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Friday 23 March, 2012

Australian Solar Institute provides boost for solar innovation in Australia

The Australian solar industry received a boost today with the announcement of close to $12 million Australian Solar Institute (ASI) Round 3 funding to accelerate solar energy technology development.

The funding was announced by Minister for Resources and Energy, Martin Ferguson AM MP during a visit to Silanna Semiconductor Pty Ltd. in Sydney, which was a successful recipient of ASI funding in 2010.

ASI Executive Director Mark Twidell said Silanna has used ASI funding matched with its own investment to demonstrate efficiency improvements to help reduce the cost of solar technology.

“Silanna is a great example of how ASI is able to assist Australian manufacturing companies to diversify and drive innovation in photovoltaic technology,” Mr Twidell said.

“Silanna’s innovations, when commercialised, will be suitable for concentrating photovoltaic applications including power plants and spacecraft.”

ASI Investment Director Olivia Coldrey said ASI is further supporting industry to develop solar technologies through new strategic investment.

Ms Coldrey said today’s announcement includes ASI funding for an exciting, diverse range of solar technologies, particularly concentrating solar power technologies.

“It includes $1.6 million for CSIRO to develop solar hybrid fuels and almost $0.5 million for BlueScope Steel Limited to collaborate with German researchers to develop thin-film solar cells which can be integrated into buildings,” Ms Coldrey said.

“These ASI-funded projects reflect the range and high quality of solar research and development around Australia, and the majority are industry-led.”

Ms Coldrey said a total of $2.3 million has been committed to projects funded under the Australia-Germany Collaborative Solar Research and Development Program.

“Australian and German researchers will work together on projects to accelerate the commercialisation of solar technologies.

“Both countries are leaders in solar innovation and have a history of successful collaboration.”

Ms Coldrey said the Australian Solar Institute is also helping to grow the skills and capacity of the sector through scholarships and fellowships.

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"We are announcing support for eleven PhD Scholars and seven Postdoctoral Fellows for the next three years, on top of eight early and mid career researchers already announced.

"Supporting the next generation of leading Australian researchers is critical to developing a viable solar industry in Australia."

Ms Coldrey said ASI investments in developing solar technologies have to date leveraged partner contributions almost three-fold, resulting in a total leveraged portfolio value of almost $260 million.

Further information and a fact sheet on Silanna's project are available on the ASI web site, www.australiansolarinstitute.com.au

Australian Solar Institute Round 3 (March 2012) projects:

Vast Solar Pty Ltd: Validation of performance modelling for 1.2MWth solar array with high temperature receiver and integrated thermal storage
ASI contribution: $437,243
Total project value: $1,261,160
Partners: Twynam Agricultural Group, The University of NSW, RMIT University
Summary: Vast Solar will expand its existing test platform by designing and installing a high temperature receiver and an additional 500 heliostats. Vast Solar will assess design, materials and performance improvements delivered at temperatures greater than 560°C with aim of developing a central receiver concentrating solar thermal plant that can deliver Levelised Cost of Electricity ~$100/MWh.

RayGen Resources Pty Ltd: Central Receiver CPV Pilot Project – Stage 2
ASI contribution: $1,750,000
Total project value: $3,636,952
Partners: Boeing Spectrolab, Proteus Engineering Group, Able Engineering, Ceramet Technologies, Gannawarra Shire Council
Summary: This project aims to demonstrate the world's first pre-commercial pilot of a central receiver CSP system that uses photovoltaic energy conversion. RayGen and its partners will demonstrate a complete operational central receiver CPV (C2PV™) system in a commercial scale repeatable unit. Successful completion of the project will help advance the technology to the commercialisation phase, retire technical risk in the technology at a component and system level and gain performance data for a commercial scale C2PV™ repeatable unit over several years. In addition, construction and installation costs for a C2PV™ pilot system will be quantified and used to inform capital cost and LCOE models.

CSIRO: Evaluation and demonstration of hybridisation of CST with carbon capture and storage
ASI contribution: $667,500
Total project value: $1,855,000
Partners: DELTA Electricity
Summary: This project will examine the techno-economic feasibility of utilising concentrated solar thermal (CST) energy for the thermal regeneration of liquid absorbents in carbon capture and storage systems employed on coal fired power stations. The project aims to

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develop a new solar thermal reboiler for post combustion capture plants and a novel storage solution for low emissions energy. It also involves testing this reboiler and storage solution at a CSIRO operated carbon capture pilot plant located at Delta Electricity's Vales Point Station in NSW. It involves a major electricity generator in the economic study and analysis of integration issues for CST plants with conventional energy generation technologies.

CAT Projects: Analysis of variations in instantaneous weather
ASI contribution: $242,625
Total project value: $520,525
Partners: Power and Water Corporation, Azzo Pty Ltd
Summary: This project will develop an improved estimate for the maximum penetration of grid-connect solar generators achievable without energy storage, which takes into account the solar generators' distribution across the geographical area of the grid. Additionally, the project will seek to identify mechanisms for the development of predictive algorithms for the operation of solar power stations within constrained grids to ensure the optimal operation of the generation assets.

