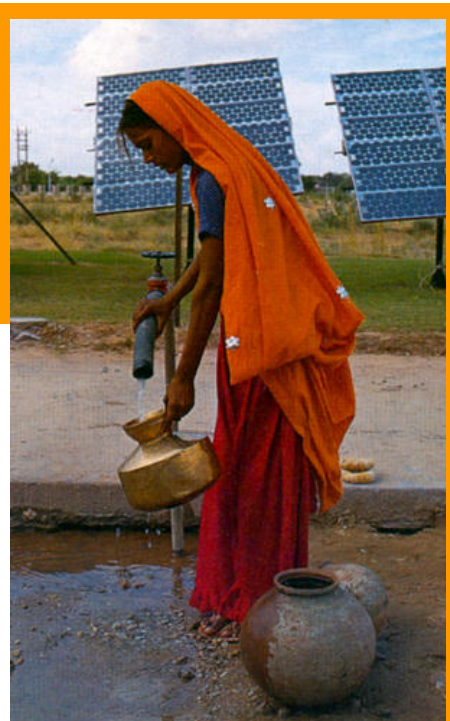
Developing Model Community Energy Systems

Presented at UN CSD-14 by:
U.S. Department of Energy
& Partner Organizations



May 3rd, 2006
New York City

Office of National Energy Policy
U.S. Department of Energy

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Clean Energy Initiative (CEI)

Launched at the WSSD, the U.S.-led CEI is comprised of three performance-based, market-oriented partnerships focused on putting sustainable development dialogue into action:

- **Efficient Energy for Sustainable Development (DOE)**

  20% energy intensity reduction, 20 countries over 10 years

- **Global Village Energy Partnership (USAID)**

  New energy access for 150 million people

- **Healthy Homes and Communities for Children (EPA)**

  Reduce 3 million deaths attributable to air pollution

EESD Services

- **Leadership –** Promote public leadership that spurs demand for efficient energy products, processes and technologies through:
  - Institutional capacity building
  - Efficient energy projects at public facilities
  - Technical standards, policy and regulatory reform
- **Finance –** Facilitate locally managed financial programs to attract affordable and sustained financing
- **Technology –** Build capacity to access and adopt cleaner and more efficient technologies
- **Tracking Performance** – Help design performance metrics and assessment methods

Community Partnerships for Sustainable Energy

- Global Energy Network/National Energy Center for Sustainable Communities;
- Alliance to Save Energy: Buildings and Utility Efficiency, Energy and Water Efficiency, and Efficient Industrial Processes;
- CLASP: Energy Efficiency Standards, Labels and Testing – A cost-effective policy tool for sustainable development;
- Public Leadership by Example (PEPS): Creating markets for energy efficient products and services through government energy management programs and alternative financing;
- APEC: Financing High Performance Buildings and Communities;
- REEEP: Developing Energy Efficiency and Renewable Energy Systems

Global Energy Network for Community Sustainability (GEN)

- Who we are:
- **Bill Becker**, Senior Adviser, Global Energy Center for Sustainable Communities
- **Doug Newman**, Executive Director, U.S. Global Energy Center / Gas Technology Institute
- **Denny Stone**, Economic Development Manager, City of Chula Vista, California
- **Alan Sweedler**, Director Center for Energy Studies, San Diego State University

www.globalenergynetwork.org

Global Energy Network for Community Sustainability (GEN)

- What is the GEN?
  - Emerging international network of centers
  - Help communities develop integrated & sustainable energy systems/technologies
- Who are its partners?
  - U.S. Department of Energy
  - Global Energy Center for Community Sustainability/Gas Technology Institute

GEN Affiliates

- Current Affiliates
  - **United States**: National Energy Center for Sustainable Communities
  - **China**: Beijing Sustainable Development Center
  - **Israel**: Samuel Neaman Institute's Israel Energy Forum
- Under discussion: Argentina, Australia, Canada, Germany, India, Japan, Netherlands, Pakistan, Thailand, United Kingdom

GEN Functions

- Facilitate energy awareness
- Produce information, tools, training, research, technical assistance
- Increase sustainable energy project investment
- Promote innovative governance models
- Help communities engage in “systems” approach to planning & development

GEN Projects

- "Energy Smart Communities" training program for Mayors
- Green homes for Thai tsunami victims
- Sustainable disaster recovery in New Orleans
- Sustainable energy for Israel's kibbutzim
- Energy Smart development in Chula Vista
- National Energy Center for Sustainable Communities

