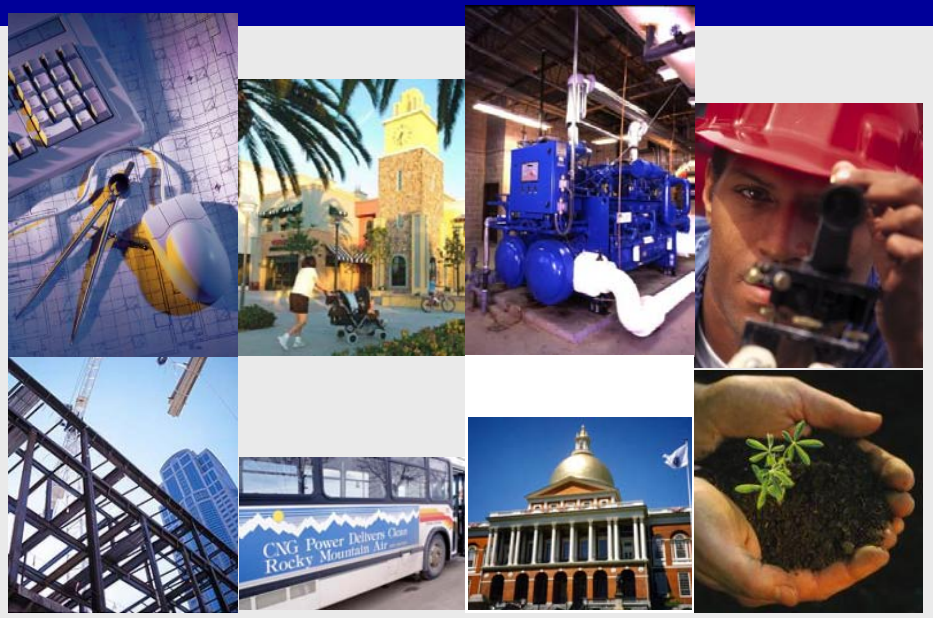
Integrating Renewable & Advanced Energy Efficient Technologies in Sustainable Community Development

- Challenges
- Response
- Research
- Demonstration
- Dissemination



National Energy Center for Sustainable Communities

- Mission:
  The pursuit of research, demonstration & capacity-building initiatives that enable development professionals to build sustainable communities

- Founding Entities:
  U.S. Department of Energy; City of Chula Vista, California; San Diego State University; & the Gas Technology Institute

- Research Focus:
  - Technology optimization & integration
  - Community planning & public policy
  - Economic, market & behavioral studies

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Challenges:

- Power outages due to system overloads & sabotage threaten health & productivity
  - Disruptions result in loss of life & cost the U.S. economy as much as $119 billion annually
- Rising energy costs are having a real impact on local economies
  - Energy is now the most costly municipal expenditure behind employee compensation
  - Escalating energy costs reduce business profits & discretionary spending for families
- Approaching peak & decline in global oil production will impact local mobility
  - Fuel costs are projected to skyrocket & lead to reductions in commercial & private mobility
- Energy-related emissions are driving potentially catastrophic changes in our climate
  - Urban areas are responsible for 75% of all greenhouse gas (ghg) emissions, globally
- Over the next 25 years, half of the nation's built environment must be built/rebuilt
  - By 2030 the U.S. will need 427 billion square feet of space to accommodate growth
  - 213 billion square feet of this need will be met through new construction & renovation
  - Buildings in the U.S. account for 65% of electricity consumption & 30% of ghg emissions
- Conventional approaches to community development aren't up to these challenges
  - Approximately 70% of a community's energy consumption is influenced by urban land use allocation, site design & development practices. Energy-inefficient community development contributes significantly to America's distinction as having the highest per-capita energy consumption in the world & hampers our ability to address each of these challenges

