Submission
to the Senate Inquiry

Renewable Energy (Electricity) Amendment (Feed-in-Tariff) Bill 2008

Sustainable Energy Policy Queensland
20 Aug 2008

Sustainable Energy Policy Queensland (SEPQ) is a group of sustainable energy consultants, developers, designers, installers and educators based in South East Queensland. Our goal is to encourage the adoption of sustainable energy and energy efficiency technologies that provide cost effective options for a sustainable energy future. We will achieve this by undertaking supply-demand energy analysis and the preparation of appropriate policy. This includes making submissions to the relevant state or federal authorities on energy related topics.

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ANZSES	Australian & NZ Solar Energy Society is part of the International Solar Energy Society; formed in 1954. Over 1200 members in Australia.
ATA	Alternative Technology Association; formed in 1980 to promote sustainable living. Over 4500 members in Australia.
ATRAA	Appropriate Technology Retailers Association of Australia; formed in 1977 to promote sustainable energy systems.
SEIA	Solar Energy Installers' Association; formed in 2006 to promote solar energy systems.

Abbreviations used in this submission:

ERoEI	Energy Return on Energy Invested
DME	Qld. Dept. of Mines and Energy
kWh	kilowatt-hour
PV	Photovoltaic systems
RE	Renewable Energy
REC	Renewable Energy Certificates
SEQ	South East Queensland
STE	Solar Thermal Electricity Systems

INTRODUCTION

SEPQ welcomes the opportunity to make a submission to the Senate Inquiry into a proposed renewable energy (RE) electricity feed-in tariff (FiT) bill. This submission outlines our general support for the bill and some issues we believe need further consideration.

POLICY CONTEXT

SEPQ recognises that there is a range of emerging and existing renewable energy generation technologies that need government support to assist their development and application. These technologies will play a pivotal role in our transition to a sustainable energy economy. Photovoltaic and solar thermal electricity (STE) systems are two such technologies. These technologies are well developed, proven and reliable and can be applied on any scale such as larger centralised (e.g. 1 MW or greater) or small distributed systems (0.1 to 10 kW) systems. However, their energy generation cost is high compared to coal fired power stations.

There are other large scale RE systems that are cost competitive with fossil fuel generation when all external costs are included. This includes RE generators such as wind farms, biomass thermal plant, landfill gas and solar water heaters (which displace electrical demand). These technologies are supported by the current RET.

ROLE OF PV AND SOLAR THERMAL ELECTRIC SYSTEMS IN THE AUSTRALIAN ELECTRICITY NETWORK

The key roles of grid connected PV and solar thermal electricity systems initially are:

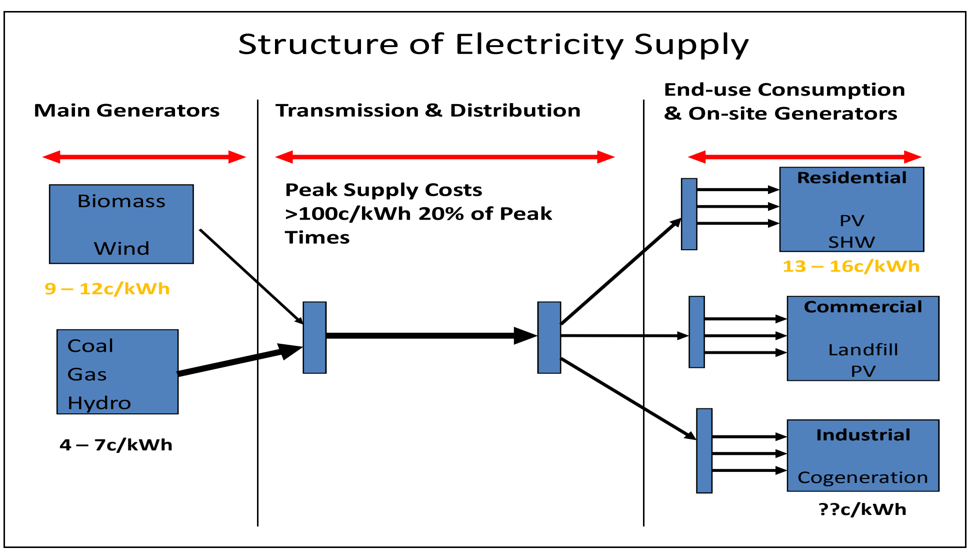
- the displacement of fossil fuel generated electricity and
- the production of electricity at the peak periods (12noon to 3pm) to offset peak demand now primarily due to commercial and residential air conditioning loads.

