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SUSTAINABLE PPPL

**Integrating Sustainability into Environmental
Management Systems**

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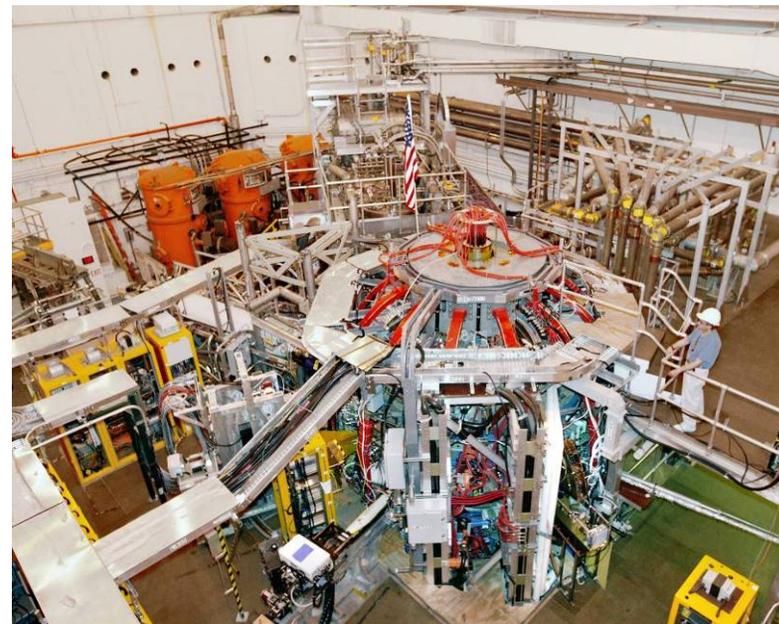
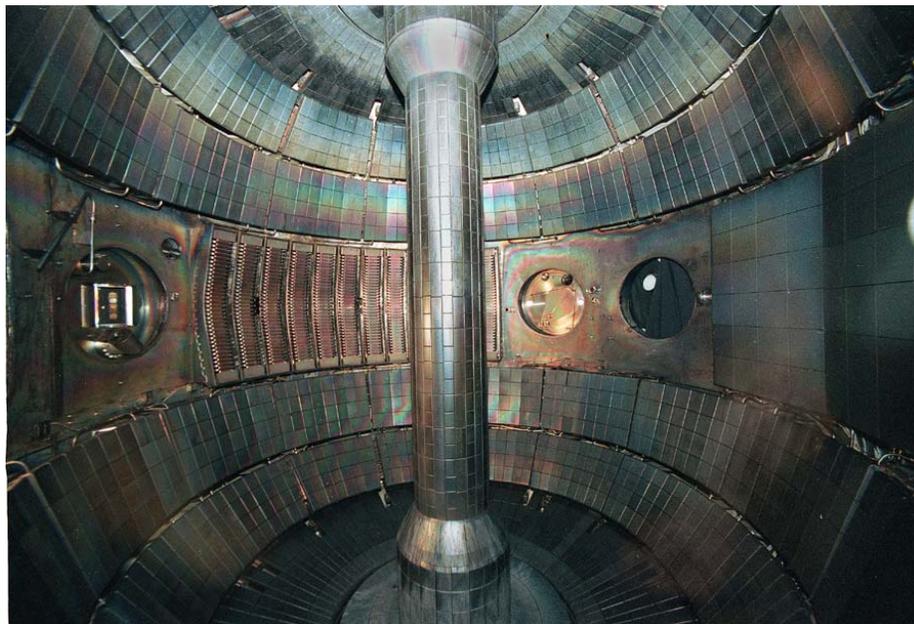
Introduction & Background

- Managed by Princeton University
- James Forrestal Campus
- ~88 acres
- ~750,000 s.f. of buildings
- *Collaborative national center for plasma science & technology and fusion energy research*





National Spherical Torus Experiment (NSTX)

