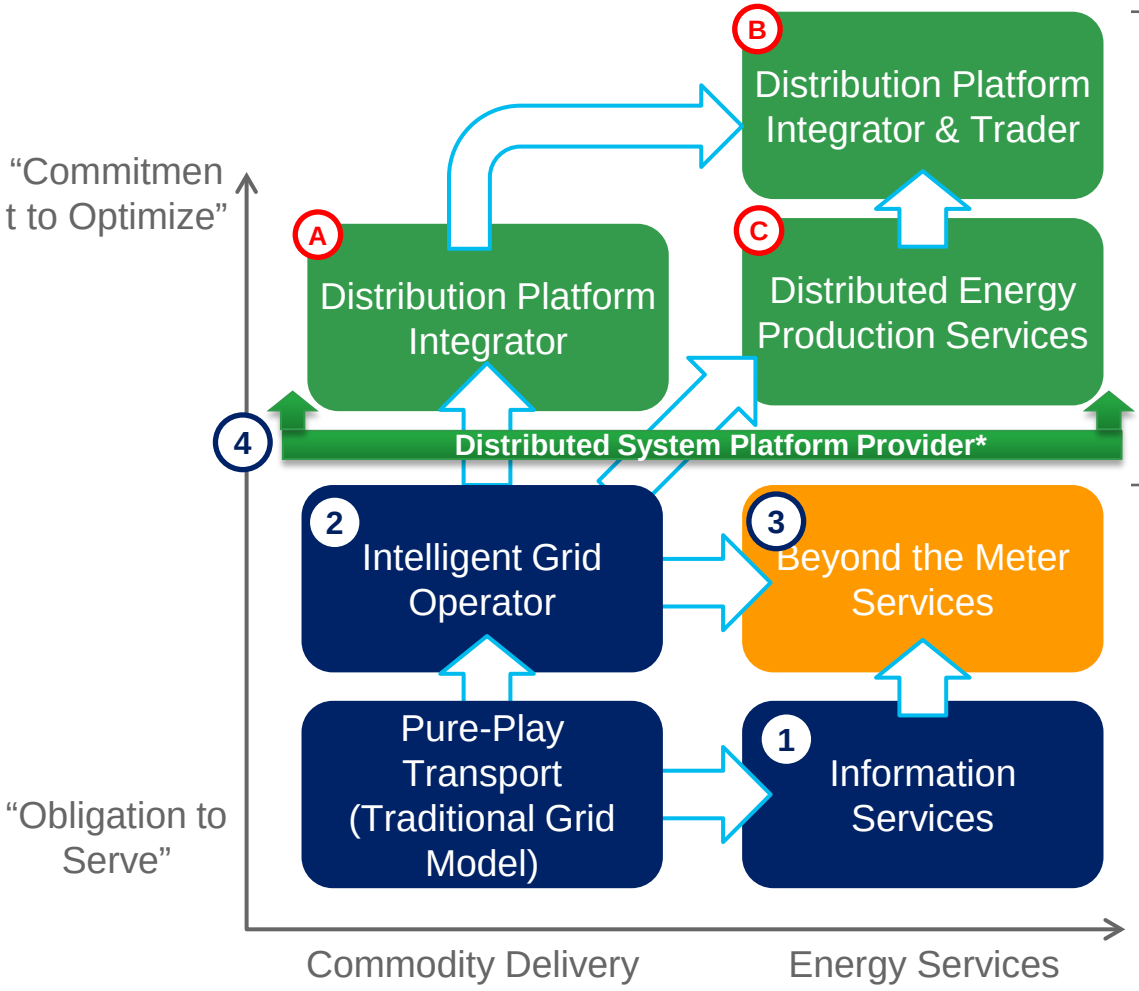
The evolving role of network businesses globally has lead to the development of four progressive business model approaches

These models open opportunities for growth from new customer products and services as well as from optimisation of the grid.



New Resilience-Building Business Models

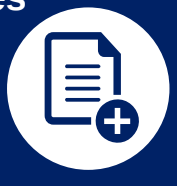
Key Strategic Questions

What choices exist for scope and role in new markets?

What capabilities are needed for business model evolution?

How can traditional utilities manage the transition to a new business model?

