ISSUES PAPER

A LEVEL PLAYING FIELD FOR LOCAL ENERGY

PREPARED FOR THE CITY OF SYDNEY

BY THE INSTITUTE FOR SUSTAINABLE FUTURES

Authors: Jay Rutovitz, Edward Langham, Jenni Downes

NOVEMBER 2014

ABOUT THE AUTHORS

THINK.
CHANGE.
DO

The Institute for Sustainable Futures (ISF) is a university research institute established by the University of Technology, Sydney in 1996 to work with industry, government and the community to develop sustainable futures through research and consultancy. Our mission is to create change toward sustainable futures that protect and enhance the environment, human well-being and social equity. Our work is future focused; we are committed to building independent capacity in our clients by passing on knowledge and skills. In this way, we create lasting change. In all our work, we aim to provide outcomes of a quality commensurate with the importance of our mission.

ISF has been a leading proponent for the value of decentralised energy in electricity systems since heading a research cluster from on the market benefits and effects of large scale local energy in the Intelligent Grid (iGRID) national collaboration from 2008-2010. ISF has conducted extensive research on the value of DE in the NSW energy system, and developed modelling tools specifically to internalise network costs into energy planning. ISF also has an in-depth understanding of the need for market mechanisms to incentivise local solutions, and further, that the lack of appropriate cost reflective mechanisms is stifling the growth of local energy.

For further information visit: **www.isf.uts.edu.au**

CITATION

Please cite this report as:

Rutovitz, J, Langham, E., & Downes, J. (2014). *A level playing field for local energy.* Issues paper prepared for the City of Sydney. Institute for Sustainable Futures, UTS.

ACKNOWLEDGEMENTS

Many thanks to Chris Barrett at the City of Sydney and Louisa Rust at the Institute for Sustainable Futures.

INSTITUTE FOR SUSTAINABLE FUTURES
University of Technology, Sydney
PO Box 123, Broadway, NSW, 2007

www.isf.edu.au

CONTENTS

FIGURES AND TABLES

EXECUTIVE SUMMARY

The context: changing times

The electricity market in Australia is undergoing an unprecedented transformation. The traditional model of one-way flows from large remote generators to consumers is changing. The past decade has seen a doubling of electricity prices. A million small customers now have solar PV. More change is coming, as new technologies and new business models unlock new demand for customer generation and energy storage.

Electricity consumption from the grid, once thought to have an inevitably upward trajectory, has been going down for more than five years. If grid defection becomes a reality, it could precipitate an untenable situation for network operators, where rising prices push customers to reduce consumption or even disconnect from the grid, which increases prices and further drives down consumption. Those customers who remain grid-connected face higher and higher prices as they pay for legacy infrastructure, built to serve a larger customer base and meet now out-dated demand forecasts.

Prepare for the future, or risk disruptive change

Reducing network charges for local energy is a proactive approach to keeping networks competitive and managing the transition to an electricity market with high contributions from local energy.

Restructuring network charges to recognise the value of local energy and the actual proportion of network utilised reduces the incentive to maximise ‘behind the meter’ generation or actually disconnect from the grid. Provided price signals reward technology and behaviour that flattens load or decreases peaks, local energy will benefit network operators and decrease the need for additional network infrastructure in the long term.

Avoiding grid defection provides benefits to electricity consumers (prices remain lower), local generators (networks can provide regulation and back-up services more cheaply than off-grid solutions), and network operators (their customer and revenue base is maintained, and the long term need for augmentation is lower).

Assigning value to local energy – the frameworks

Two alternative frameworks are outlined to value local energy.

The first framework is the **local generation credit**. The credit is paid according to how and when a generator exports and is unrelated to whether a local customer is identified.

The second framework is the ‘**virtual private wire’**. The calculation of the credit is only carried out on the portion of electricity exports that are used by local customers. The export is ‘netted off’ at the customer’s site on a time-of-use basis, and the amount used at the customer’s site forms the basis for the calculations.

Calculating the value of local energy – the methodologies

Two methodologies are outlined, a ‘**volume-based’** method based on the calculation method in the UK, and a ‘**mirror tariff’** method that uses the existing network tariff of the generator or their customer(s). Both methodologies take into account avoided network costs and potential network benefit. Both should decrease cross-subsidies between consumers and should assist network operators to future-proof their business model.

Next steps

The City of Sydney, in collaboration with other interested organisations, is planning to submit a rule change request to the Australian Energy Market Commission (AEMC) on reduced network charges for local energy in the near future.

The City of Sydney is seeking views on the frameworks and methods contained in this report, through a consultation process in November 2014.

CONSULTATION

The Institute for Sustainable Futures is organising two consultation workshops on behalf of the City of Sydney:

Workshop 1: Monday 24th November, 2:00 – 4:30pm
Level 14, UTS Building 10, 235 Jones Street, Sydney

For generators, investors, and project proponents.

Workshop 2: Tuesday 25th November, 10:00am – 12:30pm
Level 14, UTS Building 10, 235 Jones Street, Sydney

For network businesses, regulators, policy makers, and community representatives.

To register your attendance, please email: jenni.downes@uts.edu.au

Written feedback is also invited.

Please email feedback addressing the four consultation questions to jenni.downes@uts.edu.au by Friday 5th December, 2014.

CONSULTATION QUESTIONS

1. LOCAL ENERGY BENEFITS TO CUSTOMERS

1a. What are the benefits and risks of local network charging for local energy for customers?

2. BENEFITS AND DRAWBACKS TO NETWORK OPERATORS

2a. What are the benefits, risks and challenges for network operators enabling local energy through local network charges?

2b. How can network operators best offer alternatives to grid defection?

3. LOCAL NETWORK CHARGES: FRAMEWORKS

3a. Which are most important when considering the framework?

- Simplicity
- Metering and billing requirements
- Managing reverse flows
- Price certainty for generator
- Ability to pay the consumer
- Enabling local energy sales

3b. Who should credits be paid to – the generator, the consumer, or doesn't matter?

4. LOCAL NETWORK CHARGES: CALCULATION METHODS

4a. Which methodology is preferable and why – the volume-based or mirror tariff method?

1. BACKGROUND

The context: changing times

The electricity system in Australia is at a major point of transformation.

Electricity network operators are being called on to manage rapidly changing technical issues under rapidly changing market conditions.

The traditional model of one-way flows from large remote generators to consumers is changing. About 10% of small customers already have the potential to export electricity from solar PV systems on their premises.[1,2]

Electricity prices more than doubled between 2007 and 2013. Consumers are increasingly aware that investment in electricity networks – the poles and wires – played a large role in these price increases.[3 4]

There has been a historic change in electricity consumption. Australian usage rose steadily until 2008. The subsequent downturn was assumed to be a temporary impact of the Global Financial Crisis. Instead, the downward trend has continued.

There is more change coming, as more and more customers become producers as well as consumers, customer-scale battery storage becomes a viable proposition,[5] and electric vehicles reach significant numbers.

