Submission by

Alternative Technology Association

to the

Discussion Paper on NT Climate Change Issues

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By Email to: climatechange.dcm@nt.gov.au

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Introduction

ATA welcomes the opportunity to offer comment on the Northern Territory Government's *Discussion Paper on NT Climate Change Issues* (the Discussion Paper). The ATA welcomes the initiative of the Government in developing a comprehensive policy on climate change, and congratulates it on undertaking this review of the impact of activities in the Territory ion the country's greenhouse gas emissions.

ATA is a not-for-profit organisation established in 1980 to empower our community to develop and share sustainable solutions for the way we live and to promote the uptake of sustainable technologies in order to protect our environment. The organisation provides service to over 4500 members, who are actively promoting sustainability in their own homes by using good building design and implementing water conservation and renewable energy technologies.

ATA advocates in both the government and industry arena for ease of access and continual improvement of these technologies, as well as the production and promotion of information and products needed to change the way we live. As Australia's peak member-based organisation representing early-adopters of renewable energy systems, ATA is in a unique position to highlight the needs and concerns of small-scale renewable energy system owners and their interaction with the retail energy market.

ATA members have a vast experience experimenting and demonstrating the effectiveness of a range of sustainable technologies. These technologies all face a range of market failures and barriers that continue to hinder the widespread uptake of these technologies. The remainder of this submission will focus on the barriers and policies necessary to overcome these impediments, with a focus on domestic renewable micro-generation such as solar photovoltaic electricity (PV).

Response to Questions

In response to the points raised in the Discussion Paper, ATA has chosen to focus on the questions posed in Chapter 5 – Electricity and Gas – and in particular on Question 22, as follows.

Question 22 - Where are the NT's future energy supplies likely to come from in a carbon constrained world?

ATA believes that renewable energy is an essential ingredient in transitioning to a low-emissions future, and has a key role to play in providing the NT with its electricity requirements into the future. With the recent announcement of the introduction of a national Carbon Emission Reduction Scheme (CPRS), set to commence in 2010, it is important that the NT takes early action to bring about structural change in the economy to protect Territorians from the impending associated costs. The high carbon pollution footprint of Territorians leaves them potentially exposed to significant increased financial burden in this carbon constrained future.

However, given to the uncertainty surrounding the costs and timeframes associated with adopting carbon capture and storage, as well as the politically unpalatable option of nuclear power – not to mention the as yet unsolved issue surrounding the long-term storage of nuclear waste – it is essential that the NT strongly consider renewable energy as a significant player in the Territories generation mix. Whilst large-scale centralised generation will undoubtedly form a part of this, the role of small-scale distributed generation should not be overlooked.

The Discussion Paper correctly identifies the major concerns surrounding transmission losses associated with long-distance transmission of electricity across vast distances, and the increasing costs of building electricity transmission and distribution infrastructure. It has been widely acknowledged that distributed generation offers an excellent alternative to centralised generation, avoiding some of the costs associated with electricity transmission and distribution.

ATA encourages the NT Government to undertake an extensive review of the potential of distributed renewable generation to meet the Territories electricity needs and to implement a range of incentives to encourage small-scale generators to connect to both the Alice Springs and Darwin / Katherine networks, as discussed below.

How can the Territory best develop renewable energy in the most efficient way?

While the introduction of an emissions trading scheme (ETS) is an essential part of Australia's response to the climate change, it alone will be insufficient to accelerate the uptake of many important technologies, such as domestic micro-generation, as significant additional barriers and market failures will remain. As such the pending CPRS alone won't facilitate the full reduction in greenhouse gas emissions which could potentially be achieved if additional complementary schemes are in place, and barriers are addressed. Many additional policy measures and incentives are necessary to overcome the remaining financial (an ETS will only provide a small financial incentive), institutional, technical and regulatory barriers that remain.

ATA encourages the NT Government to consider the potential contribution of solar photovoltaic electricity (PV) and the many benefits that it provides. These include:

1. improved supply reliability through generation diversity;
2. greater individual and community control over energy sources;
3. reduced dependence on a small number of large remotely located generators;
4. generation closer to customers resulting in improved power quality and reduced power losses;
5. reduced greenhouse gas emissions resulting from reduced transmission losses;
6. reduced greenhouse gas emissions due to the potential for greater output from renewable energy sources;
7. avoided network augmentation costs;
8. more efficient network tariffs; and
9. improved employment opportunities, with small-scale renewable projects providing more jobs per MWh of electricity produced than conventional energy sources.

