SUBMISSION NO. 5

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8th September 2003

Dr Anna Dacre
Inquiry Secretary
House of Representatives
Environment.Reps@aph.gov.au

Re: House of Representatives Inquiry into Sustainable Cities 2025

Dear Dr Dacre,

Thank you for your letter of 25th August inviting me to make a submission to the above Inquiry. My submission is appended.

Yours Sincerely,

Andrew Blakers

Submission to the House of Representatives Inquiry into Sustainable Cities 2025

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7th September 2003

This submission is concerned with sustainable energy supplies for cities in 2025. It is highly likely that the world in 2025 will be greenhouse-constrained. Renewable energy is likely to be an increasingly important component of energy supply. The key points that I make in this submission are:

- Australia has an opportunity to be a major player in the world's renewable energy industry. However, the Australian renewable energy industry is currently in difficulties due to several unfortunate circumstances. Unless substantial changes are made, Australia is likely to be an importer rather than exporter of renewable energy services and equipment in 2025.

- Mass retrofitting of energy saving devices and renewable energy equipment to houses, commercial buildings and industrial sites will be required to meet greenhouse targets. The reason for this is that turnover of buildings in Australia is low, which severely limits the rate at which greenhouse gas emissions from buildings can be reduced by building better buildings. I propose ***Solarization***, a practical and politically palatable solution to the problem of funding retrofitting.

The Australian renewable energy industry

The renewable energy industry worldwide is booming. Sustained rapid growth rates of 30-40% per year have been enjoyed by the photovoltaic and wind energy industries over the past 7 years. These will both be $100 billion/year industries in the next decade. Solar water heaters and biomass energy are also growing rapidly. Comparisons with the mobile phone industry in the nineties are apt. Australia has a good foothold in the renewable energy industry:

- Rheem-Solahart, Solar Edwards and others have established solar water heater manufacturing plants with sufficient scale and maturity to drive costs down
- BP Solar has a world-class export-oriented photovoltaic manufacturing facility in Sydney
- There are two world-class commercially-oriented solar R&D groups, at the University of NSW and at the Australian National University
- Five Australian companies are taking new photovoltaic technologies to market
    - Origin Energy in conjunction with ANU (Sliver cells)
    - Rheem-Solahart in conjunction with ANU (CHAPS concentrator systems)
    - Pacific Solar in conjunction with UNSW (thin silicon cells)
    - Solar Systems (concentrator systems)
    - Sustainable Technologies International (titania cells)
- The Mandatory Renewable Energy Target legislation is likely to lead to the establishment of significant windgenerator assembly businesses with significant potential for export

- Several other technologies are approaching commercial takeoff, including solar thermal electricity, solar thermochemical energy storage, wave power and hot rocks.

Australia has the potential to provide major markets for renewable energy technologies, enabling world-scale export-oriented manufacturing to occur in Australia. Significant near-term local markets include:

- Only a small proportion of Australia's dwellings have solar water heaters. About 3 million dwellings are suitable for these systems, with a potential market of around $10 billion.
- Solar space heating will be a major new industry, with a similar value to solar hot water.
- Low temperature solar heat for commercial buildings and industries, such as food processing, is close to commercial take-off.
- About 80% of Australia is not covered by the electricity grid. The cost of diesel electricity is 3 to 10 times the cost of electricity from coal-fired power stations. The potential size and value of the diesel fuel displacement market is about 600 MW and $5 billion respectively. Solar water heaters, PV, wind energy and energy efficiency can all contribute to reducing the use of diesel fuel. This high-cost niche market is particularly valuable for the PV industry, allowing it to reach the scale in Australia required to get down the cost-scale learning curve.

Provided that the Mandatory Renewable Energy Target legislation is maintained and enhanced it will drive rapid growth in renewable energy sales in Australia. Increasing and extending the target (eg 20,000 GWh/year in 2010, 100,000 GWh/yr in 2025) would be of major benefit to the industry. Learning-curve cost reductions will add to the competitiveness of renewable energy products in both local and export markets. In summary, sustained 30%/year growth rates (doubling of sales every two years) are in reasonable prospect in the near term for important sections of the Australian renewable energy industry.

But will renewable energy in Australia be based on Australian products or imported products? Will the Australian renewable energy industry be export or imported oriented?

