

Alternative Energy: State and Local Initiatives

Towards a More Sustainable
Energy Future

September 14, 2007

Recent Headlines

- **Oil hits new all time high in NYC as Hurricane Humberto shuts US refineries**
 - CNN Online
- **Oil and natural gas pipelines bombed in Mexico- many businesses shut down**
 - Boston Globe
- **American Electric Power to deploy additional large-scale batteries on distribution grid**
 - Renewable Energy Access.com
- **Alamosa solar facility generates 3.6 MW of electricity**
 - Renewable Energy Access.com
- **Beware the new world energy order**
 - Financial Post – Canada
- **The Energy Emergency**
 - U.S. News & World Report

The Setting

- We seem to have reached a tipping point
 - The recognition that our energy supply is highly vulnerable is seeping in
 - Imported petroleum
 - Reliance on unstable states
 - State controlled sources/political pressure/lack of investment into exploration
 - Increasingly expensive to obtain/costs will tend to remain high or increase
 - Aging refineries
 - Increasing competition for limited supplies
 - Weather uncertainty

National Petroleum Council Report

- “Facing the Hard Truths about Energy”
 - Issued by the National Petroleum Council
 - July 2007
 - 175 members on the Council
 - Key Points
 - The *average* IOC estimate of production in 2030 is 107 Mbl/day versus an estimated demand of 138 Mbl/day, a *23% shortfall*.
 - World oil reserves are plentiful. But access to these reserves is limited.

National Petroleum Council Report

- Key Points

- “Over the next 25 years, risks above ground—geopolitical, technical, and infrastructure—are more likely to affect oil and natural gas production rates than are limitations of the below-ground endowment.”
- “Over the coming decades, the world will need better energy efficiency and all economic, environmentally responsible energy sources available to support and sustain economic growth.”



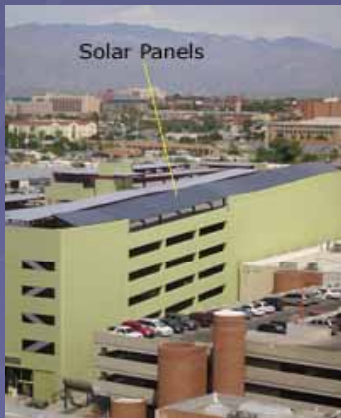
The Ongoing Energy Reformation

- Advancing technology
 - Solar panels
 - Gaining efficiencies
 - Becoming more commonplace
 - TEP has made a significant investment
 - Currently operates the largest and most productive solar panel generating field in the Western Hemisphere
 - Generates up to 4.6 MW



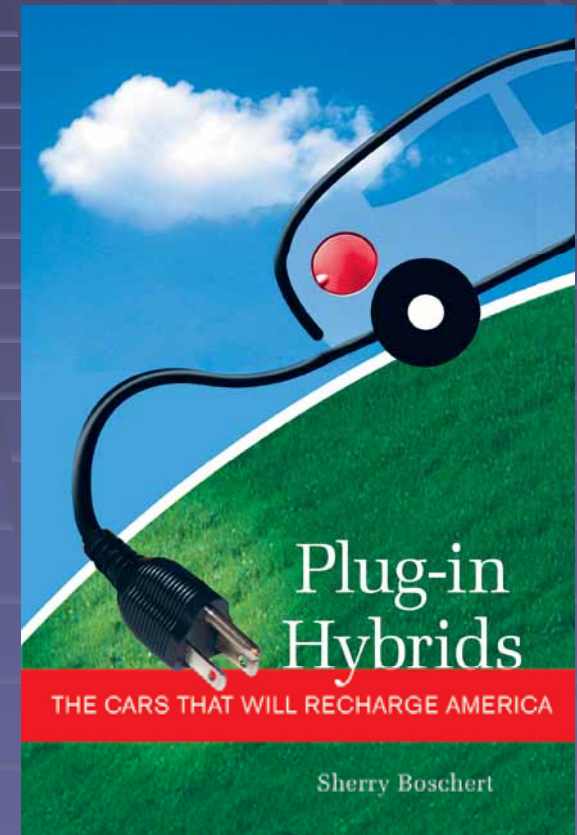
The Ongoing Energy Reformation

- Advancing technology
 - Solar panels gaining efficiencies
 - Use growing rapidly
 - Wind power well established
 - Anticipating cumulative installed wind capacity of nearly 49,000 MW by 2015