At present, a significant number of impediments exist to the uptake of small-scale, embedded renewable generation, such as solar PV. These include:

- market failure which discriminates against solar PV and fails to recognise the true value of electricity that solar PV systems produce during hot periods;
- a lack of publicly-available information that can assist system owners negotiate and undertake what is often an unnecessarily technically and administratively complex process; and
- unnecessarily a meagre return on investment – of up to $30,000 – in solar PV systems, despite the many benefits these systems produce.

As well as overcoming these impediments, the mass uptake of solar PV requires additional financial incentives. Possibly the most widely recognised and successful international example of incentives to address the financial barriers faced by solar is the introduction of feed-in tariffs. A feed-in tariff is a premium rate paid for electricity fed back into the electricity grid from a renewable electricity generation source. At present, feed-in regulations for renewable energy exist in over 40 countries, states or provinces internationally.

Possibly the most famous and successful feed-in tariff laws would be those introduced in Germany. The scheme has been responsible for the dramatic growth in Germany's renewable energy market and the solar photovoltaic(PV) industry in particular. A feed-in tariff redresses systemic market failures and rewards micro-generation for its true value to the electricity market and wider society, by providing a financial incentive for the adoption of renewable energy.

For a feed-in tariff to be effective, it is essential that the tariff offered is designed in a way as to adequately reward solar PV proponents. ATA believes that in order to provide an incentive for people to install grid-connected solar systems, and thus achieve the goals of the scheme, there are three key elements of a feed-in mechanism which need to be considered: the level of the tariff; the means of metering; and the duration of the scheme. It is the combination of these three elements which determine the success or otherwise of a feed-in mechanism.

As such we strongly believe that an effective scheme would involve a feed-in tariff mandated at 60 cents per kWh, paid on the entire output of a PV system (via gross production metering), and offered for at least 15 years. Only a feed-in tariff set at or above these levels would adequately reward the adoption of solar PV for the range of environmental, social and economic benefits arising from this technology, and encourage the uptake at sufficient levels to achieve the policy goals.

Further details of feed-in tariff benefits, as well as design possibilities and justifications are appended to this submission.

Further Consideration

ATA wishes to thank the NT Government for this opportunity and wishes to invite further discussion on the impediments and policies that relate to solar PV and a range of other sustainable technologies. We call on the Government to acknowledge the need for a combination of feed-in tariffs and upfront capital rebates to unlock this potential. Further, we urge the consideration of the full range of barriers which limit the uptake of this important technology, urge the review to address these, and to investigate feed-in tariffs in the light of international experience.

Feel free to contact ATA's Energy policy Manager, Brad Shone, on (03) 9631 5406 or via email at btad@ata.org.au to discuss any aspect of this submission or for further comment.

Attachment A – The Case for a Feed-in Tariff for Solar Micro-Generation

The Alternative Technology Association believes that the introduction of a mandated feed-in tariff for the production and supply of electricity from solar photovoltaic (PV) technology is the most appropriate mechanism for valuing the full benefit of small-scale embedded solar PV systems to the electricity market. A feed-in tariff provides a means for capturing the true economic value and many related benefits of the deployment of renewable energy technologies, in particular small-scale, or 'micro-generation', solar PV.

Feed-in Tariffs

Simply put, a feed-in tariff is a premium tariff paid for electricity fed back into the electricity grid from a designated source of electricity generation, typically renewable energy. At present, feed-in regulations for renewable energy exist in over 40 countries, states or provinces internationally. The scope and implementation of these laws varies across jurisdictions, however all involve the payment of an increase rate for electricity from renewable energy sources in recognition of the range of benefits from this form of generation.

The first instance of the introduction of feed-in laws was in the United States back in 1978. This remained the sole example of such legislation up until the early 1990s when the concept caught on in Europe whilst simultaneously the USA phased out its laws. Countries such as Denmark, Spain, Italy, Switzerland and Greece implemented feed-in policies between 1990 and 1994, and similar measures were adopted in India, Sri Lanka, Thailand, Latvia and Slovenia towards the end of the decade. More recently we have seen places as diverse as Brazil, Indonesia, Nicaragua, Cyprus and China added to the list.

