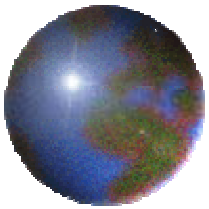


Financing Energy-Smart Community Development

Prepared by the Global Energy Center
for Community Sustainability
at the Gas Technology Institute

June, 2006

Presentation Contents

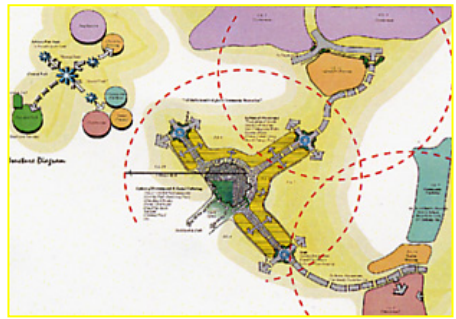
- Energy-Smart Community Development
  - Definition & Project Examples
- Alternative Financing Options
- Investor Risk
- Option Selection Process
- Project Profiles
- Links to Additional Resources

ESCD Defined

- Energy-Smart Community Development (ESCD) entails the design, construction & management of communities that make the most efficient & responsible use of all energy resources

- ESCD utilizes community land-use patterns, site planning & urban design features that reduce energy use in structures, processes & in personal mobility & public transit

- These patterns & features also create the spatial conditions necessary to optimize the use of advanced energy-efficient technologies



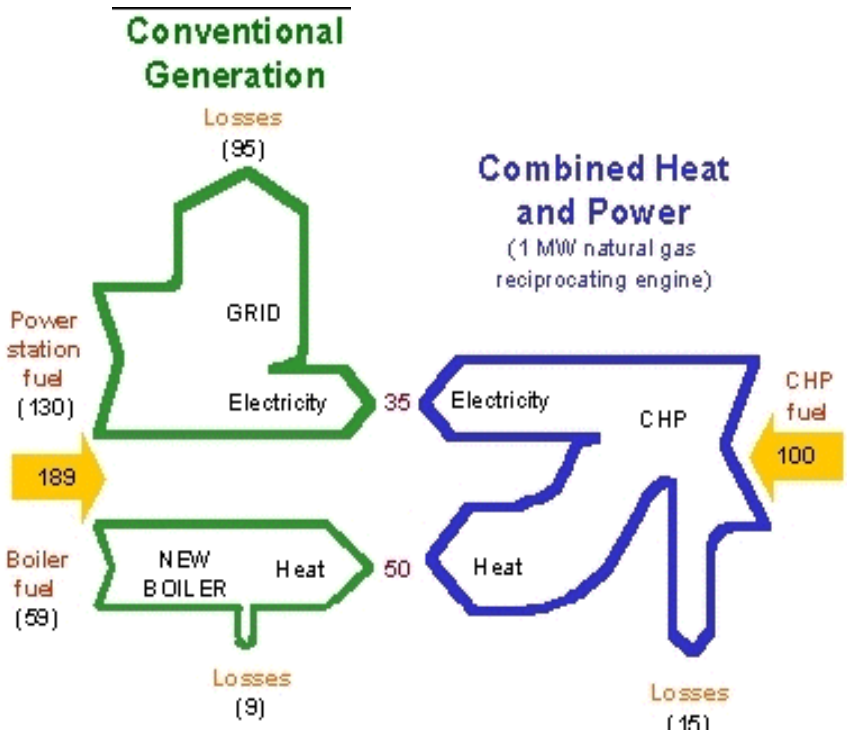
ESCD Project Examples

- Energy Technology Integration
  - DG & CCHP energy technologies
  - District energy systems
  - Smart micro-grids