Figure 1 shows how decentralised grid connected PV competes against the current price of electricity from other generators. The price varies throughout the day at the point of use on the electricity network.

Analysis of ENERGEX data shows that this cost can be higher than $1/kWh for 20 % of the peak period (White, 2005:7). For STE systems, the price that it competes against will be determined by its location in the network.

As large scale thermal or chemical storage systems are applied to these generating technologies and cost reductions occur due to economies of scale, their role will expand to include base load power generation.

Figure 1 – Structure and Costs along the Electricity System



SUPPORT FOR THE PROPOSED BILL

SEPQ supports the details given in the proposed bill. Our interpretation of the Bill's clauses and reasons for support are given within each dot point as follows:

- Section 34A (2) - Metering of all generation using a meter for that purpose – This allows proper measurement of renewable energy systems output and encourages best practice design to achieve optimum performance. It also allows quantification of pollution savings such as greenhouse gas (GHG) emissions savings and potentially other benefits from embedded micro-generation such as photovoltaic (PV) systems (See appendix 1 for outline of benefits of PV to the electricity network). It also allows system owners to check their RE system's operation.

- Section 34C (2) (b) - The owner of a qualifying generator is paid for all (gross) electricity generated - This recognises that all electricity generated by RE systems contributes to the grid by removing the need to generate and transmit power from polluting sources. Every kWh of RE generation delivers identical benefits, whether that power is consumed by the household generating the power or by another household in the electricity grid.

- Section 34D (12) - FiT is paid for 20 years at the FiT rate when the generator is registered under the scheme – This ensures long term financial and planning security for system owners and the RE industry.

- The FiT is available to all owners of a qualifying generator (ie. no limits on the size of the generator or whether the owner is a customer of the electricity retailer) – This should assist commercial premises such as supermarkets etc to install larger systems to offset peak air conditioning demand and higher Time of Use (ToU) tariffs.

- The FiT is available to all qualifying technologies, not only PV. This is important so as not to limit the benefits to any one technology.

- Section 34A (1) and (2) - That access to the grid is guaranteed and metering of the generated electricity is required – This helps to remove barriers to connection although barriers can still be imposed by electricity network managers or retailers of networks where the system is being connected e.g. cumbersome, bureaucratic internal processes that slow down system connection and implementation.

- Section 34D - The Minister will yearly set the different FiTs for different types of generators and fixed for five years (reducing by a max of 10 % per year after that). The Minister may also set capacity targets for different types of generators which will be fixed for five years (when the capacity target is reached the 10 % reduction limit does not apply).

- Section 34E - That the electricity retailers and direct customers will pay a levy which will be used to pay the FiT. This cost will be spread across the general community but any increase in the cost of electricity will be proportional to amount of electricity consumed. Added costs to lower income groups may be offset through assistance with energy conservation measures.

ISSUES FOR FURTHER CONSIDERATION

SEPQ has concerns with the following sections:

- 1 Section 5 ***excluded network*** means an electricity distribution network that supplies electricity to less than 10,000 retail customers. Why exclude smaller and often remote networks where embedded RE generators or small centralized plant can play a significant and cost effective role in offsetting normally higher electricity costs and transmission infrastructure costs? These customers are often serviced by diesel generators with high unit energy costs. In Queensland, the State Government's 'Tariff Equalisation' legislation provides that the customers anywhere in Queensland including those on small remote networks (excluding small stand-alone power systems) pay the same unit electricity price as customers on the main grid. Hence there is no reason why these customers could not be included in the levy scheme under clause 34E.