Solar Systems Pty Ltd: High-efficiency multi-junction solar cells on low-cost, large-area silicon substrates
ASI contribution: $2,000,000
Total project value: $5,167,370
Partners: Translucent Inc., IQE Plc, Emcore Corporation, Boeing Spectolab Inc.
Summary: Solar Systems proposes to develop, fabricate, and test novel next-generation multiple-junction solar cells used in the evolving utility scale Concentrating photovoltaic (CPV) solar power station industry. The key differentiator is the development of a new virtual 'Germanium' substrate wafer-based substrate where a thin layer of Ge is deposited on a Silicon wafer. This will reduce the cost and potentially improve the efficiency of the multiple-junction cells in CPV applications. The new substrates and resulting CPV cell structures will be fully characterised and analysed in the lab and then tested in on-sun in field equipment.

Chromasun Pty Ltd: Lowest LCOE: Australian pilot of rooftop CST and CPV-T micro-concentrator systems
ASI contribution: $3,461,677
Total project value: $9,263,370
Partners: Australian National University, Echuca Hospital, Little Creatures Brewing Pty Ltd, Ergon Energy, Coolgaia Pty Ltd, University of Southern Queensland, Munters, Futuris Group of Companies
Summary: Chromasun will partner with the Futuris Group of Companies to develop and establish an Australian pilot manufacturing capability for the Chromasun Micro-Concentrator (MCT) concentrating solar thermal (CST) product. Phase 1 will include a pilot deployment with MCT collectors in Victoria at Echuca Hospital and will be coupled with a double-effect absorption chiller to provide air-conditioning directly from sunlight. Another pilot deployment will be built in Western Australia at Little Creatures Brewery coupled to an ammonia chiller to simultaneously provide chilled water and heat for boiler feedwater. Phase 2 of the project will involve developing and commissioning a hybrid (CPV-T) receiver manufacturing capability for integration into MCT units. MCT-Hybrid units will then be deployed at the University of Southern Queensland and at the Australian National University. Both these MCT-Hybrid installations will conveniently and simultaneously provide electricity and hot water.

Granite Power Ltd: Solar Supercritical Organic Rankine Cycle for power and industrial heat
ASI contribution: $770,000
Total project value: $1,707,250
Partners: NEP Solar Pty Ltd, NUSport, The University of Newcastle, Newcastle Innovation, Yokogawa Australia, Turbo Power Systems

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Summary: This project will develop, demonstrate and test a small scale concentrating solar power (CSP) system plus storage using Direct Supercritical Fluid Generation (DSFG) of an organic fluid through parabolic trough solar collectors to prove the practicality and performance of DSFG, which enables field costs to be lowered. The CSP system used involves existing proven Organic Rankine Cycle technology called GRANEX®.

CSIRO: Solar hybrid fuels
ASI contribution: $1,585,853
Total project value: $6,845,570
Partners: Chevron, Orica, Colorado School of Mines, and a range of leading national and international researchers in the solar fuels area.
CSIRO will increase the efficiency of solar hybrid fossil fuels by developing and demonstrating new catalysts and membrane reactors to make the fuels at low temperatures compatible with conventional solar thermal storage. The product, known as syngas, will be suitable for electricity production in gas turbines and for making liquid transport fuels. The project also includes the assembly of a panel of national and international experts to formulate a Solar Fuels Roadmap for Australia.

Barbara Hardy Institute, University of South Australia: Development of high temperature phase change storage systems and a test facility
ASI contribution: $689,500
Total project value: $2,380,629
Partners: Whyalla Solar Oasis Consortium, AORA Solar, University of Lleida, Spain
Summary: This project involves the establishment of a world-class high temperature thermal storage test facility to test prototype high temperature storage systems. The project also involves designing, constructing and testing two thermal storage systems that incorporate new phase change materials and heat transfer techniques with the aim of reducing the cost of high temperature, high density storage systems.

CSIRO: Solar energy management system for utilities
ASI contribution: $225,715
Total project value: $570,430
Partners: Ergon Energy, GWA Group
Summary: CSIRO will develop, prototype and evaluate a world-first “firm” solar system using a solar energy management controller to monitor air-conditioning operation and utility network requests to reduce load on the electrical network, and when requests are made, remove conventional electricity load and introduce solar (supported by gas back up) to power the air-conditioner. It will be tested in three residential buildings.

Australian Solar Institute Australia-Germany Collaborative Solar Research and Development (March 2012) projects:

The University of Melbourne: Enhancing efficiencies in printed solar cells by controlling morphology development
ASI contribution: $500,000
Total project value: $1,213,235
Partners: Light Technology Institute at Karlsruhe Institute of Technology, Laboratory for Electron Microscopy at Karlsruhe Institute of Technology
Summary: This project aims to improve the efficiency, reproducibility and performance consistency of flexible, low-cost organic solar cells by controlling the molecular alignment of the active organic components in the cell. This collaborative project will develop interface modification methods to direct molecular organisation in thin printed films. The resulting organic films will be analysed using advanced electron microscopy and X-ray diffraction techniques.

