FEED-IN TARIFF DISCUSSION PAPER

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Contents

Introduction

On 27 July 2007, the ACT Chief Minister launched *Weathering the Change, the ACT Climate Change Strategy 2007-202*5 and the first of a series of comprehensive Action Plans. *Action Plan 1 2007-2011* identifies a range of measures to tackle climate change, including a proposal for a feed-in tariff for electricity produced by renewable means and supplied by a customer back into the network (Action 18). The Government will be implementing these measures between now and 2011 in order to encourage energy and emission reduction reforms and behavioural change in government, business and the wider community.

On 14 November 2007, Mr Mick Gentleman MLA tabled an exposure draft of a Private Member's Bill in the Legislative Assembly that contains a model for an ACT feed-in tariff. A copy of Mr Gentleman's exposure draft is available on the ACT Legislation Register at http://www.legislation.act.gov.au/ed/db_31437/default.asp.

Feed-in tariffs (FiTs), when used as an energy conservation measure, are a form of compensation for renewable energy exported to an electricity network by an embedded generation unit. The National Electricity Rules define embedded generating units as being any generating unit that is connected to a distribution network and not having direct access to the transmission network.

Generally, embedded generation is more environmentally friendly than traditional bulk generation. With the appropriate technology, individuals and organisations can connect to the electricity distribution network and export the power they generate. The tariff is the price per kilowatt hour (kWh) paid to these private producers of renewable power, usually at an amount set above normal market prices. It is intended that in the ACT this tariff will apply only to renewable energy generation - any non-renewables or so called "clean technologies" are not in scope.

In Australia, some State and Territory Governments have already introduced FiTs as a policy mechanism to encourage greater use of renewable energy technologies. South Australia and Victoria recently introduced legislation to support feed-in tariff arrangements. The Queensland Government has also announced its intention to implement a feed-in tariff as part of the *Climate Smart 2050* strategy.

Although the use of FiTs may potentially reduce green house gas emissions and provide an incentive for investment in renewable energy technologies, they also raise some significant policy issues. In particular, there are a number of practical challenges in the construction of an effective FiT framework, including:

- cost effectiveness;
- efficiency;
- equity;
- regulation; and
- infrastructure/technical issues.

This paper examines the policy rationale behind the proposed adoption of a FiT in the ACT, explores some existing international and domestic models and investigates some of the issues associated with the use of a FiT in this way and for this purpose.

Written submissions are sought from industry and the community on the proposed model for the purchase of energy produced from renewable sources, and the most appropriate form of FiT that could be applied for this purpose, in the context of the broad principles of simplicity, efficiency and equity.

Submissions may be emailed to feedintariff@act.gov.au. Alternatively, hard copies can be posted to:

Ms Pam Davoren
Deputy Chief Executive, Policy
Chief Minister's Department
GPO Box 158
CANBERRA ACT 2601

Submissions are due by Close of Business on 25 February 2008.

Policy Rationale

Fossil Fuels v Renewable Energy

The ACT is a small contributor to global greenhouse gas emissions, generating about 1.2% of Australia's emissions. In turn, Australia contributes about 1% of global emissions.[1] The ACT has set a target of reducing greenhouse gas emissions by 60% of 2000 levels by 2050.

Despite the relatively small emission levels in the ACT, the majority of these arise from electricity usage, which at a household level is considerably higher than the national average. Based on 2005 figures, stationary energy (including electricity) contributes 72.3% of ACT emissions.[2]

Fossil fuels are finite resources which make significant contributions to greenhouse gas emissions. Renewable energy on the other hand produces little or no carbon dioxide emissions and therefore minimises the environmental impacts of energy production.[3] The International Energy Agency has defined renewable energy as:

> "*…derived from natural processes that are replenished constantly. In its various forms, it derives directly from the sun, or from heat generated deep within the earth. Included in the definition is electricity and heat generated from solar, wind, ocean, hydropower, biomass, geothermal resources, and biofuels and hydrogen derived from renewable resources.*"[4]

Fossil fuel electricity generation is generally cheaper than renewable energy. However, the cost advantage enjoyed by fossil fuel can in part be attributed to the fact that the environmental costs that it imposes on the community through greater carbon emissions are not reflected in its price. While one solution is to limit carbon emissions through a cap or tax, an alternative policy can be to subsidise renewable energy through initiatives such as a FiT.

It is also envisaged that initiatives such as FiTs will increase investment in renewable energy infrastructure which, in turn, would allow greater investment in research and development by firms looking to sell renewable energy infrastructure. In the medium term, such investment may increase the efficiency and cost effectiveness of renewable energy infrastructure and provides another reason to subsidise renewable energy through a FiT.

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[1] Department of Territory and Municipal Services, *Weathering the Change*: The ACT Climate Change Strategy 2007-2025, available at http://www.tams.act.gov.au/__data/assets/pdf_file/0003/63624/Climate_Change_Strategy.pdf, accessed on 16 November 2007.