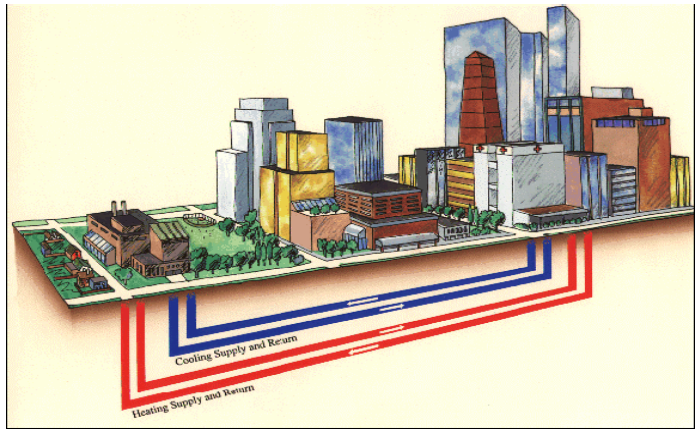
- Community Waste-to-Energy
  - Solid Waste-energy systems
  - Community biogas

Energy Technology Integration: DG & CCHP

- Energy-smart urban design facilitates the co-location of end-uses to optimize economical application of distributed generation (DG) & combined cooling, heat & power (CCHP) systems



Energy Technology Integration: District Energy



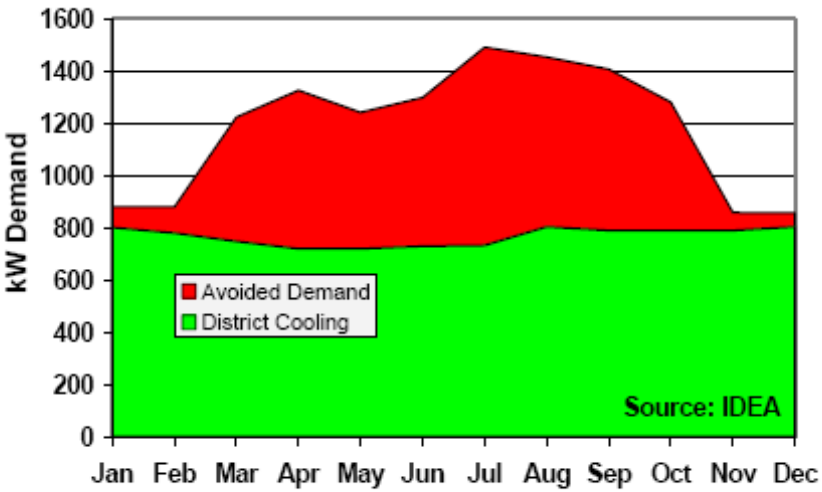
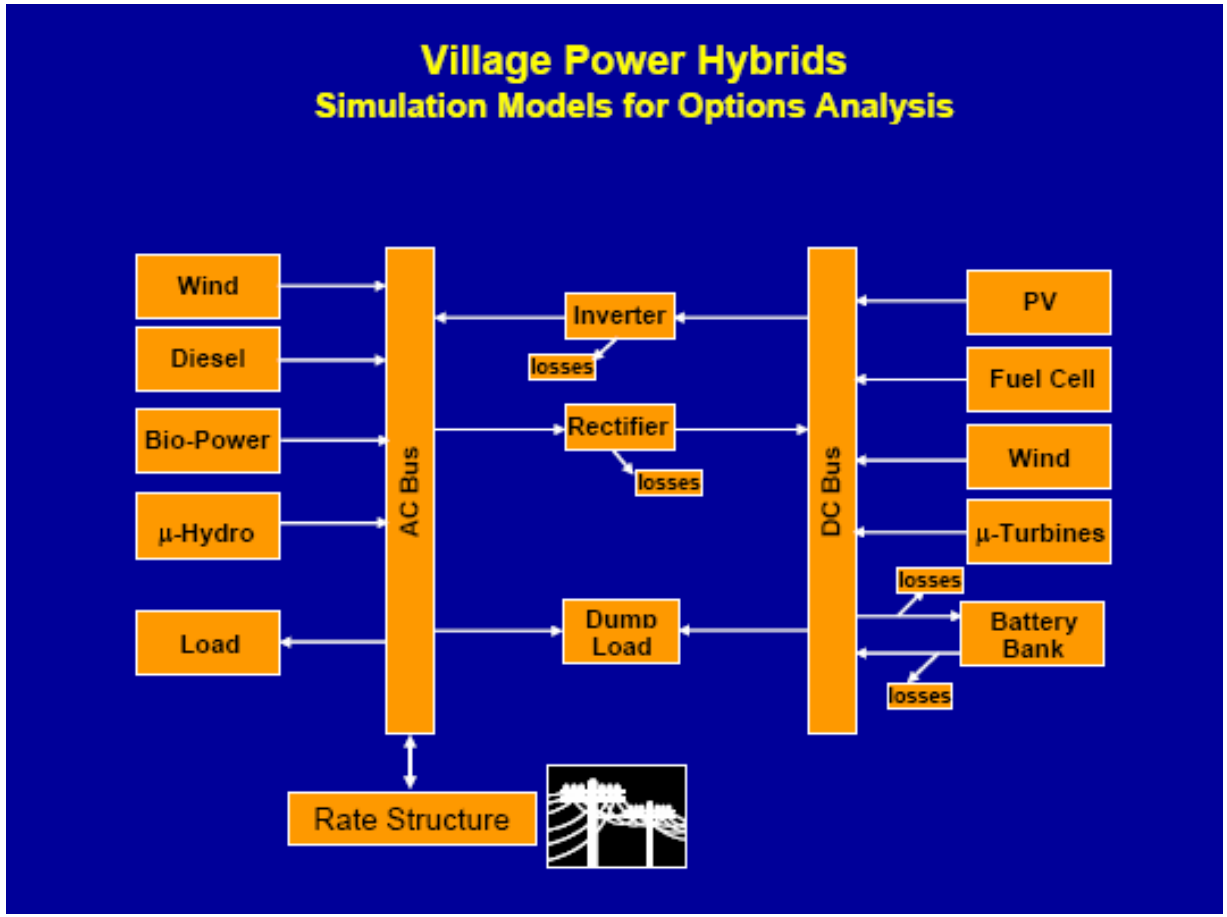