The Ongoing Energy Reformation

- Advancing technology
 - Ethanol, CNG, biodiesel
 - Hybrid vehicles
 - Prius and Escape
 - Plug-In Hybrids



The Ongoing Energy Reformation

- Advancing technology
 - All Electric Vehicles
 - A growing number of manufacturers
 - Zap
 - Phoenix Motorcars
 - Zenn
 - Tesla
 - Miles



Renewable Energy Investment

- Investment capital flowing into renewable energies such as wind power climbed from \$80 billion in 2005 to a record \$100 billion in 2006
 - UN Environment Programme, UNEP
- Experts predict investments up to \$85 billion in 2007

Benefits of Alternative Energy

- National
 - Reductions in greenhouse gas emissions
 - Less reliance on imported oil
 - Less impact of future “Oil Shocks”
- Regional
 - Greater diversity of energy sources builds-in system reliability
 - “Greener” community perception will attract opportunity
 - Providing improved transportation options can reduce traffic congestion
 - Reduced air pollution – avoiding ozone non-attainment
 - Opportunities to create more sustainable communities

Where We Are Today

- Currently
 - Most energy is derived from traditional sources
 - Coal, petroleum, gas
 - Solar represents a very small percentage of total energy generation
 - Wind is promising but limited
 - Nuclear has advantages but significant opposition remains
 - Hydropower is static

The Challenge

- Increasing the diversity of our energy supply
 - It is not practical, possible, nor necessary to go 100% renewable
 - For the foreseeable future, coal, natural gas, and petroleum will provide the majority of our energy needs
 - But, increasing 'renewable' energy diversity will
 - Create greater economic resiliency
 - Reduce market price pressure
 - Create new markets/jobs/opportunities
 - Promote innovation
 - Limit greenhouse gas contributions

Key Transition Strategies

- Conservation
 - Forced - cost-based
 - Voluntary
- On-site generation using renewables
 - Solar, wind, water harvesting
- Mileage Efficiency Standards
- Development Planning
 - Energy and sustainability need to be drivers
- Renewable Energy Standards
 - Now in place in most states
- Recycling

Strategies

- Strategies are being adopted independently by state and local jurisdictions
- Illinois
 - Will offer a \$1,000 rebate for the purchase of new hybrid cars, trucks and SUVs
 - Funded by state investment in below market securities and banks to fund the difference
- South Carolina
 - Sales tax rebates for purchase or lease of a hybrid, all-electric vehicle, plug-in hybrid
 - \$300 per vehicle

Strategies

- Massachusetts

- Massachusetts Technology Collaborative – Renewable Energy Trust

- \$15 million business expansion initiative

- Loans up to \$3 million with reduced interest rates covering up to half of capital spending over a two-year period

- Austin, Texas

- Require energy efficiency improvements in existing homes and buildings when sold

- Currently proposed

Strategies

- Oregon
 - Oregon Business Energy Tax Credit (BETC)
 - Provides up to 50% of eligible project costs up to \$20 million
 - State buildings require 1.5% of construction costs for onsite solar technologies
 - Tax exemption for solar net-metered systems
 - Energy Trust Oregon
 - Funds solar hot water and PV system installations
 - Oregon's 1999 electric-utility restructuring legislation required Pacific Power and Portland General Electric (PGE) to collect a 3% public-purpose charge from their customers to support renewable energy and energy efficiency projects