- Section 34D (3) – There are no criteria set for the determination of target levels for individual technologies. This should take into consideration manufacturing capacity and availability of trained sales and engineering staff.

- Section 34D (4) - The Minister *may* set the FiTs in accordance with the type of generator, location and capacity of the generator. These criteria seem insufficient. There are other criteria that may be required to set the FiT. These are not spelt out in the Bill or attached information. Germany's FiT selection criteria may be a good guide. Other criteria might include a reasonable simple payback period for system owners, current status and anticipated cost reductions in the technology over the next 10 years, and energy return on energy invested (ERoEI) ratio. Also embedded generation technologies such as PV have a long list of network benefits not fully identified and costed in Australia. (See Appendix 1 for more details on these criteria and attached paper).

- Section 34D (6) – This clause is not clear and needs to be reworded.

- There should be a clear link to the cost of fossil fuelled electricity including carbon cost and other external costs. This should take account of inflation and ensure that the FiT is increased in accordance with fossil fuel energy price rises.

- Section 34D (13) - This section is unclear as to why you need to review annually the technology in terms of its "environmental cost or impact" only. For example, the technology may equally provide added environmental benefits not initially recognized, leading to enhanced social, economic and environmental outcomes. We suggest this clause be modified to include both negative and positive unforeseen aspects of the technology.

- Section 34F - The Register should also record the capacity of the qualifying generator and the anticipated annual output, based on industry association approved system analysis tools or methodology. This is useful for predicting future benefits and allows checks against suppliers' claims as some suppliers may exaggerate the expected system performance.

Appendix 1 – Supporting Information for a PV FiT

BENEFITS OF PV

SEPQ considers that a FiT amount must reflect the true value of PV generation to the electricity network and to society, as it should for any RE technology. PVs can provide an extensive list of benefits including the following:

- No emissions during generation.
- No water required for generation.
- Power produced at peak demand times of the day, hence offsetting expensive power generation whose full costs of supply exceed $1/kWh for 20% of peak times (White, 2005:7).
- Does not attract trading and network charges for energy retailers.
- Saves infrastructure upgrade costs for the electricity industry.
- Reduces transmission losses by producing power locally.
- Stimulates the PV industry and creates jobs regionally.
- Saves land and infrastructure costs as it uses existing roof space / infrastructure wires etc
- Provides inflation free, stable power price.
- Provides increased resilience and reliability to the electricity grid during extreme weather events or terrorist attack, particularly if combined with short term energy storage.

Work to quantify economically some of these benefits in Australia is sparse. Hence, we have attached a document that outlines a more extensive list of benefits, particularly to electricity network planners. (See attached paper by Cliburn and Robertson, Electric Solar Utility Network (USA)). Similar research work needs to be undertaken here in Australia.

PV systems embedded in the grid will have the greatest benefit initially where local transformers and transmission lines are already heavily utilised during 10am to 5pm due to air conditioning or where high growth in demand is occurring and transmission systems may need upgrading soon.

ADDITIONAL CRITERIA FOR SELECTING A FIT VALUE

The proposed criteria for selecting the FiT value state that the Minister must consider the type, location and capacity of the qualifying generator. SEPQ suggests that other criteria will be required and that consideration should be given to the following:

Simple Payback Time – Market experience has shown that many people will only purchase solar technologies such as solar water heaters or PV systems when they estimate that the simple payback period is less than about 7 years. This period is about the average occupancy of homes in SE Queensland.

The simple payback time (SPT) is calculated as the installed capital cost of the RE system divided by the annual projected cost savings in the first year (based on the projected annual energy output and FiT unit energy rate). This simplistic method does not account for changes in the value of money over time but is the most common method used by the general community.

SEPQ have computer modelled the performance of the most typical type of PV system installed in Queensland, a 1 kWp polycrystalline PV module system (see Figure 2) for the following conditions:

- Average solar irradiation day from the Australian Solar Radiation Data Handbook
- PV array tilt angle of 20 degrees, facing north with no shading
- Temperature corrected PV output of 4.28 kWh/d or 1562.19 kWh/yr
- Installed capital cost $9000 to $13500 for bulk purchase or one off systems respectively, including metering costs (See Table 2 also).