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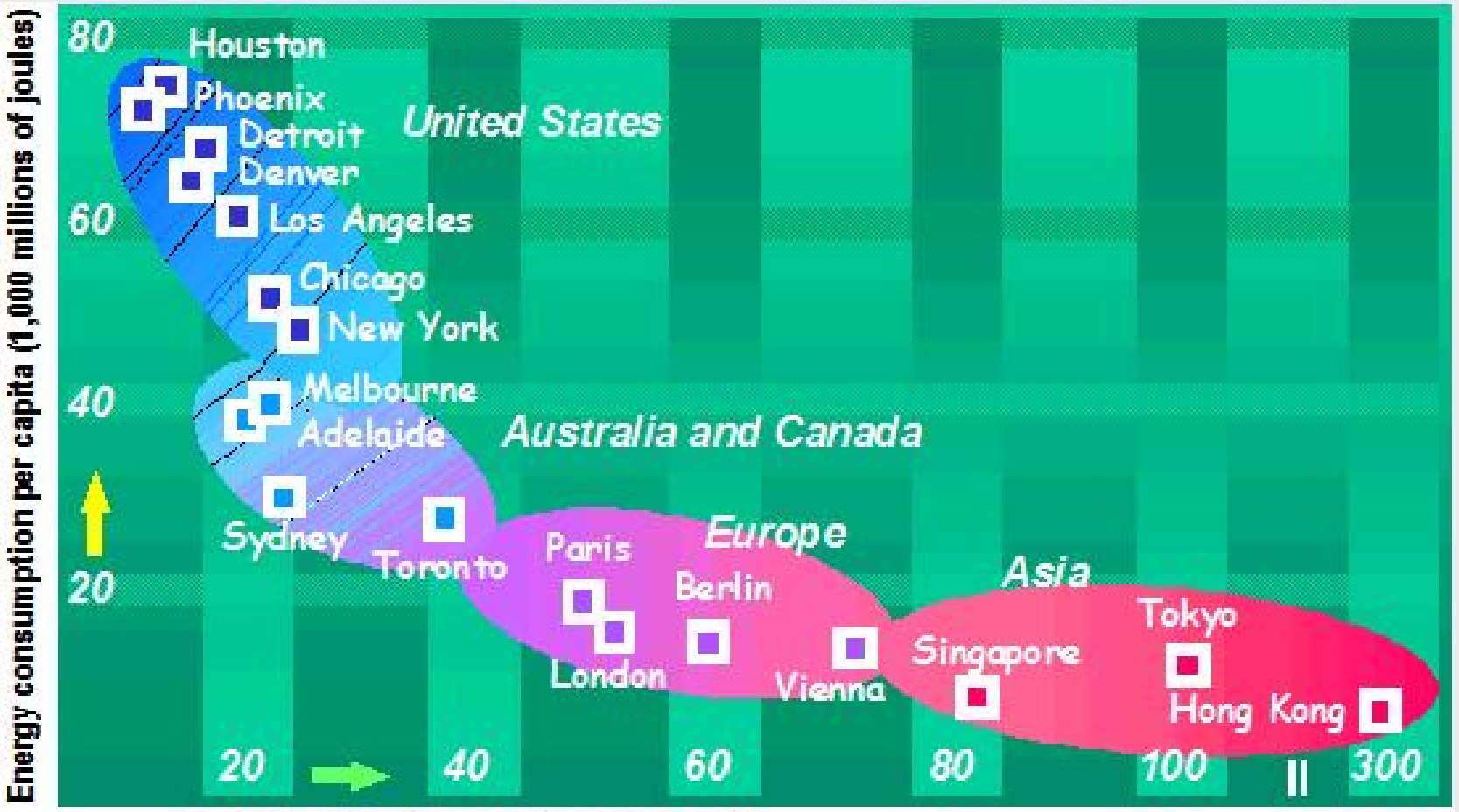
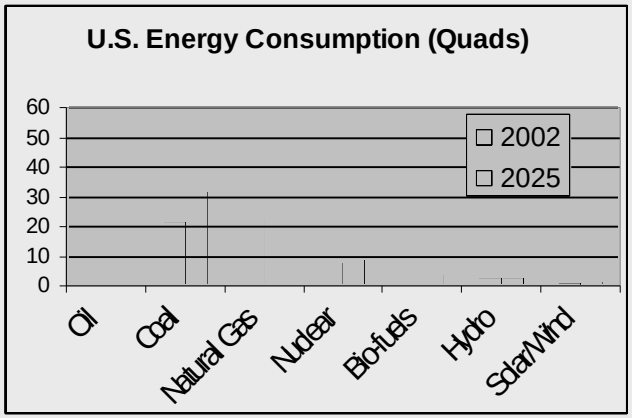
Challenges:

U.S. Energy Consumption:
Highest Per-Capita Consumption in the World!