Strategies

- Pennsylvania
 - Energy Independence Strategy
 - Goal:
 - increase Pennsylvania's alternative and renewable energy production capacity, reduce the state's dependence on foreign fuels, and create more jobs
 - Governor convening a special session
 - Sept. 17 - will consider production and consumption of homegrown biofuels and financing the Energy Independence Fund

Strategies

- Many jurisdictions adopting energy saving measures
 - Issuing Executive Orders administratively mandating operational changes
 - Meeting LEED building standards for new construction
 - Vehicle fleets to go green (ethanol, biodiesel, hybrid, electric)

Key Incentives Resource

- Database of State Incentives for Renewables and Efficiency (DSIRE)
 - Database managed by NC State University
 - <http://www.dsireusa.org/>
 - See handout

Arizona's Challenge

- Arizona's rate of growth is the highest in the nation
 - 56% between 2000 and 2005
 - 148% 2005-2025 (projected)
- This rate of growth will produce exceptional challenges and opportunities
 - Greenhouse gas emission reduction targets will be very difficult to achieve
 - New infrastructure and growth need to become "energy smart"

Arizona has room to improve

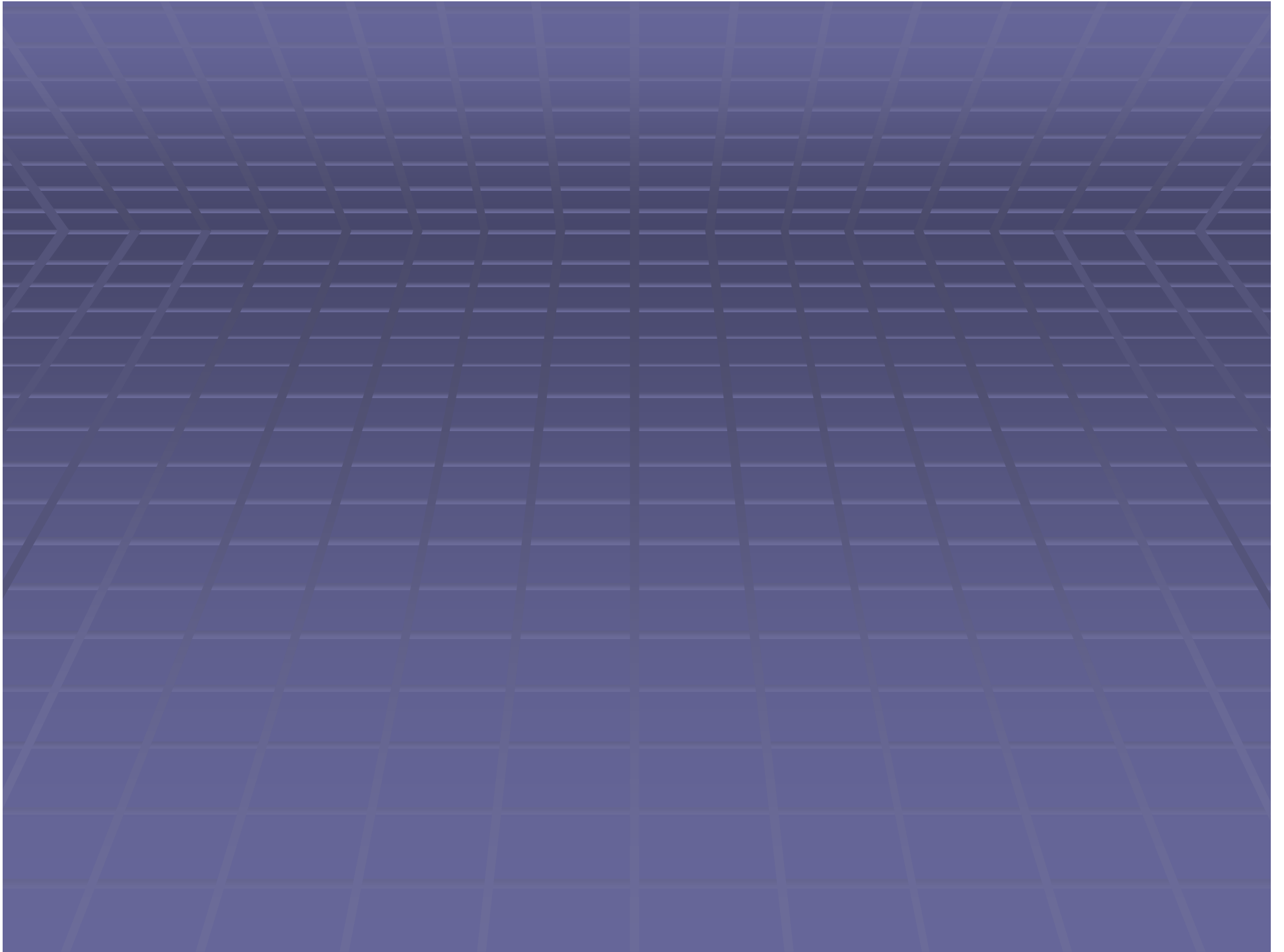
- American Council for an Energy-Efficient Economy
 - Developed a ranking of states by energy efficiency
 - Arizona ranked 23rd