Digitisation of traditional grid through automation, data and communications is the first step in business model evolution

BUSINESS MODEL	ACTIONS	RATIONALE	EXAMPLES
1 Information Services 	Invest in AMI to provide customers with information about energy usage	The collection of data is foundational to the future integration of the grid for intelligent networks.	SOUTHERN CALIFORNIA EDISON An EDISON INTERNATIONAL Company
2 Intelligent Grid Operator 	Enhance key IT/OT capabilities (AMI, Analytics, SCADA). Invest in intelligent devices for DG integration and embedded storage.	Improve integration and control of network for intelligent operation.	DUKE ENERGY
3 Beyond the Meter Services 	Build offerings that extend beyond traditional delivery of electricity such as remote monitoring and control, smart data, appliance installation & maintenance, HEMS etc.	Strategic decisions are needed regarding scope of role and opportunities for growth in new services and energy solution.	Scottish and Southern Energy

4 Progressive utilities are forging ahead in defining the pace and depth of platform business model evolution

BUSINESS MODEL	ACTIONS	RATIONALE	EXAMPLES
A **Distributed Platform Integrator**	Extend key platforms: Advanced DMS, MDM, OMS. Further penetration of grid automation and sensing with real-time decision engines and control optimization. DERs fully integrated into grid.	To move beyond an intelligent grid, a platform integrator needs to be able to make decisions on demand and supply in real-time to optimise whole-of-grid performance.	e·on, alliander, PG&E Corporation
B **Distributed Platform Integrator & Trader**	Dynamic integration with demand drivers (e.g., demand response, dynamic tariffs) to enable transactions between producers and consumers of energy.	Significant investment needs to be made not only in trading system but also to develop and test pricing strategies with targeted customers.	NY State REV, conEdison Trade Only – Limited Infras.
C **Distributed Energy Production Services**	Extend services to include the provision of DERs such as solar PV, battery storage through direct leasing or partnership arrangements.	Strategic decisions needed for scope of role and opportunities for additional growth in new services and energy solution.	Reposit Power, vandebron, SDGE, alliander, VATTENFALL

Business Model Framework: Revenue Opportunities

Beyond the Meter and Platform Business Models offer opportunities to diversify revenue streams by creating new consumer products and services.

1 Information Services

- **Value case driven business model:** provision of energy usage information to customers via web portal or other channel allows for greater data transparency and may add to consumer 'stickiness'.

2 Intelligent Grid Operator

- **Value case driven business model:** initiatives in automation, sensing and control optimization can generate savings by lowering cost of operations and maintenance and offset/delay capital investment.

3 Beyond the Meter Services

- **Revenue diversification:** generate revenue through provision of products such as smart devices (e.g. Nest) and services such as home automation systems, demand response programs, data analysis, auditing and security.

A Distributed Platform Integrator

- **Revenue diversification:** delay or offset capital investment by managing grid supply and demand from an aggregation of multiple energy sources (including DERs).

B Distributed Platform Integrator Trader

- **Revenue diversification**: revenue generated through delivery of DERs as well as facilitation of a marketplace open to all energy participants to buy and sell offerings as well as trade supply and demand.

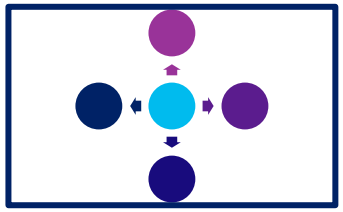
C Distributed Energy Production Services

- **Revenue diversification:** revenue generated through delivery of Beyond the Meter products and services as well as facilitation of a marketplace open to all energy participants to buy and sell offerings.

Business Model Framework: Strategic Capabilities Overview

To deliver the Business Model changes and operational improvements, five strategic capabilities are required for success

1 Intelligent Network Operations



- Ensuring **technical infrastructure and operational capabilities (IT/OT)** to monitor, control and support the management of demand and supply to the grid in near-real time.
- Advanced market and **network analytics** to identify trends / behaviours.

2 Industry & Partnership Management

- **Identify partners** who will provide either a) required platform infrastructure such as meter data providers, or b) additional value-add to the platform through new products or services
- **Develop regulatory approaches** to optimise preferred outcomes

3 Market & Commercial Intelligence

- Understand the **pricing elasticity of prosumers** on the buy and sell-side of the platform
- Setting the pricing mechanisms and supply incentives
- Develop capabilities to interact with **trading markets**
- Develop **competitor analysis and market play** capabilities

4 Performance Management

- Aligning initiatives to the strategic and financial objectives of the business.
- Establish measurable performance factors to quantify contribution to strategic direction.
- Develop performance metrics for personnel.