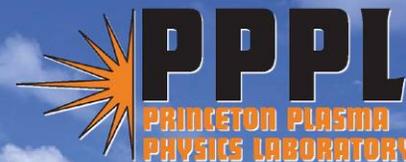


- Collaborative project with six DOE national labs and 35 university and international partners
- Explore scientific & technical issues of spherical torus plasmas
 - Higher plasma densities with lower magnetic field strength
 - Internal “boot strap” electric currents

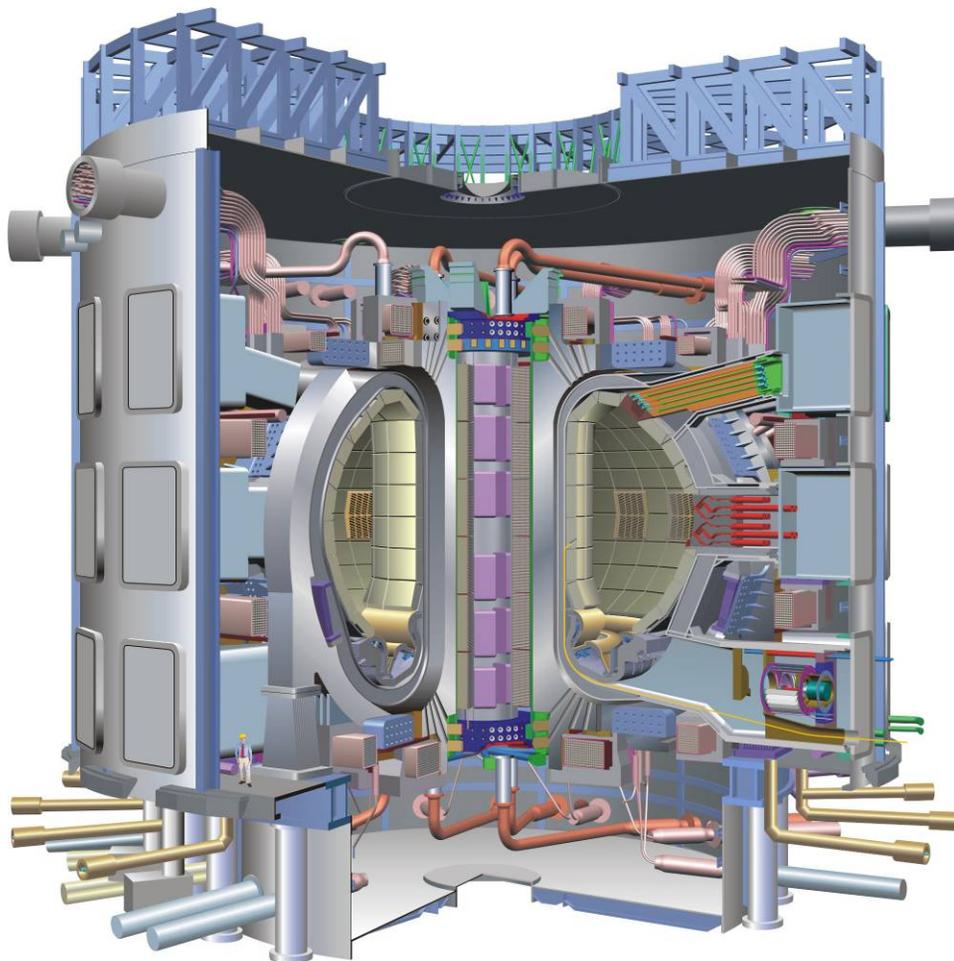


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ITER - International Fusion Energy Project



- International Partnership
 - European Union
 - United States
 - Russian Federation
 - Japan
 - China
 - India
 - Korea
- Cadarache, France
- *Establish the scientific and technological foundation for the global peaceful use of fusion power*



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Sustainability in Higher Education & Research

“In its most general sense, sustainability means using resources to meet the needs of the present generation without compromising the ability of future generations to meet their needs.”