TERMINOLOGY – LOCAL ENERGY

Local energy is used in this paper to cover:

- ***embedded***, ***distributed***, or ***decentralised*** generation, which means located within the distribution network, rather than connected to the transmission network
- ***distributed*** or ***decentralised*** energy services, such as demand reduction or energy efficiency, which reduces overall consumption or demand
- ***local use*** of local generation.

Technology, policies and customer preferences driving change

Local energy is currently a small but significant part of the Australian energy supply system.

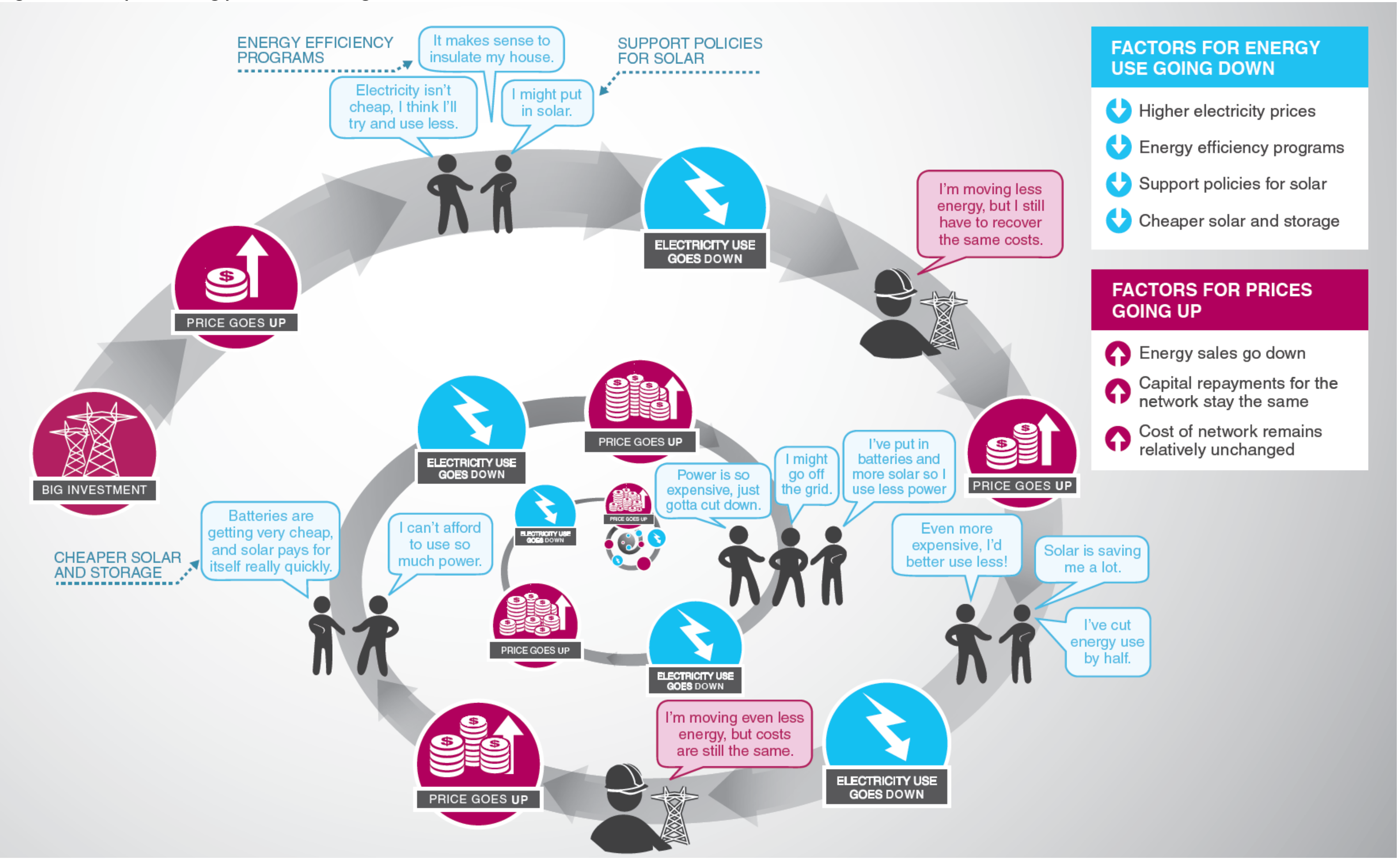
Commercial and industrial scale cogeneration is well established, although the capacity is considerably below the potential demonstrated elsewhere. Australia had approximately 3,325 MW of cogeneration in 2013, about 6% of total capacity. By contrast, about 12% of heating demand in Europe and 23% in China is met by cogeneration.[6]

Australia has over 1.2 million residential PV systems[1] with a total capacity of 3.2 GW and 96% connected to the grid.[7] The dramatic increase over the past 10 years has been driven by three factors:

1. policy support via feed-in tariffs and the Renewable Energy Target
2. the steep reduction in costs for solar PV, with the installed cost falling from $12/watt in 2004 to $2.50/watt now (excluding subsidies)[8]
3. steep increases in electricity prices, leading to much faster payback periods.

This has created a significant and growing class of consumer – the *pro*ducer AND con*sumer,* or 'prosumer' – who both draws electricity from, and exports to, the grid. In addition to technical and economic implications, the prosumer is likely to be much more engaged about their electricity supply, and may be more likely to adopt further innovation.

Figure 1: The spiral: rising prices and falling use



Future scenario: large-scale disconnection from grid?

The cost of battery storage is falling rapidly. A recent US study showed parity between PV/battery storage and grid connection occurring between 2020 and 2035 as a base case, without accelerated technological development or improved energy efficiency.[5] This is well within the lifetime of most existing network assets.

As consumption goes down unit charges increase, as network operators have to recover their costs from a smaller volume of sales. This puts price pressure on customers to increase self-generation, and as storage costs drop, to disconnect from the grid to avoid network charges altogether. This puts more upward pressure on prices, which makes grid defection more attractive, and so on, creating a spiral of rising prices and falling use. This spiral is illustrated in Figure 1 above.

Thus the customer base and volume of sales for network operators could shrink markedly, while their costs remain nearly constant. Cost recovery becomes extremely challenging.

Those customers who remain grid-connected face higher and higher prices as they pay for legacy infrastructure, built to serve a larger customer base and to meet forecasts that may not eventuate.

For those leaving the grid, particularly in the residential sector, this scenario could put the maintenance of electricity services, such as voltage support and supply balancing, into the hands of non-experts.

Network options: prepare for the future or risk disruptive change

Network operators face changes in their business model, in the technical services they are required to perform, and in their customers. They face reduced revenues as a result of falling consumption, but also strong opposition to further price rises.

The issue of self-generation, and what charge reduction should result, is highly contested. For example, the Energy Supply Association of Australia (ESAA) asserts that local PV generators are being subsidised because they are paying less annually for network services, but are still using a similar amount of network capacity.[9] Meanwhile, customers with generators capable of exporting to the grid reap no benefit for any network services provided, and must compete with centralised generation.

