

Arizona State University – A Leader in Solar

*“...be the change you want to see
in the world...”*

Mahatma Gandhi

Bonny Bentzin

Director, Sustainable Business Practices

Operations

Campus
Sustainability

Living -
Learning-
Demonstration

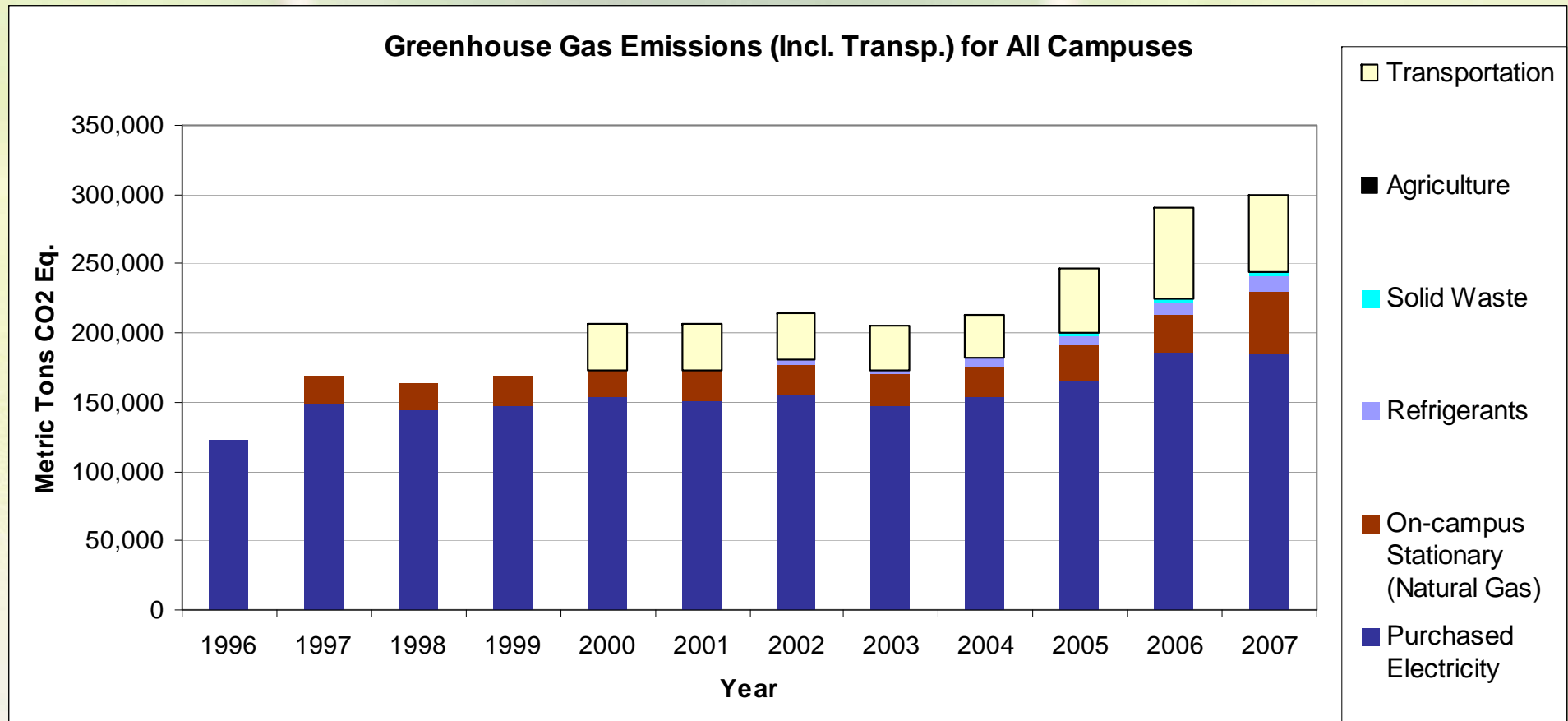
Operations/Practices

- **Carbon Neutrality**
 - President's Climate Commitment
 - Energy
 - Transportation
- **Zero Waste**
 - Solid Waste
 - Water
- **Active Engagement**
 - Campus Living Lab
 - 80K change agents



**Linking the ASU community
around solutions to walk the
talk.**

Status to Date – Carbon Neutrality



Two Years of Planning Realized

1.8 MW
installed to
date



Our Carbon Footprint – slide 1

Energy (Primary Source)



Purchased (all four campuses)

Current Sources: Coal Fired Plants, Hydro, Nuclear

Solution Strategy:

- Transition to On-site Renewable Energy Generation (Qualified Management Agreement or otherwise)
- Purchase Green energy generated by APS or SRP



Site Generated (Tempe Campus)

Co-Gen (Converts Natural Gas to 2 forms of energy)

Central Plant

Solution Strategy:

- Decommission Current Plants
- Identify alternative fuel source
- or-
- Capture and sequester emissions



Buildings/Infrastructure (all four campuses)

Solution Strategy:

- Energy Efficiency upgrades on all buildings, consideration in all purchases, performance criteria for all new builds and renovations
- Energy Conservation Education, Awareness, Engagement of the campus community
- Evaluate each campus as a system

Solar Projects at Arizona State University

- ASU's Achievements & Goals
- 2008 Reference Projects
- 2009 Opportunities for ASU



ASU: Consistent Leadership in Solar Power

- 1950s Early Headquarters for Association for Applied Solar Energy
- 1981 Opened ASU Solar Research House, training a generation of solar professionals
- 1990s Established Photovoltaic Testing Laboratory, first in the U.S.
- 2000s Established Solar Power Laboratory
- 2004 Launched Global Institute of Sustainability. Installed first solar PV system, 30 kilowatts on the Tyler Street Parking Structure
- 2008 Installed 1.85 MW of solar power systems
- Just the beginning....

Tyler Street Parking Structure

30 kilowatt Thin Film Solar System

- First solar installation at ASU in 2004.

- Solar Project canopies that support the thin film solar laminates and provide shade for 44 spaces.

- Owned and operated by the University.



Milestones Set by 2008 Installations

- Largest solar installation at a US university
- Largest non-utility solar power plant in AZ
- First commercial Solar Services Agreement in AZ
- Positions ASU as leader in adopting solar
- Environmental benefits equivalent to:



*Powering
275 AZ Homes*



*Taking 420 Cars
Off the Road*



*Averting more
than 4.9 million lbs
of CO₂*

2008 Reference Projects – Parking Structures

1.6 MW of single-axis tracking solar canopies over
Apache and Stadium Parking Structures.

Manufactured by Suntech,

Polycrystalline Panels installed by SolEquity.



Apache Parking Structure Solar Project

880 kilowatt
system



Stadium Parking Structure Solar Project



711 kilowatt system



2008 Reference Projects – Coor Hall

- 108 kW fixed tilt thin film rooftop PV system manufactured by First Solar, installed by SolEquity.
- Owned and operated by a private investor.
- ASU purchases the power.



Financing of Solar Projects –Owned and Operated by a Private Investor

- Projects were financed under a Photovoltaic System Services Management Agreement between ASU and Sun Devil Solar, LLC.
- Term of the agreement is 15 years, with a potential to extend for an additional 5 years.
- No up-front investment by ASU. The PV systems, owned by Sun Devil Solar, LLC, will generate electrical power for ASU and ASU will pay for this service.
- The Photovoltaic System Services Management Agreement applies to the above three solar projects and can be modified to add others.
- ASU can purchase the systems at fair market value at the end of the term of the agreement or extend the agreement for additional service.

How Does This Work?

- Started with a rooftop study.
- ASU issued a general RFP for solar work for its campuses.
- Three companies were selected – SolEquity, Honeywell, and Integrated Energy.
- A fourth company – APSES – was added through an intergovernmental partnership.
- Projects are called Photovoltaic System Services Management Agreement

Biodesign A & B Rooftops

- Owned, operated and maintained by ASU.
- 150 kilowatt Fixed Polycrystalline Panel Arrays Solar System



Looking Forward: ASU's Goals

- **Solar Capacity** – Current capacity is 1.85 MW. Additional systems with a target capacity of up to 8.9 MW may be installed in 2009.
- **Expanding to Other Campuses** – West Campus, Polytechnic and Downtown Campus.
- **Continued Leadership** – Demonstrating continued leadership among U.S. colleges and universities.
- **Sustainable Cities** – ASU Solar Canopies reduce Urban Heat Island Effect by providing shade for parking structure roofs.

Potential Projects at the Tempe Campus

Location	Estimated Size	Output	Status
Parking Structure #4	1100 kW	TBD	Plannin
Parking Structure #7	600 kW	TBD	Plannin
Parking Structure #3	250 kW	TBD	Plannin
GIOS	25 kW	TBD	Plannin
Hassayampa Academic	425 kW	TBD	Plannin
Student Rec. Center	400 kW	TBD	Plannin
Hayden Library	300 kW	TBD	Plannin
Police Building	50 kW	TBD	Plannin
Student Services Bldg.	200 kW	TBD	Plannin
Weatherup Center	130 kW	TBD	Plannin
Sub-Total Tempe	3480 kW (3.480 MW)		

Potential Projects at Downtown, Polytechnic & West Campuses

Location	Estimated Size	Output Cost	Status
<i>West Campus:</i>			
Open Land Area	2250 kW (2.25 MW)	TBD	Plannin g
<i>Polytechnic Campus:</i>			
Open Land Area	3000 kW (3.0 MW)	TBD	Plannin g
<i>Downtown Campus:</i>			
Nursing & Healthcare Innovation	75 kW	TBD	Plannin g
University Center	125 kW	TBD	Plannin g
Sub-total Downtown Phoenix	200 kW		
Total for All Campuses	8930 kW (8.93 MW)		

Lessons Being Learned

- The first major project is the most difficult.
- PPA's – the client (you) needs to commit to making this happen.
- Heavy coordination with the utility (APS/SRP) on interconnect agreements.
- REC's and Carbon Credits