Rationale for Feed-In Tariff

Solar PV micro-generation is disadvantaged in Australia through market failure which fails to take into account the true value and many benefits to the electricity network which arise from the adoption of renewable energy technologies embedded within the electricity grid. Additionally, solar PV, like other renewable energy sources, provide environmental benefits through reduced atmospheric pollution, and social benefits through industry development and job creation, each with related economic benefit.

A feed-in tariff redresses systemic market failures and rewards micro-generation for its true value to the electricity market and wider society, by providing a financial incentive for the adoption of specified technologies.

Direct Economic Value

Solar PV and other embedded micro-generation technologies (also known as distributed generation or DG) have a true value to the market higher than is currently able to be captured. Peak output of solar PV systems corresponds closely with times of peak demand – sunny summer afternoons, typically times of high air-conditioner use. At these times, the wholesale electricity price frequently rises well above the average National Electricity Market (NEM) price of $35/MWh, reaching the hundreds, even thousands of dollars per MWh. This pushes the overall average price higher, and hence increases the cost of power to all consumers.

By generating electricity at these times of peak demand, solar PV effectively acts as a form of consumption abatement, reducing the demand on remote electricity generators and thus lowering the peak wholesale price of electricity.

Further, by generating electricity close to the point of consumption, embedded generation technologies avoid the need for expensive transmission and distribution network augmentation. It has been calculated that Australian network services providers are committed to spending in the order of $24 billion dollars over the next 5 years on upgrades to networks in order to meet growing peak demand.

A feed-in tariff offers an opportunity to reward embedded generation for its contribution to avoiding this network augmentation, and the associated cost which is ultimately borne by consumers through electricity prices. This is particularly the case with solar PV, as the peak production of electricity corresponds closely with times of peak demand; the very times at which the network infrastructure is stretched to its limit.

Further, as the production of electricity from embedded generation is at or near the point of consumption – thus avoiding transmission and distribution requirements and associated charges – it is more accurate to value this electricity at the retail rather than the wholesale rate. As time of production for solar PV corresponds with peak retail prices, a peak time-of-use tariff needs to be applied to capture the network benefits outlined above.

Network Value

At present, Australia’s electricity generation infrastructure is heavily weighted towards fossil fuels, which accounts for 93% of all electricity generated, with 77% coming from coal alone. Further, fossil fuel generation comes from a relatively few generation facilities, owned by a small number of increasingly foreign-owned companies. This lack of supply diversity exposes

Australia's energy industry to significant risk of potential price spikes and / or supply limitations in the future. As such, it is prudent to invest significantly in lower risk / higher cost generation sources such as solar and wind to ensure security of supply.

In the USA, the application of such a portfolio approach has determined that a minimum of 6% solar and wind generation is required to ensure an adequate level of electricity supply security. At present the Australian market has less than 0.5% from these lower risk sources. As such, the Australian electricity market is exposed to significant energy supply insecurity. A feed-in tariff is a proven mechanism for promoting technology deployment to enhance generation diversity.

Societal Value

When considering an incentive for solar PV it is important to also consider the economy-wide benefits of the development of a solar manufacturing, distribution and installation industry in Australia. Solar PV generates at least 30 jobs per installed MW – more than three times that for coal-fired electricity[1].

Not only would jobs be created immediately, but the development of a high-tech solar industry in Australia with enormous export potential would negate the present trend of locally-developed innovations, intellectual property and industry exports heading off-shore in search of markets. Further, the expansion of the solar industry locally will lead to economies of scale and reduced real costs, eventually enabling solar PV to reach parity in the Australian market without the need for financial incentives.

Environmental Value

While debate continues about the economic cost of climate change, the IPCC Fourth Assessment Report and Nicholas Stern's *Review on the Economics of Climate Change* make a strong case for the need to internalise the cost of greenhouse gas pollution. In addition, emissions of sulphur dioxide (SO_2) and nitrous oxides (NO_x) have a significant environmental, social and associated economic cost, and as such are subject to emissions reduction legislation, emissions trading and taxation in many countries internationally.