Figure 6: Cuyahoga Savings Center Electricity Demand

- District power & thermal energy systems for space conditioning & commercial process steam
- Benefits
  - 70% energy efficient
  - Cost savings to individual developers
  - Lower costs for “client” building owners
  - More secure & reliable energy supply
  - Enables more profitable use of commercial floor space in client buildings
  - Environmentally friendly
    - minimizing NOx & SOx via natural gas
    - chillers using non-ozone depleting refrigerants
  - More aesthetic

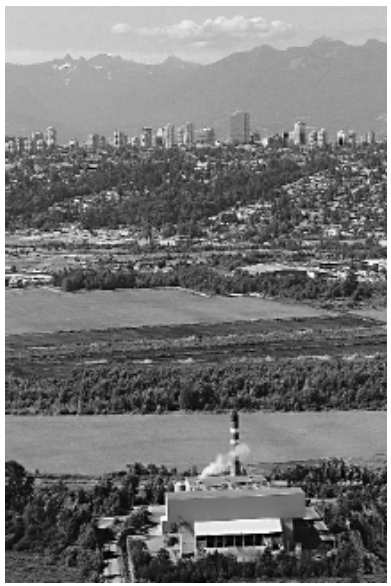
Energy Technology Integration : Smart Micro-Grids



Source: Roger Taylor

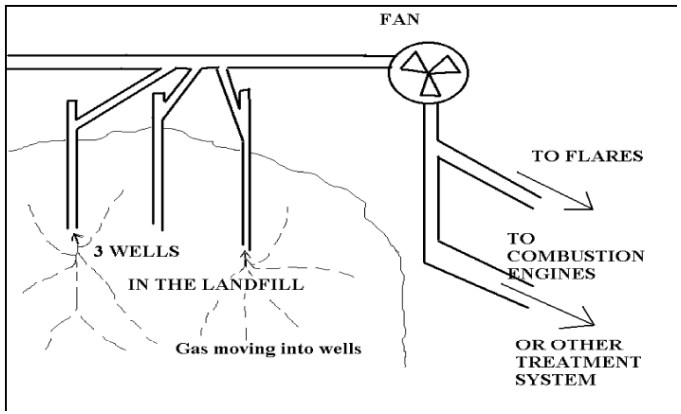
- Multiple sources of renewable energy & advanced generation
- Intelligent, interacting local micro-grids reinforcing the community
- Consumers utilizing demand response control technologies

