

# Energy

- Green Power Purchasing
- Green Power Generation
- Energy Conservation

Nebraska Multiplier –

For every dollar spent on renewable energy industries, the effect is \$2.82 versus the conventional energy multiplier of \$1.48

# Green Power Purchase

Several military and civilian installations purchase renewably generated energy:

- Ft. Carson, Campbell, Bragg, Lewis, Hood
- Dyess AFB purchases 100% renewably (solar/wind) power
- The Northwest US region has experienced an 88% increase in the last year in green power purchasing.

# Fort Carson Buys Green Power

A portion of the power purchased by Fort Carson comes from renewable sources like wind...



# GreenWood Ranch Estates – Phoenix, AZ

- First substantial privately financed completely grid-free community
- 487 5-acre ranchettes
- Basic 1650W system
- Under \$100K for 3 bed, 2 bath

# Deep Lake Water Cooling

- Pulls cold water from nearby lake to mimic A/C
- Enough to power 100 high-rise office towers without electric A/C
- 75% less energy consumption
- Piloted in Toronto



# Renewable Energy at Fort Carson

- First federal solar ventilation preheating system powered by a solar wall
- Air is pre-warmed as much as 54F before entering the heating system

Initial Investment:       \$140,000  
Payback Period:         13 Years  
Cost Savings:            \$11,000/year  
Energy Savings:         2,444,000ft<sup>3</sup> of  
                                Natural Gas



# Solar Benefits

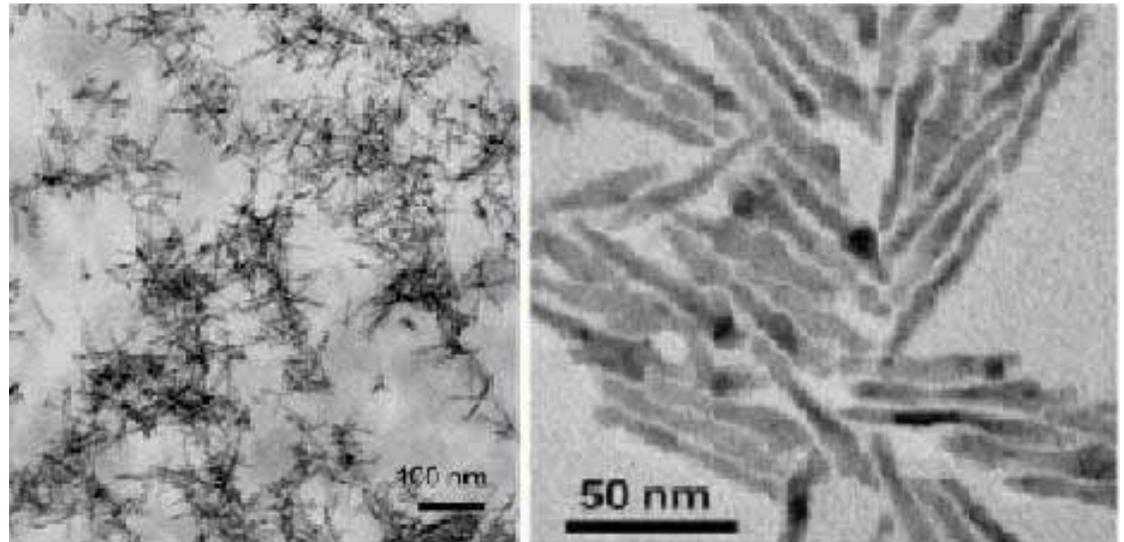
- John F. Williams Federal Building in Boston, MA
  - One of the largest operating solar arrays in the Northeast.
  - Containing 372 solar panels and covers 3930 sq. ft.
  - Offers an estimated savings of 28,014 kWh/year



An estimated 147,000 independent solar buildings and 1.1M with some form of solar power.