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The University of NSW: Si nanocrystals embedded in silicon oxide and nitride as nanoscale heterojunction for third generation photovoltaics
ASI contribution: $500,000
Total project value: $1,593,640
Partners: Fraunhofer Institute for Solar Energy Systems ISE, Institute of Semiconductor Electronics at RWTH Aachen University and Laboratory of Nanotechnology at IMTEK at Albert Ludwigs University of Freiburg.
Summary: This project aims to increase the efficiency of low cost third generation photovoltaic solar cells by increasing the number of silicon nanocrystal layers in silicon oxide and silicon nitride, following work showing silicon nanocrystals embedded in silicon oxide and silicon nitride enables the separation and transport of electrical carriers.

Blue Scope Steel Ltd: Expanding the value proposition for Building Integrated Photovoltaics: Thin film Building Integrated Photovoltaic Thermal retrofitting of buildings
ASI contribution: $477,320
Total project value: $1,597,320
Partners: Fraunhofer Institute for Solar Energy Systems ISE, The Sustainable Buildings Research Centre at The University of Wollongong,
Summary: This project aims to lower the cost, and improve the value proposition of, Building Integrated Photovoltaics by developing a systematic approach and methodology to optimise the design configuration and sizing of Thin-film Building Integrated Photovoltaic Thermal (BIPV-T) systems to suit installation on existing buildings. The project also includes a feasibility study to expand the functionality of BIPV-T systems to include energy storage.

Australian National University: Local doping using Laser Chemical Processing technology for advanced silicon solar cells
ASI contribution: $352,365
Total project value: $1,043,240
Partners: Fraunhofer Institute for Solar Energy ISE
Summary: This project aims to advance Laser Chemical Processing technology to enable it to be used for the creation of improved contacts to silicon solar cells, thereby increasing the efficiency and decreasing the manufacturing costs of the cells.

The University of NSW: Time- and spectrally resolved photoluminescence for silicon solar cell characterisation
ASI contribution: $490,166
Total project value: $984,538
Partners: Fraunhofer Institute for Solar Energy ISE, Australian National University
Summary: This project involves developing techniques to more accurately measure the type and amount of efficiency-reducing contamination in silicon solar cells and investigate the lifetime effects of contamination. The project includes the establishment of a calibration standard library in both countries.

<u>PhD Scholarships- total value= approximately $770,000</u>

- Yu-Heng Jaret Lee (Jaret), Australian National University: 'III-V Semiconductor nanowire solar cells'
- Alex Pascoe, Monash University: 'Trapping, detrapping and loss mechanisms in dye sensitised solar cells'
- Bjorn Sturmberg, The University of Sydney: 'Nanostructured and metamaterial photovoltaics'
- Ahmad Mojiri, RMIT University: 'Spectral beam splitting for improving the energy conversion efficiency in hybrid concentrating solar collectors'
- Jae Sung Yun, The University of NSW: 'Materials characterisation of crystalline Si thin-film solar cells'

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- Shane Sheoran, University of South Australia: ‘A direct contact heat exchanger for high temperature thermal storage in solar power plants’
- Simon Heslop, The University of NSW: ‘Facilitating high penetration PV integration into the electricity network’
- Tobias Prosin, Murdoch University: ‘Development of a state of the art solid particle receiver CST system, optimised for commercialisation in the Australian market’
- James Bullock, Australian National University: ‘Understanding and optimising dielectric charge in industry applicable solar cells’
- Dylan Cuskelly, The University of Newcastle: ‘Thermionic emission from MAX phase materials’
- Joseph Giorgio, University of Wollongong: ‘Light weight and flexible solid-state dye-sensitised solar cells’

Postdoctoral Fellowships- total value= approximately $2.3 million

- Guodong Du, The University of Western Sydney: ‘TiO2-based nano-size systems for solar water oxidation: Effect of nano-size structures and composition on solar water disinfection and solar hydrogen generation – the solid state science approach’
- Wensheng Yan, Swinburne University of Technology: ‘More cost-effective, large-area amorphous silicon ultrathin film plasmonic solar cells towards industrial application’
- Thilini Ishwara, The University of NSW: ‘Solar efficiency optimisation of hybrid organic-inorganic solar cells
- Philip Van Eyk, The University of Adelaide: ‘Solar gasification – using renewable energy to produce lower-carbon, high-value liquid transport fuels using low grade carbonaceous feedstocks’
- Niraj Narsey Lal, Australian National University:’ Light trapping for tandem solar cells’
- Kallista Sears, CSIRO: ‘ITO free, efficient organic solar cells based on textured graphene electrodes’
- Kwan Hee Lee, The University of Queensland: ‘Enhancing organic solar cell performance through defect characterisation and engineering’

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