Table 1 gives the simple payback time for various FiT values and installed system cost range above, which excludes the current $8000 rebate and renewable energy certificates (RECs).

Table 1 – Simple Payback Time for various FiT Values excluding Rebates and RECs

	Installed Capital Cost – 1 kWp	Installed Capital Cost – 1 kWp
FiT Rate (c/kWh)	**$9000**	**$13500**
60	9.6 years	14.4 years
80	7.2 years	10.8 years
100	5.76 years	8.64 years

Based on our computer modelling of PV output in Brisbane and simple payback time, Table 1 above shows that, without rebates or RECs, a PV FiT of greater than 80 cents/kWh would be required to provide a simple payback period of around 7 years. This period is the average home occupancy time and hence system owners would see a full return on their investment, excluding any increase in home resale value due to the PV system. In Melbourne for example, the PV system output will be reduced and simple payback times will increase accordingly.

Rebates

If a rebate is retained in conjunction with a FiT, then a much lower gross FiT could be charged. For example, for bulk purchase of systems, if the installed cost of a 1kW PV system after the current rebate and RECs payments is $1400 (See Table 2, Local Power installed cost for bulk purchase), then a FiT value of only 15c/kWh is required to give a simple payback of less than 7 years in Brisbane. If the installed cost is $5120 for non-bulk purchase cases, (average Origin Energy cost), then the gross FiT value of about 50c/kWh is required to give a simple payback of less than 7 years in Brisbane.

The advantage of a rebate scheme over a gross FiT only scheme is that it reduces the upfront cost of PV systems. This high upfront cost has been the major barrier to the adoption of solar systems. More discussion with industry needs to occur to weigh up the pros and cons of gross FiT only versus rebate (plus FiT) schemes.

Home Owners and Landlords

The average occupancy of homes in SE Queensland is 7 years. The changing of home ownership and relocation should not be a discouragement to those considering installing a PV system. A gross FiT would bring financial certainty and a value to the PV system that would be appreciated by a purchaser of a home.

An increasing number of Australians are renting and the roof area of these houses represents a valuable resource. A gross FiT would enable landlords to make an investment to install a PV system on a house and receive payments from the gross FiT. The payment will be based on all generation so the financial benefit to the landlord is not affected by the electricity consumption of a tenant.

Energy Return on Energy Invested (ERoEI) - This is a ratio of the energy output of an energy system over its life time to the energy used to construct and maintain the system over the same period. It is preferable that this is as high as possible for renewable energy technologies if the goal is to rapidly reduce GHG emissions. This is because each renewable energy technology will require the consumption of some fossil fuel in its construction and maintenance. The higher this ratio, then the lower will be the amount of GHG emissions resulting from fossil fuels used to construct and maintain the RE system. Therefore, where practical, preference should be given to RE technologies that have demonstrated high ERoEI ratios of 6 or greater. For PV systems, there is a broad range of ERoEI quoted in authoritative literature. Typically, thin film or sliver technologies have a higher ERoEI than older poly-crystalline or mono-crystalline manufacturing technologies. The general trend is for all PV manufacturing technologies to gradually improve their ERoEI over time.

One practical conflict that occurs here is that roof space for PVs (and if including solar water heating) is often limited due to roof shape, orientation or shading. Because thin film PV technology is less efficient, it requires about twice the roof space of traditional older PV modules. For example, a typical solar water heater takes up about 5 to 6 m^2 of roof space. A typical 1 kilowatt poly-crystalline or mono-crystalline PV array takes up about 10 to 12 m^2 of roof space. Hence, application of PVs should not be restricted to the technology with the highest ERoEI.