5 Customer Interaction / Marketing

- Attracting and retaining **platform participants**.
- Development and marketing of a **portfolio of products and services**.
- Management of **communication channels**.
- Develop platform **brand image and awareness.**

New Operating Principles for Progressive Business Models

The case studies highlighted common themes between responses by utilities to the market and regulatory environment.

Future Business Model Progressive principles:

- Being able to integrate all types of generation.
- Enabling consumers to provide services back to the grid.
- Offering enhanced or optional services, such as microgrid services and other DER support services.
- Being agnostic about supply.
- Facilitating a retail market for consumers and third-party providers to buy and sell services.

Foundational operating principles for the traditional grid model

Maintaining a safe and reliable grid	**Increasing grid efficiency**	**Optimizing asset utilisation**	**Support / implement public policies**	**Highly reliable & resilient energy services**	**Identify most cost-effective ways of achieving outcomes**

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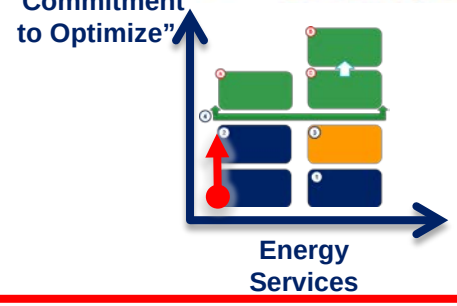
Duke Energy

Duke Energy is exploring how to enhance capabilities in smart grid whilst identifying and developing selected DER technologies.



Company Overview

- A leading energy company in the United States, **supplying energy to more than 7.2 million customers**. Customers are located in Ohio, the Carolinas, Kentucky, Florida and Indiana.
- Duke Energy provides **generation, transmission and distribution** operations (over 400,000 km of lines), and other energy services in the Americas – including a **portfolio of renewable energy** assets.

Drivers for Change

- Technological evolution will threaten Duke's traditional business model, in particular due to growth of solar + storage, EVs, fuel cells and energy efficiency.
- The most imminent threats will come from improvements in Energy Efficiency technologies that could cut peak capacity, and the rapid growth of solar PV + storage.
- In 2014, South Carolina passed the Distributed Energy Resource Program Act to provide producers and consumers of electricity with more choices and moves solar power forward in the state^.
- Both federal and state incentives across multiple jurisdictions are helping drive down cost of solar PVs.

Plans & Actions

- Duke is predominantly a pure-play "Grid Manager" but is moving toward becoming an "Intelligent Grid Operator" by investments in intelligent network and AMI infrastructure.
- Assess potential investment opportunities in "beyond the meter" products and services with EVs, solar and storage, fuel cells, energy efficiency and demand response.

Progress

- Key initiatives focus on increasing capital investment in renewables, IT/OT grid capabilities and investigation of fuel cell leasing models.
- Outcomes delivered so far include a commitment to ~$2b spend on renewables generation projects over the next 4 years and the rollout of standardised IT/OT platform. Fuel cells determined to provide limited value in s/term.

Implications for Australia

- Investment in renewables requires significant investment both in the as**set acquisition as well as ongoing integration efforts**. Distributors must take this into consideration for both short and long term budgeting.
- An intelligent grid is required to support renewables and generate value for a distributor. **Digitising a grid must be thus planned in parallel with any DER integration targets.**

^ Source: Solar Power at a Glance, **duke-energy.com/solar**

Summary for Duke Energy

Renewables Activity Accelerates but Not Strategic Focus

- Duke investigated opportunities related to diversifying revenue streams and investing in renewable technology. This led them to focus on acquiring solar power assets however their portfolio remains mostly fossil fuels. Duke has yet to see much of an impact from DER and likely won't for some time due to their electricity prices are generally quite low.

Long Term Approach to Digitising the Grid

- Duke is pursuing greater information and control over its network through improving distributed intelligence and interoperability. These initiatives commenced in 2007 as part of a long term plan to improve the operational performance, improve security, manage data and reduce costs.