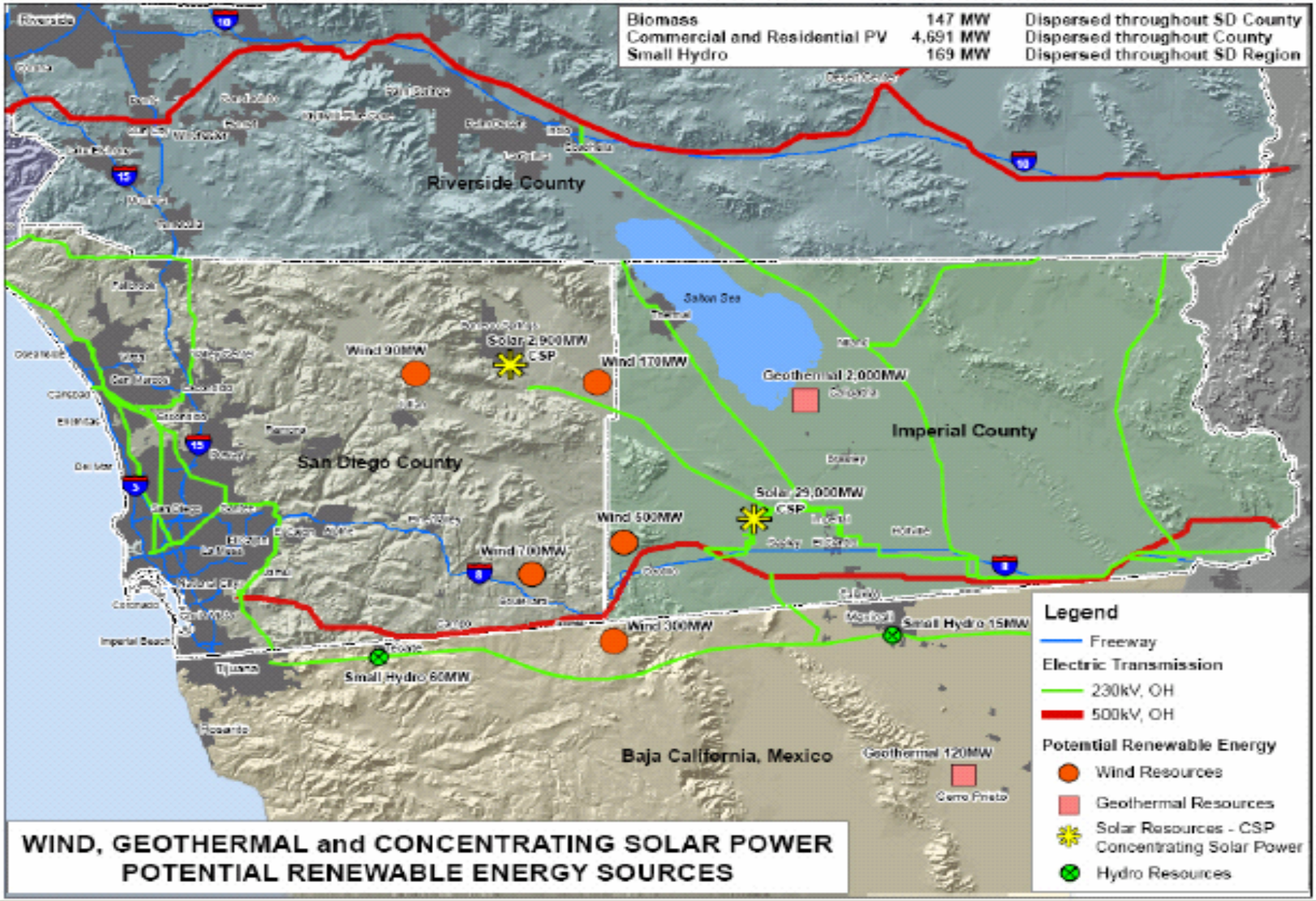
National Energy Center for Sustainable Communities

- Cooperative venture between US DOE, Gas Technology Institute, City of Chula Vista California & San Diego State University.
- Serves as Secretariat of Global Energy Network.
- Advances development of sustainable communities through efficient & responsible use of energy resources.

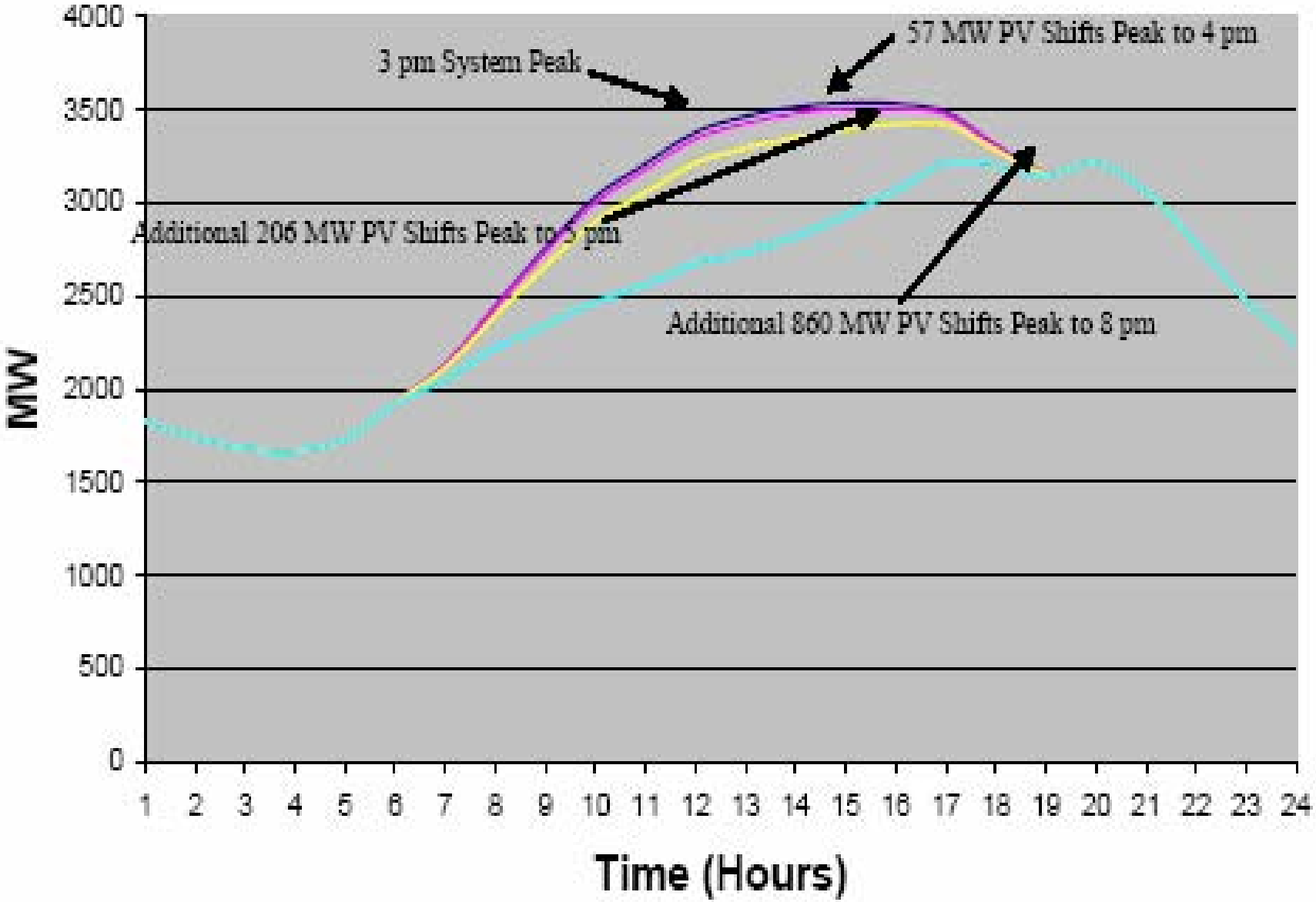
National Energy Center for Sustainable Communities

- Integrate renewable resources, energy efficiency, new building technologies & municipal infrastructure to achieve sustainable communities
- Work with developers to incorporate latest technologies & strategies into existing & new communities.