[2] Department of Territory and Municipal Services, Weathering the Change: The ACT Climate Change Strategy 2007-2025, available at http://www.tams.act.gov.au/__data/assets/pdf_file/0003/63624/Climate_Change_Strategy.pdf, accessed on 16 November 2007.

[3] Source: CSIRO web page, available at http://www.csiro.au/org/ps1b.html, accessed on 3 October 2007.

[4] International Energy Agency Renewable Energy Working Party, *Renewable Energy……Into the Mainstream*, October 2002, available at http://www.iea.org/textbase/nppdf/free/2000/Renew_main2003.pdf, accessed 15 November 2007.

Policy Context

In the context of this discussion paper, the FiT will refer to a premium tariff that will be paid to consumers that install a network connected renewable embedded generation unit.

The tariff gives consumers an incentive to invest in this technology by providing a direct financial return on their investment. A significant constraint on the wider adoption of renewable energy technologies is the significant up-front costs associated with the installation of the technology. A further issue with renewable energy systems is their reliance on favourable environmental conditions which impact on the amount of output generated.

By targeting exported renewable energy that is flowing into the network and redistributing that electricity, they potentially reduce the electricity network's reliance on energy derived from fossil fuels which, in turn, contributes to reductions in greenhouse gas emissions.

This paper will not deal extensively with the benefits attributed to FiTs as these have been addressed in numerous other studies.[5] However, in general, FiTs are considered to contribute to the following policy outcomes:

- reducing greenhouse gas emissions by lessening reliance on non-renewable energy sources;
- accelerating the uptake of renewable energy technologies;
- stimulating greater innovation in renewable energy technologies;
- reducing distribution loss factors[6] associated with the flow of electricity through the distribution network; and
- reducing the amount of energy required to be purchased from the wholesale electricity market by reducing reliance on network delivered energy.

While FiTs may have many benefits, they are not without difficulties and costs. FiTs have been criticised for distorting competitive pricing and being a relatively inefficient and costly way to reduce carbon emissions. They can also require the purchase of backup energy sources to cover failures of renewable energy systems to operate to satisfactory levels.

There are significant equity concerns surrounding the subsidisation of those who can afford to purchase the technology by low income households, who eventually share in paying the cost through higher electricity bills. It will be necessary to ensure that the costs to the community and to the Government do not outweigh the environmental benefits of the proposal.

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[5] For example, see Mendonca, M. *Feed-in Tariffs: Accelerating the Deployment of Renewable Energy*, Earthscan, London, 2007; *The Energy Research Centre of the Netherlands, The Performance of Feed-in Tariffs to Promote Renewable Electricity in European Countries*, November 2002, available at http://www.ecn.nl/docs/library/report/2002/c02083.pdf, accessed on 15 November 2007.

[6] The distribution loss factor is the electricity lost as it travels through the distribution network.

The Electricity Market

Before examining the introduction of an ACT FiT, it is important to examine the market structure under which the tariff will operate.

National Market

The ACT is part of the National Electricity Market (NEM). The NEM commenced operation in 1998 and provides a wholesale electricity market which includes NSW, Victoria, Queensland, South Australia, the ACT and Tasmania.

The NEM is divided into four sectors:

- Electricity Generation: producing electricity from fossil fuel (coal and natural gas) and renewable energy sources (hydro and wind);
- Transmission Network Service Providers (TNSP): carrying high voltage electricity from generators to distribution networks;
- Distribution Network Service Providers (DNSP): supplying electricity to consumers; and
- Retailers: selling electricity purchased directly from the NEM to consumers.

The regulatory framework under which the NEM operates is set out in the National Electricity Law (NEL) and National Electricity Rules (NER). The Australian Energy Market Commission (AEMC) is responsible for developing and reviewing the NERs and providing advice on NEM issues.

The regulator for the NEM is the Australian Energy Regulator (AER) which is currently only responsible for the regulation of TNSPs. It is expected that the regulation of DNSPs and Retailers, with the exception of retail pricing,[7] will be taken over by the AER during 2008. Until that time, the Independent Competition and Regulatory Commission regulates these sectors in the ACT.

The wholesale NEM is operated by the National Electricity Market Management Company (NEMMCO), which is owned by NSW, Victoria, Queensland, South Australia, the ACT and Tasmania. Each jurisdiction is represented by a director on the NEMMCO Board. NEMMCO administers and manages the NEM and is responsible for ensuring supply security, system reliability, and a supply reserve.

Generators submit wholesale prices to NEMMCO which are dispatched to the NEM according to price and availability. Retailers and generators buy and sell most electricity through futures contracts rather than the spot market. The prices for distributing electricity via the TNSPs and the DNSPs are, or will be, set in five year price determinations by the AER.

[7] Along with the other States and the Northern Territory, the ongoing regulation of consumer electricity prices in the ACT will be reviewed in accordance with the Australian Energy Market Agreement.

ACT Electricity Market

The ACT electricity market is unique in the national context as it has no significant generation capacity. As such, the ACT is reliant on electricity from the NEM delivered through the NSW Transmission Network operated by TransGrid.

