Mexican Community Modeling Project
Potential Sponsors: Clinton Global Initiative & REEEP

This project is intended to produce a set of replicable community development models that optimize the efficient use of energy and natural resources and significantly reduce the release of global greenhouse gases and other pollutants typically associated with urban development. The models produced will be designed specifically for widespread use in Mexico, with applicability to other Latin American nations.

Building upon recent research sponsored by the U.S. Department of Energy and the California Energy Commission, this initiative will translate and apply a proven planning methodology and set of tools to create models for energy-efficient community development in Mexico. The scaleable models will be fashioned upon an actual community development site within an existing Mexican city of approximately 200,000 persons, located near Mexico City.

The site(s) to be selected will ideally include greenfield, brownfield and infill development components and will be include a diversity of planned economic activities and building types. The planning methodology to be used will be an enhanced version of the approach devised for the “Chula Vista Research Project” (CVRP), which is currently being conducted under funding from the U.S. Department of Energy and the California Energy Commission.

The proposed methodology entails 6-tasks that will:

1.) Assess the energy consumption and associated economic and environmental impacts of the proposed development plans for the build-out of the selected site(s). Energy consumption will include electricity, natural gas, thermal energy and petroleum. Economic impacts will assess developer’s return on investment and consumer energy affordability. Environmental impacts assessed will include greenhouse gases (CO_2, CH_4, N_2O, SF_6, HFCs, FCs) and priority pollutants (NOx, SOx, VOCs, HC, TP, PM_{10}, $PM_{2.5}$), surface and groundwater quality, and various solid waste impacts;

2.) Formulate a set of alternative development options consisting of integrated renewable energy (solar, geothermal, biomass, etc.) and energy efficiency technologies (distributed tri-generation / CCHP, district energy systems, and demand response mechanisms) and complimentary land use, urban design and building construction features that optimize their performance (smart-growth, urban heat island and stormwater runoff mitigation measures and green building materials). This stage will include a cost-benefit analysis on the alternative options to eliminate those that prove to be economically in-feasible;

3.) Solicit community stakeholder input on the alternative development options and identify and address existing legislative, regulatory and market barriers to their use. Stakeholders will include the site developer(s), builders, investors, real estate brokers and buyers as well as community and environmental advocates and municipal authorities. Stakeholder input and the barriers analysis will be used to enhance/modify the alternative development options;

4.) Formulate a time-sequenced implementation plan for the alternative development options, a financing plan and a plan for needed policy and market innovations to overcome identified barriers;

5.) Re-calculate the energy consumption and associated economic and environmental impacts for the alternative development options and compare to the original build-out plans;

6.) Document the research methodology, alternative options considered, findings and the resulting development models in a set of reference documents on energy-efficient community development for Mexican development professionals and construction trades and for national, regional and local public officials.

The methodology will entail the integration and use of six (6) modeling tools. In order of their sequencing, they include:

- Harmonized Emission Analysis Tool (HEAT) - developed by the International Council for Local Environmental Initiatives (ICLEI)
- Building Energy Analyzer (BEA) - developed by Gas Technology Institute
- Energy-10 - developed by the Sustainable Building Industry Council
- City Green - developed by the American Forests Organization
- TERMIS - developed by 7-Technologies of Denmark
- CommunityViz - developed by the Orton Family Foundation

HEAT will be used to conduct the baseline and final alternative development model emissions impacts (Steps 1 & 5). BEA, Energy10, City Green, TERMIS and CommunityViz will be integrated and used to conduct the alternative modeling work and will be used in presentations during the stakeholder review process (Tasks 2 & 3). Specifically, BEA will be used to model energy, economic and environmental parameters for 10-16 types of commercial, institutional and commercial-residential mixed-use structures. Energy-10 will be used to model 3-5 types of single and multi-family residential buildings.

City Green will be used to model alternative landscape design elements and to support evaluation of the urban heat island effect. TERMIS will be used to evaluate the technical and economic feasibility of a district cooling system for the community and, if proven feasible, to develop a hydraulic design and implementation plan. CommunityViz will be used to model potable water and wastewater treatment infrastructure, urban runoff, alternative land-use configurations and transportation infrastructure, patterns and strategies. CommunityViz will also be used to co-register and synthesize data inputs from the other software tools and to produce 360-degree visualizations and real-time impact simulations for stakeholder meetings in which alternative development options are evaluated.

Modeling of transportation infrastructure, patterns, and strategies for energy consumption and emission impacts will entail estimating average daily vehicle-miles traveled (VMT) using both quantitative factors such as housing density and road patterns, and qualitative factors such as the probability that residents will choose alternative modes of transportation. Based on the estimated VMT, potential savings in energy consumption and air emissions will be calculated using generally accepted averages.

The project will produce the following deliverables:

- A new modeling protocol & a set of enhanced & integrated modeling tools
- Baseline energy, economic & environmental impact assessment for the site(s)
- Set of alternative energy-efficient development options
- Reference guide on energy-efficient community development for the development and construction industries in Mexico
- Reference guide on energy-efficient community development for national, regional and local public officials in Mexico
- Replicable elements of the reference guides that can be used to create reference guides for use in other Latin American communities

Emergency Energy System Design for Critical Urban Infrastructure
Potential Sponsor: U.S. Department of Homeland Security (DHS)

The NECSC has approached the DHS with a proposal to produce and disseminate a model emergency energy system design, technical planning guide and practical implementation tools (toolkit) to ensure the operation of critical urban infrastructure and services during disruptions of electric and gas supplies. The target audiences for these materials will include: local government energy and emergency services personnel; local government elected and appointed officials; municipal planning and development commissioners and departmental officials; municipal utility personnel; and personnel from other relevant city and county agencies. The 24-month project will be managed by the NECSC in consort with relevant local energy and emergency service stakeholders and with the assistance of both electric and gas industry representatives.

The Concept - To achieve and maintain sustainable energy security, alternative emergency energy systems are needed to support critical facilities (those supporting the health, safety, security and orderly functioning of a community. These systems would permanently disaggregate and decentralize the production of both emergency electricity and thermal energy resources through the use of community-based, fuel-flexible, distributed generation technologies. The delivery of these resources to critical facilities would then be provided by small-scale, local-area electrical energy micro-grids and thermal energy pipelines. The non-emergency operation of these systems could also enable local governments to reduce energy costs and price volatility while providing an opportunity to recover equipment installation costs through interconnection arrangements with local utilities. Similarly, utilities could benefit from the operation of these systems by their ability to shed loads on their distribution systems during peak use and realize cost savings as a result.