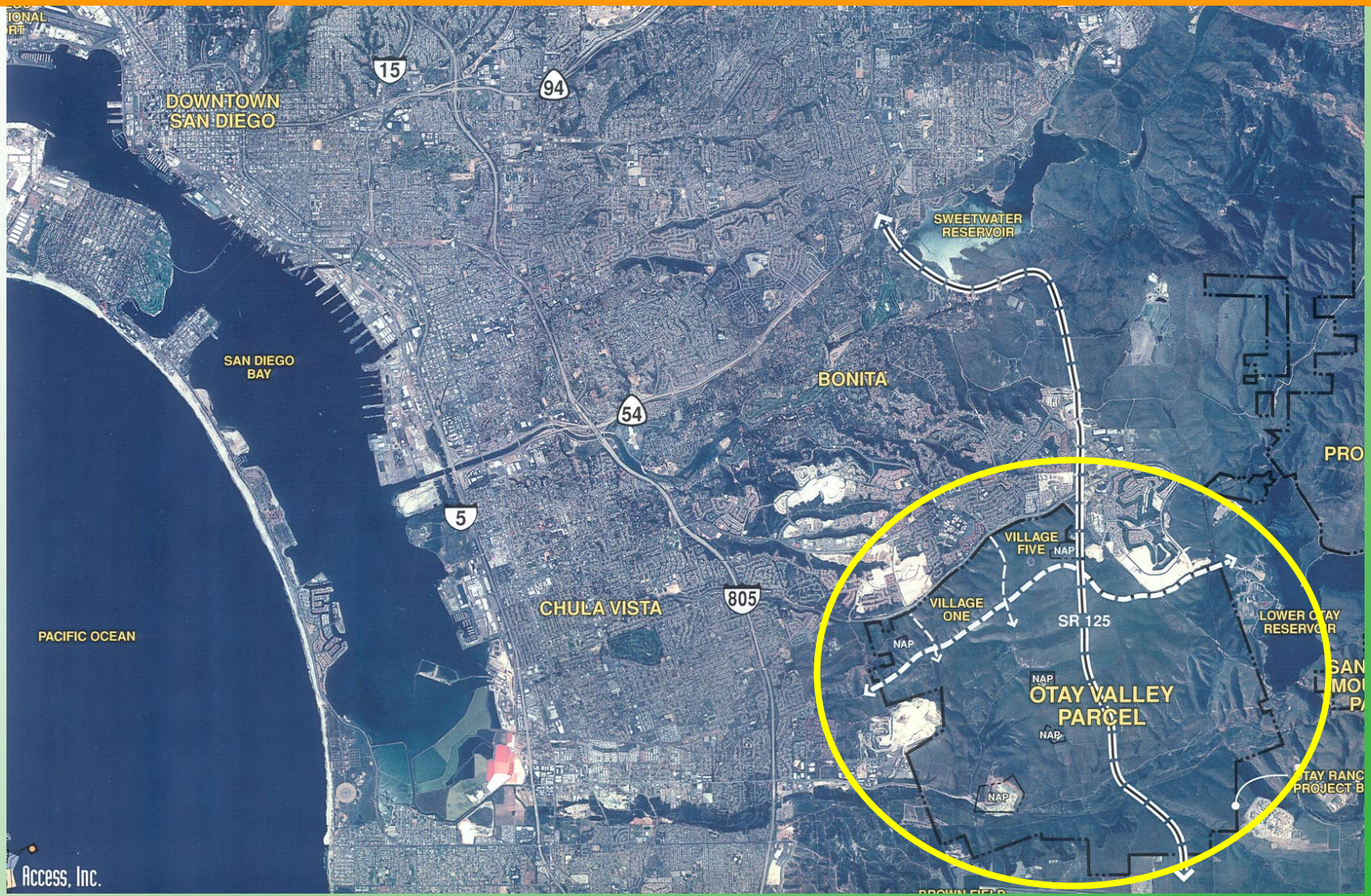
Figure 1.1: Approximate Locations for Major Renewable Resources in the Region



How PV Can Shift Peak Power Needs



Community-Scale Energy Modeling & National Demonstration Site Initiatives



Research Site – Otay Ranch, Chula Vista, CA

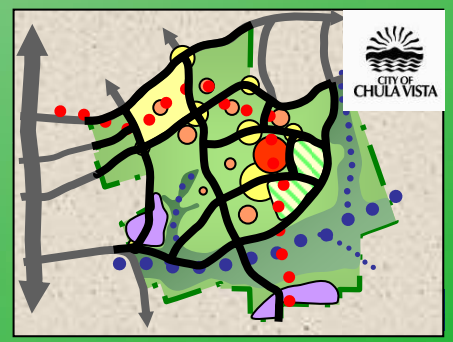
- 6,000-Acre Parcel (the research site is a representative 1,500 acre subset)

- 70,970 Anticipated Population
  (27,389 subset population)
- Mixed-Use, Smart Growth Plan
  Walkable villages, transit-oriented, green belts
- Shared University Campus
  U.S. & Mexico grad. & undergrad. programs
- Science & Technology R&D Park
  Energy, environmental, healthcare, sports medicine, biotechnology

