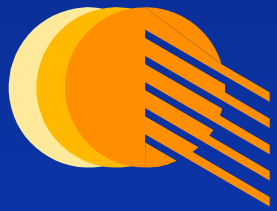

Status of Australia's PV Market - 2005

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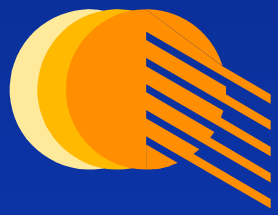
Introduction

- Australia - at forefront of PV R&D since the early years of terrestrial deployment
- Rapid growth in world uptake of PV with new products, marketing strategies, policies and deployment programs
- Australian policies on energy research, industry development, electricity supply & greenhouse gas reduction impact on local PV market
- This presentation will summarise the current status of the Australian PV market, with a discussion of trends and implications



Production and Use

Production Capacity

BP Solar
40 -> 50 MWp cells
~80% exported
12 MWp modules
~50% exported

Photo: BP Solar

Solar Systems - 5 MWp concentrator facility

Pilot lines:

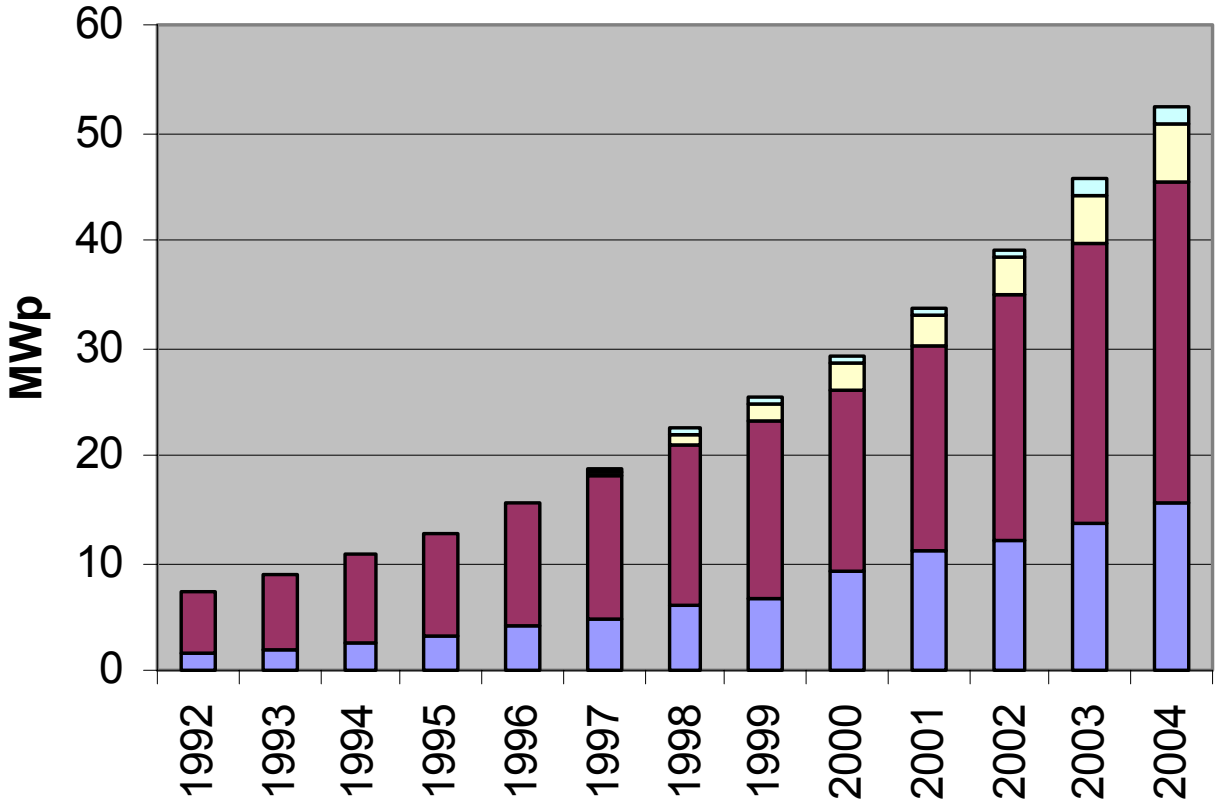
- **Origin Energy** (Sliver™ cells)
- **Sustainable Technologies International** (Dye Sensitised Cells)
- **CSG Solar** (crystalline Si on glass) – German manufacture