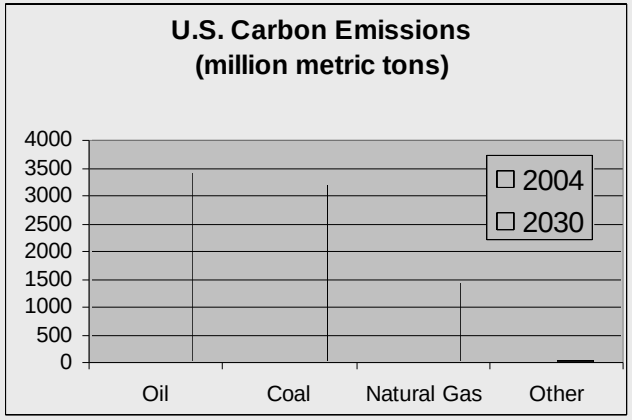


Response: What's Being Done…

- U.S. DOE, the States & the private sector are pursuing research to develop renewable & energy-efficient energy technologies…



…However, these technologies, operating in isolation, will not abate the nation's growing consumption of fossil fuels & carbon emissions

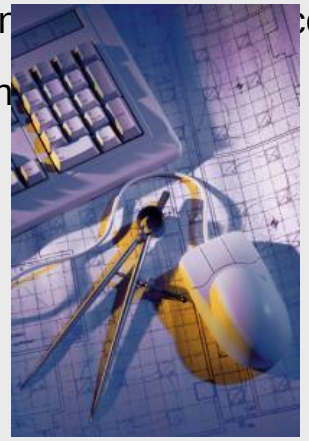


Response: What More Needs to be Done…

- To effectively meet these challenges it will be necessary to act on a systems basis & on a community-scale to:
  - Integrate renewable & energy-efficient (REEE) technologies into structures, infrastructure, transportation systems & large-scale community development projects
  - Optimize the performance, marketplace acceptance & deployment of these new technologies, &
  - Anticipate the emergence of future REEE technologies in the design of structures, infrastructure & transportation systems & large-scale development projects today

Research:
Chula Vista Research Project (CVRP)

- Integrate renewable & energy efficient (REEE) technologies & strategies in community design & development
  - Fo development patterns to optimize techn e
  - Ex ss models & partnerships to advance th



- Address legislative, regulatory & market barriers to the deployment of these technologies & strategies in community development projects
  - Explore mechanisms to stimulate market demand for REEE technologies

- Create model designs & development guidelines that encourage & facilitate use of REEE technologies & strategies

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Research: City of Chula Vista

- A Community Concerned About & Taking Action On the Climate Crisis!
- City Developed a Carbon Dioxide (CO2) Reduction Plan in 1996
  - Three main components:
    - Baseline Assessment – 1990 levels
    - Emissions Forecast – 2010 levels
    - 20 Reduction Actions
- Goal – 80% of 1990 levels by 2010

Research: City of Chula Vista

- A Multi-Agency Strategy
  - Municipal clean fuel vehicles
  - Green power public education
  - Energy efficient building program
  - Increased land use mix
  - Bicycle lanes, paths, & routes
  - Energy efficient landscaping
  - Traffic signal upgrades

GREENSTAR BUILDING EFFICIENCY PROGRAM

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Research: City of Chula Vista

- **Program Accomplishments**

  - 84% of City buses fueled with CNG (33)
  - 9,100 Compact Fluorescent Bulbs (CFLs) for residents
  - 2,500 “GreenStar” buildings approved

  - 4,022 shade trees planted along older streets
  - 4,800 traffic & pedestrian signals converted to LEDs
  - Energy saving features at Public Works facility
    - Cool roofs
    - Skylights
    - Solar power system

Research: City of Chula Vista

- City of Chula Vista received **ICLEI Milestone 5** Award
  - Recognized for continuing progress on reduction efforts
  - 1 of only 11 U.S. cities to receive this award

- The current research in Chula Vista will further enable the City to determine how best to maximize ghg emissions reductions in each of our major development areas:
  - Brownfield & infill development areas on the City's West side & a 6,000-acre greenfield area on the City's East side