The ACT market structure consists of a monopoly DNSP and competition in the retail sector. ActewAGL Distribution controls the electricity distribution network in the ACT and has a deemed contract with customers under the *Utilities Act 2000* requiring, among other things, the connection of premises to the distribution network. Small consumers in the ACT have been able to choose their electricity retailer since 2004. There are currently fourteen retailers licensed under the *Utilities Act 2000* with five active participants in the residential and small business parts of the market.

ActewAGL Retail is the incumbent electricity retailer in the ACT. Under existing policy, ActewAGL Retail is required to supply electricity to all consumers in the ACT who have not opted to enter into a contract for the supply of electricity from another supplier. Currently over one third of ACT household customers have entered into individual supply contracts with ActewAGL Retail and other competing electricity retailers. ActewAGL Retail supplies the remainder of the household consumer market under the terms of a Transitional Franchise Tariff (TFT) which is currently set by the ICRC.

Regardless of who the retail supplier is, or the form of contract under which electricity is supplied, the consumer's electricity bill comprises the cost of generation, the transmission and distribution charges, and the retailers margin for the supply for the electricity.

Renewable Energy Sources in the ACT

Renewable energy can be sourced from either smaller generators such as households and small businesses or from larger scale activities such as wind farms or landfill gas extraction facilities.

South Australia has chosen to introduce a FiT for residential/small business photovoltaic (PV) generated power only. In Victoria, a FiT is utilised to encourage households and companies to install a range of renewable energy sources including wind, solar, hydro and biomass. In Germany the FiT appears to be aimed at both households and larger enterprises that generate renewable energy from biomass, PV, wind, landfill, gas and geothermal sources.

Weathering the Change suggests a wider approach so that residential, commercial and industrial consumers of electricity could be eligible. Discussion is invited on the scope for the tariff to be provided to both smaller and larger generators of renewable energy.

Larger scale producers such as large solar or wind farms, are arguably more efficient and can take advantage of economies of scale. Disadvantages associated with these generators include:

- a possible requirement for upfront Government support or subsidy; and

- a failure to engage community responsibility for energy use and addressing climate change.

On the other hand, it has also been argued that smaller generators such as households do not provide a constant or sufficient flow of electricity and therefore do not make a significant difference to emissions. The argument presented is that the energy that is exported to the network is not on sold because it is too small an amount and simply dissipates through the network.

However, it is also argued that the electricity generated from these systems is consumed and reduces losses as it is produced locally rather than travelling throughout the network. The effect of this is that generating households and nearby consumers would utilise the exported renewable electricity, thereby reducing the amount of energy that a retailer must purchase from the NEM.

In terms of ACT households, ActewAGL has advised that there are 113 installed embedded generation facilities in the ACT, with 22 approvals pending meter installations or approval (as at September 2007). The first approved grid connected unit was installed in August 2000 and up to December 2006 there were 50 approved sites across the ACT. There has been a surge in demand for grid connected embedded generation facilities in the period between January 2007 and June 2007, with more than 50 approvals granted.

All of the approved embedded generation facilities in the ACT are photovoltaic systems (PV systems). In 2006/07 these facilities generated 55 MWh of renewable energy or about 0.002% of the ACT's annual electricity consumption. In addition, there are four approved installations which are not metered and only supply the customers' premises.

Generation from landfill gas extraction facilities at the former Belconnen Tip and Mugga Way landfill provides around 27.2 MWh of renewable electricity annually. This electricity is not used for residential purposes and is purchased directly by the ACT Government.

This discussion paper has been largely confined to PV technologies. However, any ACT FiT scheme should be flexible enough to apply to other renewable technologies as appropriate. Work to determine an effective FiT rate for these technologies would be undertaken as the need arises.

Questions:
1. What other renewable energy technologies are utilised in the ACT?
2. Are these technologies commercially viable?
3. Should the FiT be extended to commercial and industrial premises?

Existing Programs to Encourage Renewable Energy

The cost of a PV system can be mitigated by the Commonwealth Government's Photovoltaic Rebate Program (PVRP) which pays an amount of up to $8,000 towards the installation costs of a PV system. PV owners are also able to use the Commonwealth's Renewable Energy Certificates (RECs) scheme to further offset the costs associated with PV systems. RECs are a tradable electronic form of currency for each MWh of eligible renewable electricity

generated or deemed to have been generated. Whilst the PVRP is limited to PV systems, RECS can be utilised by generators of alternative forms of renewable energy.

The Commonwealth also introduced a Mandatory Renewable Energy Target (MRET) in 2001. This scheme requires wholesale purchasers of electricity to proportionately contribute towards the generation of an additional 9500 GWh of renewable energy annually by 2010. MRET seeks to encourage additional renewable energy generation, reduce greenhouse gas emissions and ensure that renewable energy sources are ecologically sustainable. The market response to MRET has been to seek efficiencies in larger renewable projects such as wind farms. However, the result of this program has been an increase in electricity prices for consumers, who inevitably pay the costs associated with these measures.