2004 Production

- BP Solar:
  - mc-Si cells: 30MWp
  - sc-Si cells: 5MWp
  - Modules: 8MWp
- STI
  - dsc: 0.1MWp
- Solar Systems:
  - Concentrators: 0.7MWp

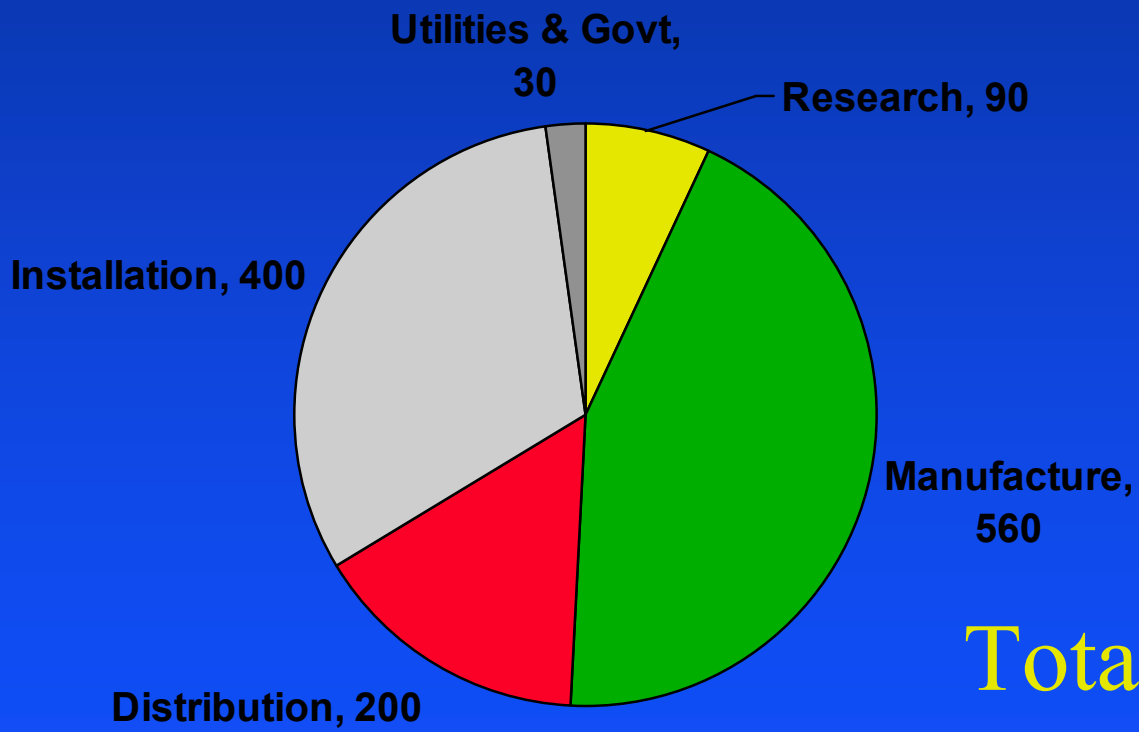
Photo: STI
DSC Demo, CSIRO Energy Centre Newcastle

Installations

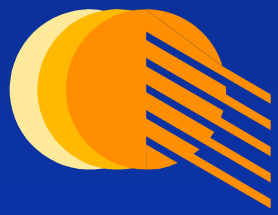


2004: ~ 6.7 MW
PVRP & RRPGP:
2.6 MW = 40%
Grid ~ 13%

Employment
Fulltime equivalents



Total: 1280



Research & Market Support

New PV Technologies

- Origin Energy
  - pilot production of Sliver™ technology in 2005
  - less silicon for same power
- CSG Solar
  - crystalline silicon on glass
  - thin film with c-Si performance
  - German production 2006
- Sustainable Technologies International
  - dye sensitised titanium dioxide (DSC) technology for BIPV market
  - pilot scale manufacture
- Solar Systems
  - Continued development of concentrators