United Nations World Commission on Environment and Development, 1986

American Association for
Sustainability in Higher Education



Campus Consortium for
Environmental Excellence

American College & University
Presidents Climate Commitment

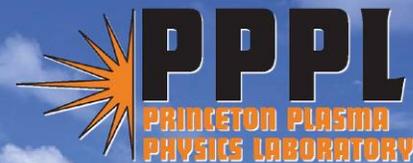


AMERICAN COLLEGE & UNIVERSITY
PRESIDENTS CLIMATE COMMITMENT



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Environmental Aspects & Impacts

Enviance - PPPL - Windows Internet Explorer provided by PPPL

File Edit View Favorites Tools Help

Google

Go

https://go.enviance.com/MainForm.aspx

Enviance - PPPL

PPPL
PRINCETON PLASMA
PHYSICS LABORATORY

Welcome, Robert Sheneman

Notify | Envision | Help | Profile | Sign Out

powered by
enviance

Desktop Calendar Messages Tasks Custom Field Library Templates Materials/Activities Admin & Security

System Models

PPPL (Home)

- Locations & Programs [17]
 - Air Permitting Program [1]
 - EMS Aspects & Impacts [42]
 - Env. Restoration Program [17]
 - Env. Services Operations Center [5]
 - Env. Services Training [10]
 - Env. Surveillance Program [3]
 - Haz Waste Mgmt Program [6]
 - Materiel Control Training [12]
 - Materiel Services Equipment Maintenance [5]
 - Materiel Services Operations [2]
 - NJPDES Program [5]
 - Pollution Prevention Program [1]
 - Rad Waste Mgmt Program [2]
 - SBRSA Program [5]
 - SPCC Program [3]
 - Z_Test Audits-Inspections [4]
 - Z_Test Schedule [0]
- Citations
- Documents [38]
 - Hazardous Waste Tracking Documents [3]
 - M&ES Procedures [36]
 - NTS Documents [5]
 - Release 5 [6]
 - SPCC [11]
 - Statements of Work [12]
- Reports [22]
 - EMS Program Reports [6]
 - Env. Surveillance Reports [3]
 - Environmental Compliance Reports [4]
 - Groundwater Monitoring Reports [7]
 - NJPDES Reports [10]
 - SPCC Reports [1]
 - Waste Management Reports [1]

Desktop ? Friday, May 30, 2008

Data Warnings This Month

Type	Data Entry Date	Data Entered By	Complete Date	Object Name
Warning	5/9/2008 4:18 PM	Virginia Finley	4/1/2008 4:00 AM	PPPLNJPDES Program\DSN001\PCE

Tasks This Month

Type	Task Name	Task Due	Status	Comments
Task	Renew Subcontract	5/1/2008 9:00 AM	0 %	
Task	Renew Subcontract	5/1/2008 9:00 AM	0 %	
Task	Renew Subcontract	5/1/2008 9:00 AM	0 %	
Task	Renew Subcontract	5/1/2008 9:00 AM	0 %	
Task	Renew Subcontract	5/1/2008 9:00 AM	0 %	

Displaying only five of 11 records. Click on 'Tasks' to see all records.

Messages This Month

Subject	Date	Sent By	Object Name
---------	------	---------	-------------

Custom Searches All

Search Name	Type	Date Last Used
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Enviance® - A state-of-the-art web-based compliance management system to track:

- **Obligations & Citations**
(regulations, orders, etc.)
- **Tasks**
(inspection, monitoring, etc.)
- **Documents**
(reports, procedures, etc.)
- **Data**
(sample results, audit findings, corrective actions, performance metrics, etc.)
- **Reporting**
(DMRs, citations, KPI's, etc.)