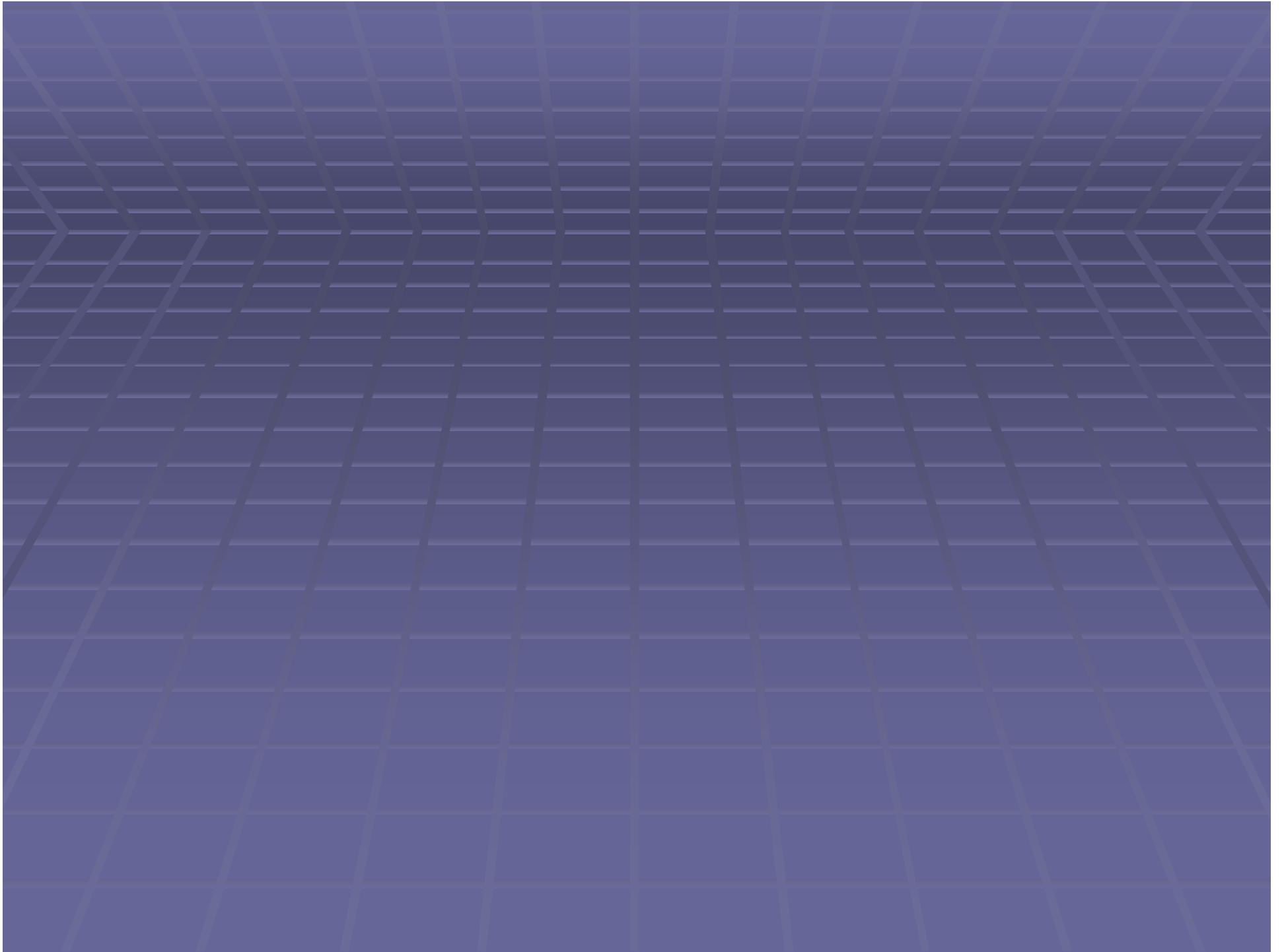
A move in the right direction

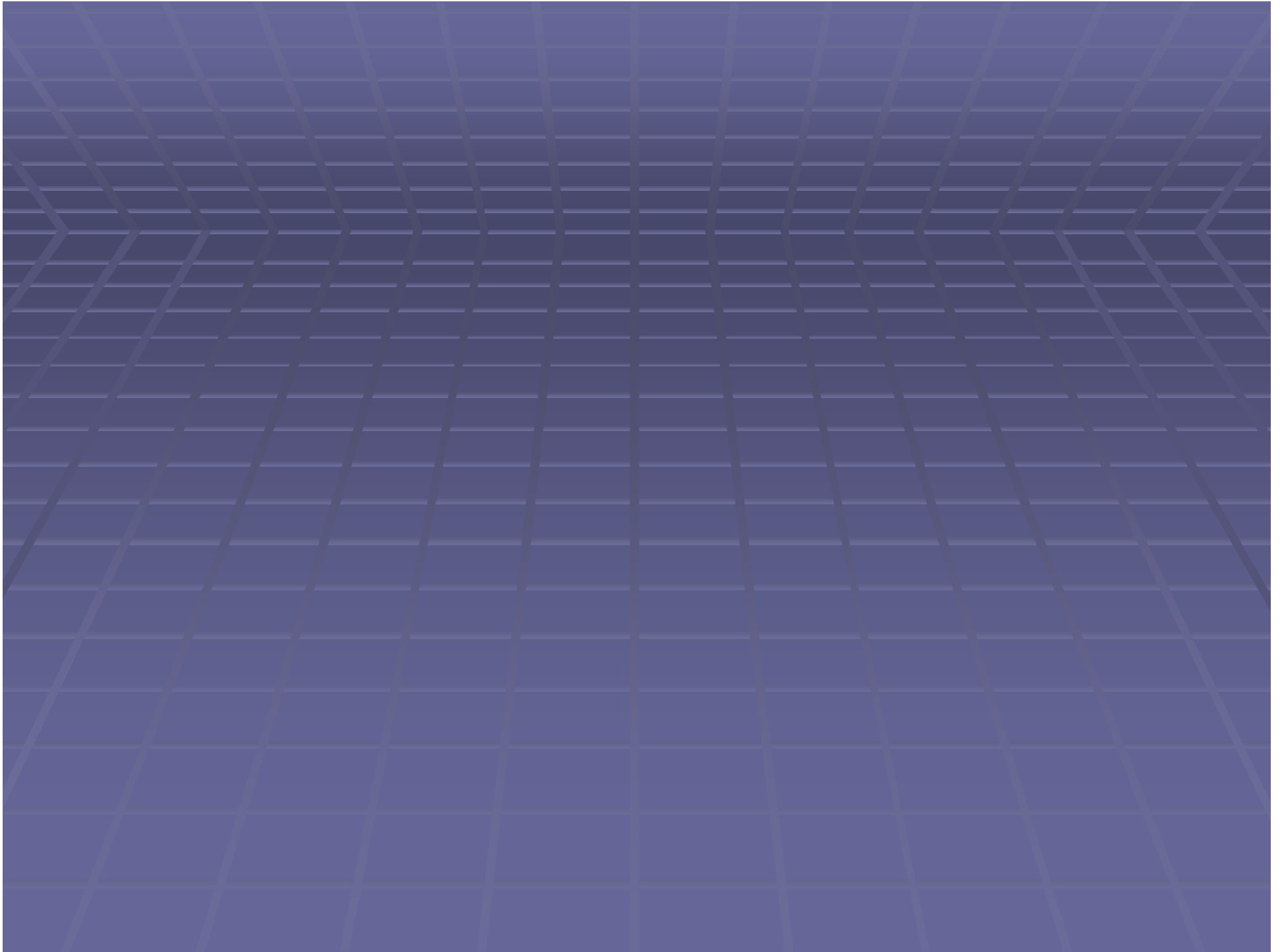
- Arizona's Renewable Energy Standard
 - Adopted by the Arizona Corporation Commission
 - Approved by Attorney General June 15, 2007
 - Requires that energy generated within the state be 15 percent renewable energy by 2025
 - Require that 30% of the renewable requirement in years 2011 and beyond must be met by local on-site renewable energy projects installed by homes and businesses