Appendix 2 - Critique of the Queensland Government's FiT scheme – "The Solar Bonus Scheme"

The public generally welcomed the Queensland Government's Solar Bonus Scheme initiative to introduce a Feed-in Tariff (FiT) for solar PV systems. The scheme is described in the Department of Mines and Energy (DME) 'Solar Bonus Scheme' brochure. The broad goals of the scheme are:

- To make solar power more affordable for Queenslanders
- To stimulate the solar power industry

However, when members of SEPQ examined the scheme in detail, we found that the goals of the scheme will not be achieved with the current import–export FiT.

SEPQ has found the scheme has the following limitations:

- It will deliver no financial benefits to the vast majority of home owners because it is only paid on electricity that goes to the grid (generation minus consumption). Our computer modelling shows that the average household power consumption **during the daytime (based on (DME) Solar Bonus Scheme Brochure - 10MWh/year)** is more than the PV power output, even when electric hot water is deducted from the daily load profile. This is because nearly all electric water heating in Queensland is on controlled tariffs and heating mostly occurs at night after 9pm. Hence the average household will receive no payment under the import–export FiT scheme (see Figures 2 and 3).

- It is inequitable because people who live and work at home during the day will have a higher daylight electricity demand and use a large proportion, if not all, of the energy produced by their PV system. Only those who leave their home daily and do not use the energy produced by their PV system will be credited with a FiT payment. Accordingly, households that have made equal investments in PV systems will be rewarded differently, depending on their living circumstances.

- It is only paid on electricity that goes to the grid (generation minus consumption). This does not recognise that all electricity generated by PV systems contributes to the grid by removing the need to generate and transmit power from other sources. Every kWh of PV generation delivers identical benefits, whether that power is consumed by the household generating the power or by another household in the electricity grid (see Figure 1).

- The Solar Bonus Scheme requires import–export metering. Under this scheme, the generation from the PV system and consumption by the household cannot be individually metered. Only the difference can be metered. This means the Queensland Government will not be able to determine the greenhouse gas reductions from PV generation or from energy efficiency measures in the home that contribute towards Australia meeting its Kyoto target (see Figure 4a and 4b).

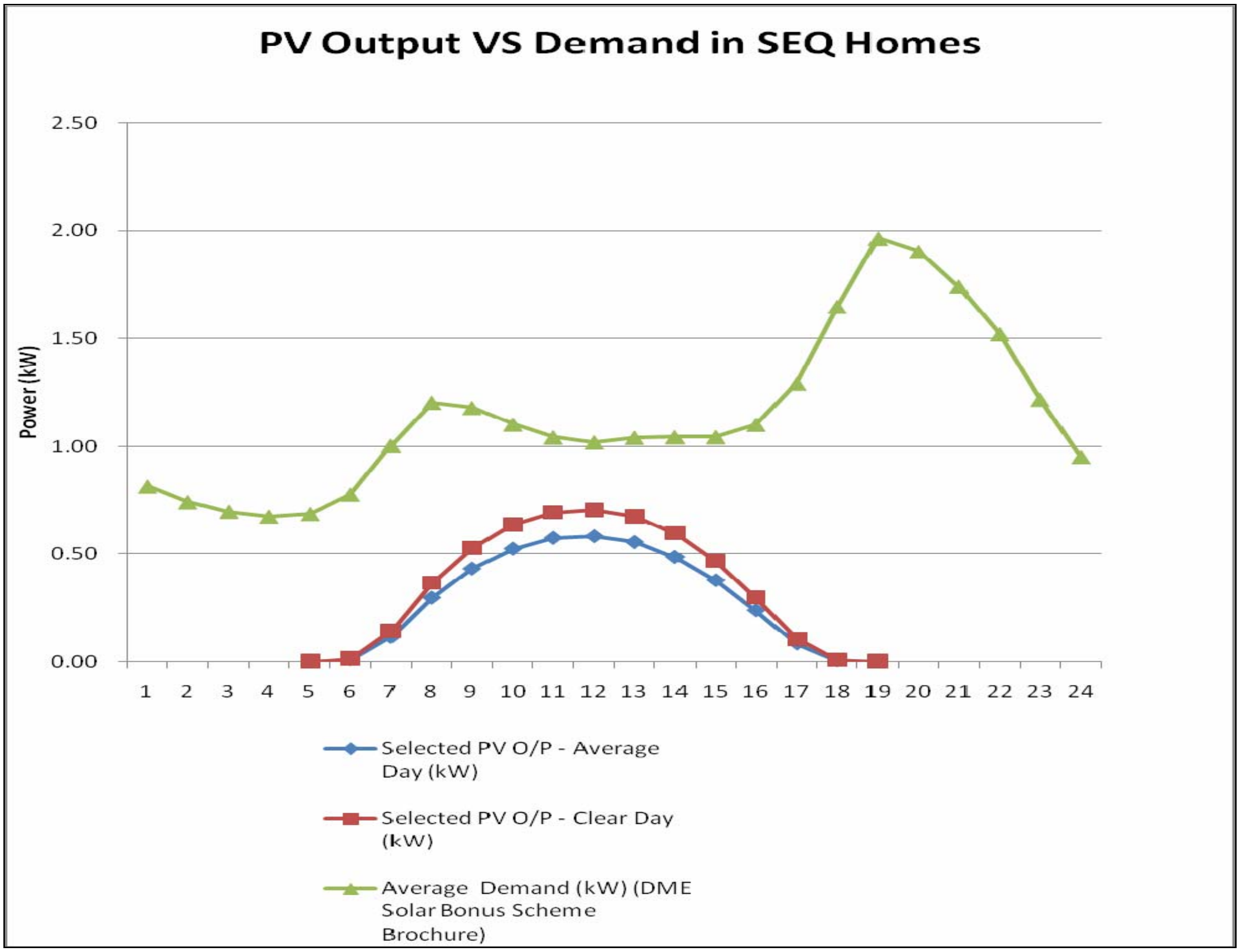
- The proposed metering scheme will no longer give home owners feedback on their own consumption or on the performance of their PV system. This will discourage energy saving measures and not allow home owners to check their PV systems operation.