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Environmental Aspects & Impacts

The screenshot shows the Enviance software interface. The left pane displays a tree view of 'System Models' under 'PPPL (Home)', including 'Locations & Programs' and 'EMS Aspects & Impacts'. The main area shows configuration options for various utility uses:

- Heating:**
 - Central Plant Steam
 - Local - NG
 - Local - Electric
 - Heat Pump - NG
 - Heat Pump - Electric
 - Propane
 - Other (describe)
- Heating Notes:** A 40 ton A/C unit provides cooling to the entire facility. It is connected to the BAS. Unit is capable of using natural gas for heating but gas is not connected. There are four steam heat
- Cooling:**
 - Central Plant - chilled water
 - Local Unit AC
 - Heat Pump - Electric
 - Other (describe)
- Cooling Notes:** Air conditioning is provided through a 40 ton A/C unit
- Lighting:**
 - Fluorescent
 - Metal Halide
 - HP Sodium
 - Incandescent
 - Compact Fluorescent
 - Other (describe)
- Lighting Notes:** Ceiling mounted lighting consists of 18 sodium light fixtures that are normally on. There are 40-50 2-bulb fluorescent fixtures to provide direct lighting in work areas. They are controlled by
- Other Utility Uses:**
 - Electricity - other than lighting & HVAC
 - Water - Potable
 - Water - Non-potable
 - Sanitary Sewer
 - Other
- Other Utility Notes:** One rest room is located in the southwest corner. Non-potable is available for fire protection.
- Chemical Use:**
 - Acids
 - Caustics
 - Cleaners - biodegradable
 - Cleaners - non-biodegradable
 - Diesel Fuel
 - Gasoline
 - Metals (lead, mercury, beryllium, etc.)

Major energy use

- Heating
- Cooling
- Lighting
- Operating equipment

Water use

Chemicals used

Waste generation & recycling

Wastewater

Air emissions

Spill potential

Vehicles & equipment

Resource use (paper, etc.)