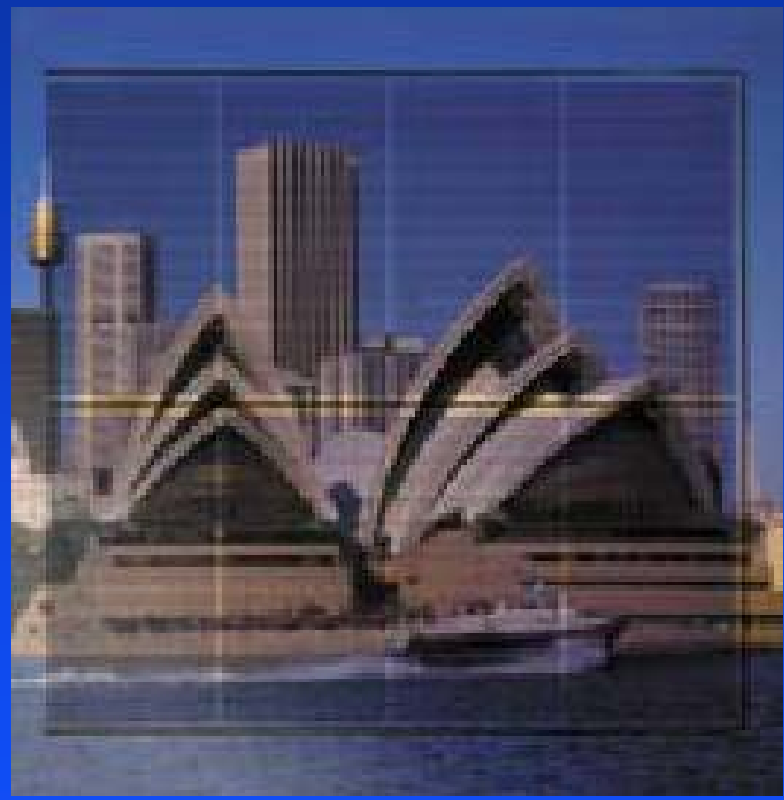
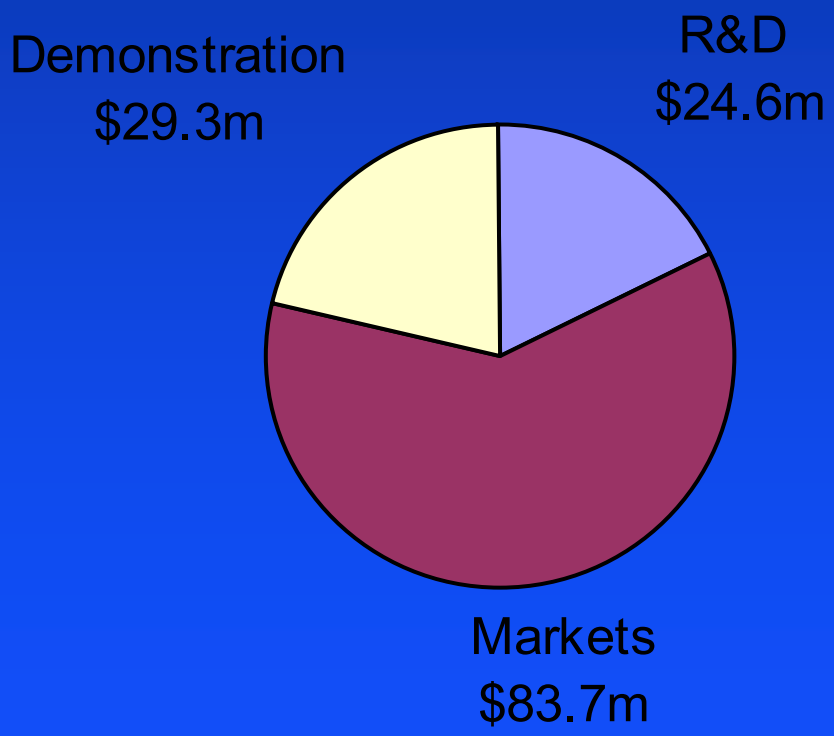


Photo: Origin Energy
Semitransparent Sliver Module

Cumulative Government Support 1996-2004 $million



2004: ~$20m

Australian PV Standards

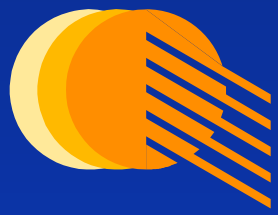
- safe & high quality product critical for a new industry
- problems impact on potential customers & government support
- Australia also active on international standards committees