- The claim that the scheme will encourage energy conservation in the home to reduce demand is not substantiated. It is a hope, not a guaranteed outcome. It may simply encourage users to displace electrical energy demand to the evening or early morning, potentially increasing peak residential demand on the local transmission system. As well, to achieve any payment at the schemes buyback rate of 44c/kWh, a 50 percent reduction in demand (27.4 to 13.7kWh/d) would be necessary in the average home. While energy audits by Berrill and others show that this is achievable and in fact desirable to meet GHS reduction goals, it requires expenditure of about $6000 over time in energy efficiency measures and solar water heating.

- The import–export metering requires modification of the existing gross metering already used by ENERGEX. This adds a cost of at least $300 to each PV system, including existing systems, and will be a discouragement to investors and add cost burdens to electricity distributors and retailers. The superior gross metering method is already in place.

- The scheme is limited to domestic and other small energy customers who 'consume no more than 100 megawatt hours (MWh) of electricity a year'. This limits the potential of the scheme to stimulate the solar power industry. All customers should be given the opportunity to invest in PV generation.

Figure 2 – Average Hourly Power Output of 1kW PV System VS Demand for Average SEQ Home (10 MWh/yr – DME Solar Bonus Scheme Brochure)



(Load profile data for SEQ homes is based on monitoring of 238 homes by Energex in 2004 and scaled up from 21.06 to 27.4 kWh/day on average (Berrill, 2005:18)).