Research: 3 CVRP Development Sites

~1,500 acres, accommodating 27,389 residents in 10,306 dwelling units

Village Two (V-2)

- Developer: Otay Ranch Company
- 777 acres – predominantly residential
- Avg. density = 8 dwelling units/acre
  - 23% residential, 2% commercial retail, 17% mixed-use, 9% industrial, 11% institutional, 38% recreational

Eastern Urban Center (EUC)

- Developer: McMillin Land Development
- 290 acres – predominantly commercial
- Avg. density = 41.2 dwelling units/acre
  - 16% commercial retail, 16% comm. office, 34% mixed-use (res./comm.), 21% institutional, 13% recreational

Village Nine (V-9)

- Developer: Otay Land Company
- 418 acres – residential & institutional
- Avg. density = 15.6 dwelling units/acre
  - 15% residential, 1% comm. retail, 43% mixed-use residential, 22% institutional, 19% recreational

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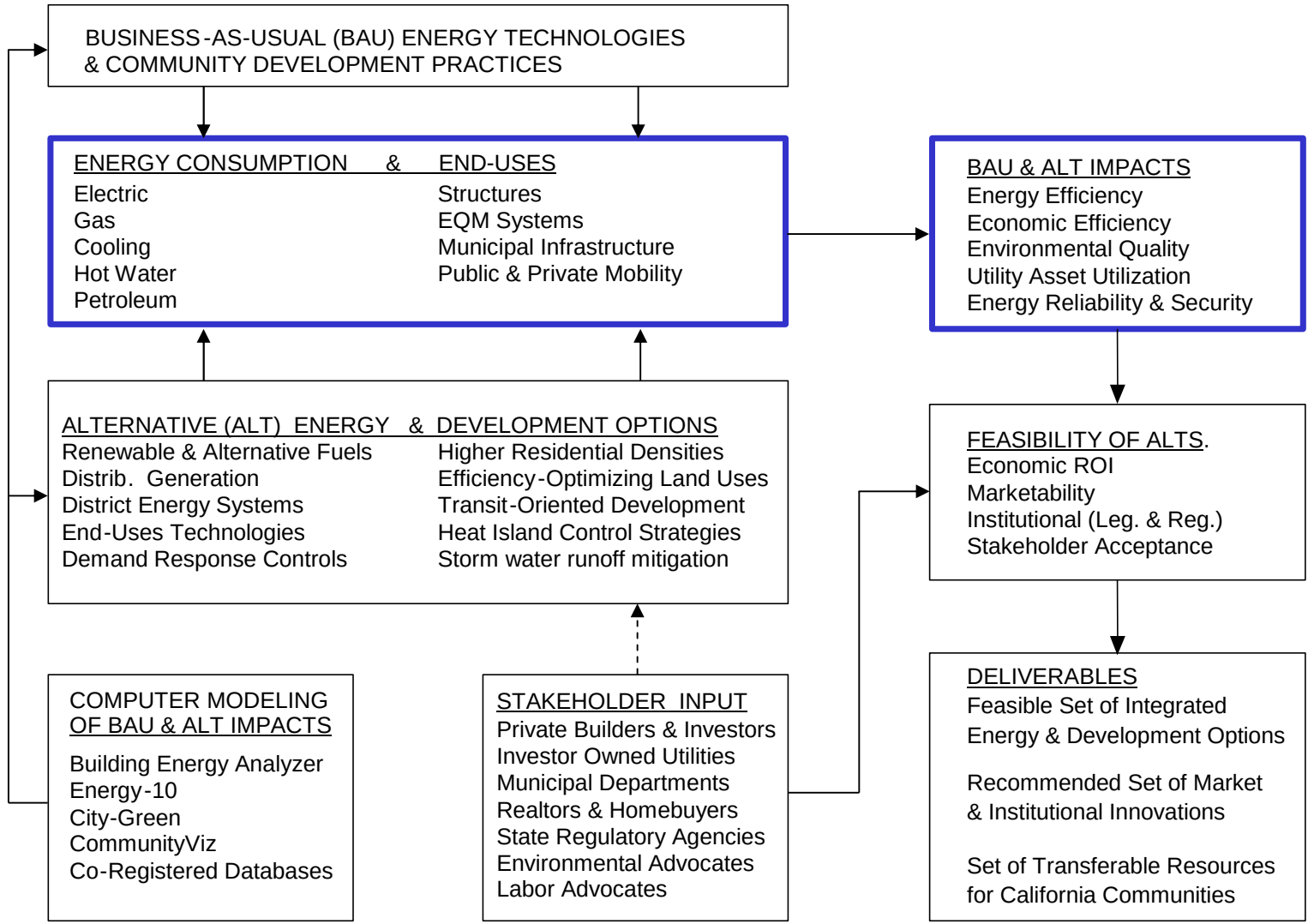
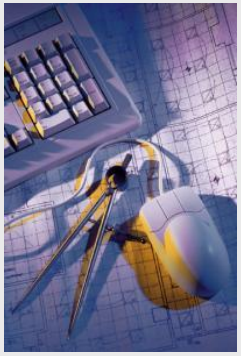
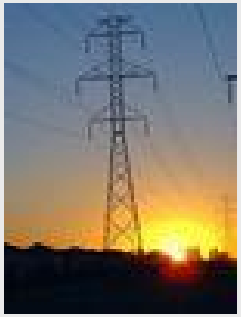
Research: CVRP Methodology