This disincentive to export intensifies customer desire to find ways to operate ‘behind the meter’ to offset retail prices, driving the concern of grid defection highlighted by the Electricity Networks Association (ENA).[10]

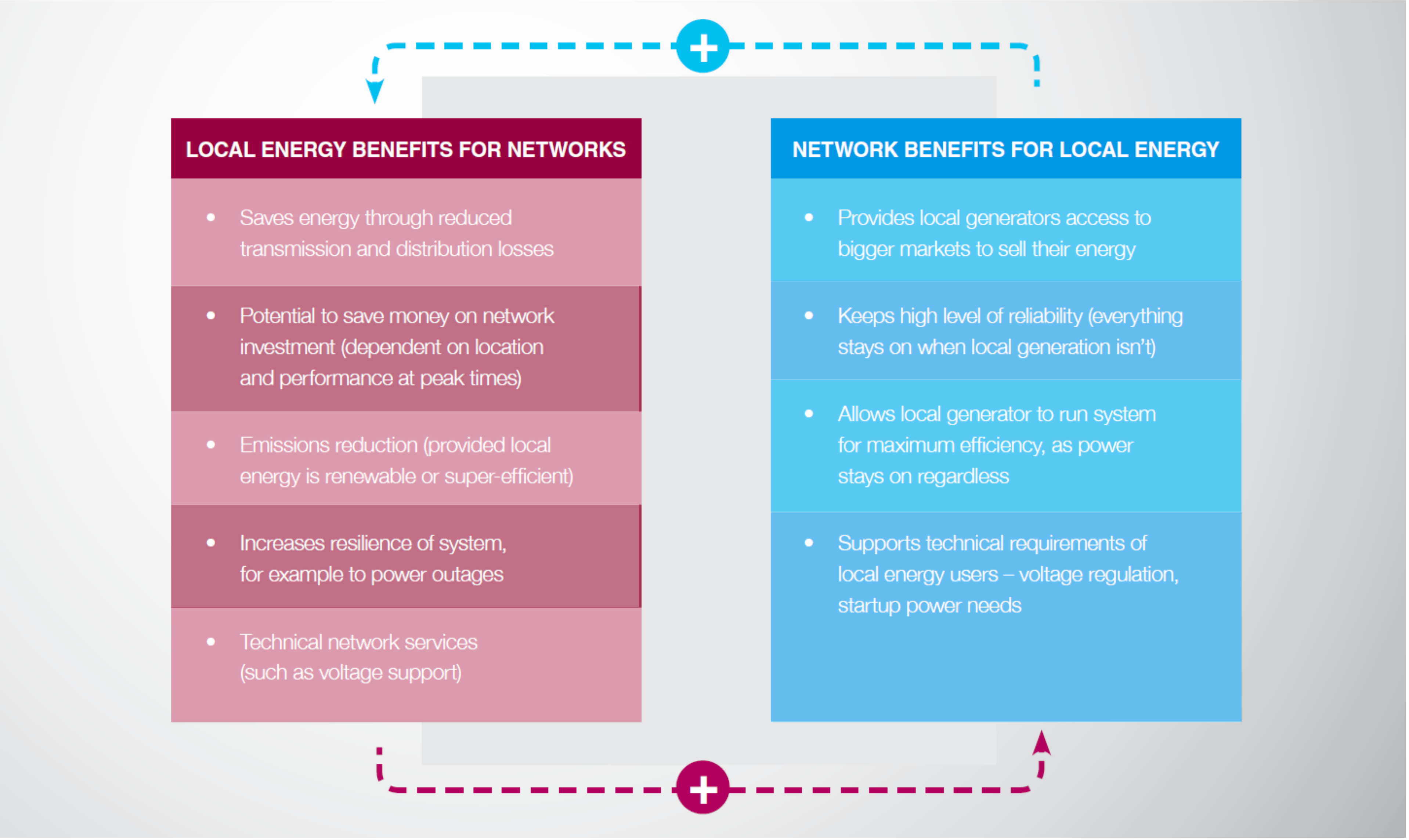
Moves towards cost reflective pricing structures may ameliorate revenue impacts from local energy (i.e. distributed or embedded generation) in the short term, but could accelerate grid defection and so make matters worse in the long run. Daily access charges also raise equity issues as low use, low income households pay a disproportionate amount compared to the services they receive.

Cost reflective pricing will see charges shift from volumes, based on the amount of electricity units sold (kWh), to capacity payments, which are made on the peak supply that is provided. Self-generation always reduces volumes, but may not reduce the capacity required when the consumer is importing electricity from the grid.

For network operators, local energy with storage represents both a risk in allowing grid disconnection, and a huge opportunity for business and residential customers to actively manage their load profile, and offer network services when needed. This has the potential to enhance network operators’ management options, and reduce overall real costs for electricity services.

Avoiding grid defection provides benefits to electricity consumers (prices remain lower), local generators (networks can provide regulation and back-up services more cheaply than off-grid solutions), and network operators (their customer and revenue base is maintained, and the long term need for augmentation is lower). This is illustrated in Figure 2 below.

Figure 2: Mutual benefits for local generators and network operators



Source: Adapted from Electricity Networks Association.[11]

Regulatory change for distributed generation

A range of regulatory changes that affect local generation are underway, primarily due to the Power of Choice Review by the Australian Energy Market Commission.

Proposed changes and those underway do not directly address the value of local use of energy, or include the introduction of local network charges. Instead they address specifics like metering, connection arrangements, and the cost reflectivity of network pricing, as shown in Table 1. These changes are complementary to a rule to enable local charging. Specifically:

- Rule changes (b), (d) and (f) on metering and electricity use data will generally assist in the introduction of local charging, and specifically local selling.
- Rule changes (a) and (e) relate to *connecting* local generators.
- Rule change (h) aims to increase incentives to network operators to promote non-network solutions in constrained areas. Local network charging would enhance the ability of local generators to offer non-network solutions.
- Rule change (c) on distribution network pricing would facilitate methodology development for cost reflective local network charges.
- The introduction of local network charges may increase the amount of information easily available on Demand side participation, rule change (g).

The City of Sydney, in collaboration with other interested organisations, is developing a rule changes proposal that would deliver a more level playing field for local energy. As well as improving the financial benefits for local generators, this will facilitate long term change considered beneficial for networks businesses.

TERMINOLOGY – LOCAL NETWORK CHARGE

Local network charge is used in this paper to mean Local Use of System Charges (LUoS), which continues the logic of Distribution Use of System (DUoS) and Transmission Use of System (TUoS) charges.