- AS 4509 - Stand-alone power systems
  - System design guidelines; Safety requirements; Installation & maintenance
- AS 4086 - Batteries for use with stand-alone power systems
  - General requirements, installation and maintenance
- AS 4777 - Grid Connection of energy systems via inverters - revised
  - Requirements for Installation; Inverters; Grid protection

- New standards under development:
  - Installation of PV arrays
  - Inverters for stand alone power systems – critical safety issues
- Standards needed:
  - charge controllers
  - grid interconnection procedures

ResLab Testing Facility, Perth

- Commercial testing of renewable energy systems and components
- Facilities:
  - solar simulator, large PV array, PV module tester, power quality analysers
- Systems test beds:
  - configurable battery energy storage systems, battery capacity test facilities, constant temperature baths, associated test & monitoring equipment



Applications

Off-Grid Systems

- Remote farms, small communities, pastoral stations, water pumping, pipelines, fences, telecommunications
- Renewable Remote Power Generation Program
  - Commonwealth grants (50% RE cost) administered by States
  - Bushlight, ResLab
  - 3.8 MWp of PV installed to date
- 57% of installed PV used in off-grid non-domestic market

Photo: SEDO
Hamersley Iron 31 kWp system

Diesel Mini Grids

Lingara: 9 bay stationpower® array with inverter and battery bank

Photo: Ergon Energy

NT PAWC Kings Canyon: 225 kWp c-Si in 1 MW diesel station

Photo: W.Meike, Novolta

Concentrator Systems

- 30 dishes (720 kWp) for 3 NT-PWC community power systems in 2005
- Also suited to end of grid applications, hydrogen production & combined heat and power production
- 112 curved mirrors per dish
- 500 X concentration focused onto central receiver
- dishes cooled and independent tracked

Photo: Solar Systems
Pitjantjatjara 220 kWp in diesel grid

Off-Grid Residential & Pastoral Property Systems

- 15 MWp – 30% of PV installed is for off-grid houses around Australia
- Increasing size (many $200-400,000 systems -> 7-15kW PV)
- High RE uptake in pastoral stations (>40% in WA)
- PVRP (grants up to $4000/kWp) and RRPGP support

Photos: SEDA

Water Pumping & Purification

- Rapidly growing interest
- 10-15% of 2004 PV installations (25% of WA programs)
- Trend from windmills to PV
- Stock, cropping, domestic, water purification, desalination, ground water lowering
- Mono pumps:
  - tracking arrays, submersible brushless DC motor, positive displacement pump
- Solar Energy Systems
  - low maintenance PVC poly-piston PV water pumps
  - for use with saline, high acid, high iron content water

Photo: A.Maslin, Solar Energy Systems "Solarflow"

Grid Systems – Community

Kogarah Town Square:

- 160 kWp of PV
  - roofing (a-Si), transparent roof and awning (c-Si)
- 153 MWh of electricity each year