The newly elected Federal Labor Government has announced it will set a 20 per cent Renewable Energy Target to ensure that the equivalent of approximately 60,000 GWh of Australia's electricity supply is generated from renewable sources by 2020.

At a local level, the ACT operates the Greenhouse Gas Abatement Scheme in conjunction with NSW. This scheme commenced in 2005 and requires ACT electricity retailers to source an increasing component of their product annually from cleaner and/or renewable sources. To date this has been achieved largely through increased efficiencies rather than new direct investment in renewable energy generation.

Additionally, ActewAGL and other retailers offer a solar buyback scheme for every excess kWh of energy exported back into the network from PV systems with a capacity of up to 10 kilowatts. ActewAGL offers a rate of 7.4 cents per kWh for net exports of electricity over a billing period. The major limitation of this scheme is the significant amount of energy that a consumer is required to generate in order to become a net exporter (i.e. more energy is exported by the consumer than is imported from the network for usage) over a billing period. Due to the size of PV systems currently installed, it is understood that only one consumer in the ACT is a consistent net exporter of electricity. Nonetheless, such PV systems reduce the net consumption and provide savings on electricity purchases equal to the rate per kWh charged by the retailer.

Cost Issues

It is recognised that a FiT, along with other policy initiatives to encourage the production of renewable energies, might increase the uptake of a variety of renewable energy technologies in the ACT. However, it is difficult to ascertain which of these technologies are, or will be commercially viable in the ACT and the level of subsidy required through a FiT to enable a commercial return.

It is necessary then that there is an understanding of what technologies are currently available and when others may be expected to become available. Discussion is invited on the range of renewable energy technologies currently utilised in the ACT, and the utility of applying a FiT on their output to the network.

This section will outline the costs associated with the installation of PV systems as other forms of renewable energy technology are not believed to be widely utilised at this time in the ACT. The cost of embedded generation systems, along with their electricity output, will

be a major factor in ascertaining the payback required to provide an adequate incentive for consumers to install them.

Cost of Systems

The cost of a PV system varies according to the size of the system, metering costs and installation costs.

It appears that PV systems can range from around the 1000 watt level to around the 5000 watt level with costs applying according to the size of the model. It is noted, however, that the upper size limit set out in the ActewAGL installation rules is a 10KVA model (10,000 watts) and bigger systems than this may be granted approval on a case-by-case basis. It is uncertain what the cost associated with a system of this size would be, but it is likely to be significant.

The following table represents a snapshot of some PV system sizes and associated costs.[8]

System Size	System Cost	System Cost (assuming full $8,000 Commonwealth Rebate)	Average Output/day
1050 watts	$13,220	$5,220	4.4 kWh
1750 watts	$25,690	$17,690	9.9 kWh
3150 watts	$37,990	$29,990	19.9 kWh
4200 watts	$48,990	$40,990	23.8 kWh
5250 watts	$59,090	$51,090	29.8 kWh

The average household electricity consumption in the ACT has been estimated at around 22 kWh per day.[9] Based on these figures, a 4200 watt system at a price of $40,990 (after the $8,000 Commonwealth rebate has been received) would be required in order for it to be possible to export more energy to the network than is consumed by the average householder.

The more affordable 1750 watt PV systems sell at a cost of around $25,000 and produce on average 9.9 kWh of electricity per day. It should be noted that the exports associated with these systems are dependent on a range of environmental factors along with where they are installed. As such, it is difficult to predict with any certainty what an individual system will contribute.

Payback Period

The impact of other incentive programs needs to be considered when striking an appropriate tariff rate. If a consumer purchases a PV system and is eligible to claim the Commonwealth

[8] Sourced from online brochures for PV systems.
[9] ACT Infrastructure Five-Yearly Report to the Council of Australian Governments (COAG), ACT Chief Ministers Department, January 2007.

rebate and the benefits associated with RECs, the FiT should "payback" only the remaining amount.

The following analysis assumes that the average consumer will invest in a PV system around the 1750 watt size. These systems retail at around $25,000 which, after subtracting the amounts received from the PVRP and RECs, gives a payback amount of approximately $16,000. It is recognised that the payback amount will differ according to the cost and size of the PV system purchased, and that some consumers may not fully recover the cost of the system over the life of the scheme.

The other major issue concerns the length of the payback period that will be adopted. Germany provided a 20 year period for its FiT program, with degression (i.e. gradual reduction) of the tariff rate over this period to provide an incentive for manufacturers to reduce the costs of producing the system over time. By contrast, South Australia has proposed a five year period for its scheme. [10] It is noted that the South Australian FiT is not a "payback scheme" as such, and will not repay investment in a PV system.

The calculations below assume a ten year period for an ACT FiT. This period of time will allow sufficient certainty for purchasers of PV systems and will provide a payback period that may cover the costs associated with the installation. It is not considered necessary to introduce degression over this period of time as it would add a layer of unnecessary complexity to the FiT. This arrangement would result in higher administrative costs and is not considered desirable.