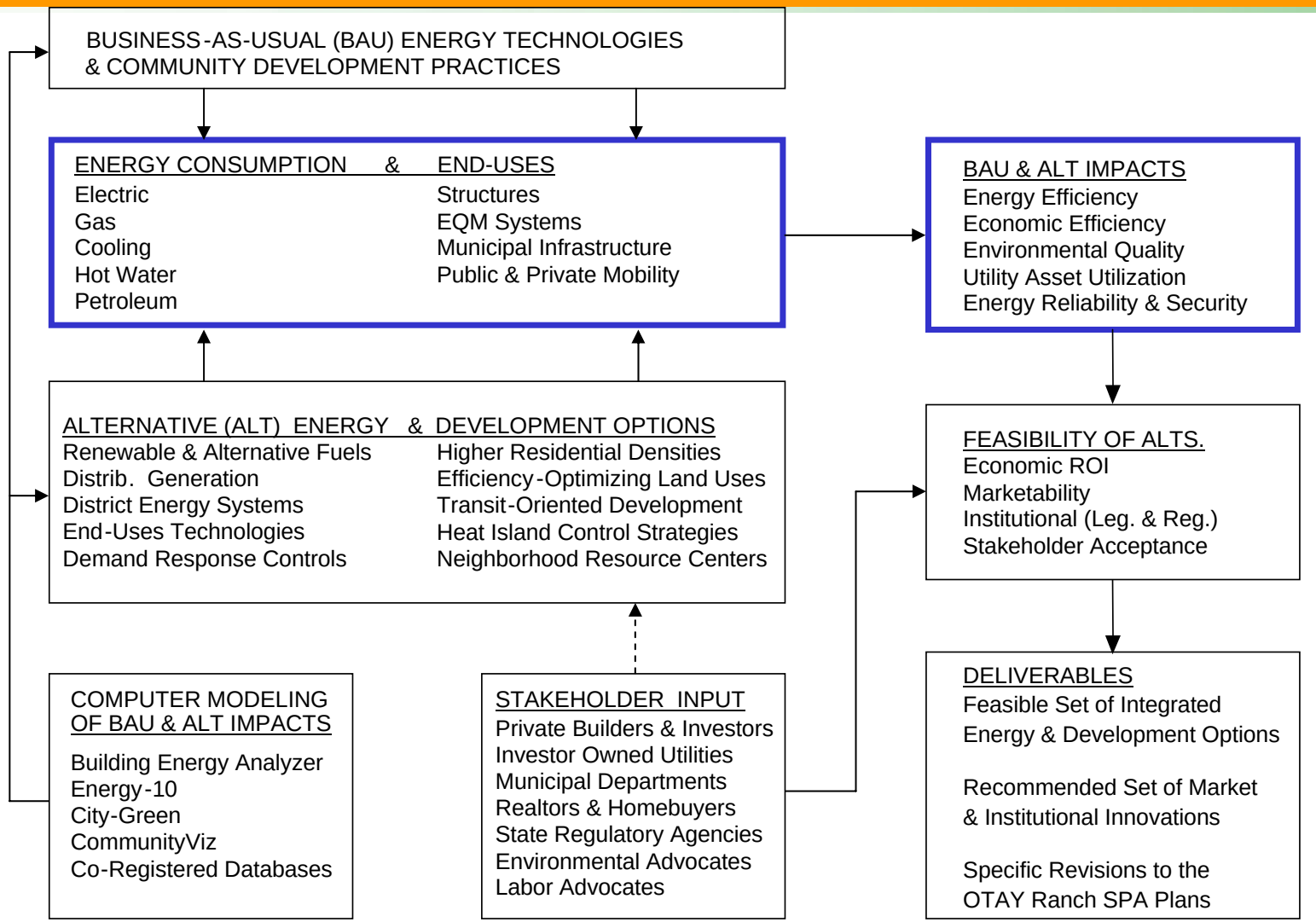
- U.S. Olympic Training Center
  Collaborative facility use plan
- International Plaza
  Conference facilities
  Trade & commerce center
  Technology transfer center
  Cultural & entertainment amenities

Chula Vista Community Assets

- Municipal Officials Committed to Sustainability
  - Energy Conservation & Renewable Energy Policies
    - Passive heating & cooling
    - Building & facilities energy efficiency
    - Renewable energy generation
    - Renewable energy purchase
    - Energy Star products
  - Facilities, Processes & Practices
    - Police facility – model "Green Building"
    - Advanced recycling program
    - Landfill methane recovery operation
    - Fuel cell fueling station & vehicle program
    - Alternatively fueled vehicle fleet
- Unique Geographic Location & Collaboration
  - Proximity to San Diego & Tijuana
    - Potential to upscale, translate & migrate applications
    - Opportunity for international technology transfer
  - Tradition of Regional Collaboration
    - Regional-scale sustainable energy development



Chula Vista Research Project



Energy Efficiency Programs
for More Sustainable Communities

CSD-14 Session on
Community Partnerships for Sustainable Energy

Brian T. Castelli

Executive Vice President & Chief Operating Officer

Alliance to Save Energy

May 3, 2006

Presentation Outline

- A little bit about the Alliance
- Examples of Alliance programs that help make communities more sustainable:
  - Buildings and Utility Efficiency
    - Building Energy Codes
    - Appliance and Equipment Standards
    - Demand-Side Management
    - Energy Efficiency Tax Incentives
  - Energy and water efficiency of water supply (Wategry)
  - Industry

ALLIANCE TO SAVE ENERGY
Creating an Energy-Efficient World

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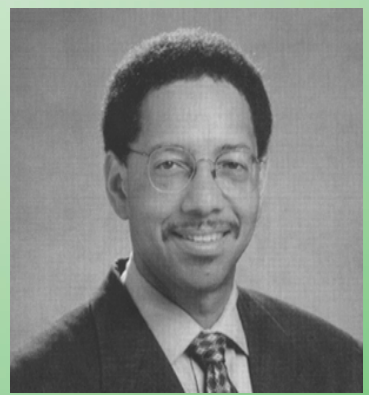
What is the Alliance?

- NGO coalition of prominent business, government, environmental and consumer leaders who promote the efficient and clean use of energy worldwide to benefit the environment, economy, and national security.

- Mission: To advance energy efficiency world-wide through policy, education, research, technology deployment, market transformation and communication initiatives.