Pursuing Strategy of Power Purchase Agreements (PPAs)

- Duke is not only building a number of PV plants but also signed a number of PPAs with a total of eight solar projects that together have a capacity of 278 MW. These agreements provide certainty of demand whilst investing in a capital intensive asset.

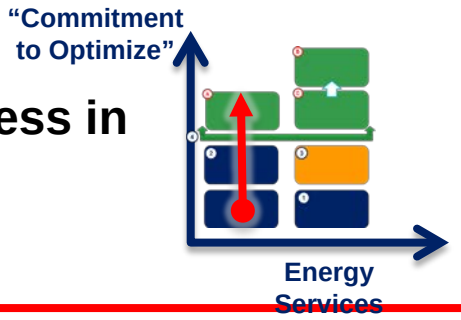
Duke Actively Participates in Policy Discussions

- Duke has submitted requests to change legislation that would cut revenues paid to independent solar providers. This request was opposed by the solar industry, stating these changes would hinder solar development. Duke has also requested reduction of net metering for solar which is seen to erode the traditional utilities business model.

Source: Accenture Research

Vattenfall

Vattenfall is embarking upon a repositioning of its business in Europe to focus on the generation and distribution of renewables.



Company Overview

- 100% **Swedish state-owned** with operations in **Sweden, Germany, the Netherlands, Denmark, Finland, France and the UK**. Net sales: SEK 171.7 billion (167.3)
- Vattenfall works throughout the value chain including operations in **generation and sales across all markets as well as offering distribution services in Germany and Sweden.**
- Vattenfall's operations produce electricity and heat from **wind power**, nuclear power, natural gas, **biomass**, coal power and **hydro power.**
- Purchased **49% of Nuon** in 2009 and has taken over operative control. Over the next five years will complete full ownership

Drivers for Change

- Weak demand, a surplus of generation capacity and historically low wholesale prices.
- Increasing political pressure to shift business towards the development of renewables and away from coal and gas (Vattenfall has profitable lignite and nuclear operations).
- Aggressive targeted reductions in CO2 emissions.
- October 2014 announcement of $3.13b impairment loss (includes Nuon writedowns).
- 1 out of 7 household in the Netherlands will have PV by 2020.
- With the current low price of electricity, construction of new generation capacity in Northern Europe is uneconomic without subsidies or other support systems^.

Plans & Actions

- Committed to becoming a 'smart energy enabler' as the key strategic focus area.
- Developing smart grid capability to support decentralisation of energy distribution.

Progress

- Key initiatives are focused on the development of new products and services, financial restructuring and piloting smart grid technology.
- Outcomes delivered so far include the development of a range of offering including appliance remote control and solar installation to CHP and VPPs. Vattenfall has also exited coal operations and non-core markets and is currently on track to achieve cost reduction targets. Active partner in Smart Grid Gotland.

Implications for Australia

- Partnerships with technology and renewables specialists are necessary to **develop and test innovative renewables technologies at scale**.
- Investment in **strengthening the core business can free up resources (people and capital)** to support new revenue streams.

^ Source: Vattenfall 2013 Sustainability Report

Summary for Vattenfall

Strategic Direction

- The Vattenfall planned approach hedges risk in developing a portfolio of products and services that increase revenues in the current business model as well as strengthening sustainability through diversified revenue streams in the future.

"Refresh the core"

- With a directive to focus the portfolio on renewable energy, Vattenfall made key decisions to reduce its international footprint as well as sell the profitable coal business. This strategy will allow them to focus resources towards supporting the platform and the renewables that power it.

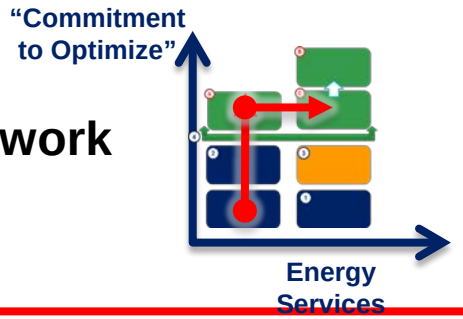
Escalation of Political Risk

- Vattenfall considers politicial risk now has a greater impact than market risk on the performance and ultimate success of utilities. This is due to signifcant impact on subsidies to support the investment and takeup of renewables technologies by distributors.