A study by the European Commission places the cost of SO_2 and NO_x emissions from electricity supply at roughly $25/MWh for black coal and up to $50/MWh for brown coal fired

[1] Navigant Consulting, Inc., *Survey of Predicted and Actual Renewable Energy Job Creation* Presented at 'POWER-GEN Renewable Energy and Fuels 2007' conference, March 7, 2007

generation[2]. When added to a price for the emission of greenhouse gases, such as carbon dioxide and methane, the economic case for solar PV and other renewable energy technologies is further enhanced. Feed-in tariffs offer a mechanism to economically value the reduced emissions from these technologies and appropriately reward technologies which avoid environmental pollutants in the generation of electricity.

Collating the Economic Benefit

By combining the many economic benefits of embedded solar PV electricity generation, as outlined above, we can see that the total economic value of solar PV exceeds the installed cost of the technology.

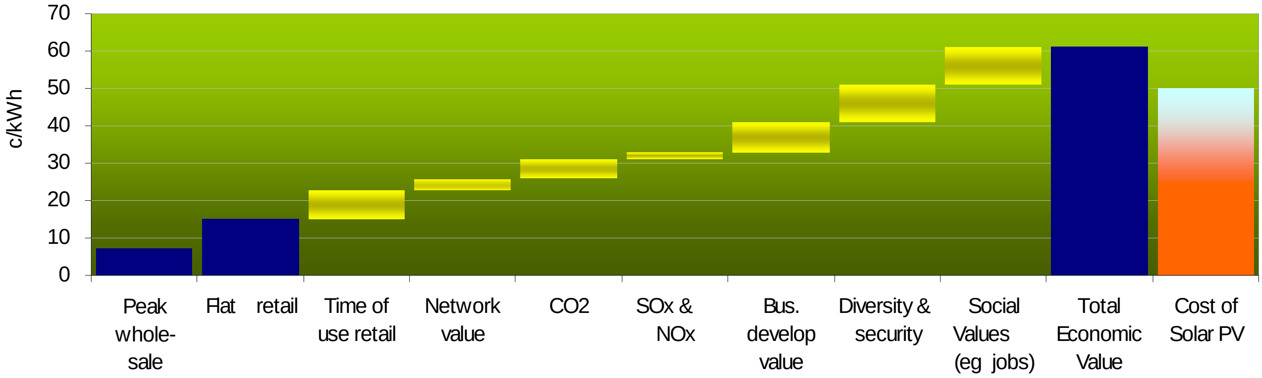

***Figure 1: An illustration of the financial case for a feed-in tariff*[3]**

Over time, as economies of scale and technological advances reduce the installed cost of solar PV and a price on carbon emissions increases the cost of non-renewable generation, it would be expected that the installed cost of solar PV would eventually reach parity with the value of electricity supplied. As such the level of support offered by a feed-in tariff could be gradually reduced, say at 5% per year, as is the case in many international examples, with, over time, solar PV competing squarely with the retail time-of-use electricity price.

The German Experience

Possibly the most famous, comprehensive and successful instance of feed-in laws internationally would be those introduced and modified in Germany over the past 16 years. In 1991 the German government introduced the Electricity Feed Act, legally regulating the feed-in to the grid of electricity generated from renewable resources. This act required utilities to purchase electricity generated from renewable resources at set rates.

[2] Rabl, A & Spadaro, J (2005), *Externalities of Energy: Extension of accounting framework and Policy Applications*, ExternE, European Commission
[3] Graphic courtesy of BP Solar

This scheme was expanded and enhanced with the adoption of the Renewable Energy Sources Act of 2000, which has been responsible for the dramatic growth in Germany's renewable energy market and the solar photovoltaic industry in particular. In the five years from 2000, the quantity of electricity fed into the grid from eligible sources has more than doubled, with a seven-fold increase in installed solar photovoltaic (PV) capacity to over 1,500 MW by the end of 2005. By comparison, at the same time Australia in the order of 7MW of grid-connected solar PV, or less than 0.5% of Germany's capacity.