Photos: Energy Australia

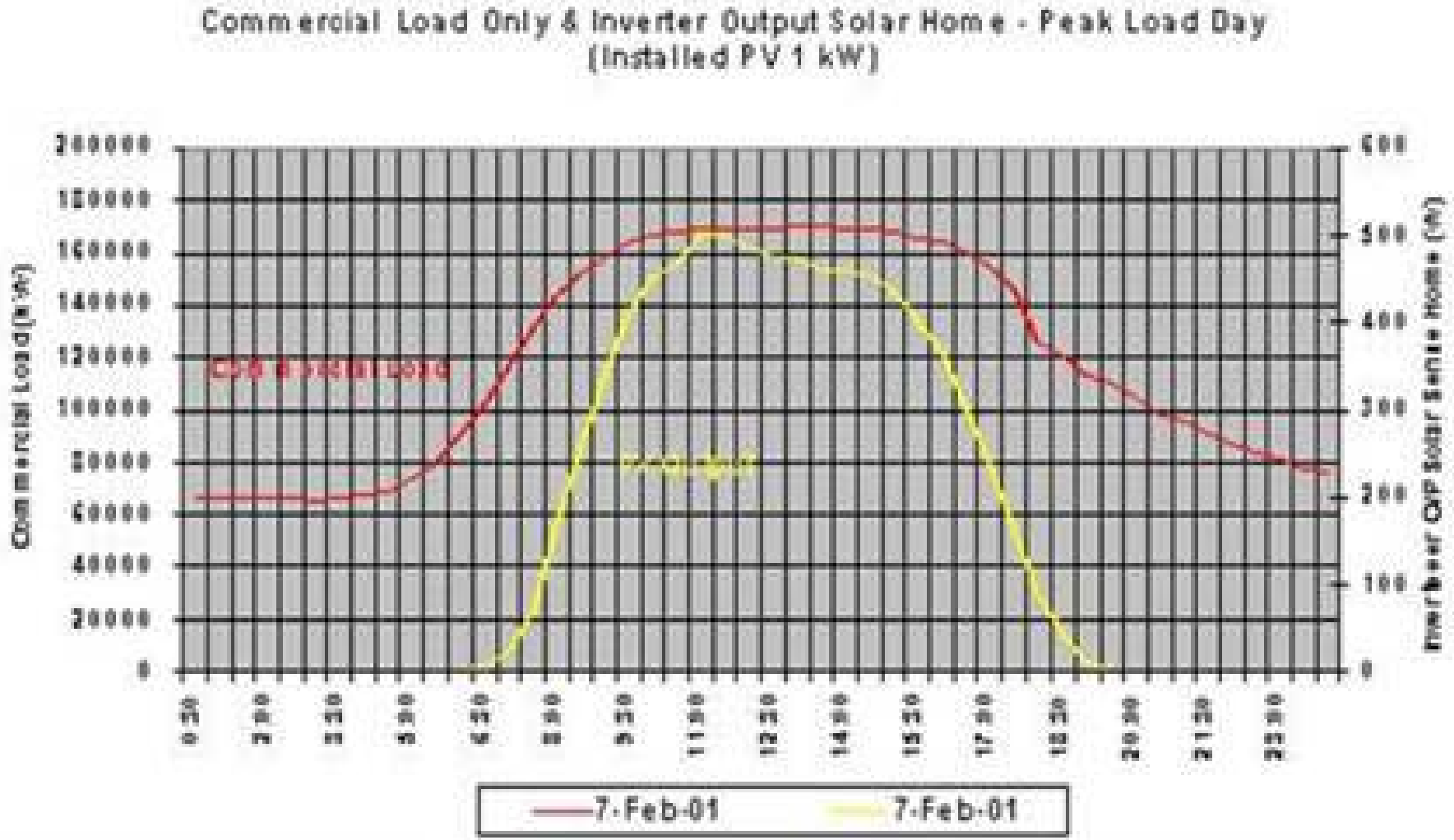
Grid Systems - Commercial

Edward St Brisbane (Photo: SEDA)

Melbourne Uni Private (Photo: STI)