Figure 3 – Electricity Demand in SEQ homes with Controlled and Uncontrolled Electric Water Heaters (Berrill, 2005)

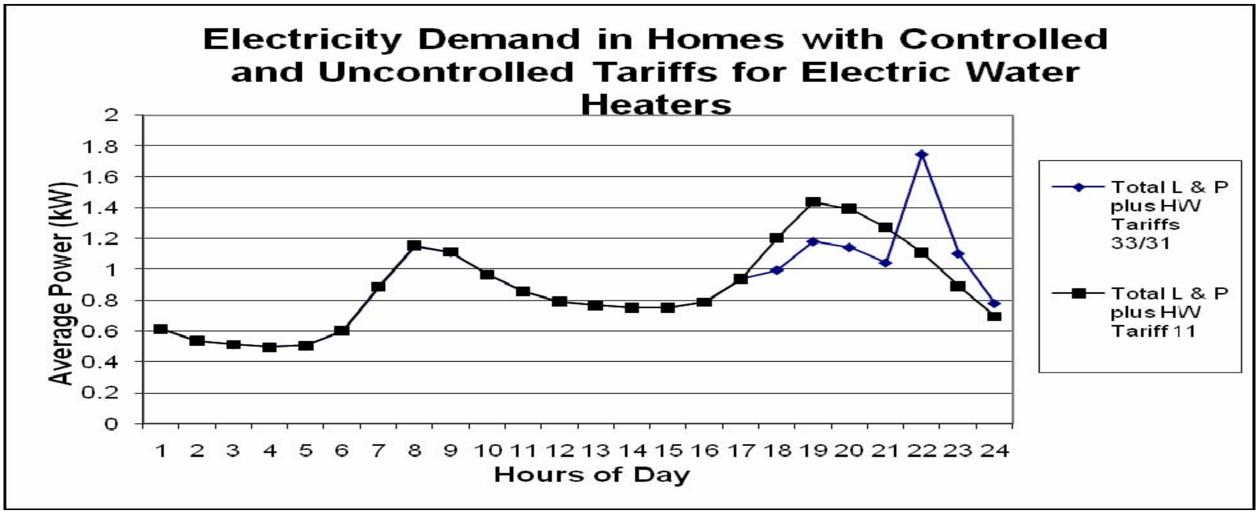


Figure 4 – PV Metering Schemes

Description of Metering schemes; *Metering of embedded generators in Australia* by David Roche, Australian Greenhouse Office, 2001

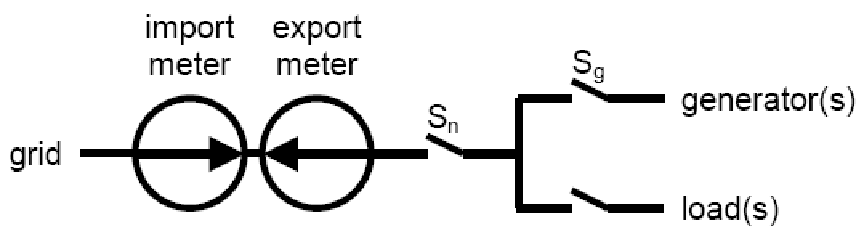


Figure 4a

Imports and exports are separately metered by two unidirectional meters (AGO Metering scheme 2) Metering scheme proposed for the Queensland Solar Bonus Scheme.