Table 1: Rule changes relating to local generation

Rule change Status	Completed/proposed rule changes	Timeline
Recently completed	a. Connecting embedded generators to distribution networks	Final determination 17th April 2014
	b. Open access and common communications standards (energy services enabled by smart meters)	Advice provided to COAG Energy Council
In process	c. Distribution network pricing arrangements	Final determination November 2014
	d. Expanding competition in metering and related services	Final determination April 2015
	e. Connecting embedded generators to distribution networks under Chapter 5A	Draft rule August 2014
	f. Consumer access to their electricity consumption data	Draft rule August 2014
	g. AEMO obtaining better demand side participation information	Commenced September 2014
Commencing soon	h. Reform of demand management and embedded generation incentive scheme for networks	Pending

NEM economic framework reflects historic physical structure

The current charging structure in the National Energy Market (NEM) reflects the historic model of one-way flows from large, remote generators, via the transmission and distribution systems, to the customer. Everyone except very large customers used all (or nearly all) network levels.

Most network charges are levied on volume, particularly for small customers, and costs are smeared across all consumers according to the volume of energy they use.

Volume charges do not deliver appropriate price signals, and result in cross-subsidies between consumers. In fact, the cost of the network is almost entirely determined by peak capacity requirements rather than by the volume of electricity used. An increase in electricity use at peak time in a constrained part of the network increases costs dramatically, as the network cannot supply that additional demand without augmentation.

The current charging structure does not produce optimal outcomes. There is little incentive to reduce peak loads, there is no flexibility to cater for partial use of the distribution system, and the potential benefits of local energy and use are not rewarded.

Current charges also reflect the historic investment to supply peak capacity, which may now be underutilised. As the customer base diminishes, it may be less and less equitable for the customers who remain to pay for unused legacy infrastructure.

End of era of growth in energy consumption and demand

The traditional business model for networks included a relatively fixed or growing customer base, and a presumption of steadily increasing capacity requirements. Network investment was partly driven by forecasts for strong growth in both demand and consumption, and up until 2012, the market forecasts in Australia assumed a steep upward trend.

Instead, after nearly 30 years of growth, both consumption and demand have dropped. Energy efficiency, local energy, changing economic times, and electricity price signals themselves, have resulted in changing expectations of both energy consumption and peak demand, as shown in Figure 3.

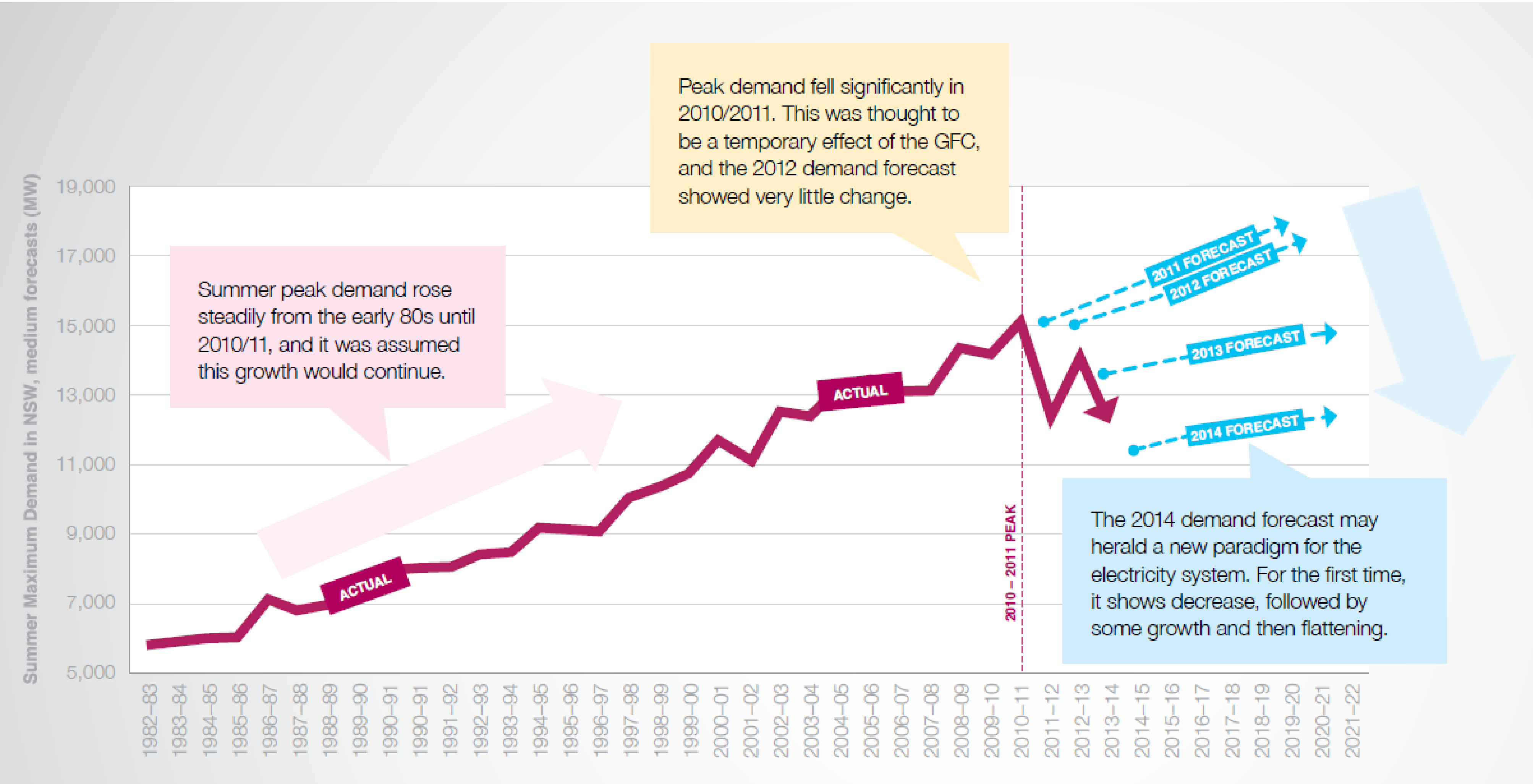
KEY ISSUE – WHO PAYS FOR LEGACY INFRASTRUCTURE

Up to one third of the $45bn network investment from the regulatory period just ended was to meet peak demand growth forecasts that have not eventuated.

Combined with falling consumption patterns and a potentially falling customer base, this could precipitate future network price rises for customers that continue to purchase all their electricity from the grid.

In the event that significant numbers disconnect from the grid, is it equitable for remaining consumers to pay for this infrastructure?

Figure 3: End of an era? Summer peak demand in NSW



Sources: AEMO ESO 2010, 2011, 2012, NEFR 2014, Transgrid 2009 Annual Planning Report.

3. CREATING BETTER OUTCOMES FOR CUSTOMERS

Enabling local energy can benefit customers

Enabling local energy, by modifying the structure of the market to recognise the benefits that it provides, will increase the number of local energy options, including generation, efficiency and load management. Provided price signals are appropriate and reward technology and behaviour that flattens load or specifically decreases the peak, local energy will decrease the need for additional network infrastructure in the long term. Increased local energy will reduce greenhouse gas emissions. While there are additional gains from reduced transmission and distribution losses, most emission reduction occurs because the local energy is either renewable (wind, solar, hydro or biomass) or very high efficiency (such as co-generation).