Research: CVRP Methodology

- 8,760 Building Energy & Emissions Modeling
  - **Building Types**
    - Residential - single-family & multifamily
    - Commercial – retail, office, mixed-use
    - Industrial & Institutional
  - **Modeling Parameters**
    - Building Envelope
      - foundation, framing, roofing, insulation, glazing, doors, walls & ceilings
    - Operating Equipment, Appliance & Plug Loads
      - Heating, ventilation, air conditioning, lighting, control systems, distributed generation with CHP, solar PV & thermal, & thermal storage
  - **Enabling Land Use & Urban Design Features**
- Utility Impacts
  - **Peak Demand Reduction & Asset Utilization**





Research: Team

- **Modeling**
  - Gas Technology Institute
  - Sustainable Building Industry Council
  - Orton Family Foundation – Placeways
  - San Diego State University
    - Center for Energy & Environmental Studies
    - College of Engineering – Civil & Environmental Engineering
- **Market Feasibility & Policy Studies**
  - University of San Diego
    - Burnham-Moores Center for Real Estate
    - Energy Policy Initiatives Center
- **Utility Impact Analysis**
  - SEMPRA San Diego Gas & Electric

Southern California Gas Company
A Sempra Energy utility

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Research: Prospective Advisors

Building Industry

- U.S. Green Building Council
- National Association of Home Builders
- California Building Industry Association

Real Estate & Finance Professions

- National Association of Realtors
- National Association of Mortgage Bankers
- Pension Fund Advisors Association

Energy Utilities

- SEMPRA/SDG&E
- Pacific Gas & Electric
- Southern California Edison

Municipal Authorities

- City of Chula Vista
- California Municipal League
- League of California Cities

Environmental Organizations

- Apollo Alliance
- Natural Resources Defense Council
- Planning & Conservation League

University & Other Research Orgs.

- University of California at San Diego
- National Renewable Energy Laboratory
- Sandia National Laboratory

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Research: CVRP Deliverables

- **Reference Guide for California Development Professionals**
  - Containing: commercially viable, integrated energy technology & community design options for high-efficiency, low-impact community development in California, including recommendations for energy technology applications & energy-efficient development strategies for residential, commercial & institutional structures & supporting municipal infrastructure for planned communities
- **Reference Guide for State Agencies, Finance Entities & Local Governments**
  - Containing: recommended public policy, incentive & market mechanisms to accelerate investment in & use of advanced energy technologies & enabling community design options in development projects
- **Outreach Plan for the State-wide Dissemination of the Reference Guides**