Community Waste-to-Energy: Solid Waste Power Generation



- Waste is sorted for recyclable & hazardous materials & the remainder is burned to drive a steam turbine for electricity or to deliver steam to nearby industrial users
- Reduces solid waste mass by 90% & ash can be used in building products

Community Waste-to-Energy: Solid Waste/Landfill Biogas



- Relatively small quantities of LFG (methane & carbon dioxide) can be used to produce clean, efficient energy
- Methane is harvested through wells & blown to a gas processing unit that cleans the fuel for onsite electric power & thermal production or for pipeline distribution
- Reciprocating engines or micro-turbines burn the LFG to produce electricity & thermal energy for industrial uses

PHOTO: CAPSTONE

Alternative Financing Options

- Energy Efficiency & Renewable Energy Loan/Grant Programs
- Debt Financing
- Equity Financing
- Third-Party Financing
- Project Financing

  - Note: Co-funding by public agencies & debt financing typically have the lowest financing costs
  - Equity financing have the highest financing costs

2 Key Lender/Investor Project Evaluation Criteria

- **Debt Coverage Ratio:** One key indicator of a project's financial strength is its ability to meet debt payments. The debt-coverage ratio measures a project's operating revenue against debt service demand and is typically calculated on an annual basis

- **Rate of Return (ROR) on Equity:** Commercial lenders typically look for a ROR between 12% & 18% for most projects. Private investors will typically seek an ROR of 15% to 20% or more

Alternative Financing Options

- Energy Efficiency & Renewable Energy Loan/Grant Programs
  - Various national, regional and international funding sources make loans and grants available to cover a portion or all of a project's costs if they can serve as models to promote wider use of these technologies within targeted geographic regions
    - Example of a key international funding source:
      - Renewable Energy and Energy Efficiency Partnership **www.reeep.org**

reeep renewable energy & energy efficiency partnership

  - Low-interest loans & tax credits may also be available to reduce project costs, however both require additional time for application preparation & for loan & credit processing

Alternative Financing Options

- Debt Financing
  - Loans typically derived from a bank or government agency, debt financing is one of the most commonly sought forms of energy project financing
  - Loans can either be set at fixed rates or floating rates typically tied to a national monetary index
  - Lenders can provide loans that cover up to 80% of installed costs, but require owner equity of 20% and repayment in 8-15 years
    Note: the debt-to-equity ratio will vary depending on the lender's assessment of the project's risk
  - Lenders may also require owner or developer contributions to an equipment maintenance account to ensure operation throughout the loan period

Alternative Financing Options

- Debt Financing (continued)
  - The advantage of debt financing is ability to maintain ownership control of the project
  - The disadvantage of debt financing is an often lengthy and rigorous justification process to obtain the project loan
  - Lenders will examine in detail the potential financial performance of the project and influences such as the qualifications of participants, structure of primary and subordinate contracts, equity positions of investors, local permits, technologies proposed, assets & credit worthiness of the owner & or developer, & market factors
  - Project documentation typically required by lending institutions include
    - An executed interconnection agreement with the local utility
    - A Fixed-price agreement for facility construction
    - Executed equity agreements with all partners
    - Approved environmental & local building permits

Alternative Financing Options

- Equity Financing
  - Equity is invested capital that creates ownership in the project & may be provided by the project developer, owner, outside investors, equipment providers or investment banking institutions
  - Equity is more expensive than debt, because the equity investor accepts more risk, as the debt lender is the first to be paid from project earnings, before payments are made to investors
  - The primary advantage of equity financing is its availability. The primary disadvantage is its high cost
  - Like debt lenders, equity investors conduct due diligence analysis to assess the project's potential ROR. However, this analysis is often accomplished in less time due to the entrepreneurial orientation of equity investors as compared to institutional lenders

Alternative Financing Options

- Equity Financing (continued)
  - Adequate ROR on their investment is the key criteria by which equity investors evaluate a project. They will pay particularly close attention to project costs & operating data, as they form the basis for the investor's investment offer
  - Equity investors may be willing to finance up to 100% of the project's installed cost, often with the stipulation that supplemental equity investors or debt lenders will be engaged at a later time
  - Investment banks specializing in the placement of equity or debt are also sources of equity financing, along with equipment vendors, & companies involved in the project that may also be willing to take equity positions. Accordingly, this prospect should be considered when selecting vendors & companies that will participate in the project