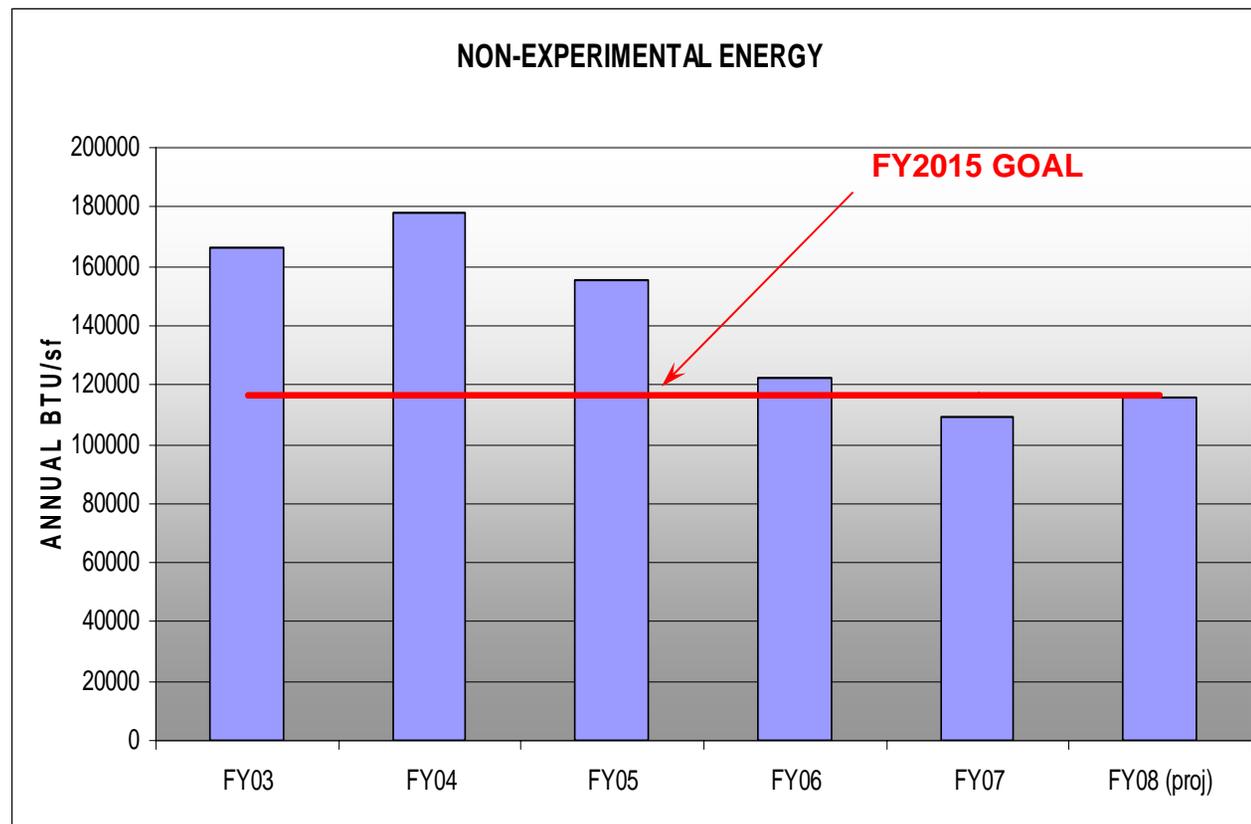
Potential Environmental Impacts



Environmental Performance Improvement Energy Efficiency

Reduced non-experimental energy intensity (Btu/s.f.) by ~37% from FY2003

Reduced annual CO2 emissions by ~4,275 tons from FY2003 baseline





Environmental Performance Improvement Waste Management



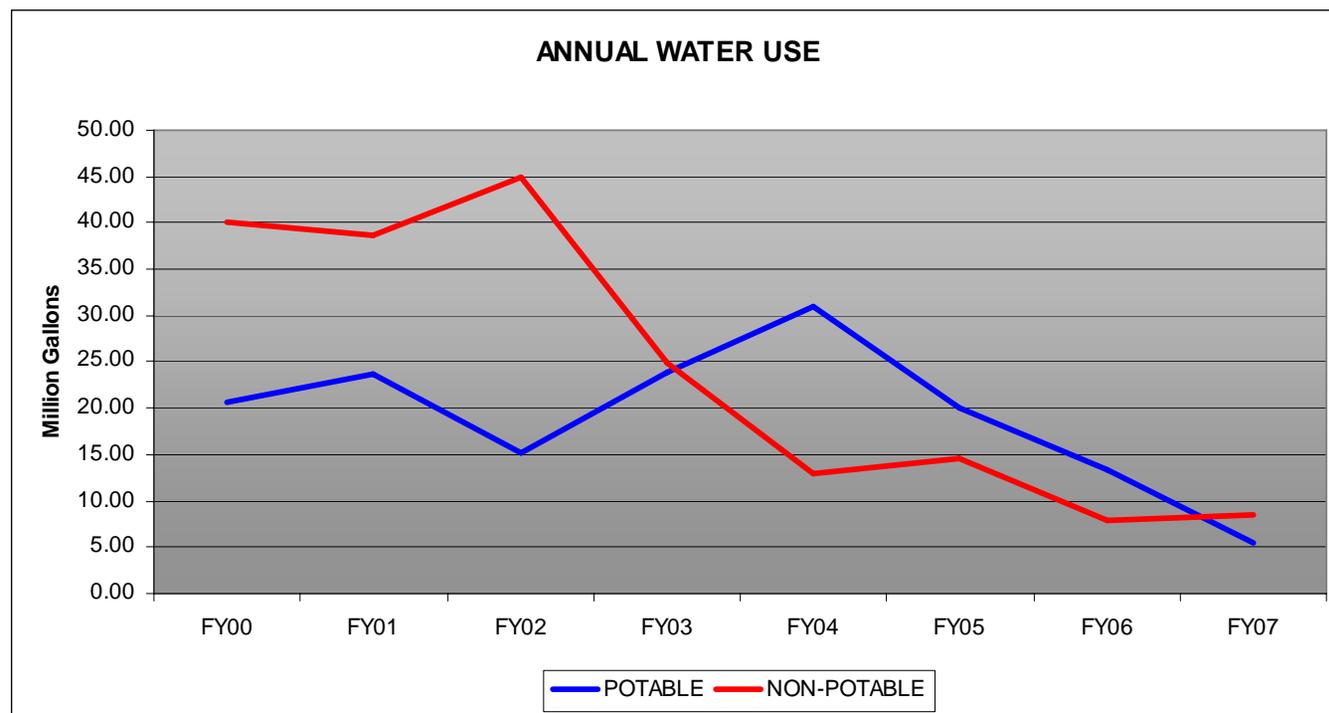
- Solid waste recycling averages 50% for five consecutive years
- Construction waste recycling >90% in 2007
- Overall recycling rate ~93% in 2007
- Chemical & universal waste recycling ~50%
- *6 tons of material recycled for every FTE*
- *\$300,000*