Costs of a Feed-In Tariff

One of the attractions to government of the feed-in law is that it is cost-neutral, with the costs of paying the tariffs apportioned to electricity consumers. When spread across a broad consumer base, this cost is reduced to a small portion of a customers total electricity bill, partially off-set by savings resulting from avoided network augmentation and reduced wholesale electricity prices.

In Germany, for all the additional investment and capacity resulting from the feed-in law, the raw cost to consumers is presently around 3% of the total retail cost of electricity, with electricity prices actually falling in real terms in the seven years from 1998 to 2005[4]. When considering the portion of this cost attributable to solar PV, the cost to consumers is less than 0.5% of a typical retail electricity bill, or about 20 Euro cents (35 cents) per month[5]. That is, 35 Australian cents per month for 1500 MW of grid-connected solar PV, or over 200 times Australia's installed capacity.

It should also be noted that this is in a market where the cost of a feed-in tariff has been applied only to residential and commercial consumers of electricity, with large industry and railways exempt from the levy.

Applying Feed-In Tariffs to Other Technologies

This paper primarily concerns the application of a feed-in tariff to solar PV micro-generation embedded within the distribution network; however feed-in tariffs offer an appropriate incentive mechanism for all forms of renewable energy. With a range of rates available tailored to capture the benefit to the electricity market, environment, economy and society of the particular technology, feed-in tariffs provide a financial incentive for individuals, communities and companies to invest in renewable energy infrastructure.

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[4] Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) 2006 *What Electricity from Renewable Energies Costs* BMU, Berlin, Germany

[5] Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) *Environmental Policy - 2006 Renewable energy sources in figures - national and international development - Status: May 2006* BMU, Berlin, Germany

In particular, embedded generation and small to medium renewable energy projects are particularly disadvantaged in the National Electricity Market on a number of levels. The inability to capture the network benefits of embedded generation, the lack of a carbon price, the poor negotiating position of relatively small electricity generators in securing a fair price for electricity supplied to the grid, and the inability to accurately calculate and capture avoided network use-of-system charges severely disadvantage proponents of these technologies. A feed-in tariff provides an ideal way of reducing these barriers and correctly valuing renewable and embedded electricity generation, providing a financial incentive to stimulate their uptake.

Attachment B – The Design of a Feed-in Tariff for Australia

In order to provide an incentive for people to install grid-connected solar systems, and thus achieve the goals of a feed-in tariff scheme, there are three key elements of a feed-in mechanism which need to be considered: the level of the tariff; the means of metering; and the duration of the scheme. It is the combination of these three elements which determine the success or otherwise of a feed-in mechanism.

Grid-connected solar PV has numerous benefits, including reducing greenhouse gas emissions, limiting the growth in peak demand and avoiding the need for expensive network infrastructure augmentation. A fair price for the feed-in of electricity is one in which the homeowner receives not only full reward for the value of the electricity at the retail rate at the time of production, but also recognises these and other numerous benefits of solar PV. As such we strongly believe that an effective scheme would involve a feed-in tariff:

- ⇒ **mandated at 60 cents per kWh;**
- ⇒ **offered for 15 years; and**
- ⇒ **paid on the entire output of a system via gross production metering**
- ⇒ **5% degression rate**

Tariff Level and Scheme Length

In the accompanying document, *The Case for a Feed-In Tariff for Solar Micro-Generation,* we outline the numerous benefits achieved from the installation of grid-connected solar PV. These benefits are many and varied, with the environmental, network and economic case alone warranting a feed-in tariff incentive to stimulate the growth of this technology. When considering the additional industry development and employment creation benefits, there is a strong case for development of the solar PV industry.

The key element in driving investment in solar PV via a feed-in tariff is in creating a guaranteed return on investment and reducing payback times down to a reasonable level. We believe that a payback period between 10 and 15 years is essential to provide sufficient incentive to drive private investment in solar PV.

For this to be achieved, a feed-in tariff rate needs to be set at around 60c / kWh and be guaranteed for a minimum of 15 years. With the federal government’s Photovoltaic Rebate Programme (PVRP) capped at $8000 for a 1kW system, a feed-in tariff of 60c will bring paybacks down to this level – around 15 years in the south of the country, and closer to 10 in the sunnier north. However, it is essential that this is paid on the total generation of the solar PV system.