Alternative Financing Options

Third-Party Financing

- This financing arrangement entails providing a third party some portion of the project's future revenue stream in exchange for that parties' responsibility for project fund-raising, implementation, & or long-term operation & maintenance
- Disadvantages of third-party financing include accounting & liability complexities & loss of certain tax benefits by the project sponsor
- Third-party financing arrangements typically involve some form of "lease financing" such as leveraged leases, sales-leasebacks & energy savings performance contracts
- In lease financing a project developer leases all or part of the project's assets from the asset owner. These arrangements typically give the lessee an option to purchase the assets or to extend the lease

Alternative Financing Options

- Third-Party Financing (continued)
  - Many of the larger multinational energy technology & building equipment manufacturers have subsidiaries that lease equipment
  - As stated, the most common lease arrangements include:
    - **Leveraged Leases** – where equipment users lease equipment from the owner that has financed the equipment with debt & or equity
    - **Sales-Leasebacks-** where the equipment user buys the equipment, then sells it back to a corporation, which then leases it back to the user
    - **Energy Savings Performance Contracting (ESPC) -** An ESPC entity, such as a venture capitalist, owns the system & incurs all costs associated with its design, installation, or maintenance in exchange for a share of any cost savings. The ESPC entity recovers its investment & ultimately earns a profit. It is earned by charging the energy customer for supplied energy at a rate below what energy would cost from a conventional utility

Alternative Financing Options

- Project Financing
  - Project financing funds are made available by investment capital companies, banks & from various international & national energy investment funds
  - lenders provide project debt for up to 80% of the facility's installed cost & accept repayment over 8 to 15 years
  - Project finance transactions can be costly & the process of satisfying lenders' criteria can be very involved
  - The principal advantage of project financing is the ability to use another entities’ funds, without giving up ownership control of the project
  - The principal disadvantage is the difficulty of obtaining project financing for technologically complicated energy projects