- Chaired by Senator Mark Pryor (D-AR) and James DeGraffenreidt (CEO Washington Gas) with strong bi-partisan congressional, corporate & public interest leadership


ALLIANCE TO SAVE ENERGY
Creating an Energy-Efficient World

Buildings and Utility Program Mission

- Energy efficiency in the **building** sector
- **Utility** energy efficiency and demand-side management (DSM)
- Launching the **Southeast Energy Efficiency Alliance** (SEEA)
- Current focus:
  - building energy **codes**
  - appliance and equipment **standards**
  - **DSM**
  - EPAct **tax incentives**

ALLIANCE TO SAVE ENERGY
Creating an Energy-Efficient World

Alliance Activities in Building Energy Codes

- **National Model Code Improvements**
  - *International Energy Conservation Code*
  - *ASHRAE Standard 90.1*
- **State Energy Code Adoptions**
  - Annual target states
  - 26 State adoptions in 2002-2005
  - Partner with Responsible Energy Codes Alliance (RECA)
- **"Beyond Code" Advanced Building Guidelines**
  - ASHRAE SP-102 for Small Offices and Retail
  - Energy Star Homes, NBI E-Benchmark and USGBC LEED
- **Efficient Windows Collaborative**
  (market transformation for advanced window technology)

ALLIANCE TO SAVE ENERGY
Creating an Energy-Efficient World

Alliance Activities in Appliance and Equipment Standards

~ Appliance & equipment standards generate the largest energy savings in buildings sector ~

- **National** standards
  - Current DOE rulemakings (ANOPRs)
  - Pressure to move delayed rulemakings
  - Legislation for negotiated consensus standards in EPAct 2005
- **State** standards: 10 state adoptions so far
- Close partnership with **Appliance Standards Awareness Project** (ASAP)

Estimated Savings from Energy Code Adoptions 2002-2004

2006
- States: **GA**, **NC**, **OH**, **VA** and Phoenix, **AZ**
- Estimated Annual Savings: **2.13 TBtu**

2005
- States: **IL**, **FL**
- Estimated Annual Savings: **1.92 TBtu**

2004
- Adopting States: **AR**, **DE**, **MT**, **NM**, **OH**
- Estimated Annual Savings: **0.39 TBtu**

2003
- States: **AL**, **DC**, **ID**, **KS**, **MI**, **NE**, **UT**, **VA**, **WV**
- Estimated Annual Savings: **1.13 TBtu**

2002
- States: **GA**, **NH**, **NY**, **PA**, **RI**, **WI**
- Estimated Annual Savings: **1.59 TBtu**

Savings from 26 state code adoptions:

- 7.16 Trillion Btu/yr for 2006
- 1.8 Quads cumulative by 2025

Alliance Utility DSM Programs

- Promote end-use efficiency through **utility-sponsored** programs:
  - ✓*residential*
  - ✓*commercial*
  - ✓*industrial*
- Funding through public benefit funds (PBF) or utility rates requires **regulatory or legislative** effort
- 2005 success at **Georgia Public Service Commission** will restore DSM programs after 10-year absence
- Similar efforts planned for Southeast through **SEEA**

ALLIANCE TO SAVE ENERGY
Creating an Energy-Efficient World

What is WATERGY?

Helping cities distribute water and treat wastewater efficiently, saving energy, water and money.

WHY IS THIS IMPORTANT?

- ✓ Every liter of water that passes through a system has a significant **energy cost**, compounded by the money invested to produce it.
- ✓ Water sector efficiency leaves more funds for crucial and often underfunded **public services**.
- ✓ Water supplied that is lost in developing countries : **1/3 to ½**

AND IT'S COST EFFECTIVE…

- ✓ **Rapid Payback:** generally ranges from immediate to 2 years
- ✓ **Huge Savings:** at least 20% in energy costs with just no- & low-cost measures
- ✓ Reduces the need for new **infrastructure**

CASE STUDY: Emfuleni, South Africa

ESCO Model of Performance Contracting APPLIED TO WATER

PROBLEM

- **80%** of water delivered was **lost** through leaking plumbing fixtures!
- Exacerbated by high pressure in bulk water supply lines:
  - ✓ makes existing leaks worse;
  - ✓ pre-mature failure of plumbing fixtures in this **low-income** area.

SOLUTION

- ✓ **Pressure reduction**
- ✓ Water pressure management firm acting as ESCO
- ✓ Fees: firm gets **20%** of savings
- ✓ **Build-Own-Operate-Transfer** to municipality after 5 years

Emfuleni Case Study, continued

The water lost was enough to fill two Olympic swimming pools every hour!

Emfuleni Case Study, continued

RESULTS

- **Payback** period: 3 months
- *Annual Savings*

  COST: $3.8 million

  ENERGY: >14 million kWh

  WATER: 7 million kiloliters

  CO_2 Emissions avoided:

  12,000 tonnes

- Performance contracting applied to water supply

ALLIANCE TO SAVE ENERGY
Creating an Energy-Efficient World

CASE STUDY: Veracruz, Mexico

PROBLEM

- Leaks & sporadic service - severe interruptions common

PROJECT

- System automation
- Variable speed drives
- Pressure reduction
- 2 pumps found to be working against one another

RESULTS

- Energy Saved: 25 million kWh/year (24%)
- Cost Saved: US $400,000/year *(not counting water saved)*
- Reduced water losses >>>> more water delivered
- Improved reliability

CASE STUDY: Fortaleza, in Brazil's Arid NE

PROBLEMS

- Many households not connected to service
- Many inefficiencies: pumps, O&M, system management
- Utility couldn't afford energy costs

PROJECT:
- ✓ automated **controls** on pressure & pumping
- ✓ improved **data** collection & analysis
- ✓ improved **motor efficiency** (replaced or re-wound them)