# NanoSolar Cells

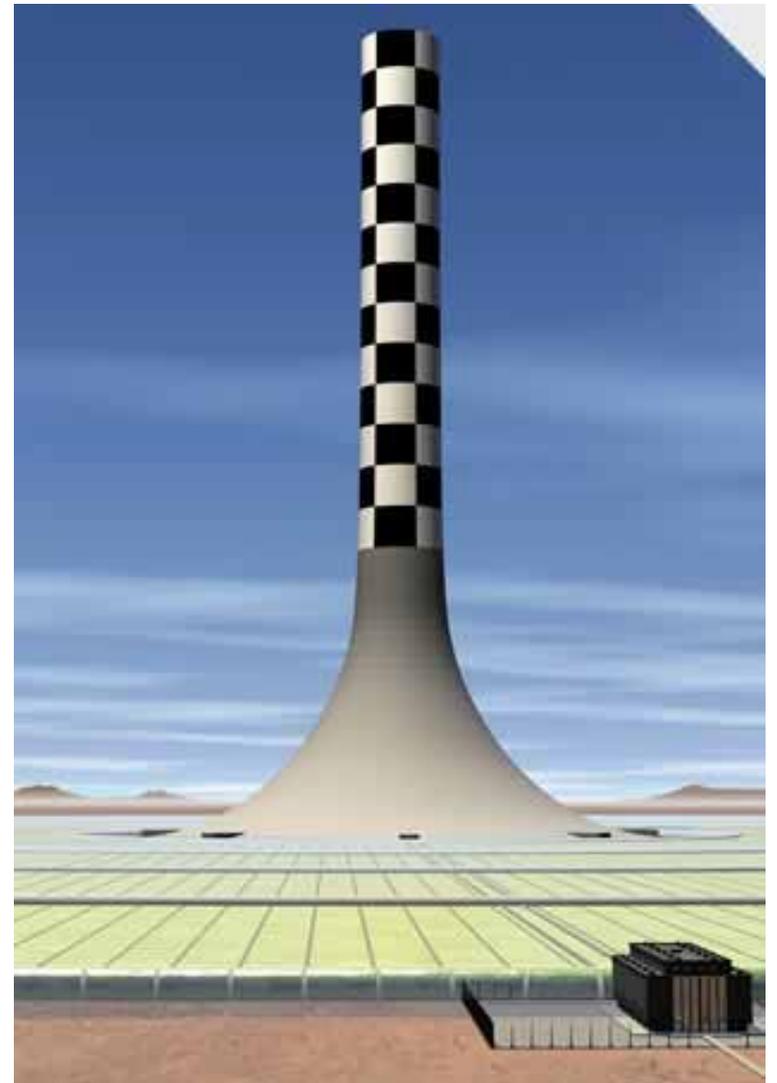
- \$40 per square foot – substantially cheaper
- Lightweight conductive plastic
  - Doesn't require high temperatures during manufacture
- More flexible for greater placement choices



Nanorod based plastic cell: Nanorods clump in uncontrolled, random ways.

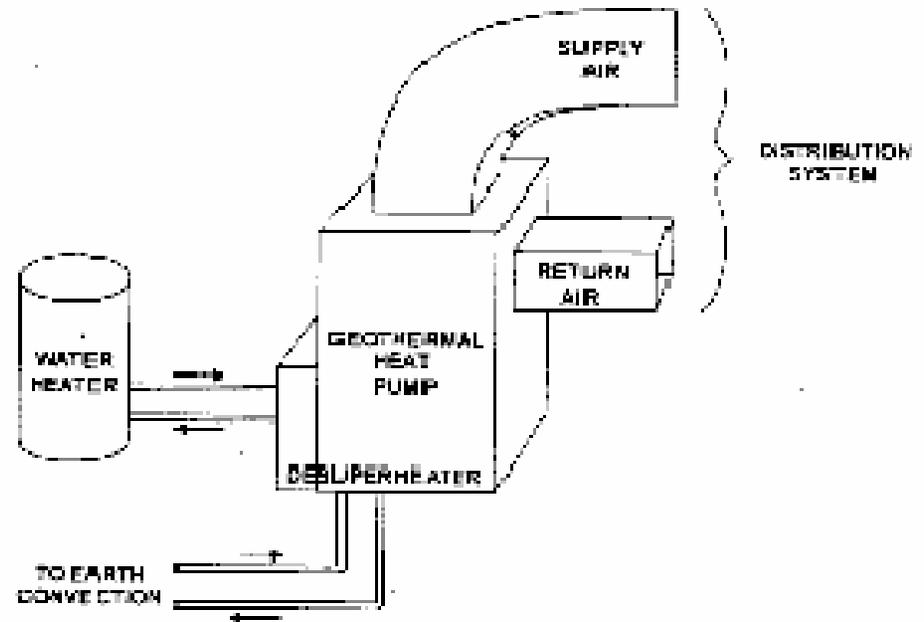
# Solar Tower In Australia

- 3000 foot chimney in the outback
- Air is heated by the sun, and then rises, to power turbines
- 200 megawatts, for 200,000 homes