Environmental Performance Improvement Water Conservation

Since 2000, PPPL has reduced:

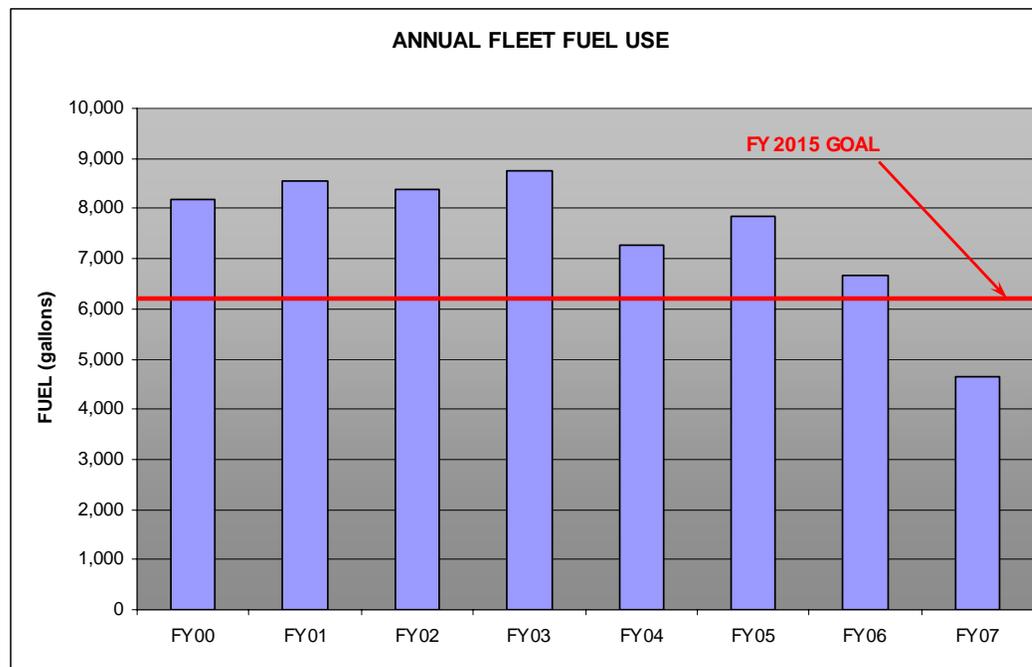
- Potable water use 73.5%
- Non-potable water use 78.7%
- Overall water use 76.9%
- *\$125,000 savings in last two years*





Environmental Performance Improvement Fleet Management

- Reduced fleet petroleum fuel use by 44% from FY2005
- Increased use of alternative vehicle fuels by ~900%
 - Compressed natural gas (CNG)
 - B-20 fleet conversion
 - B-20 John Deere® “Bio-Gators”
 - Flex-fuel vehicles





Environmental Performance Improvement Beneficial Landscaping



- Reduce soil erosion
- Reduce mowed areas
- Reduce use of chemical fertilizers & herbicides
- Utilize native, drought tolerant, and deer resistant plants
- Enhance wildlife habitat & health of trees
- Improve campus aesthetics



Environmental Performance Improvement Supply Chain

- **Office Supplies**
 - Recycled content products
 - Remanufactured products
 - On-line (paperless) ordering system
- **Furniture & Building Products**
 - Cradle-to-Cradle^{cm} certified furniture products
 - Cool-Zero[®] (carbon neutral) carpeting
 - Recycled content & recyclability
- **Bio-based Products**
 - Cleaning products, hydraulic oils, machining fluids
- **Energy-Star**
 - Expanded use of Energy-Star certified products & EPEAT electronics