Development of Virtual Power Plant (VPP) Offering

- The VPP not only supports the objectives of Energiewende but helps to manage grid fluctuations, store and optimise capacity usage as well as integrate renewables efficiently into the grid.

Alliander



Alliander is pursuing a dual strategy of digitising the network whilst building capabilities in distributed generation.

Company Overview

- Alliander is a **government owned Distribution System Operator** (DSO) and the largest grid company in the Netherlands. The company services 2.1 m gas and 2.9 m electricity connections. ~5,000 FTE employees with yearly grid investments of around €0.6 billion.
- Regulatory changes lead to unbundling of Nuon (production & supply) and Alliander (grid - formerly Continuon) in 2009. Alliander has 3 business units: **Liander** (regulated services), **Liandon** (engineering services e.g. maintenance for the national grid) and **Endinet** (small regional grid in South Netherlands).
- Operates ~84.000 km of distribution grid. Transports 32 GWh electricity generating €1.4b revenues.

Drivers for Change

- The energy market in Europe is unbundling, there is a clear separation between transport- & distribution companies (regulated) versus energy generation & -supply companies (liberalized).
- Challenges to address in evolving business
  - data management: digitization of the network and increasing dependence of data
  - lack of technical skills: growing shortage of educated technicians
  - changing competencies: new skills are required in Alliander employees to support the energy transition
  - power outage duration: the Dutch regulator sets targets and factors that influence the amount of fee a network distributor can requrest from its customers. The regulator also sets targets for power outages (this could be an issue if transitioning towards a more unreliable mix of energy).

Plans & Actions

- The ambition is to develop a 'best in class' smart energy network in order to fully facilitate the energy transition – as part of a roadmap to a more sustainable energy system.
- Moving from digitising networks to digital grid management – to enable standardised central control and optimise distributed generation.