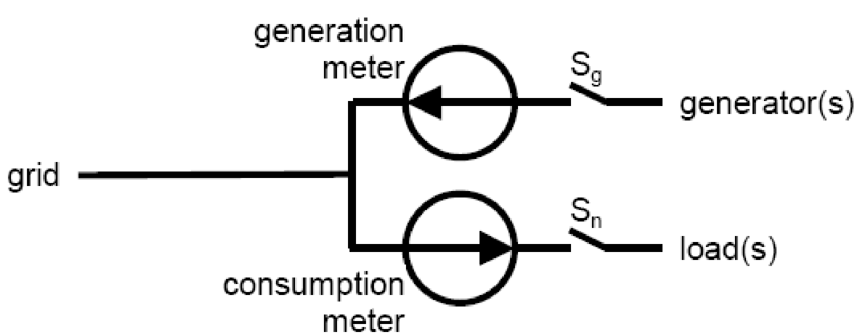
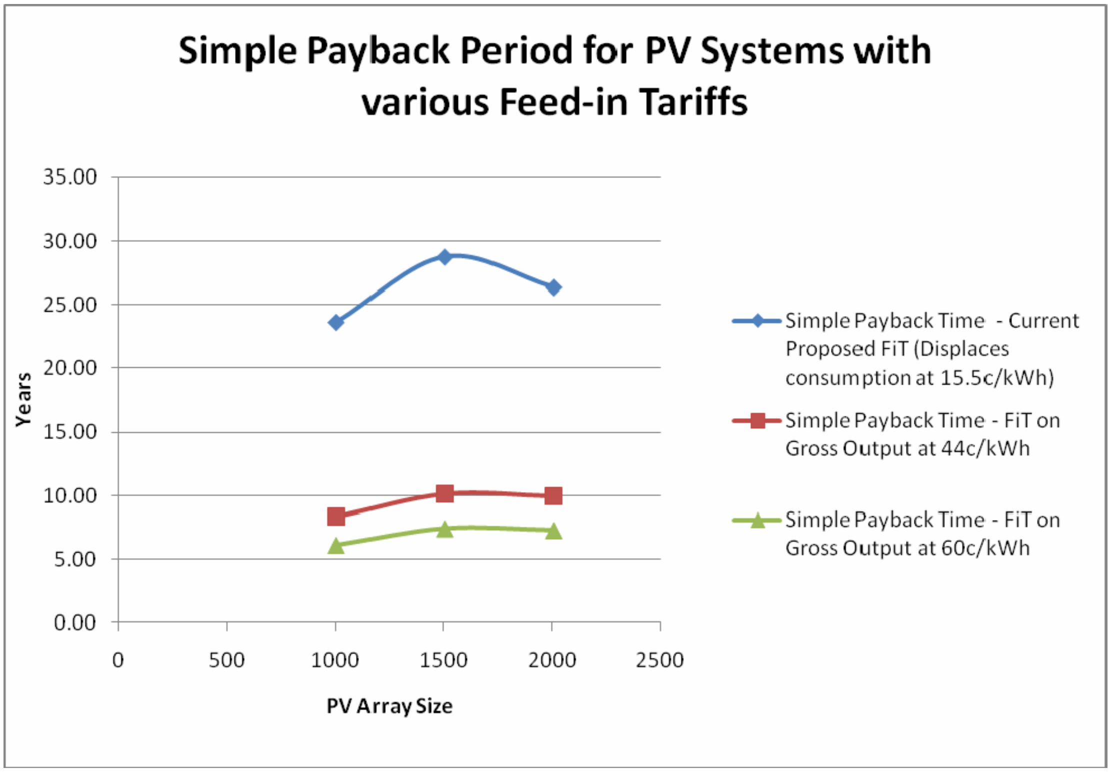


Figure 4b

Gross generation and gross consumption are separately metered by two unidirectional meters (AGO Metering scheme 3) Existing metering scheme used by ENERGEX.

Figure 5 – Simple Payback Period for PV Systems of various sizes (in Watts) with various Feed-in Tariffs based on average Origin Energy installed system costs, including current $8000 rebate and REC payments at $40/REC.



NB. The installed capital cost used for 1, 1.5 and 2 kW PV systems in Figure 5 assumes a one off purchase, not bulk purchase. The installed cost was take as 1 kW system - $5120, 1.5 kW system - $8230, 2 kW system – $11,200.

Appendix 3 – Bulk Purchase of PV Systems

Through bulk purchase of PV systems, some companies and community cooperatives are achieving significant cost reductions in the installed capital cost. The following 1 kW system costs have been offered after the $8000 rebate and RECs:

Table 2 – Range of Installed Costs for 1 kW PV System after rebates and RECs

Company / Cooperative	**Installed Capital Cost for 1 kWp PV System**
Local Power	about $1400 ea. (actual cost over 140 installations)
Beyond Building	about $1400 ea. (personal communication)
Free Solar	$1825 (with 20 year warranty)

References

Berrill T. et al (2005). Energy Demand and Scenario Analysis Report – Kelvin Grove Urban Village. Qld Sustainable Energy Industry Development Group, QUT.

White, S. et al (2005). Tapping Demand Side Management Opportunities in SE Qld: A Scoping Study. CSIRO Investigation Report CET/IR 705.