Metering

It is essential that any feed-in scheme implements a system of gross production metering, whereby a homeowner is credited for the full production of their system. Gross production metering – typically involving a separate meter to measure the entire generation from the PV system – results in the fairest and most accurate calculation and payment, fully rewarding the system owner for the benefit of their system to the electricity grid. It is also consistent with the nearly 50 feed-in tariff schemes internationally.

The alternative 'import-export' metering scheme as proposed by both South Australia and now Queensland, rewards homeowners for the electricity exported to the grid minus what is consumed in the home at the time of production. This system of net export metering significantly discriminates against certain classes of consumers, as well as making calculation of the cost of the scheme, and potential financial return, extremely difficult.

An import-export metering regime for feed-in tariffs discriminates against both owners of smaller grid-connected systems and those who are more likely to consume electricity during the day, such as senior citizens or stay-at-home parents. In cases such as these, where instantaneous system production rarely exceeds household consumption, system owners rarely exporting electricity to the grid would not be able to receive the benefit for premium feed-in rates offered, and thus would gain very little financial return on their investment.

Further, a system of net export metering creates significant uncertainty in the market, both in terms of potential financial return from the feed-in tariffs for the system owner, and in the cost of the system for the government and wider community. The introduction of gross metering allows for far clearer estimates of ongoing costs and benefits of the tariffs due to the relative predictability of gross electricity production for a given sized installation over a given time frame.

Whilst it is possible to achieve the same level of incentive for some classes of individuals (those with larger systems and / or those not at home during the day) to invest in a solar PV system using net export metering, it would require significantly higher tariffs, longer implementation times, or both. For all of the above reasons, we strongly believe that any feed-in tariff scheme in Australia should be based on a system of gross generation metering.

Degression Rate

In order to take into account the economies of scale and technological advances which will lead to a reduction in the installed costs of PV systems over time, ATA proposes the inclusion of a 5% degression rate of the feed-in tariff. Thus, the initial tariff of 60 c/kWh in the first year would fall to 57 c/kWh in the second, 54.2 c/kWh in the third year, and so on. With increasing retail rates for electricity and falling costs for solar PV over time, the up-front costs towards the end of the 15 years a degression of 5% would result

Cost of the Scheme

In the 7 years since the inception of the Photovoltaic Rebate Program (PVRP) Australia has seen the installation of under 10MW of grid-connected solar PV. Given that there would have been a small number of systems installed across the country before the introduction of the PVRP, as well as a handful of installations since 2000 not subject to the PVRP, it could be assumed that a total grid-connected capacity of just over 10MW exists in Australia. By means of comparison, under what is widely considered a worlds-best-practice feed-in tariff model, Germany has a total installed capacity nearing 2,600MW, with up to 750 MW installed in each of the past two years alone[6].

Even with the modest target of a 10-fold increase in capacity over the next five years, the cost of this additional 15 MW is relatively minor when spread proportionally across the millions of electricity customers across the country. This cost is even lower for the typical domestic customer when proportioning the cost on a volume-consumed basis, rather than merely per customer.

These costs are further reduced, when considering the direct financial flow-on to residential customers from reduced network augmentation costs and associated network charges (presently approximately 50% of retail electricity charges) and lower peak wholesale pool prices. With appropriate concessions to protect low-income and disadvantaged customers, the cost of such a scheme under a gross production metering is clearly readily affordable.

Indeed, a recent progress report by the German Government on their feed-in tariff scheme shows that there was actually a net financial benefit from the feed-in tariff scheme introduced there, with the savings from reduced wholesale electricity and fuel imports costs, as well as

[6] International Energy Agency Photovoltaic Power System Program (2006) *PVPS Annual Report 2006,* IEA PVPS, p. 63

the avoided damage resulting from climate change, outweighing the cost of the feed-in tariff by a factor of approximately two-to-one[7].

The additional economy-wide benefits of improved supply reliability, enhanced energy security through diversification, reduced greenhouse gas emissions, and industry development resulting in additional employment opportunities, along with the subsequent and ongoing reduction in costs of solar PV technology resulting from economies of scale, make the case for an enhanced feed-in tariff based on gross production metering a very compelling one.

[7] Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) *Renewable Energy Sources Act Progress Report 2007*, BMU, Germany, 2007