Questions:
1. Is there a need to limit the size of systems that are entitled to receive the FiT?
2. Is it appropriate to set a maximum net investment in a PV system?
3. Is a ten year payback period appropriate?

Level of Tariff

The level of tariff necessary to achieve payback on an investment will depend on whether it is payable on net exports or gross exports of electricity to the distribution network. A net export system is one where the FiT applies only to exports of renewable energy in excess of what is consumed by the user. The gross model applies the FiT to all renewable energy that is exported to the network, regardless of the electricity consumed by the user. Another consideration is how the exports are measured, for example measurement over a billing period or time of use metering.

Annual average domestic consumption in the ACT is about 22 kWh per day. As noted above, a net export model will only be effective in promoting the take up of PV systems in the ACT where the system installed is around the 4000 watts size (cost of around $40,990). As already noted there are many variables that will affect this such as energy efficiency, environmental conditions and any household demand reduction measures applied. Out of the

[10] It is noted that the SA Greens have successfully moved amendments in the upper house to the SA Government's Feed-in Tariff Bill that has extended the duration of the scheme to 20 years.

113 PV systems currently installed, it is understood that only one installation is consistently in a net export position.

A gross model would be more likely to have an impact on demand for PV systems in the ACT. However, the tariff rate would need to be sufficient to provide a benefit to the exporter of electricity in terms of payback. For a household PV system of around 1750 watts it is estimated that a tariff rate of **67 cents per kWh** (approximately 4.8 times the market price for electricity) will be necessary if a 10 year pay back period is put in place. This calculation of the tariff rate includes a discount rate of 8 per cent to reflect the time value of money, reflecting higher payments in the longer term to "pay back" earlier costs.

An additional consideration is the option to provide differential tariff rates to residential, commercial and industrial consumers. Should the FiT apply to larger commercial exporters, it may be necessary to strike a commercial rate for it in order to minimise the cost impacts of commercial generation of renewable electricity that would be passed on to household consumers.

Review of Tariff Rate

Regular independent reviews will need to be undertaken to ensure that the tariff rate is appropriate and is providing an incentive to install renewable energy systems. These rate reviews could occur annually. Alternatively, the tariff could be automatically updated through some pre determined formula linked to prices in the NEM.

Question:
1. Is an annual review sufficient/excessive?

Equity Issues

The impact of many initiatives to increase the supply of renewable energy has already resulted in higher prices of electricity. Further initiatives, such as the proposed Emissions Trading Scheme and the FiT will also impact on electricity prices paid by consumers. If the costs of the tariff are passed on across the consumer base as price increases, issues of equity need to be considered.

The impact of measures in the ACT Climate Change Strategy, such as the feed-in tariff, will be considered as part of the ACT Climate Change Strategy Action Plan 2007-2011. Action 29 commits the ACT Government to undertake a Social Impact Analysis (SIA) to analyse the effects of climate change, and actions to address climate change, on low income, disadvantaged and vulnerable ACT residents. The SIA will include an examination of best practice models locally and interstate, and an assessment of the adequacy of the current concessions regime. The SIA will also include the application of the draft Poverty Impact Analysis to a number of actions, including the FiT. This review will be completed in 2008.

Higher electricity prices will occur as a result of the FiT, and these price increases will impact more significantly on lower income householders, who would effectively be subsidising wealthier households that can afford the up front investment required for a

renewable energy system. The level of price increase will depend on the uptake rate across the community of renewable technologies and how the resulting cost is spread across the residential and commercial consumer sectors. It is difficult to predict with any certainty what the uptake from the FiT may be.

The following table provides some guidance on the estimated increase expected for an average electricity bill at different uptake rates.

% uptake	Uptake by number of households	Total cost	Maximum annual increase in average households electricity bill (if borne by households only)	Maximum annual increase in average households electricity bill (if costs shared with business)	Increase in electricity price per kWh	Increase in electricity price (%)
1%	1,296	$27,148,598	$24	$10	$0.0011	0.76%
2%	2,593	$51,385,220	$45	$18	$0.0020	1.45%
3%	3,889	$75,621,841	$67	$27	$0.0030	2.14%
4%	5,186	$99,858,463	$89	$35	$0.0040	2.83%
5%	6,482	$124,095,084	$110	$44	$0.0049	3.51%
10%	12,965	$245,278,191	$218	$87	$0.0097	6.96%

One argument suggests that lower income households should bear the costs associated with their contributions to climate change and that a measure such as the FiT would encourage reductions in energy usage through price sensitivities. However, lower income households are generally less able to reduce their consumption in response to higher energy costs, for example, they often rent and are less able to invest in energy saving changes such as insulation.

In addition, low income households spend a higher proportion of their income on energy costs, making increases in electricity prices harder to meet. On this basis the FiT will potentially increase financial hardship for lower income households by reducing disposable income, thereby impacting on their capacity for economic and social participation.[11]

It has also been argued that there are issues with an approach that in effect subsidises the energy usage of wealthier members of the community while penalising lower income households who, according to current research[12], have a lower rate of energy consumption on average, than middle income and high income households.