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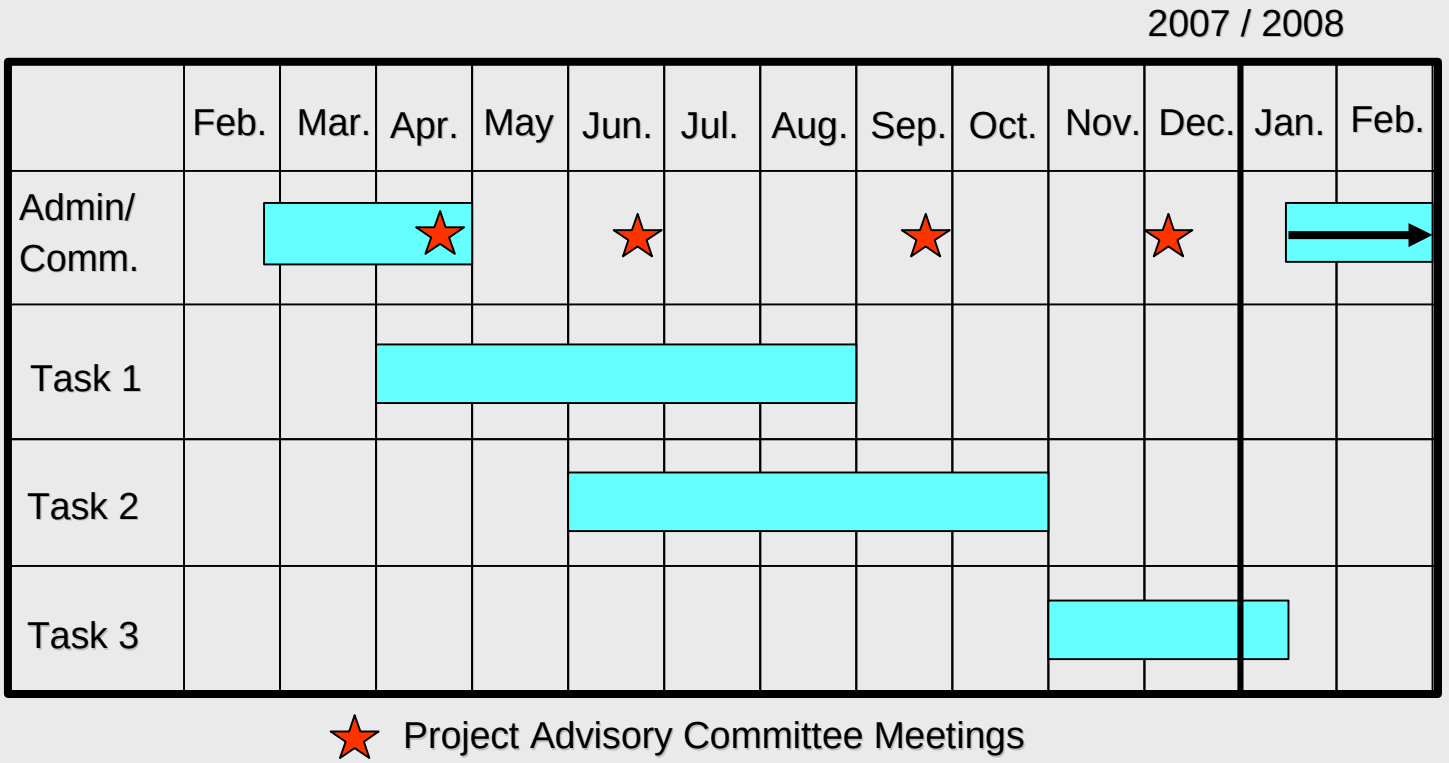
Research: CVRP Tasks & Schedule