As explained in Section 1, providing a level playing field for local energy may also prevent customers from disconnecting from the grid, which has multiple benefits. Firstly, it will prevent the upward pressure on electricity prices for customers remaining on the grid. Secondly, grid electricity services are likely to be more reliable than stand-alone systems in terms of maintenance down time, voltage, and power quality. Finally, grid connection allows customers the ability to sell exported energy ('local exports') or provide other services such as voltage regulation.

CUSTOMER BENEFITS OF FACILITATING LOCAL ENERGY

Local energy can benefit **customers** by reducing:

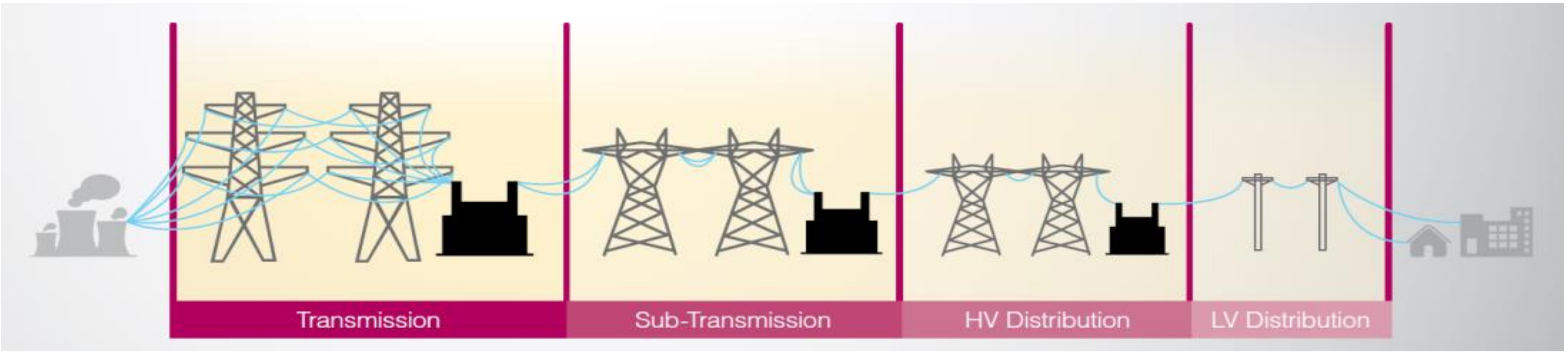
- energy prices
- the need for additional network infrastructure in the long term
- the take up of off-grid solutions, keeping cost sharing for the network more equitable
- greenhouse gas emissions.

CONSULTATION QUESTION 1

– LOCAL ENERGY BENEFITS TO CUSTOMERS

What are the benefits and risks of local network charging for local energy for customers?

Figure 4: Different network levels



4. LONG TERM BENEFITS FOR NETWORK BUSINESSES

Enabling local energy can benefit network operators

Firstly, demand-side participation was an important recommendation from the Power of Choice review.[11] Encouraging local energy helps achieve demand side participation. Providing a robust framework means this generation can be built into system forecasts, to optimise future network investment.

Secondly, a standardised, cost reflective framework for valuing local exports creates price signals to weight generation towards the times of day and seasons when the network needs it. Developing appropriate local charges and payments will enable network operators to start 'shaping' local energy to deliver effective network support.

The most important benefits for network operators from enabling local energy are likely to be in the medium to long term, in 'future proofing' their business model.

Figure 5 below illustrates a transition from a centralised network to one with high penetrations of local energy.

The mutual benefits for local energy generators and network operators are summarised in Figure 2.

NETWORK BENEFITS OF FACILITATING LOCAL ENERGY

Facilitating local energy can benefit network operators by promoting:

- cost structures that suit the grid of the future
- continued customer participation (less risk from grid defection)
- reliable demand-side participation in local network
- improved accuracy of system forecasts.