There are three policy levers to reduce the potential equity issues associated with the FiT:

[11] Australian Bureau of Statistics "*Low income low wealth households*", from Australian Social Trends 2007, August 2007, available at http://www.ausstats.abs.gov.au/ausstats/subscriber.nsf/0/99955627BF989D77CA25732F001CA16B/$File/41020_Low%20income%20low%20wealth%20households_2007.pdf, accessed on 5 December 2007.

[12] National Institute of Economic and Industry Research, The Impact of Carbon Prices on Victorian Selected Household Types – A Preliminary Analysis. March 2007. Available at: http://www.bsl.org.au/pdfs/NIEIR_impact_of_carbon_prices_prelim_analysis_26mar07draft.pdf, accessed 5 December 2007.

- pricing mechanisms;
- support for demand reduction to reduce expenditure on basic needs such as energy supply; and
- financial compensation.

Of these levers, financial compensation for those sectors of the community that will be most affected by the increases in electricity prices appears to be the most practical and simple way of reducing the impact associated with the FiT. This compensation could take the form of an increase to the energy concessions program run by the ACT Department of Disability, Housing and Community Services. Under this scheme, certain concession card holders are currently eligible for a maximum annual rebate of $189.11.

Another mitigation option could be to provide a general exemption for lower income households. This option however, is likely to be complex, difficult to administer and prone to dispute.

These mitigation measures would also come at some cost to the Government which would need to be funded by the Territory.

Question:
1. What options are available to ensure that there is no unacceptable impact on those less able to pay or install network connected renewable energy systems?

Environmental Impacts

The environmental impact of a FiT will depend on the uptake of renewable energy technologies. *Weathering the Change* indicates that the ACT currently emits approximately 4.45 million tonnes of greenhouse gases per year. The emissions target set by the ACT Government in *Weathering the Change* would see this reduced to 1.62 million tonnes per year of greenhouse gas emissions by 2050.

In terms of judging the effectiveness of a FiT in contributing to this target, it is necessary to estimate the amount of greenhouse gases that will be avoided and the costs arising from the scheme. Based on the lower limit of best practice from the Australian Greenhouse Office, the normal production of one kWh of energy creates 1.037kg of greenhouse gas emissions. If there was a one percent uptake of PV systems as a result of the FiT (or 1,296 extra households) over the proposed 10 year period, it is estimated that 47,163 tonnes of greenhouse gas emissions could be avoided. This saving would come at a cost to the ACT consumer base of $202 per tonne of carbon that is saved.

Based on a more generous uptake figure of ten per cent (or 12,965 households) over the proposed ten year period, it is estimated that 426,100 tonnes of greenhouse gases could be saved. The cost per tonne of carbon saved based on this uptake rate is $200. By comparison, the costs associated with other carbon savings schemes have been estimated at $15 per tonne

for offsets (ie tree planting), $24 per tonne through the ACT's Renewable Energy Target and at around $100 per tonne from solar hot water systems.

There may also be a reduction in total emissions arising from reduced demand in response to higher electricity prices, which may require people to better manage electricity usage in order to keep their bills lower.

The following table provides an estimate of the greenhouse gas emissions from the FiT, modelled at various take up rates, over a ten year period.

% uptake	Cost per tonne of carbon saved	Total carbon saved over life of system (25 years) (tonnes)	Total carbon saved over life of policy (10 years) (tonnes)	Maximum annual carbon saved (tonnes)
1%	$202	134,101	47,163	5,364
2%	$201	255,555	89,267	10,222
3%	$201	377,009	131,371	15,080
4%	$200	498,464	173,475	19,939
5%	$200	619,918	215,579	24,797
10%	$200	1,227,189	426,100	49,088

Questions:
1. Is a FiT a cost effective and/or efficient method of reducing greenhouse gas emissions?
2. Is the FiT a cost-effective way of increasing solar energy use?

Metering

ActewAGL is currently required to approve all metering arrangements prior to connection to the network. All standard metering equipment will be provided by ActewAGL however, the consumer is required to bear any costs associated with non-standard equipment which includes additional meters.

In most cases ActewAGL uses a twin element meter for consumers who wish to export electricity to the network. In certain cases however, it may be necessary to install a second meter. The twin element meter is capable of measuring and separately recording the energy that the consumer imports as well as the energy the PV installation exports to the grid. It is not proposed to alter this arrangement, which allows for the separate recording of the PV output, which is often very useful information to the customer and to the utility.

It is noted that ActewAGL's meters are capable of being bidirectional, but this facility in the current metering set up program is not applied to photovoltaics because it would net off (rather than record separately) the output of the solar generator at the meter level.

FiT Models

The ACT is seeking to formulate a model that will:

- be simple, effective and efficient;
- comply with national market rules and regulations;
- reduce impacts on disadvantaged ACT electricity consumers;
- reduce administrative impact on electricity retailers;
- impose no net cost on the distributor in the ACT;
- encourage maximum take-up of renewable energy technology;
- minimise reliance on fossil fuel generated power; and
- reduce greenhouse gas emissions.