For normal or uninterruptible power supply

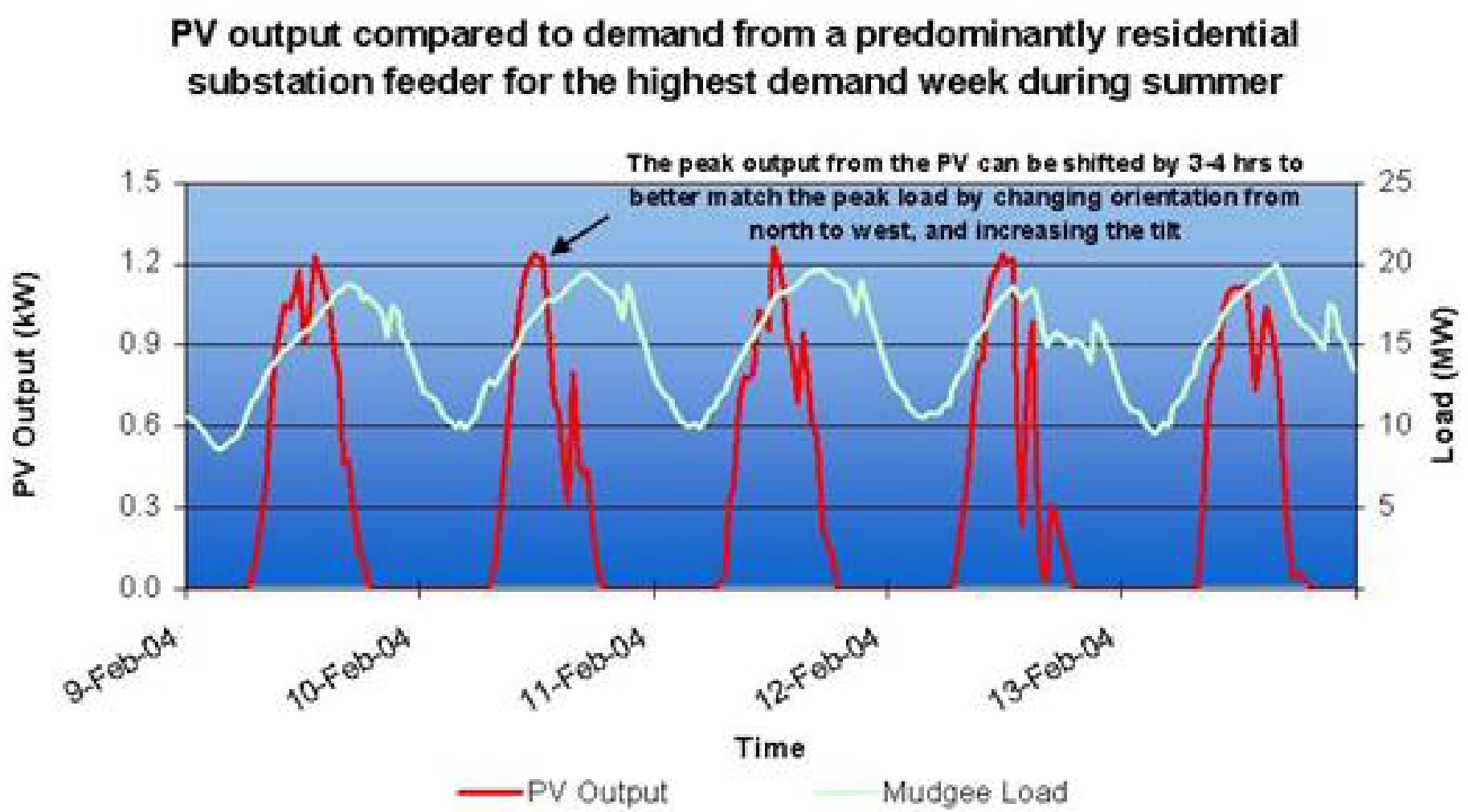
PV Output & Commercial Load

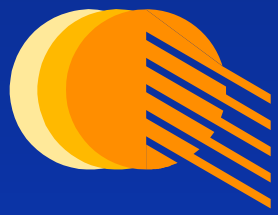


Grid - Residential

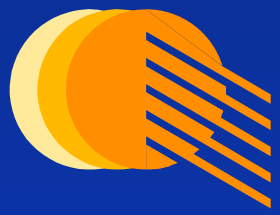
- standard kits for rapid installation on tiled or metal roofs
- PVRP – 6.8 MWp PV since 2000 (5870 systems, 38% grid)

PV Output & Residential Load





Trends & Outlook



International Context

- Internationally:
  - Large increases in demand
  - Large increases in production
  - Japan dominates production & now pursuing exports
  - China and SE Asia increasing production
  - Silicon constraints
- Australia:
  - Increasing exports as production increases
  - Increasing imports - ~40% of installations
  - Move from dominant to minor player

Support for Renewables

- PVRP
  - 17% of market
  - May end 2005 - will grid market be sustained?
- RRPGP
  - 22% of market
  - Trend to larger systems -> wind, concentrators?
  - Restrictions on water pumping
  - Implications of removal of diesel fuel excise
- MRET
  - Proposed increase in deeming period for PV & size of deemed systems
  - Tapering off from 2006
- Solar Cities
  - Short term grid sales -> longer term impact?
- Renewable energy R&D funding
  - Industry priorities need to be defined
  - Opportunities for product & systems development

Outlook

- Industry policies
  - –Few targeted policies to encourage RE industries to set up or stay
  - –Loss of Australian technologies overseas
  - –Low Si technologies hold promise while Si shortages remain
  - –Silicon production could be considered – carbon source issues
  - –BOS components and systems opportunities

Outlook

- Electricity policies
  - Supply side focus
  - Restructuring focussed on wholesale market
  - Demand side solutions (best PV potential) difficult to implement
  - Solar Cities, BASIX and similar planning based drivers now emerging
  - Opportunities for peak demand
  - State based feed-in tariffs?
  - Diesel grid and end of grid market
- Exports
  - Good reputation regionally for policy & project expertise, systems, training, accreditation
  - Efforts so far piecemeal & uncoordinated
  - Overseas aid approach often not helpful
  - Opportunities to retrofit old SHS as energy requirements increase