# Ground Heat Pumps

- Cost 2x as much, but save 50-70%/year in heating costs.
- Hanscom AFB –
  - \$122,000 LC cost savings
  - Didn't use 2600 gallons of oil and 17,000 KW-hours (approximately 95,000 lbs CO<sub>2</sub>, 361 lbs. SO<sub>2</sub>, and 162 lbs of Nox)



# Go with the Flow....

## Tidal Power

- First tidal power turbines to be plugged into the local electricity grid in Norway, planned version in SF Bay
- Similar to dam technology but without the ecosystem damage.



- More dependable than other renewable energies
- Usual small amounts of power generation-500-1000 MWs.

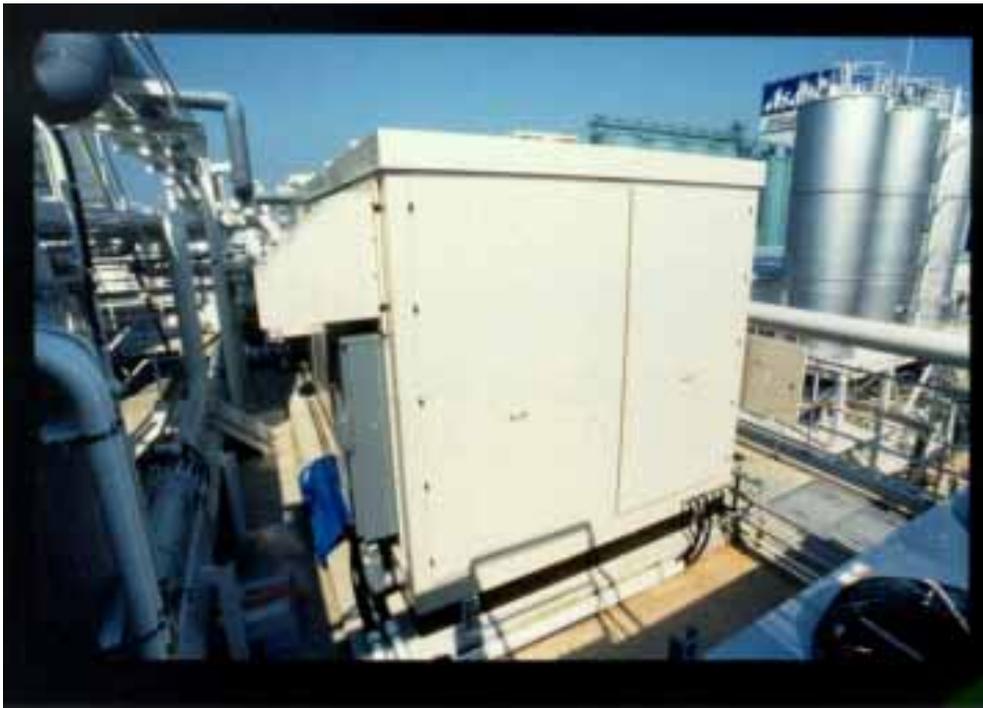
# Fuel Cells – The small version

## Bacteria-Driven Battery

- Microbial fuel cell powered by organic household waste
- Produces 8x as much energy as similar fuel cells and no waste
- Estimated cost - \$15
- By next year, NEC plans to sell fuel cell- powered computers



# Fuel Cells – the large version



- GM fuel cell system to power Dow Chemical Plant – 500 units
- Largest fuel cell deal to date
- To promote the greater use and decreased costs for fuel cells.