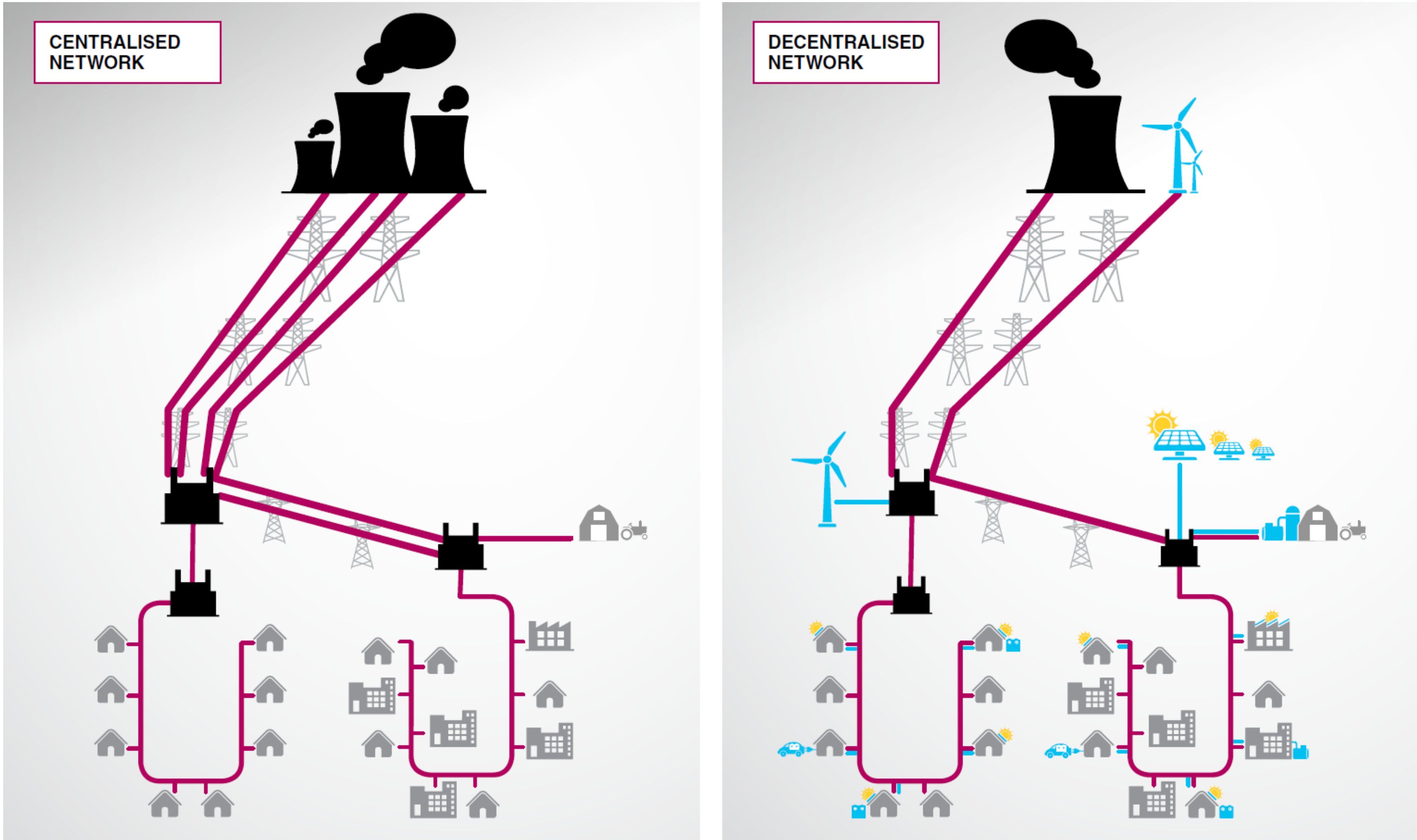
CONSULTATION QUESTION 2

– BENEFITS AND DRAWBACKS TO NETWORK OPERATORS

2a. What are the benefits, risks and challenges for network operators enabling local energy through local network charges?

2b. How can network operators best offer alternatives to grid defection?

Figure 5: Creating a more efficient network with local charging



5. VALUING LOCAL ENERGY: THE FRAMEWORKS

The current situation

The National Electricity Market framework rewards local generators in two very limited ways:

- local generators registered in the NEM (usually only applicable to generators larger than 30MW) are eligible to receive any savings in transmission use of system (TUoS) charges
- local generators may receive network support payments for specific services.

Neither of these methods provides a satisfactory framework for valuing local energy:

- due to changes in the way TUoS charges are calculated, savings may be minimal and in any case rebates do not apply to smaller generators, regardless of whether they reduce TUoS charges
- network support payments are negotiated on a case-by-case basis only, and there is no credit for reduced use of the distribution system.

Two alternative frameworks, '**local generation credits'** and '**virtual private wires'**, could systematically value the network benefit of local energy and assign a benefit to local generator or local energy consumers. These frameworks are outlined below. The electricity flows and money flows for these frameworks are illustrated in Figure 6.

Local generation credits

A local network credit is paid to generators embedded within the distribution system who export electricity into the grid, to reflect the network benefits they offer.

The credit is paid according to how much they export and what time of day, and is unrelated to whether a local customer is identified.

Customers still benefit, as credits paid to local generators are likely to be passed on by way of lower energy charges.

Electricity exported to the network will always be used by the nearest energy user, so unless a situation arises where local energy generation exceeds local demand, exported energy will be used within the local distribution system.

With a local generation credit:

- The generator does not need have a financial relationship with a local customer. This simplifies the mechanism, and may fit more easily into current market arrangements.
- Technical solutions may be needed to ensure the credit is only paid when justified. For example, credits may be restricted to times when exports are used within the generator's local network area, or at least adjusted to account for the reduced benefit. Technical solutions could include remote disconnection of PV or other local energy, or extra metering to ensure the credit only occurs when there is no upstream export.

Virtual private wires (local generation linked to consumer demand)

A 'private wire' (or private network) is used when a generator at one site is connected to another site. For example, a university may use a cogeneration plant to supply a group of its own buildings, and use a private wire to cross a road from one to another. No network charges are payable.

Virtual net metering (VNM) is a market arrangement that allows network operators to offer a similar service as private wires, to create a 'virtual private wire', and charge appropriately.

In the virtual private wire system, the calculation of network benefit is only carried out on the portion of electricity exports that are used at the customer site.

It requires the export to be 'netted off' at the customer's site on a time-of-use basis, and the amount used at the customer's site forms the basis for the calculations and charges.

The virtual private wire arrangement could be used by a generator supplying multiple sites of its own, or supplying other local customer(s). Exported electricity could also be transferred from multiple sites to one local customer, for example if a local council wishes to purchase energy from local residents or businesses.

The requirement for netting of the consumption at a different site will require additional metering, and establishing the metering system may have significant associated costs.

With a virtual private wire:

- Only the energy that is used by an identified local customer is credited. A generator that loses their local customer may be 'stranded', losing the local generation credit, even if their energy is still being consumed locally.
- Extra metering is required to 'net off' at the customer site. This may impose extra costs, however it may also enable the generator to realise a higher value for their energy exports, as they are effectively competing with retail prices.

Figure 6 below illustrates the transaction flows with current network charges, and with local network charges, with the corresponding physical flows shown at the top.

CONSULTATION QUESTION 3

– LOCAL NETWORK CHARGES: FRAMEWORKS

3a. Which are most important when considering the framework?

- Simplicity
- Metering and billing requirements
- Managing reverse flows
- Price certainty for generator
- Ability to pay the consumer
- Enabling local energy sales

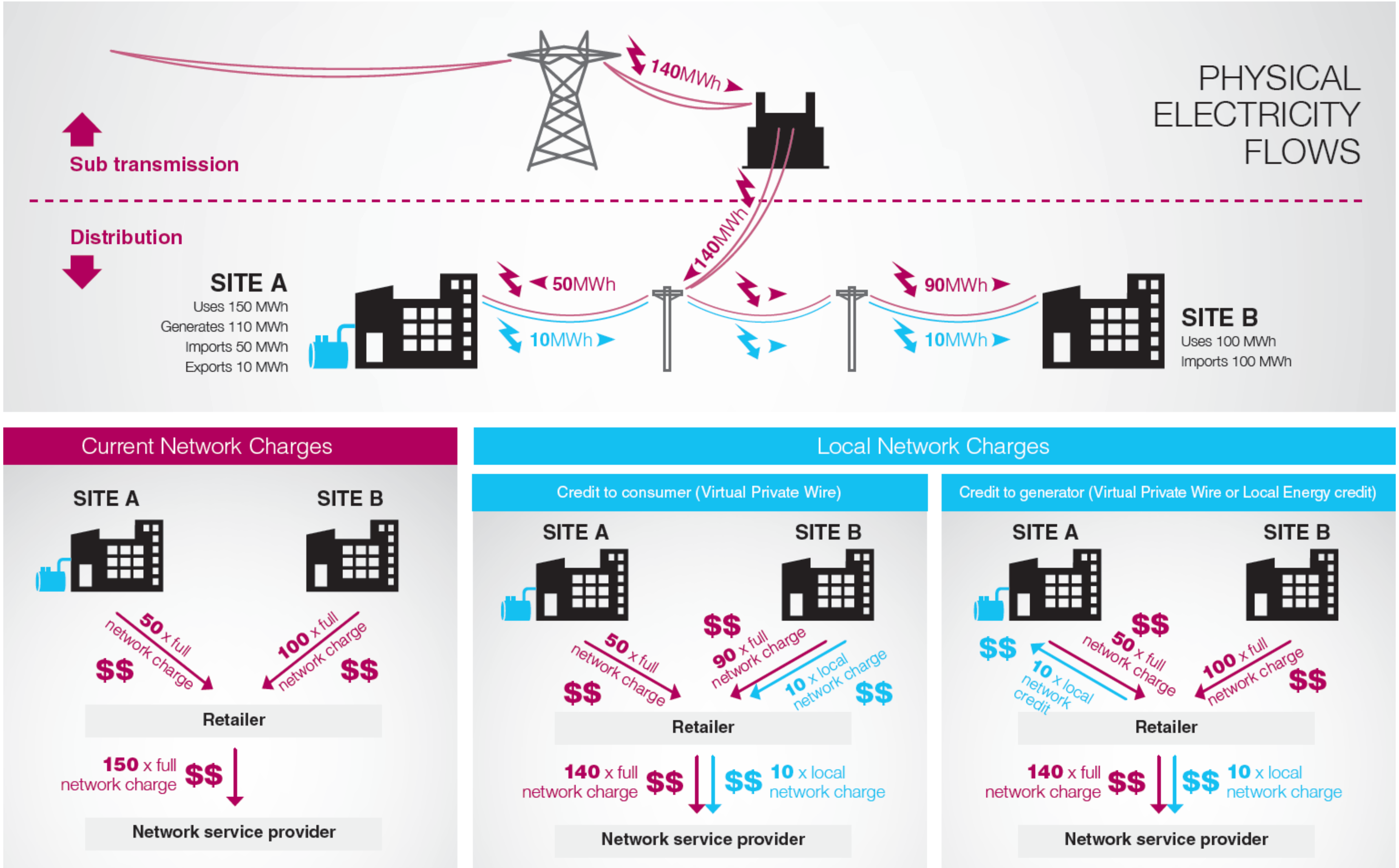
3b. Who should credits be paid to – the **generator**, the **consumer**, or **doesn't matter**?