Unfortunately, a major problem has developed in the area of research, development, demonstration and commercialisation of Australian renewable energy technology as well as research and industrial training. For the first time in 30 years there is no Australian renewable energy funding agency. A vibrant industry requires a partnership between companies, research organisations and universities. Universities not only provide research, but equally importantly, research training and the training of industry professionals. It is difficult to provide high-quality training in the absence of cutting edge research.

A large gap has developed between R&D funding provided by the Australian Research Council (ARC) and the stage of work that companies are willing to fund, caused by the recent demise of all renewable energy funding agencies. Our competitors in the renewable energy industry overseas continue to enjoy substantial government support. Our competitors in the fossil fuel industry in Australia continue to enjoy substantial government support. For some reason the Australian renewable energy industry is expected to develop without government assistance. I will illustrate the problem by using the example of the Centre for Sustainable Energy Systems at ANU.

CSES is an externally funded Centre with 28 staff and 9 research students. It has an annual turnover of about $3 million. The researchers in CSES have secured approximately $16 million in competitive and private funding over the last decade. CSES engages in solar energy research, development, commercialisation and education. Five separate CSES

technologies are moving into the commercial phase. I will briefly describe the two most prominent of these.

Sliver solar cell technology began with ARC funding 9 years ago. Funding was then obtained from the Energy R&D Corporation and the NSW State Energy R&D Fund, which provided a total of $550,000 in the period 1994 to 1997. In 1998 the Energy Division of Boral (now Origin Energy) agreed to invest $4 million over 4 years at ANU to bring the technology to commercial readiness. Origin Energy is currently investing $20 million to construct a factory in Adelaide to produce sliver solar cells.

The Combined Heat and Power Solar System project began in 1994 with ARC funding of $130,000. In the period 1995 to 1997 ERDC and Solahart invested $450,000, with smaller amounts coming from Western Power and the Northern Territory Power & Water Authority. The Australian CRC for Renewable Energy provided $500,000. In 1998 ANU, Solahart and Western Power won a matching $300,000 Commonwealth REIP grant to build a 20 kW system in Perth. The CHAPS project was supported by an ARC SPIRT grant in conjunction with Solahart and ActewAGL. In 2001 the Australian Greenhouse Office awarded $1 million to ANU and Rheem/Solahart for a large demonstration system and for tooling up, under its Renewable Energy Commercialisation Program (RECP). Commercialisation will occur next year.

In most of our projects, research work begins using relatively small sums of money from the ARC. Then follows development and demonstration support from a variety of State and Federal organisations, with modest private investment. Finally the technology reaches the point where companies are prepared to invest substantial sums of money for commercialisation.

Unfortunately, this route from basic R&D to commercialisation is now broken.

In the table below is listed all of the organizations to whom CSES made funding applications over the last 10 years. The agencies that used to fund the gap between the Australian Research Council and commercialisation have all died.

Funding currently available to CSES	
Australian Research Council grants	25% success rate. Funding is modest ($50-150k/year)
Private companies	
Funding no longer available to CSES	
Australian Greenhouse Office	Never funded energy R&D. RECP finished in 2002.
Australian CRC for Renewable Energy	Not renewed in December 2002
ACT Knowledge Fund	For companies only.
NSW State Energy R&D Fund	Grant scheme defunded
Sustainable Energy Development Auth.	No R&D. Only offers loans.
Energy R&D Corporation	Organisation disbanded by Commonwealth 1996-97
Electricity Supply Assoc. of Australia	Grant scheme disbanded
Electrical Utilities	Corporatisation/privatisation has nearly eliminated R&D

The recent increase in funds to the ARC is welcome. In 2003 CSES was awarded a second-round ARC Centre of Excellence, with funding of $300,000 per year for five years. However, it has to be recognised that ARC funding does not easily lead to commercialisation. As part of the normal review process our ARC applications are sent to experts in Australia and overseas, who are often our most able competitors. ARC grants are awarded on the basis of public track record. In contrast, successful commercialisation in collaboration with companies usually requires long periods of confidential research without publications. ARC funding and commercialisation are, often, mutually exclusive.

The organisations listed in the table above made funding available on a confidential basis in collaboration with industry. The steady erosion of government funding over the past decade has had a major negative impact on the ability of CSES (and other research groups) to translate a good idea (developed with ARC funding) into a technology in which private companies are prepared to invest millions. Most renewable energy research and training groups have shrunk below critical mass or folded as the funding agencies closed down one by one.