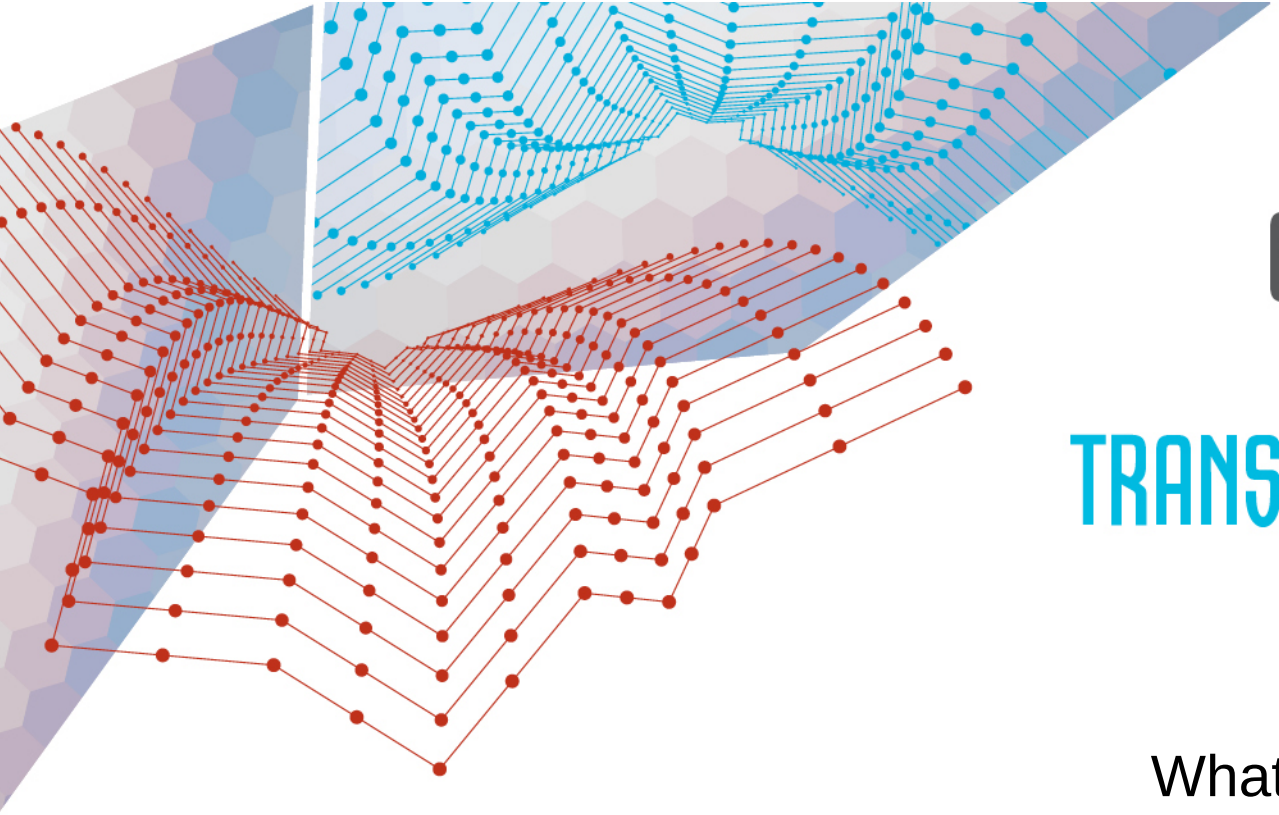
Progress

- Key initiatives are focused on digital grid management, electric transportation and distributed generation. Alliander has also set up a deregulated new business to cover the shortfall in grid revenue.
- Outcomes delivered so far include investments in automation and smart metering at the household and substation level. Multiple partnerships seek to improve technology and infrastructure for EVs whilst a comprehensive program of pilots are testing solar, CHP and microgrids.

Implications for Australia

- Partnerships with technology and renewables specialists are necessary to **develop and test innovative renewables technologies at scale**.
- Digital initiatives have focused on addressing and improving different sections of the network (e.g. households as well as substations) .

Sources: Accenture Research. Publically available information.



ELECTRICITY NETWORK TRANSFORMATION ROADMAP

2015-25

What Happens Next?

