#### **Energy Strategic Plan** Los Angeles Community College District

Community College League Conference

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## West Los Angeles College -Baseline



Total Elec. Consumption

7,216,762 kW

**Total Gas Consumption** 

5,961 MMBtus

Total Water/Sewer 34,625 kgals

Overall Avg. Operating Annual Budget

\$2,498,570

# LACCD Comprehensive Energy Strategic Plan

### A Paradigm Change:

- 1. Efficient Renewable Energy Central Plants
- 2. Demand Management Through Performance Contracts
- 3. One MW Solar/PV per campus
- 4. Sustainable Curriculum Program

## 1. Renewable Central Plant Objectives

- One Central High Efficiency Sustainable Source for Hot Water and Chilled Water
  - Heating and Cooling
- Meet current demand with expansion capbility for future facilities and needs
- Provide power for clusters of buildings
- Digital Control System

### BASELINE vs CENTRAL PLANT LIFE CYCLE COST COMPARISON



## **Central Plant Features**

• Solar Heat Tube

- Hot Water - near steam

- Absorption Chillers (Multiple Units)
  Chilled Water for Air Conditioning
- Thermal Storage Ice
- Co-Generation Electricity and Heat
- Hot Water Boiler / Heater

#### Vacuum Tube Heat-pipe Collectors and Architectural Design Possibilities



## **Central Plant Costs**

- Proposition 39 bond resources
- SS. 5956 Private sector financing
- AB 1492 State of California Financing through the Foundation for California Community Colleges
  - Lowest Cost Borrowing
  - Requires Intercept Mechanism

## 2. Performance Contracts

- Retrofit all energy consuming elements for maximum efficiency
- Install conservation features in all buildings
  - Insulation
  - Low-E Glass
  - White Roof
  - Green Roof
- State of the art and new technologies
- Metering and Monitoring Systems

# Performance Contract Financing

- Design Installation Financing By Private Sector
- SS. 4217 Contract 25 year payback maximum
- Uses Private Sector Funding
- Guaranteed Payback within <u>existing</u> utility charges
- Incentive Funds Available from California Public Utility Commission and municipal programs administered by the utilities

# Performance Contract Arithmetic

- Electric / Gas Bill Before Energy Measures- Annual
- Electric / Gas Bill After Energy Measures - Annual
- Difference (Amount Available for Payback) - Annual

• \$1,000,000

• \$ 800,000

\$ 200,000

# 3. One Megawatt Solar / PV

- Private Sector third party to install
- Parking Lots and Roofs
- Hybrid systems with storage
- Future technology innovations

# Initial SOLAR Cost Concept

• Solar PV

Private Sector firm will install system and sell electricity equal to utility cost

System will be net metered

#### • Solar Heatpipe

- Provides free energy source for cooling and heating
- Renewable and sustainable

## Photo Voltaic Incentives

- DWP & IOU offer Solar / PV incentives
- Calif Public Utility Commission -- \$3 billion over 11 years
- National Energy Act (05) with incentives in 06
- Aggregated buying of systems

## Photovoltaic 3<sup>rd</sup> Party Arithmetic

- Federal Energy Credit 30%
- Rapid Depreciation 25 %
- Utility Incentives 20 %
- Green Tag Sale 5% (?)
- Bulk Procurement 10 % (?)
- 10 Cents on the Dollar !!!

#### 4. Sustainable Development Curriculum

- Green Buildings on different Campuses with basic focus on technology and learning from actual projects
- Courses offered as certificated, licenses and advanced degrees
- Career opportunities and training for jobs, new companies and advanced degrees
- Collaborate with unions, private businesses, public, government and non-profit sectors
- Provide actual experiences on campus through building programs
- Sustainable Development Curriculum: solar, wind, geothermal, hybrid technologies, economics, etc as well as new businesses, life cycle accounting, investment, operations and maintenance
- •Impact on Climate Change -- the solutions for global warming are available today for immediate implementation

#### **Distributed Energy Solutions**

- Renewable H<sub>2</sub> is based on water electrolysis is the only pathway to deliver a zero-emission energy cycle
- H<sub>2</sub> is the ideal medium for storing electricity for on-demand distributed power generation and fueling
- Scale-up of renewable power and HES solutions will address "clean and secure" energy requirements
- Wind power is becoming "lowcost" energy solution
- Advanced solar technology and volumes driving lower costs
  - Significant potential for home energy applications

# Renewable Hydrogen Pathway

### **Fuel Cell Basics**

A fuel cell is a device that generates electricity by a chemical reaction



#### **Fuel Cell System - 3 major modules**

**Fuel Processor Module** (Reformer) - reforms natural gas (CH4) into hydrogen rich gas (reformate) for use by fuel cell.

**Power Generation Module** (Fuel Cell) - uses hydrogen in reformate to produce electricity (DC voltage)

**Power Conditioning Module** (Inverter) - converts DC Voltage produced by the Fuel Cell into AC Voltage (240VAC) for use by the grid.

## Integrated Fuel Cell System

- Direct energy conversion
- Low maintenance and capital costs
- More environmentally friendly Air

- Quiet operation
- Scalable
- No transmission and distribution losses



### **Power Generation**

Fuel & Air Delivery

Cooling

Waste Heat Capture

Integrated Controls Fuel Processor Stack/Balance of Plant Inverter/Grid



#### **Anaerobic Phased Solids Digestion Technology**





#### An advanced and technically validated approach to the problem of handling a wide variety of problematic organic waste materials

### Wind Mill Power

#### Costs are competitive with natural gas



- Wind Power uses wind to create electricity
- Accounts for around 1% of California's electricity supply
- On-site wind power
- Case in point: farms and town in N. Europe
- The turbine technology and costs have changed.
- Hybrid Systems and Integrated
- On-site Generation
- Courtesy of California Energy Commission and Distributed Energy Systems 2006

## Off The Grid !!

- Using current and future Proposition 39 bond resources
- Buy Out
  - Central Plant Loans
  - Performance Contracts
  - Photovoltaic / Fuel Cell Installation
- No Future Energy Cost !