# CAESAR

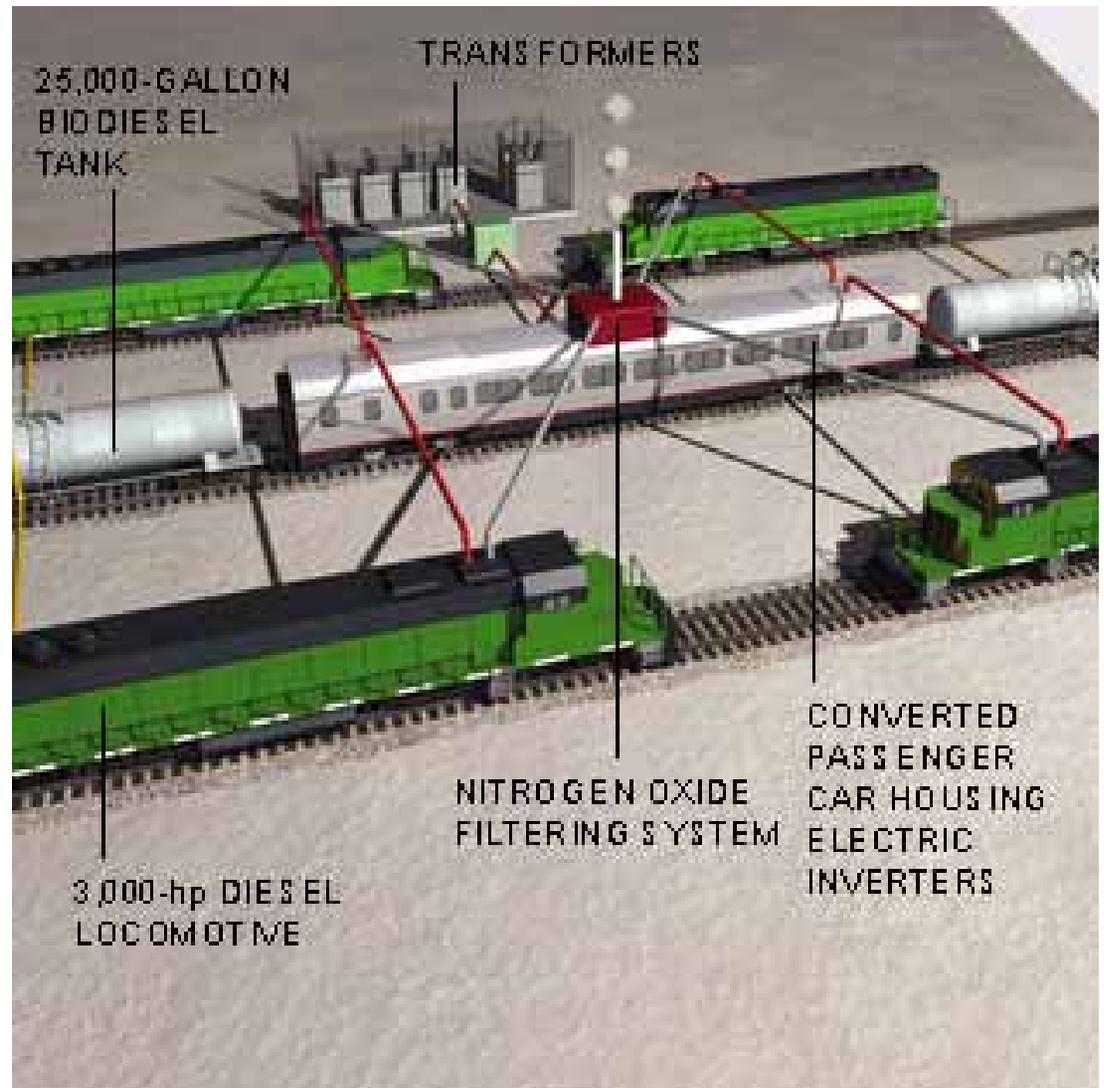
(Clean and Environmental-Safe  
Advance Reactor)



- At UMD, generates electricity from nuclear waste
- Impacts:
  - Decreased fossil fuel use
  - Reuses present nuclear waste
  - Doesn't create new weapons-grade materials

# Power Train

- Electric systems using stationary retrofitted bio-diesel trains.
- 95% decrease in emissions, as compared to power plants.



# Largest Wind Farm in the World (Welcome to Iowa!)

- 310 MW Farm in NW corner of Iowa, with 180-200 turbines
- Enough to power 85,000 homes
- Online by 2004-2006



# The Power of Conservation

If every person in California would had retired one light – there would have been no energy crisis in California

Even the most minor changes can result in huge reductions in energy consumption and emission of air pollutants

# Energy Star Program

In 2001, business and consumers saved more than \$5B in energy costs, while reducing greenhouse gas emissions equivalent to 10M cars.

The average appliance can save...

- Refrigerators: \$35/year
- A/C's: \$20/yr
- Dishwashers: \$30/year and decreased water usage
- Clothes Washer: \$93/year
- CFL's- 75% less energy and last 10x longer
- Heating and Cooling Systems: 10-40% on heating and cooling bills