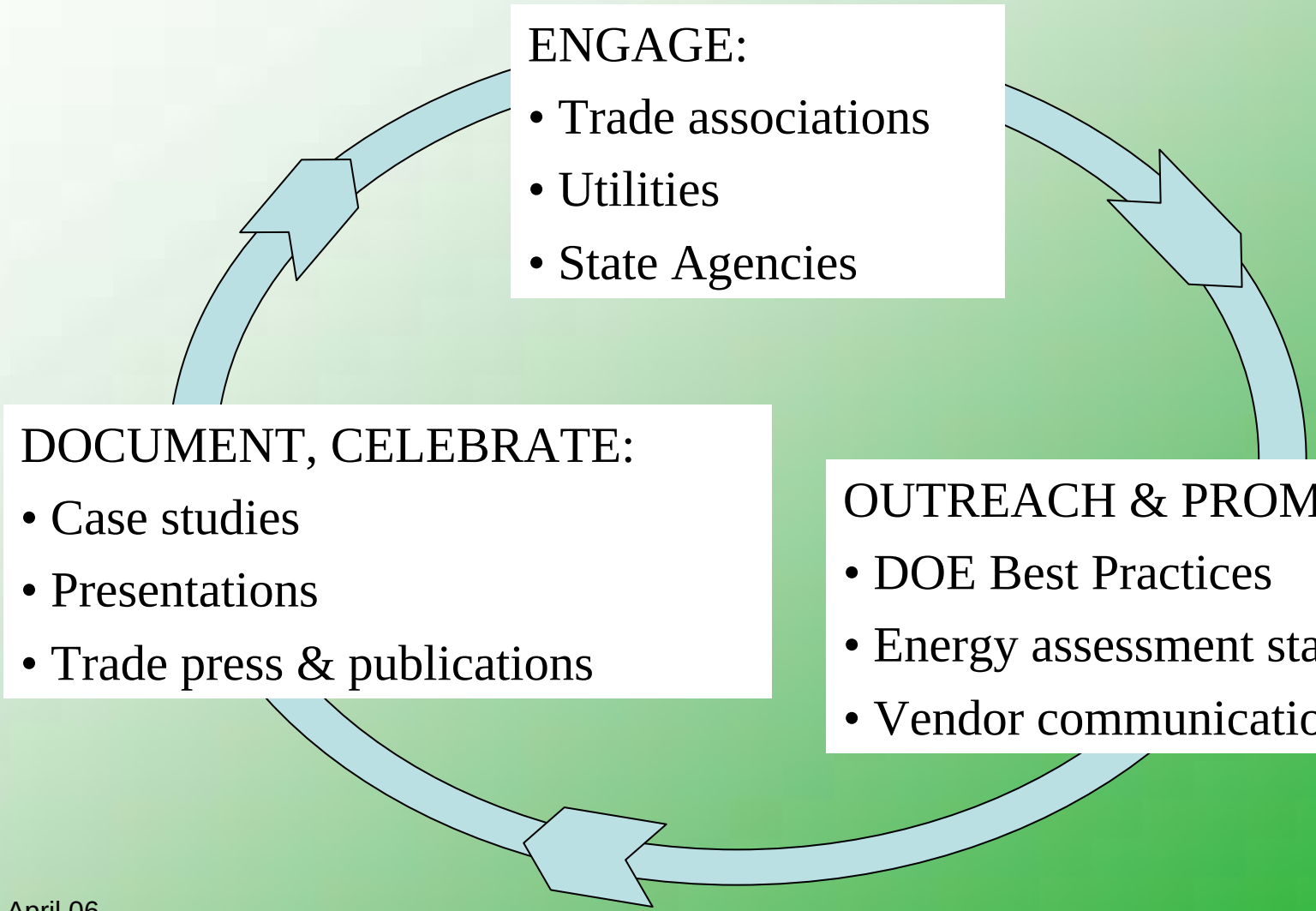
RESULTS

- 88 million kWh saved over 4 years
- …while adding **88,000 new connections** *using same amount of water*
- $2.5 M saved *every year* w/investment of only $1.1 M
- Payback: **7 months**

Objectives of Alliance INDUSTRY Program

- Overcome industry's **lack of awareness** or misunderstanding of the efficiency concept
- Engage the appropriate **decision-makers** …explain what's in it for them
- Identify message partners:
  - ✓ utilities
  - ✓ trade associations
  - ✓ professional societies
- Identify, promote & disseminate **success stories**

How Do the Alliance Industrial Programs Work?



Alliance Industrial Programs in 2006

- **Support for DOE's Save Energy Now**
  - *World-Class Energy **Assessment Standards***

    Diagnosing technical AND organizational improvements

    Communicating implementation strategies

- **Allied Partner Development**
  - *Support to DOE in developing **motor** system reference material*

    Developing reference literature and diagnostic software

- **S. Carolina Environment & Business Roundtable**
  - *Developing a **regional collaborative** for energy and regulatory compliance **best practices***

    Devising ways to benchmark regional best practices

Contact Us!

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- Chris Russell, Director of Industrial Prog: crussell@ase.org

The Collaborative Labeling and Appliance Standards Program (CLASP)

- CLASP has developed a guidebook for policy makers and practitioners of energy efficiency standard-setting and labeling (S&L). It addresses all the steps in developing and implementing S&L programs:
  1. Deciding on whether to implement an S&L program;
  2. Developing a testing capability;
  3. Designing and implementing a label program;
  4. Analyzing and setting standards;
  5. Designing and implementing a communications program;
  6. Ensuring program integrity;
  7. Evaluating the S&L program.

International Initiative: PEPS

(Promoting an Energy-Efficient Public Sector)

PEPS Partners:

- Alliance to Save Energy
- International Institute for Energy Conservation (IIEC)
- ICLEI – Local Governments for Sustainability
- Lawrence Berkeley National Lab
- U.S Department of Energy (EESD)

PEPS Program Elements

- Projects (technical assistance & training)
  - China – energy-efficient purchasing for national and local governments
  - Mexico – municipal energy-efficient purchasing
- Decision tools and information
  - Web site: www.pepsonline.org
  - *Guide to Efficient Energy Use in the Public Sector*
  - Software: savings estimation from EE purchasing
- Conferences and workshops
  - 2002: Asilomar, CA (ACEEE)
  - 2003: Beijing, China; Kuwait; Capetown, So. Africa
  - 2004: Kunming, China (APEC)
  - (2005): Mandelieu, France (ECEEE)

APEC's Financing High Performance Buildings and Communities Initiative

- Challenge and Objectives;
- Region-Wide Municipal Network to Promote Energy Efficient Buildings and Communities;
- Pilot Financing Programs for High Performance Construction and Modifications;
- Model Community Energy System Development;
- APEC Energy Working Group and Expert Group Market Transformation Efforts.

Summary

- Creating markets for EE technologies, products and services;
- Public Leadership by Example at all Governmental levels;
- Buildings and Communities:
  - "Whole buildings," building codes and performance standards, demand-side management and utility EE, transaction chain;
  - "Integrated community energy and environmental systems;"
  - Zero Energy, Emissions, Waste pathways;

  Financing high performance, low impact buildings and communities (performance contracting/guarantees, mortgages, tax incentives/rebates)

  Linkages: Regional and International Networks/Partnerships

  Open network of affiliations for distributed peer production of models and tools for energy smart community planning, design and development.