A number of models for FiTs are applied elsewhere and details on a selection of these can be found at Appendix 1 to this paper. On the whole however, there appear to be two core models:

- a distribution model; and
- a retailer model.

Distribution Model

Under this model, the operators of distribution networks would be required to compensate consumers that export renewable energy into the distribution network. It is envisaged that this "payment" would take the form of a credit on the Distribution Network Use of System (DUOS) charge which would be passed onto consumers at the billing stage via their retailer. Where exports consistently exceed imports, the distributor could be required to pay the consumer the amount they are owed for the renewable energy exported.

The Distribution network operator recovers costs by passing them on across the consumer base through an increased DUOS charge.

This model has been introduced in South Australia, where it will be made a condition of a distributor's licence that a consumer will be allowed to export renewable energy to the distribution network. The distributor's licence will also require the crediting of the tariff amount payable against the charges attributable to the supply of electricity to the consumer. It is then a condition of a retail licence that a retailer must reflect this credit in the electricity bill payable by the consumer. The South Australian model is a net export model, although it may be possible to apply the scheme to a gross model, with the distribution network operator crediting the gross production of the PV owner.

At the international level, the German FiT model is also applied through distribution networks. This model has been widely acclaimed as a highly successful example of a FiT.

Under this system it is unclear who actually owns the exported energy. The Distributor compensates consumers for the electricity they export into the network, but under current ACT regulation, is incapable of selling electricity. Furthermore, it recoups the costs of its purchase from the consumer base.

Retailers benefit from the renewable energy that is exported as it reduces the need to purchase wholesale electricity from the NEM. This might occur simply as a substitute for wholesale electricity purchases, or by reducing the distribution loss factor which is built into purchases of wholesale electricity. However, retailers are not "owners" of the exported electricity and do not bear any direct costs associated with its acquisition.

Issues associated with the distribution model include:
- potential conflicts with the national energy rules and regulations.
- ownership of power that is fed back into the network.
- finding an appropriate mechanism to ensure that the distributor credits consumers.

Retailer Model

The retailer model represents an extension of the current "buyback scheme" offered by certain retailers around the country (ActewAGL offers such a scheme currently in the ACT). While the buyback scheme currently operates on a net export model, it could also be applied to a gross export model.

The "payment" for the exported energy would be credited against charges for electricity consumption on electricity bills. Where exports consistently exceed imports, the retailer could be required to pay the consumer the relevant amount they are owed for the renewable energy exported. It is envisaged that the costs to the retailer would be passed on to all consumers through higher DUOS. It is anticipated that as the retailer is the "purchaser" of the renewable electricity, they would obtain the benefit of avoided purchases of power from the wholesale NEM. This benefit would need to be taken into account when passing on costs to consumers. By recovering the cost through the DUOS each retailer would be on a level playing field, however, it is likely the ACT Government would need to administer such a scheme.

This type of model is currently used in Victoria[13] where retailers can set a price for exports of renewable energy into the network providing it is "fair and reasonable". This is achieved through a licence condition requiring the retailer to publish an offer comprising the terms on which renewable energy will be purchased. Where the published tariff is not considered to be fair and reasonable it can be referred to the Essential Services Commission. Retailers are required to have more than 5,000 customers in order to be able to participate in the scheme. Victoria is also investigating further reforms to their FiT scheme.

[13] It is noted that Victoria has been recently assessed as having reached "full retail competition".

The ACT Government understands that a similar model for a FiT is being proposed in Queensland as part of its *Climate Smart 2050* Strategy.

Issues associated with the retailer model include:
- adoption of either a statutory or market set tariff.
- cost to smaller retailers.
- market size and competition.
- creation of barriers to new entrants.

Other Variables

A number of variables are then imposed on top of the models above according to the desired policy outcomes. These variables include, but are not limited to, items such as:

- whether the tariff is a premium tariff that is mandated by regulation or set by market operators;
- whether the tariff is paid on gross or net exports to the grid;
- whether the tariff will be available to the commercial sector as well as households;
- the extent to which the model recognises alternative renewable energy technologies other than solar power; and
- determining an appropriate rate for the tariff.

Regulatory Issues

The ACT Government is keen to ensure that the FiT is consistent with the regulatory regime for the National Electricity Market.

A level of uncertainty over cost-recovery mechanisms exists because of the scheduled transfer of the regulatory functions for distribution networks to the Australian Energy Regulator and the implementation of proposed National Electricity Rules for distribution networks. Further advice is being sought on certain issues arising from the draft *National Electricity (Economic Regulation of Distribution Services) Amendment Rules 2007*.

However the draft *National Electricity (Economic Regulation of Distribution Services) Amendment Rules 2007* do make clear in clause 6.5.6 (a) (2) that the submission of forecast operating expenditure of an electricity distributor is to include any costs which it considers necessary to "comply with all applicable *regulatory obligations* or *requirements* associated with the provision of standard control services".