Comparing frameworks

Table 2: Comparing frameworks: local generation credit and virtual private wire

ISSUE	LOCAL GENERATION CREDIT		VIRTUAL PRIVATE WIRE	
Simplicity	Simpler to administer (paid to all local generators according to a pre-determined formula)	✓	More complex to administer (requires relationship between generator and local consumer)	✗
Metering and billing requirements	Simpler metering	✓	More complex metering (may impose significant costs)	✗
Reverse flows (may impose costs on network businesses)	Requires additional technical solutions to prevent payment at times of export, and may be difficult to determine which generator should get credit at that time	✗	Ensures that any generation credited is balancing a load	✓
Price certainty and flexibility for generator	More price certainty for generator, as credit is irrespective of local customer contract	✓	May result in sudden drops of income, if generator loses local customer	✗
Ability to pay customer	Benefit paid to generator, but can be passed on in form of lower energy charges	~	Benefit may be credited to the consumer OR the generator	✓
Enabling local energy sales	Generator still needs mechanism for energy sales	✗	System to net off energy at customer premises gives multiple benefits for energy sales	✓

Figure 6: Electricity flows and money flows



6. VALUING LOCAL ENERGY: THE METHODOLOGIES

Two methodologies for calculating the value of local energy are outlined here, and illustrated in Figure 7.

The first is called '**volume-based**', and is based on the model operating in the UK. The second is called '**mirror tariff**', and is based on the actual network tariff of the generator or their customer(s).

Both methodologies should:

- be cost reflective
- decrease rather than increase cross-subsidies between consumers
- work in a wide range of circumstances
- enable more local generation
- assist network operators to future proof their business model.

The methods are used to calculate the appropriate charge for local use of the network, and the equivalent local network credit. The local network credit is the difference between the network charge levied for use of the entire system, and the local network charge. It can be applied as a direct credit to the generator, or as a reduction in the consumer's network charges.

Volume-based method

The volume based method credits all local energy exports on a volumetric basis, with no separate component for capacity payment.

As illustrated in Figure 7, the model uses the average incremental capacity costs of building additional network infrastructure in each area, in $/kW/yr. The incremental cost is calculated by assigning value to each defined network level (for example transmission, sub-transmission, low voltage, as per Figure 4).

The incremental cost in $/kW/yr is then transformed into a volumetric value of the avoided network cost (that is, $/KWh) for each time-of-use period: peak, shoulder and off peak. Value is allocated to each period according to the probability of the system peak occurring in that period.

An 'F-Factor' is also defined, which represents the security of supply provided by different types of local energy.

The local energy payment (the credit) is the calculated avoided network cost multiplied by the appropriate 'F-Factor'.

A capacity component is included to some extent by the weighting of the network cost towards peak times, and basing the initial value on the augmentation cost per kW.

Australian figures to calculate incremental capacity costs are not available in public documents, but could be readily introduced into the model using data internally available to network operators.

Mirror tariff method

The mirror tariff method uses the actual network tariff of either the generator or their customer as the basic input for calculation of the local network charge, rather than carrying out an entire calculation of the incremental cost of network augmentation for each area.