Contact Information

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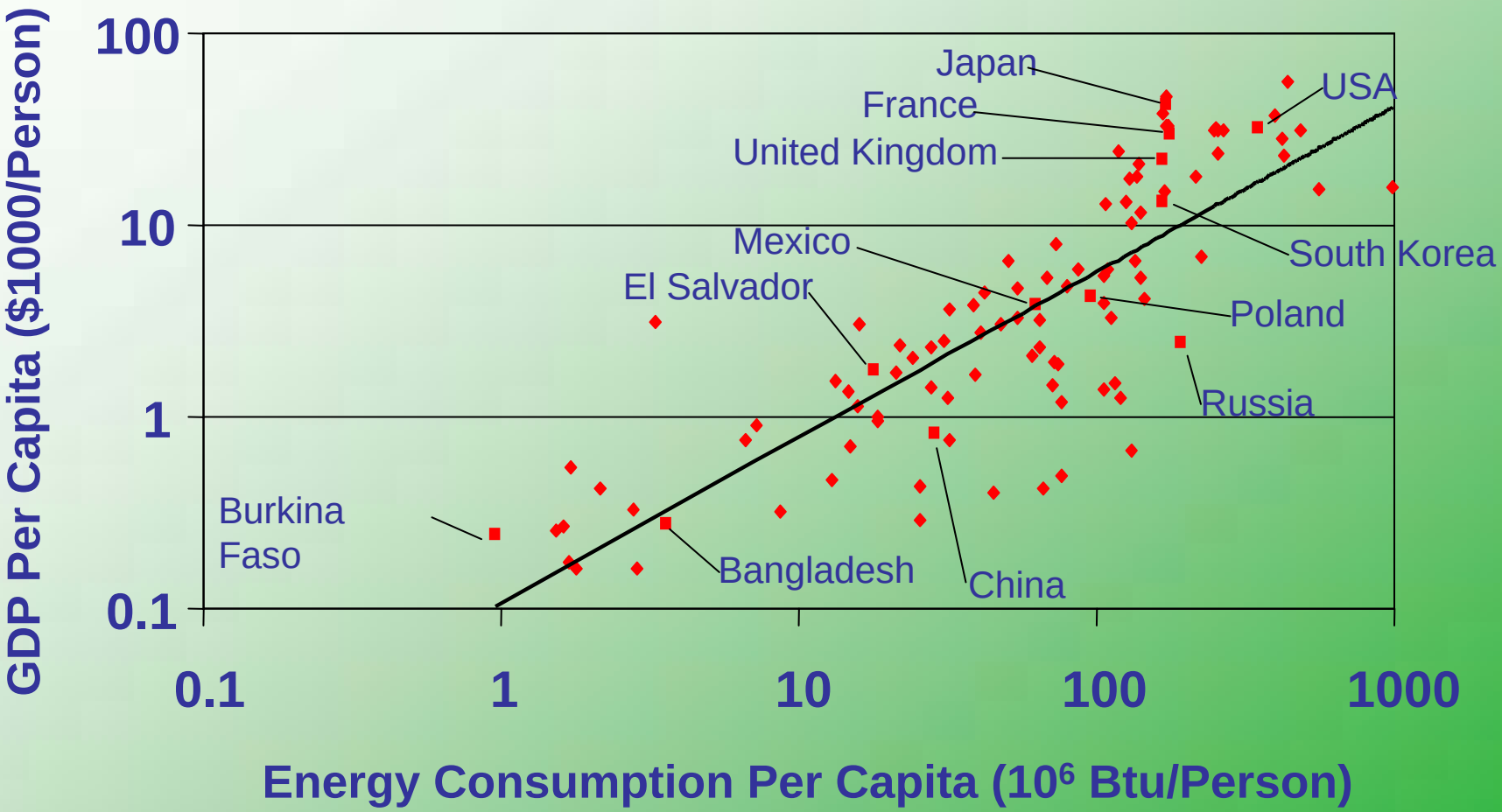
Appendix
&
Supporting Materials

The Problem of Inefficient Energy

- Three billion people have access to only inadequate, unreliable and prohibitively expensive energy
- In many developing economies, the percentage of expenses for energy can be as high as 70%
- Efficiency losses for generation, delivery and use of energy range from 20 to 50%
- Energy demand is growing exponentially in these countries
- Even modest efficiency gains could free up some $30 billion a year to address broader social and development goals

Economic Growth Requires Energy
Poverty Breeds Global Insecurity



Source: International Energy Annual 2000 Tables E1, B1, B2; EIA Country Energy Data Reports

World Summit on Sustainable Development (WSSD)

"The World Summit has a unique opportunity to advance the new approach to development that I embraced…based on shared accountability among developed and developing nations."

"Clean water, modern energy, good health, and productive agriculture…can lead us to a world without poverty…. We will stand together in Johannesburg to bring our full support to this important battle."

-- President George W. Bush, August 19, 2002

Johannesburg, South Africa
August 26 – September 4, 2002

Clean Energy Initiative (CEI)

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- **Global Village Energy Partnership (USAID)**

  New energy access for 150 million people

- **Healthy Homes and Communities for Children (EPA)**

  Reduce 3 million deaths attributable to air pollution

Clean Energy Initiative (CEI):
Partnerships for Sustainable Development

EESD Mission:
Reduce Poverty by Modernizing Energy Services

The EESD Partnership will work internationally to:

- Improve the productivity and efficiency of energy systems
- Save money for residents, industry and government
- Reduce pollution and waste
- Improve reliability of energy systems
- Use less energy intensive products
- Use more energy efficient processes

Modernizing Energy Services Through Market Development

- Turn forces of globalization to poverty reduction
  - Technology
  - Information
  - Capital
- Assist Rapidly Industrializing Countries “Leapfrog” Technology
  - Get ahead of development curve through peer-to-peer leadership, innovative financing, technology and sound policies
  - Move from government initiatives to market-driven energy efficient projects, processes and products
- Build foundation for economic development in nascent developing economies
  - Integrating efficient energy into basic services
  - Diversifying energy sources
  - Institutionalizing for infrastructure development
- Bilateral and Multilateral Engagement