Task 1: Model Energy Technology & Community Design Options

Task 2: Conduct Stakeholder Review, Policy & Market Feasibility Analysis

Task 3: Translate Research into Transferable Resources



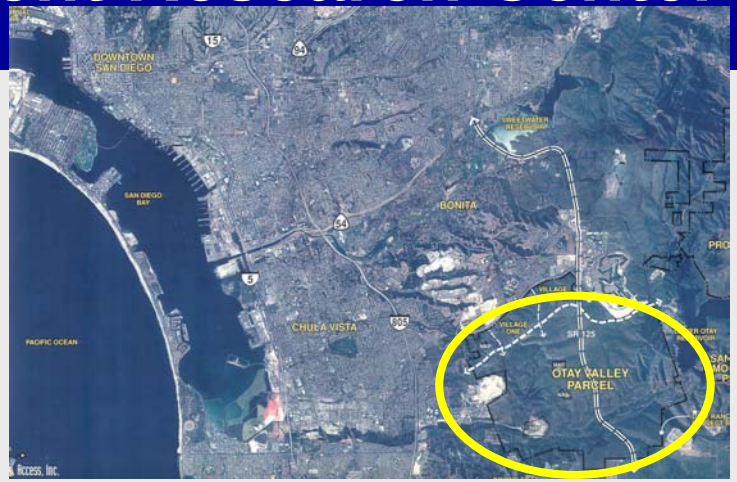
Demonstration: Citywide Locations

- Chula Vista Research Project (CVRP) findings will result in subsequent initiatives to install & demonstrate REEE technologies & to showcase efficient energy management practices throughout the new communities
- Subsequent research will result in similar demonstrations at infill brownfield & grayfield development sites across the City, creating a national demonstration site for energy-efficient community development
  - Renewable & energy-efficient technologies, distributed & district energy systems, green buildings, heat island reduction & storm-water mitigation, solid & sanitary wastewater processing[illegible]es, transit & mobility





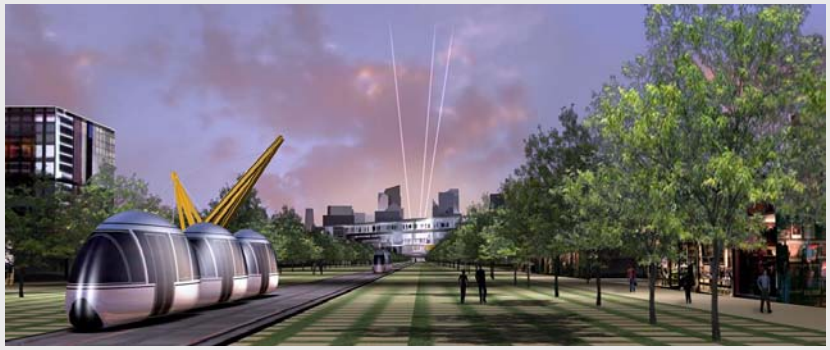

Demonstration: Permanent Research Center



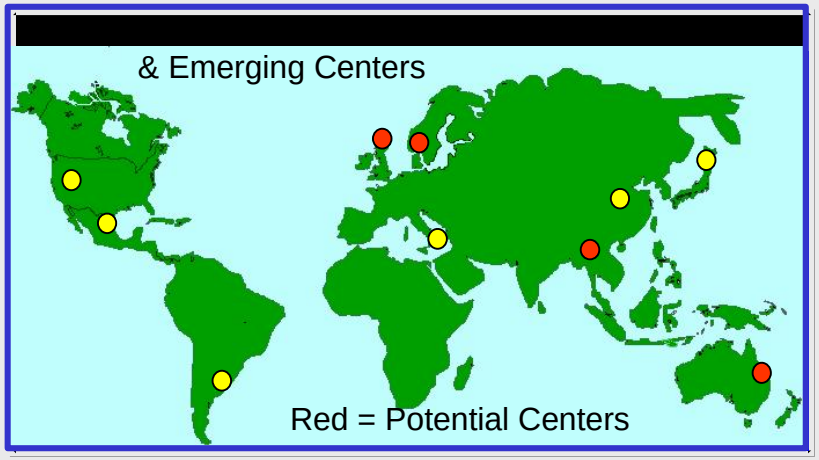
- A 5-acre site at the center of a new 6,000-acre community for 70,000 residents in Chula Vista, California
- 40,000 sq. ft. Green Building
- Technology Labs
- Training Rooms
- Conf. Rooms
- Visitor Center
- Public Plaza
- Alt. Fueling Units
- Departure Point for Demo. Sites

Dissemination:

- Capacity Building
  - Information resources
  - In-service training
  - University curriculum
  - Web-casts



- Global Energy Network



- Network of collaborating organizations advancing energy-efficient community development
- Existing centers in China & Israel
- Emerging centers in Argentina, Japan & Mexico
- Initial discussions underway in Australia, the Netherlands, Thailand & the United Kingdom

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www.globalenergynetwork.org

Integrating Renewable Energy & Energy-Efficient Technologies in Sustainable Community Development

- Doug Newman
  Director, NECSC
  619-476-5323
  doug.newman@necsc.us

- Denny Stone
  Manager, Economic Development,
  City of Chula Vista
  619-585-5797
  dstone@ci.chula-vista.ca.us

On the Web at:
www.necsc.us