In summary...

- Energy availability is a principal driver of the economy
- Petroleum fuel
 - becoming more scarce and costlier to replace
 - Increasingly subject to disruption
- Renewable forms of energy offer great advantages
- Many initiatives are underway to promote renewable energy utilization
- The use of renewable energy is currently limited
- We are in a window of vulnerability
 - Transportation is the most susceptible/fragile





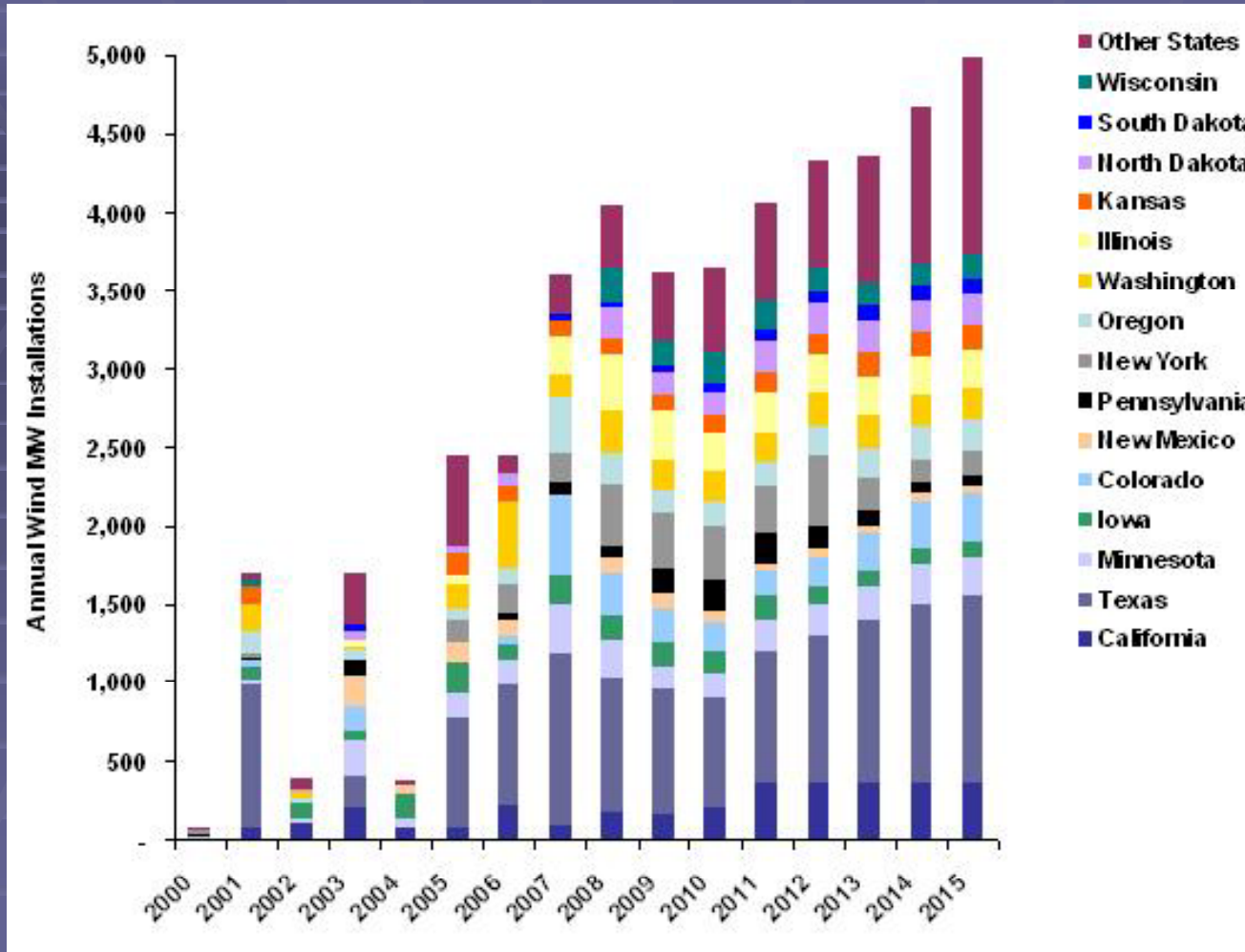


- **China** has overtaken the United States as the world's biggest producer of carbon dioxide, the chief greenhouse gas

- Consumers, who are using about 1.5 percent more gasoline this year than last despite high prices.
- "The industry is producing record volumes of gasoline today, but the consumer is burning record volumes of gasoline today."

- Rex W. Tillerson, CEO ExxonMobil

EER Base Case Annual Wind Power Capacity Growth by State, 2000-2015 (MW)



US wind power market is expected to reach a,

Arizona Climate Action Plan

- Adopted August 2006
 - 49 options focused on energy issues
 - Goal: achieve 2000 GHG emission levels by 2020
 - Goal: achieve 50% below 2000 GHG emission levels by 2040
- Executive Order 2006-13
 - Established climate change executive committee
 - 120 strategies developed/plan in summer 2007
 - Adopt a clean car program
 - Convert state vehicle fleet to low GHG emissions