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Recognition

**NJ Department of Environmental Protection
Award for Outstanding Achievement in Recycling**
*with the New Jersey Association of Recyclers
in the category of "Institution"*

**Environmental Protection Magazine
Facility of the Year Competition - Honorable Mention**
Only Federal facility to be recognized in both 2006 & 2007

Sustained Recycling Performance

- *Office of Science "Best in Class" P2 Award*
- *DOE "P2 Star" Award*

Alternative Fleet Fuels

- *Office of Science "Noteworthy Practice" Award*
- *DOE "P2 Star" Award Honorable Mention*





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What Does the Future Hold?

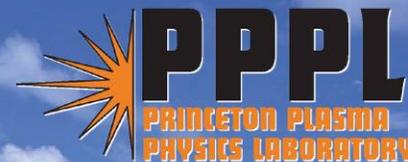
- LEED-EB building certification
- Continue focus on energy & water
- Renewable energy project
- Alternative fueled vehicle fleet
- Sustainable supply chain & subcontractors
- Comprehensive GHG inventory & management
- Princeton University Sustainability Committee





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Lessons Learned

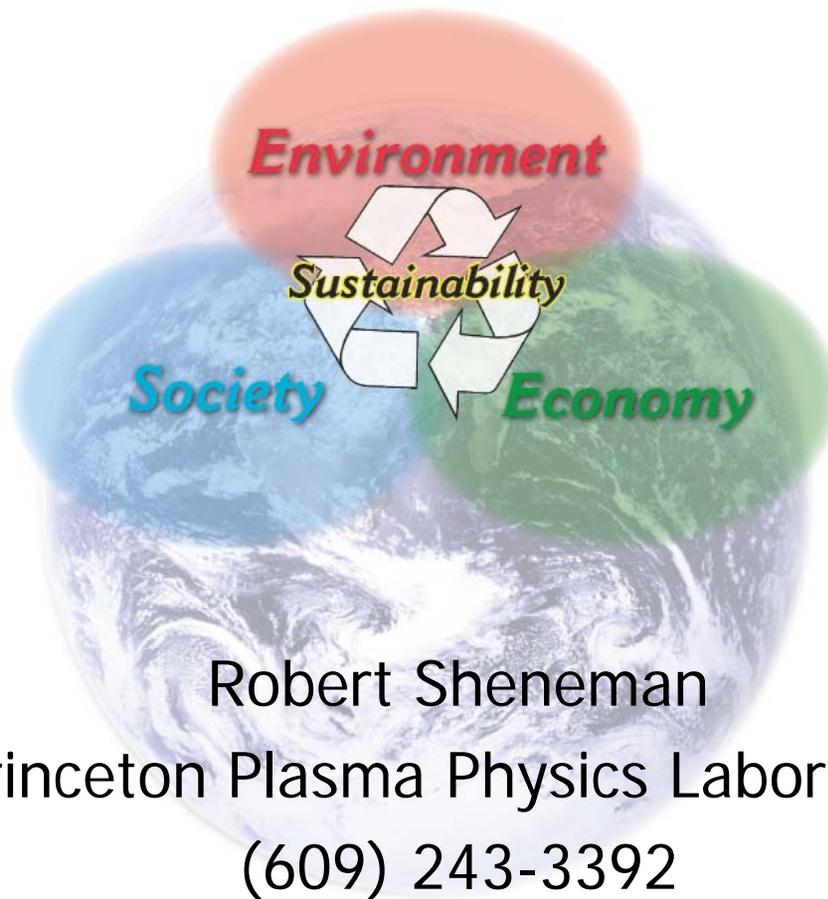
- Sustainability is a journey, not a destination
- Risk is essential and inherent to success
- Organizational change takes three to five years
- Gain momentum through early success, *share the credit*, and “talk it up”
- Admit a mistake, apologize, fix it, and learn from the experience
- *Build partnerships* – with operations, procurement, executives, etc.
- *Believe in what you do* – *you make a difference every day*





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