EESD Services

- **Leadership –** Promote public leadership that spurs demand for efficient energy products, processes and technologies through:
  - Institutional capacity building
  - Efficient energy projects at public facilities
  - Technical standards, policy and regulatory reform
- **Finance –** Facilitate locally managed financial programs to attract affordable and sustained financing
- **Technology –** Build capacity to access and adopt cleaner and more efficient technologies
- **Tracking Performance** – Help design performance metrics and assessment methods

EESD Objectives

- **Efficiency gains in the supply, delivery and use of energy through:**
  - Clean energy technologies in energy production
  - More efficient industrial and agricultural operations
  - Efficient energy projects in public facilities
- **Capacity development through:**
  - -- Policy and regulatory reforms
  - -- Adoption of technical standards, labeling and testing procedures
  - -- Knowledge exchange and management
  - -- Facilitating market development through sustained financing mechanisms, intermediation and institutionalization
- **Tracking Performance and drawing on Lessons Learned**

EESD Desired Outcomes

- Use of energy savings as an asset to address broader social and development objectives access cleaner and more efficient technologies
- 20% energy intensity reduction in up to 20 host countries over 10 years
- 10:1 leveraging of U.S. Government funding
- Public Sector Energy Management Plans saving at least 20% of budget overhead costs in up to 10 countries

EESD Desired Outcomes (continued)

- Establish U.S. Community Partnerships in up to 8 countries
- Financial facilities that support upgrades to 10,000 schools, 5,000 medical facilities and 10,000 low income multi-family buildings in up to 10 countries
- Energy Efficient building codes established in up to 15 developing countries.
- CLASP in up to 20 countries
- WATERGY in up to 20 countries

EESD Benefits

Local Communities	• Spend less on energy, more on community • Efficient energy infrastructure creates jobs • Higher incomes and better quality of life from improved energy and social services
Local NGO's and Entrepreneurs	• Access to training and project financing •Technical Assistance on project feasibility and market development • Seed capital for projects and business development
Host Country Governments	• Reduced poverty, improved economy and environment, enhanced energy security • Increased foreign investment • Access to project planning and technologies • Policy and regulatory reform consultation for market development
Financial Institutions	• Investment portfolio expansion; New business lines •Financial Intermediation • Partner and project connections
Private Sector Companies	• Seed capital for pre-feasibility study • Access to partners and country expertise

EESD Partnership Commitments

- Improve energy efficiency and reduce poverty
- Develop new business and financing models for sustainable development and clean energy projects
- Promote integrated sustainable development by optimizing forces of the new global marketplace
- Form new alliances with governments, international organizations, industry and civil society
- Provide capacity building and technical and managerial assistance
- Monitor, evaluate and report results

Financing – Local Leadership is Key

- The public sector (hospitals, schools, public housing) is often the biggest user of energy and water.
- Budgets alone are rarely adequate to address all energy and water needs.
- Barriers to finance include small projects, credit risks and cost of capital.
- Significant energy savings may be achieved by upgrading facilities, pumps and other equipment. Energy savings are public assets and can be collaterized to finance projects and adoption of technologies.
- Financial intermediaries or Special Purpose Entities ("SPE's“) serve as a conduit between good public projects and interested lenders.
- SPE's bundle projects, standardize process, help address risk and cost for both borrower and lender. Every U.S. state has some form of SPE for environmental projects.

Technology

- Demonstration & Deployment
  - Commercialization of private innovation
  - Commercialization of public innovation
- Public – Private Partnerships
  - Project Implementation
- Sustainable Market Development
  - Technology Standards & Regulations
  - Innovative Strategies Clearinghouse

US/Australian Partnership through APEC

- Linked initiatives at the WSSD to address development needs through modernizing energy services
- Maximize energy sector's contribution to development; minimize environmental impacts of energy supply and use
- Focus on building regional cooperation through APEC's Energy Working Group and institutions
- Help host countries get ahead of their development curve by:
  1. Promoting institutional and policy agendas for investment in clean energy technologies
  2. Structure self-supporting financing to create market demand
  3. Empower local entrepreneurs to participate in the marketplace

BUILDING REGIONAL COOPERATION

ON SUSTAINABLE DEVELOPMENT through APEC

FINANCING:

"Financial Intermediation" to close the gap between private capital and qualified energy and environmental projects; New Products

PUBLIC FACILITIES/FEMP/PEPS:

Creating a market for energy efficient products and services through Government Energy Management Programs and alternative financing

CLASP:

Energy Efficiency Standards, Labels and Testing – A cost-effective policy tool for sustainable development

PARTNERSHIPS FOR COMMUNITY SUSTAINABILITY:

Peer to peer leadership on an institutional and policy agenda for sustainable investments, products and services and technology transfers

EESD Partners

Donor governments, developing countries, international organizations, industry and civil society partners include:

- Australia, Botswana, Brazil, China, India
- Mexico, Nigeria, Philippines, Uganda, U.K.
- Asia Pacific Economic Cooperation Forum's Energy Working Group
- International Energy Agency
- G-8 Energy Working Group
- Bilateral Energy Working Groups with Japan, EU, Russia, China, India, Ukraine, Venezuela and others
- US-Mexico-Canada Energy Working Group
- Global Environment & Technology Foundation
- Energy Conversion Devices
- Resource Mobilization Advisors
- World Federation of Engineering Organizations
- Gas Technology Institute
- Edison Electric Institute's International Power Partnership
- Business Council for International Understanding
- Business Council for Sustainable Energy
- International Council for Local Environmental Initiatives
- North American Development Bank
- FE Clean Energy Group, Inc.

Partnership Activities

- **Integrated Public/Private Finance**
  - Innovative underwriting of efficiency improvements to public facilities in Mexico, Russia and Eastern Europe and Asia Pacific Region
- **Community Partnerships/GEN**
  - US states and communities collaborating on projects with their sisters in the developing world; developing a global network of energy centers focused on community sustainability; pilot model community energy systems; collaboration through APEC on high performance, low impact buildings and communities
- **Natural Gas Flaring Reduction**
  - Captured gas generating electricity for local use / economic activity (Angola)
- **Eco-Industrial Development**
  - Integrated project development for fossil and non-fossil energy sources (Asia Pacific and Africa)
- **PEPS & CLASP**
  - Asia Pacific, Latin America, Central and Eastern Europe
- **Renewable Energy Production**
  - Biodiesel in Brazil; Geothermal in Kenya

Contact Information

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