The FiT and ActewAGL's associated administration costs would become part of the operating expenditure that the AER would approve in the process of determining ActewAGL's revenue requirement for the next regulatory period commencing 1 July 2009. In this way, the cost of the FiT will be fully recovered in network prices.

If the FiT was to be introduced before 1 July 2009, then arrangements would need to be in place for ActewAGL to be fully compensated for any costs imposed on it within the current price direction period.

Other Options

It is noted that in other areas of the world, uptake of renewable energy technologies has been driven by mechanisms other than FiTs. For example, at the end of 2004-2005 Japan was the largest producer of solar power in the world. This growth was driven by investment in R&D and direct subsidies for installation. While the subsidies have been discontinued, strong growth in the photovoltaic market is still evident.

A model involving direct subsidies could be applied in the ACT with a minimum of effort. For example, a scheme could be implemented whereby the ACT matched dollar-for-dollar, the amount paid by the Commonwealth Government as part of its Photovoltaic Rebate Program (a maximum outlay of $8,000). This would have the benefit of significantly reducing a householder's upfront costs associated with installing renewable energy systems.

In conjunction with the existing solar buyback schemes, it would provide a significant incentive for consumers to purchase renewable energy technologies and potentially extend the access to these technologies to lower income households. This compares with the estimated cost of the FiT per installation for a ten year period at an assumed export tariff of 67 cents, of $16,171. In the case of an upfront subsidy, this would most likely be met directly by Government and would need to be funded.

Questions:
1. Are there any other options could be used instead of, or to complement a FiT?
2. By reducing the upfront costs associated with installation, are direct subsidies a more attractive option to encourage the adoption of renewable energy technologies?

Conclusion

Submissions are invited on the contents of this discussion paper. Submissions are due by Close of Business on 25 February 2008.

Appendix 1

Comparison of International and Australian Feed-in Tariff Models

Feed-In Mechanisms - Table of Comparisons					
	GERMANY	**SPAIN**	**JAPAN**	**SOUTH AUSTRALIA**	**VICTORIA**
TARIFF	• Multiple steeped rates for different categories of renewable energy and capacity of installation.	• Various flat tariff rates depending on type of renewable energy.	• Average electricity prices for grid-connected PV, 24 Yen/kWh for residential use; • 10-12 Yen/kWh for industrial use.	• $0.44 cents/kWh;	• "Fair and Reasonable" rate. Set by retailers and required to be published.
HOW IT WORKS	• A renewable energy generator is entitled to feed electricity into the next appropriate electricity system and receives a payment by a local transmission network operator (DNO); • A regional transmission system operator is obliged to purchase RES electricity from DNO; • Att TNOs are obliged to exchange their electricity from RES sources, resulting in an equal share among all TNOs; • All electricity suppliers are obliged to purchase from their TNO a share of electricity from renewable energy.	Two options available: • Option 1: Sale to the distributor at the regulated tariff, which is the same for all scheduling periods, calculated as a percentage of the yearly average tariff. The regulated tariff for electricity produced in PV plants of less than / of 100 kW is 575 % of the average electricity tariff. • Installations less than 100 kWh are tied to Option 1. Therefore Option 1 is effectively the only option for a residential solar PV system; • Option 2: Free market sale, through the bidding system managed by the market operator, the bilateral contracting system or forward contracting system (or both). The price is set by	Solar PV owner's electricity bills are being netted off at one-for-one rate.	Each customer has a separate contractual relationship with a retailer and the distributor, ETSA Utilities. The retailer and the distributor have another contractual relationship with eachother. (The retailer bills the customer as the agent of the distributor.) Financial flows: the payment of an electricity bill by a customer to a retailer results in a cascade of payments. Market Contract: PV customers in SA are connected via a 'market contract'. Two retailers offer contracts to PV customers. Net Export Arrangements: Current metering arrangements in SA result in the measurement of the 'net export' of electricity from the connection point of a PV owning customer (i.e., electricity returned to the grid after household consumption).	• Retailer facilitates connection of feed-in system to network, if requested. • The FIT is paid on actual meter readings; • Review payments at customer's request; New FIT provisions (9/8/07) now apply: • to retailers with more than 5,000 customers; • Installed generation of less than 100KW; • wind; solar; hydro; biomass. Energy Retail Code (ERC): • ERC regulates the supply of electricity from a retailer to a customer. It does not cover electricity going from the customer back to the retailer.

Feed-In Mechanisms - Table of Comparisons					
	GERMANY	**SPAIN**	**JAPAN**	**SOUTH AUSTRALIA**	**VICTORIA**
		the market or negotiated by the parties in the case of a bilateral contract, plus an incentive and a premium for the power guarantee. The incentive for participation in the market and the premium are calculated as percentages of the yearly average tariff.			
Degression	Yes	No	No	No	No
GUARANTEE PERIOD	20 years	1 year guarantee but the general duration of support is from 10-25 years.	N/A	5 years	Not known
GROSS GENERATION VS NET EXPORT	Gross generation	Gross	Net Export	Net export	Net