 - No longer purchasing vehicles that do not meet specified criteria

Western Regional Climate Action Initiative

- Agreement endorsed February 26, 2007
 - Washington, Oregon, California, Arizona and New Mexico
 - By August 2007 - set a regional goal
 - By August 2008 – establish a cap and trade program

U.S. Mayors Climate Protection Agreement

- California
 - Legislation requires 25% cut in California's greenhouse gas emissions by 2020
 - Executive Order requiring car and trucks to reduce carbon emissions in their exhaust 10% in the same time frame

- Renewable Energy Standard

- Funding provided through a tariff assessment of \$0.004988 per kilowatt-hour (kWh)
- Monthly impacts capped at \$1.05 for residential customers, \$39 for small commercial, and \$117 for large commercial

Green House Gas Emissions

- Last year China produced 6.2 billion tons of carbon dioxide
 - Up 8.4 percent from 2005 -- an increase much faster than most international economists expected.
- The United States emitted 5.8 billion tons
 - a 1.4 percent decline that analysts say was primarily caused by a warmer-than-normal winter and higher gasoline prices

Oil Price Predictions

- Goldman Sachs Group
 - \$100/barrel oil may only be a few months away
 - Growth in demand is creating upward price pressure
 - OPEC not expected to increase production
 - State-owned petroleum not investing to keep pace with demand