Critical mass of staff & equipment is highly desirable for productive research, commercialisation and research training. Only two research groups, one at the University of NSW (~50 staff & PhD) and the other, my group, at the Australian National University's Centre for Sustainable Energy Systems (CSES) (37 staff & PhD students) still retain critical mass in renewable energy in Australia. Other groups are much smaller and below critical mass.

It will be difficult to build a strong renewable energy industry on a shrinking base of research, research training and industrial training.

I recommend the establishment of a renewable energy RDD&C funding organisation (eg "Solar Energy Foundation") with a long-term mandate to provide competitive strategic investment in the industry. It would help fill the gap between ARC and commercial funding. Funding of around $10 million per year would allow the Foundation to provide long-term, stable funding to Universities and other research organisations for R&D, demonstration and commercialisation in collaboration with companies, plus research and industrial training. It would complement the ARC as follows:

- Provide strategic government support on a matching basis with industry
- Encourage University groups to engage in commercially-relevant activities by rewarding commercially-successful groups with untied research funding.
- Offer fellowships to encourage exchanges between universities, CSIRO and industry.
- Recruit experts from universities and industry on a rotating basis to staff the Foundation.
- Monitor research training and professional engineering training in the field of renewable energy
- Provide periodic reports to government and the community

In contrast to the renewable energy industry, the fossil fuel industry enjoys substantial strategic energy funding from the Federal government (over and above any funding procured by the industry from private sources and the ARC).

CSIRO does not direct significant resources to renewable energy. Remarkably, the new "Energy Transformed" Flagship Program is all about fossil fuel.

In addition to CSIRO Flagship funding, the fossil fuel industry also has three Cooperative Research Centres (Commonwealth funding of around $50 million) and the Rio Tinto Foundation (Commonwealth funding of around $35 million). Much of the work in these five fossil fuel research programs is directed towards carbon sequestration. This is the proposal to (among other techniques) capture carbon dioxide emissions, separate them from nitrogen and other gases, compress them, transport them and store them permanently in underground aquifers. It may be worthwhile investigating carbon sequestration. However, it is unwise to direct most of Australia's strategic energy R&D funding to this one method for reducing greenhouse gas emissions, at the expense of renewable energy.

The role of Australia's Chief Scientist is to provide advice to the government and public on matters of science and engineering. The current Chief Scientist, Dr Robin Batterham, is also the Chief Technologist for Rio Tinto, a large coal, aluminium and minerals company. He has claimed in numerous presentations to government and in public fora that large-scale carbon sequestration will cost around A$10/tonne. This is far below other estimates, and is apparently based on a private consultant's report that has not been made available for public scrutiny. The Chief Scientist has a direct conflict of interest in providing advice to the Government and the public on carbon sequestration, a subject that directly impacts on the business of his other employer, Rio Tinto. It is disappointing that he has not recognised his conflict of interest, and refrained from exercising influence on public energy policy.

Solarization

The turnover of Australia's building stock is low, so even if all new buildings have excellent energy ratings, there is only a slow reduction in average greenhouse intensity. Mass retrofitting of buildings is the only way in which rapid reductions in greenhouse gas emissions can be achieved in the building sector (space heating, water heating, efficient appliances).

Mass retrofitting of roof, wall & floor insulation, draught proofing and solar water heaters to existing buildings ("solarization") will yield large greenhouse gas reductions. In a typical brick veneer house the cost of thorough solarization is about $8,000. The reduction in energy bills pays for solarization well within the lifetime of the solar water heater and insulation. The barriers to mass solarization are the need for up-front capital and the lack of information on the part of building owners. This paper suggests a practical and commercially attractive method of removing these obstacles.

Australians move houses frequently. An investment in solarization is often not recognised in the sale price of the house. There is no incentive for a landlord to invest in solarization because they do not pay the energy bills. There is no incentive for a tenant to invest in solarization because they do not own the house. How to pay for solarization, up front? The key to an effective solarization funding model is that the debt belongs to the house, not the homeowner.