John Bradley, CEO ENA

9 September 2015

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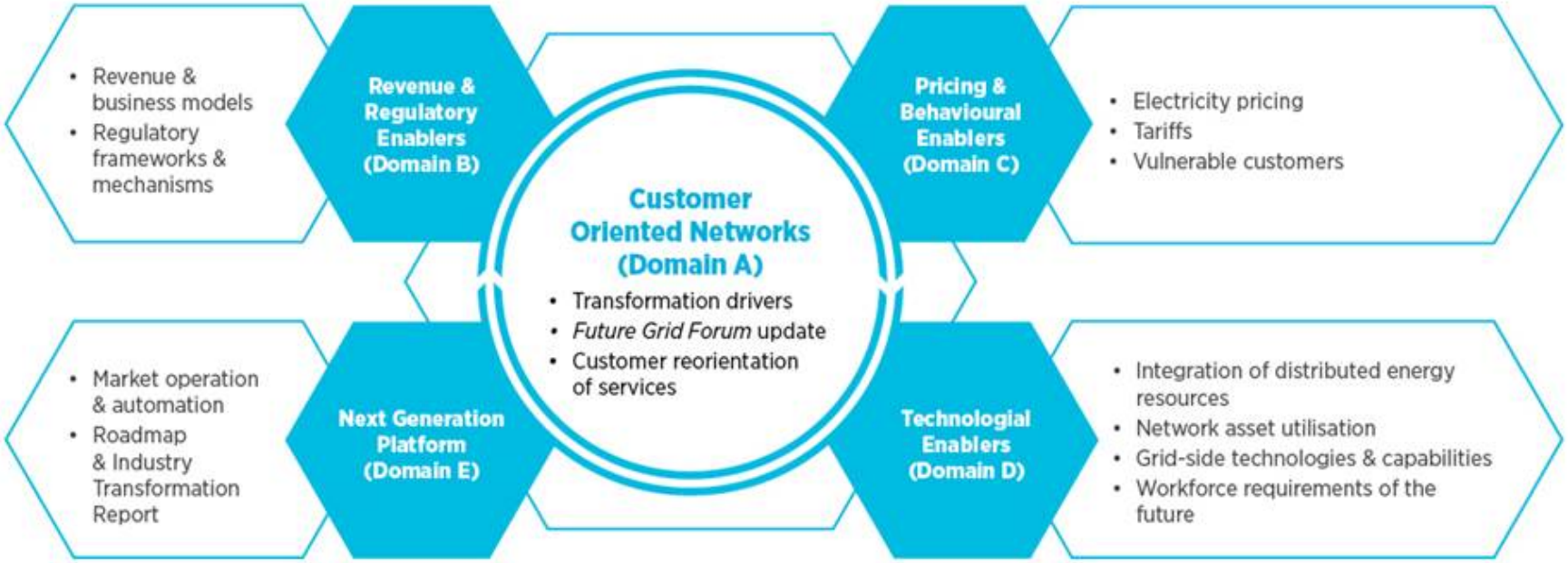
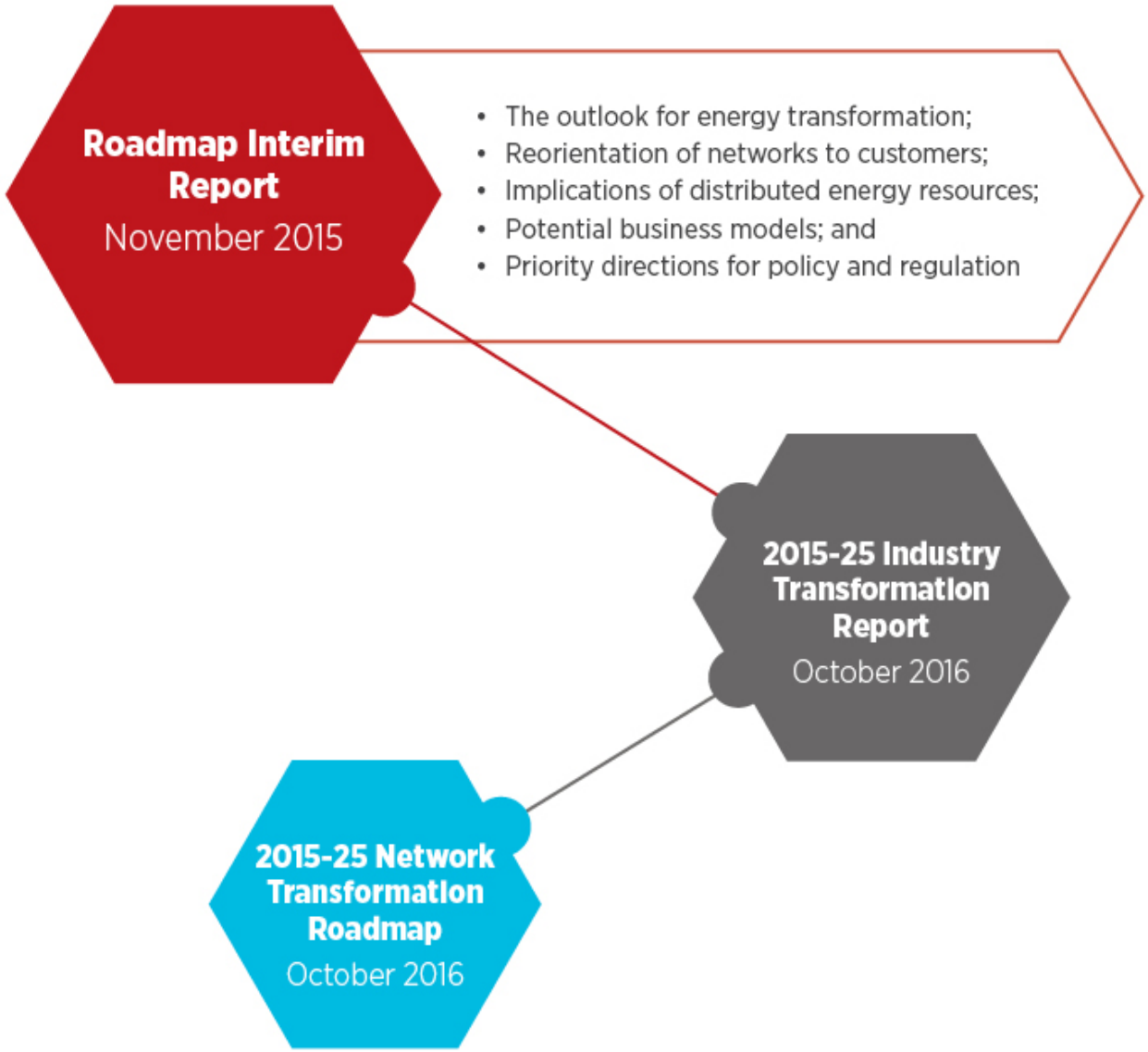
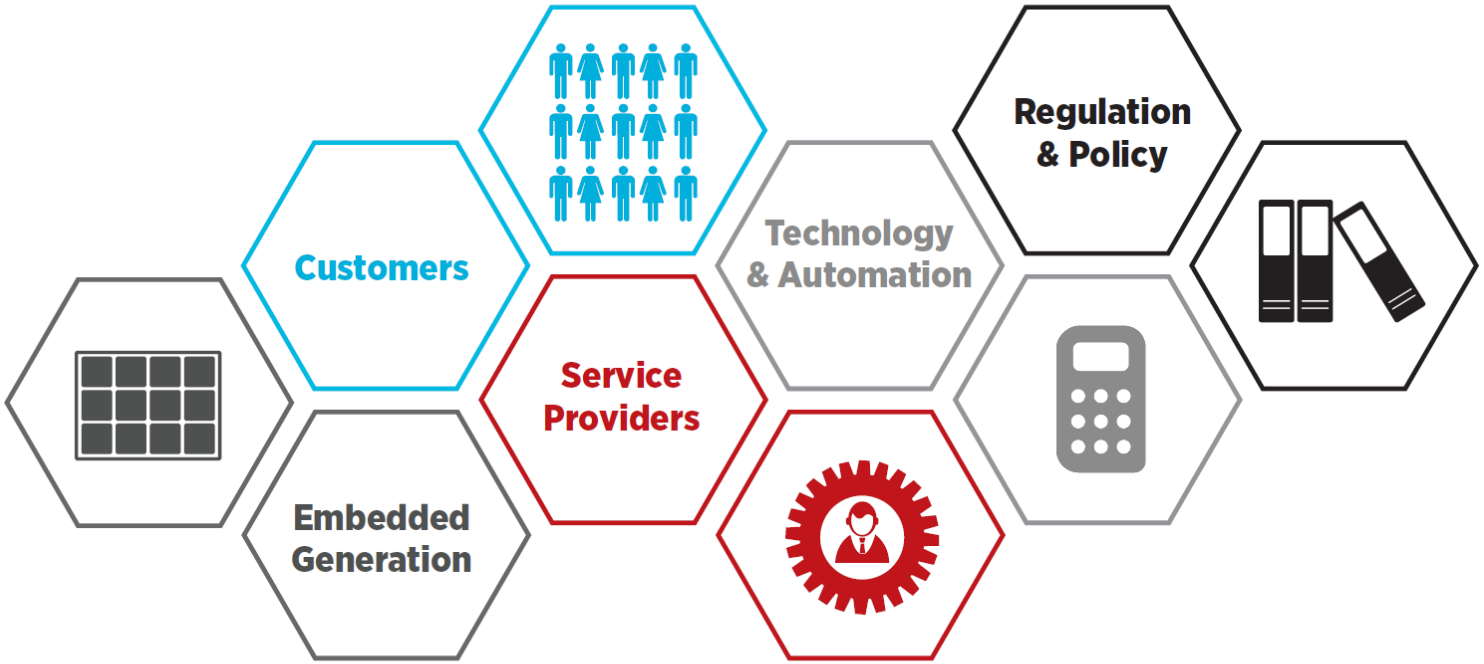
Reiteration: Five Domains to Enable the Transition…



Key Milestones for NTR



Collaboration and Co-Design



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What we would welcome from you …

1. Your further feedback on the Accenture report on business models, including:
   - Your comments on the analysis and findings in the report;
   - Your views on business model evolution for electricity networks in Australia

   Send to: ntr@ena.asn.au

   Requested by: 23 September 2015

What we would welcome from you …

2. Your continued engagement with ENA/CSIRO on our NTR program.

The Integrated Program Report on Phase 1 of the NTR is due November 2015.

Workshop Opportunity:

- Roadmap Interim Report, Thursday 1 Oct 2015, Sydney
- Further opportunities will be advised as NTR progresses

Want to know more?

For more information on the Electricity Network Transformation Roadmap Project, please contact

Dr Stuart Johnston at ENA
at **ntr@ena.asn.au** or 02 6272 1555

Thank you