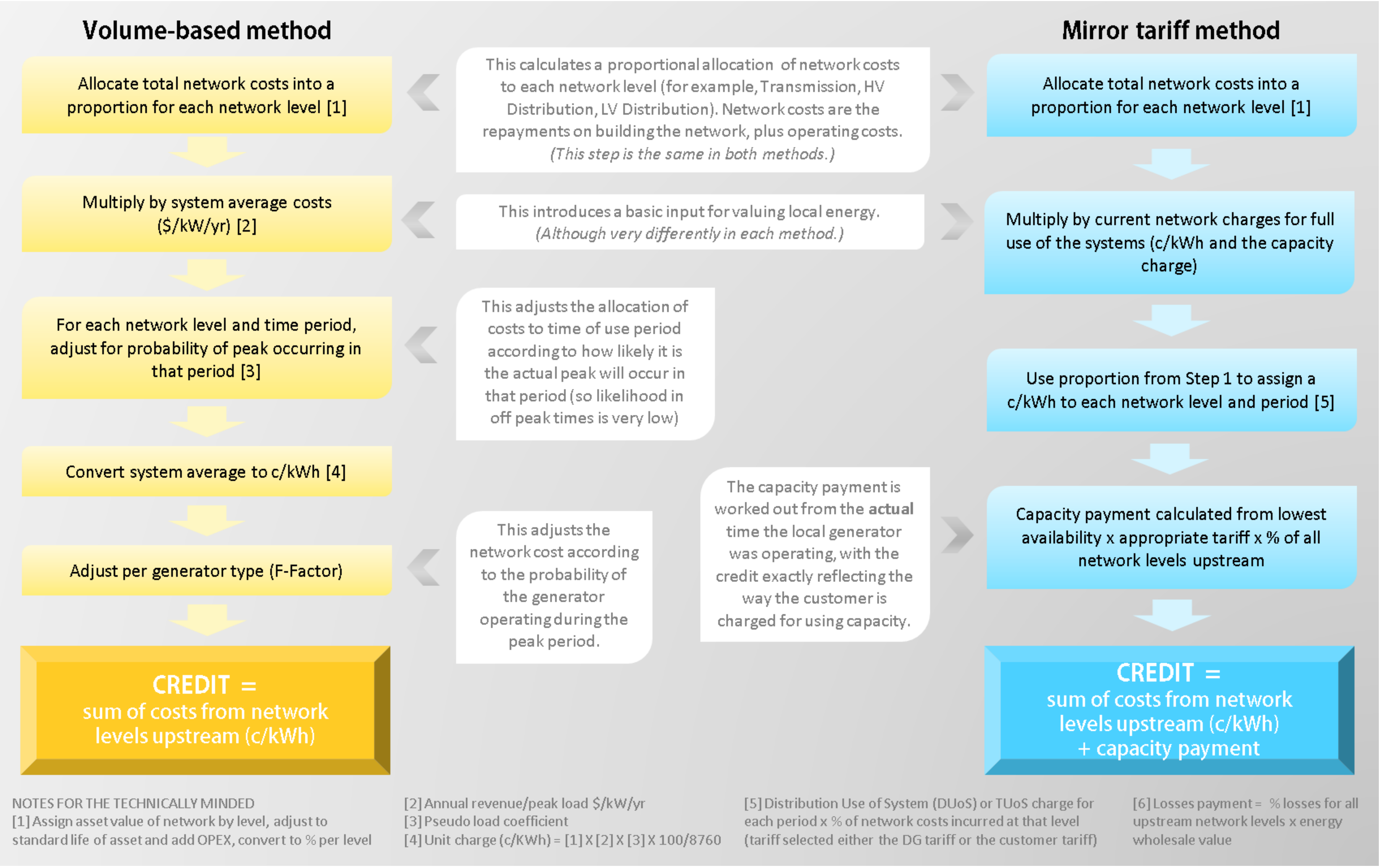
The network tariff used in the calculation must be time-of-use, and include a capacity charge. Local network credits in this method will exactly mirror the existing network charge, with a volumetric and a capacity component.

The mirror tariff method will be as cost reflective as the relevant network tariff. While network charges are often not cost reflective at present, they are currently under review with the specific objective of making them so, following the recommendations of the Power of Choice review[12].

Using existing network tariffs as the building blocks for local network charges avoids duplication of effort, and means the improvements resulting from the current price reform process will automatically flow through to local network charges.

The method for allocating network costs to each network level is exactly the same as used in the volume-based local approach, as shown in Figure 7. The percentages allocation is then applied to the relevant network tariff.

Figure 7: Calculation methodologies



Payment of the local network credit

Both methods may be used to credit the generator, and if the Virtual Private Wire framework is used, both may be used to give the credit to the consumer.

Assuming the credit is paid to the generator, volume exports are credited at the local energy value corresponding to the network levels not being used. In this case, the consumer pays full network charges, and a portion is passed through to the generator. The network operator receives revenue for all network levels at or below where the local energy transfers are occurring, and the generator is paid for the network service.

Alternately, the benefit could be received directly by the consumer. This would require the virtual private wire framework, so that the amount of local energy purchase is known. The consumer's current network charge would be reduced by the proportion of network levels not being used.

As well as a time-of-use volumetric payment, in the **mirror tariff** method a capacity payment is made based on the **lowest** level of measured generator output during peak periods on a number of key peak days. This is the inverse of capacity charges, which are based on the **highest** customer demand during the relevant period. The general principle would be to reflect the charge to the local generator, to incentivise firm supply at the time most needed.

CONSULTATION QUESTION 4

– LOCAL NETWORK CHARGES: CALCULATION METHODS

Which methodology is preferable and why – the volume-based or mirror tariff method?

Comparing the methods

Table 3: Comparing methodologies: volume-based and mirror tariff

Issue	Volume-based method (UK model)		Mirror tariff method	
1. Incentivises local capacity when needed	Capacity payments use a standard methodology by generator type, so don't reward actual availability.	~	Mirror tariff credits reflect the actual availability of the local generator at peak times	✓
2. Reliability	Relies on statistical probability to align payments with period of greatest need in a local area	~	No payment for on-demand response, but payment for actual available capacity at peak time	~
3. Simplicity	Complex to calculate the first time for each network area , but subsequently is a publicly disclosed formula	~	The mirror tariff system reflects existing network tariffs, so very simple to calculate	✓
4. Certainty	The payments are pre-determined, so the generator has certainty.	✓	The volumetric portion of charges is certain, but the capacity payments depend on actual availability. This is also an advantage, as it rewards network services.	~

7. NEXT STEPS

The City of Sydney, in collaboration with other interested organisations, is planning to submit a rule change request to the AEMC on reduced network charges for local energy, in the near future.

In preparation for the rule change request, the City of Sydney is seeking views on the frameworks and methods contained in this report, through a consultation process in November 2014.

Following input on the broad frameworks and methods, the detailed rule change will be prepared.

The Institute for Sustainable Futures is hoping to undertake trials of the two calculation methods with project proponents and network operators in the first half of 2015, as well as further methodology development. This will include analysis to gain understanding of the operational, economic and equity implications for the different stakeholders.

REFERENCES

1. Clean Energy Council (2013). *Clean Energy Australia Report 2013*.
2. Energy Supply Association of Australia (ESAA) (2012). *Electricity Gas 2012*:140.
3. Dunstan C, Sharpe S, Harris S, Wynne L, Jenni D, Razain H. (2013. *GAME CHANGE: Decentralised energy and electricity networks in the low carbon era. Prepared for the City of Sydney. Institute for Sustainable Futures, UTS, Sydney*: 48.
4. Dunstan C, Downes J, Sharpe S. (2013). *Restoring Power: Cutting bills & carbon emissions with Demand Management. Prepared for the Total Environment Centre. Institute for Sustainable Futures, UTS, Sydney*: 61.
5. Bronski P, Creyts J, Guccione L, et al (2014). *The economics of grid defection*.
6. International Energy Agency (IEA) (2014). Linking Heat and Electricity Systems.
7. Watt M, Passey R, Noone B, Spooner T. (2013). *National Survey Report of PV Power Applications in Australia 2013. IEA PVPS programme*.
8. Martin J. Solar PV price check – July (2014). *Business Spectator* (July).
9. Electricity Supply Association of Australia (ESAA) (2013). *Who pays for solar energy?*: 5.
10. Electricity Networks Association (ENA) (2014). *Enabling Embedded Generation - Turning Australian electricity on its head*: 8.
11. Productivity Commission (2013). *Electricity Network Regulatory Frameworks - Report No. 62 (Volume 1)*. Canberra:356.
12. Australian Energy Market Commission (2012). *Power of choice review - giving consumers options in the way they use electricity*.

Institute for Sustainable Futures

UTS
UNIVERSITY OF TECHNOLOGY, SYDNEY