A mechanism for funding solarization is proposed. Consortia would be established (e.g. "Solarization Pty Ltd") comprising a solar water heater company, a house insulation installer, a billing agency (typically a retail energy provider) and a financier. Solarization P/L would contract its members to retrofit solar water heaters, insulation and draught proofing in houses and commercial buildings. The company could also install double-glazing, gas heaters and photovoltaic systems. The house owner would not be required to put up the cash. Instead, Solarization P/L would recover its investment (at normal commercial rates of return) over 8-12 years through quarterly bills to the house owner. This is equivalent to the way in which electricity companies recover their investment in a new power station.

House owners (and tenants) would enjoy reduced overall energy costs (comprising gas, electricity and the solarization quarterly repayments) and improved thermal comfort and noise insulation. A much better greenhouse outcome per dollar would be obtained than from "green electricity". The uptake will be high if Solarization P/L provides a fast efficient turnkey service for a range of energy technologies & services – a single visit by an assessor skilled in all of the energy technologies, followed by a well-managed and rapid implementation including easy financing. A low cost financing option is to draw additional funds from a mortgage.

Solarization P/L would construct alliances with insulation and solar suppliers that includes the supply of equipment & services at a substantial discount to reflect reduced advertising costs and increased sales volume. It would be very helpful if the State Government were to pass legislation to allow the debt for solarization to be easily attached to the house (without incurring a second mortgage) rather than the house owner. The debt would need to be disclosed each time a house is sold; its like disclosing rates or electricity bills or the House Energy Rating. This legislation is not essential, but would be helpful because the risk of default would be almost eliminated, allowing Solarization P/L to charge a low interest rate on the debt.

Companies involved in solarization will benefit from a low risk investment, because the equipment to be installed has a long guarantee period and the debt is against the house rather than house owner. Gas and electricity companies will experience reduced sales of energy. However, solarization will provide replacement revenue and profit. They will have the opportunity to "lock-in" customers for long periods (an important consideration in the era of contestability) and will acquire a large supply of RECs from the solar water heaters. Solarization of 100,000 homes in Canberra over a decade would be worth around $80 million/year and would lead to the creation of about 800 new jobs. Electricity utilities will benefit from mass solarization through a reduction in peak loads, because better insulation will reduce the space heating peak-load in winter and the air conditioning peak-load in summer while solar water heaters will have gas or off-peak electric boosting. Solarization also helps energy companies (eg in NSW) cope with any government requirements that the greenhouse intensity of their products must decline each year.

A large majority of local government districts in Australia have no gas, coal or electricity production. In these districts there are few economic losers from tough greenhouse targets. On the contrary, there are many winners. Solarization is more labour intensive than electricity or gas production, and most of the jobs are local. Tenants living in uninsulated homes will be big winners, since it gets around the problem that the landlord has no incentive to invest in energy efficiency because the landlord does not pay the energy bills. . Solarization is one of the rare occasions when employment, social, economic and environmental objectives are aligned, and is therefore politically attractive, particularly at a local level.

Government moral support would be valuable, in order to give credibility to this new idea. A modest initial Government subsidy could also accelerate uptake. In return for a modest subsidy Solarization P/L would promise to solarize a specified number of buildings to a specified standard (eg 5 stars). The Government might also include a tender provision that rewards local manufacturing. Alternatively, Councils could offer modest revenue-neutral rate relief that is linked to the star rating of a building.

Initial solarizations could focus on the items with the most clear-cut financial benefit. This would increase the probability that the scheme is commercially successful. In approximate order this would be ceiling insulation, draught proofing, house zoning and low-flow shower heads followed by solar water heaters and wall & floor insulation followed by photovoltaic systems and double glazing.

Solarization will create a substantial number of new jobs in the local community. The scheme fits very well with the building energy rating scheme in several states. Early solarization companies will be well placed to dominate the national solarization market that is likely to develop in a few years time. The risk is low because the debt is secured against the building and is repayable within the guarantee period of the equipment. Large reductions in greenhouse gas emissions are likely.

Solarization can be tested on a small scale in a few suburbs or in a regional centre. Early adopters could be the 2-3% of customers who purchase "greenpower". Housing trusts for low-income tenants and upper-income, busy professionals are two other groups of potential early adopters.

The key to successful solarization is that the service be provided by well-known companies offering a very smooth, no-fuss service – eg, one phone call, one house-assessment visit, one contract, rapid & trouble-free installation of insulation & equipment and good after-sales service.