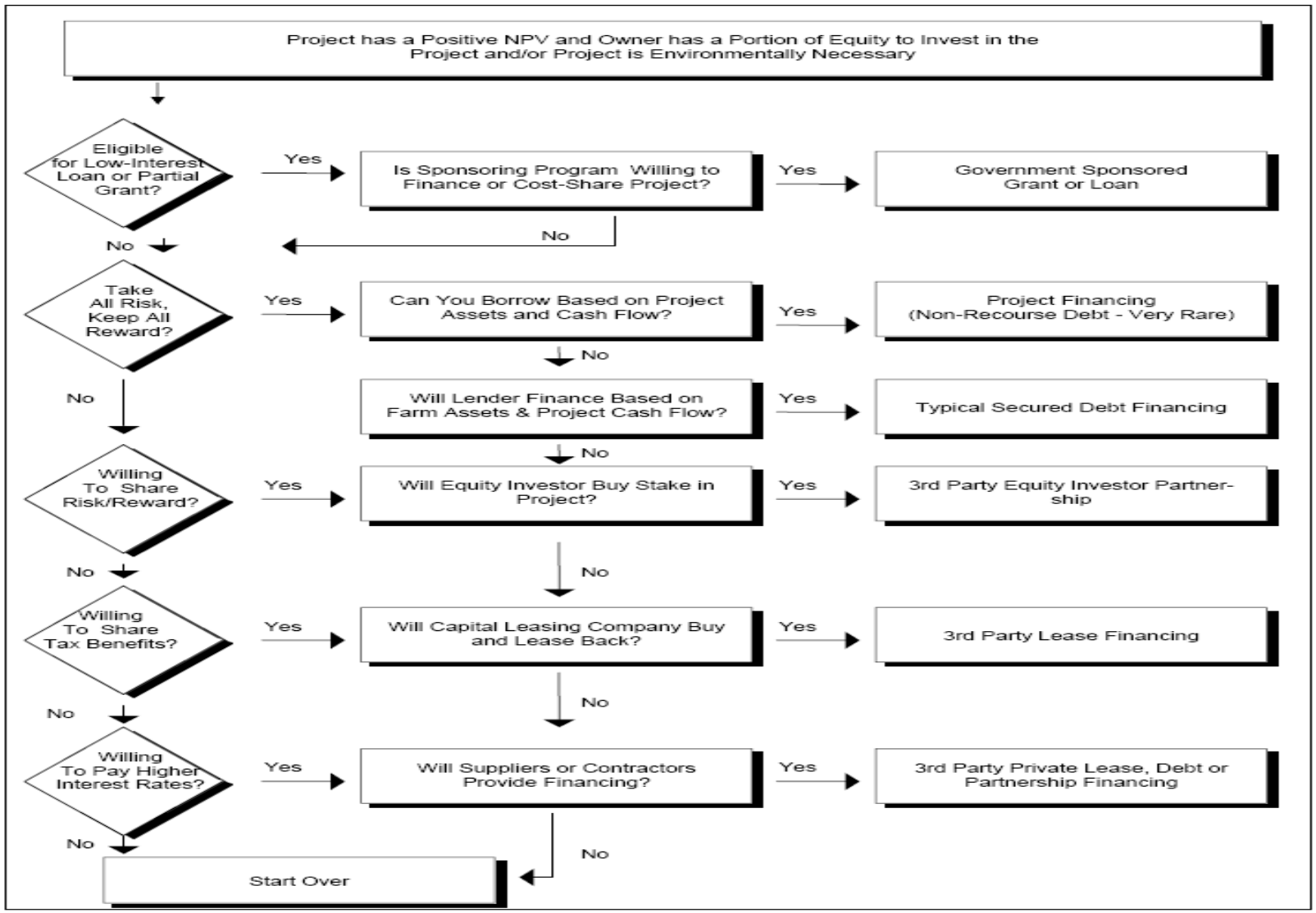
Investor Risk

- Top Investor Risks & Mitigation Measures
- Example: A Community Biogas Facility

Risk Category	Risk Mitigation Measure
Biogas Production Potential	• Use FarmWare to model gas production over time • Hire expert to report on gas production potential • Provide for back-up fuel if necessary
Construction	• Execute fixed-price turn-key contracts • Include monetary penalties for missing schedule • Establish project acceptance standards, warranties • Be sure the project conforms to NRCS standards
Equipment performance	• Select proven designer, developer, and technology • Design for biogas Btu content • Get performance guarantees, warranties from vendors • Select and train qualified operators on farm
Environmental permitting	• Obtain permits prior to financing (waste management, building)
Community acceptance	• Obtain zoning approvals • Demonstrate community support
Utility agreement	• Have signed contract with local utility • Make sure all aspects are covered • Get sufficient term to match debt repayment schedule • Confirm interconnection point, access, requirements • Make sure on-line date is achievable • Include force majeure provisions in agreement
Financial performance	• Create financial pro forma • Calculate cash flows, debt coverages • Commit equity to the project • Ensure positive NPV • Maintain working capital, reserve accounts • Budget for major equipment overhauls

Source: U.S. Environmental Protection Agency

Option Selection Process



Source: U.S. Environmental Protection Agency

Project Profiles

• This section contains profiles of recent projects financed through one or more of the preceding options & suggest the type of projects & financing approaches that draw the support of the World Bank - Global Environment Facility (GEF) & other international funding sources.

Bulgarian Wood Waste-to-Energy

Foreign Private Commercial Sources invest $3,640,000.00 to reduce greenhouse gas emissions generated at Svilosa (Bulgaria), by substituting coal with residual wood as a fuel for power, and heat generation, and, through savings of methane emissions from residual wood waste, stockpiled at the plant. The first component involves the installation of a biomass boiler to burn wood residues, thus reducing the amount of coal needed in the combined heat and power (CNP) plant, but providing the Svilosa facility with the same energy requirements. As a result, it will reduce the release of greenhouse gases, and local pollutants, while the utilization of biomass wastes will reduce the release of methane emissions, which would have been released if these wastes were to be disposed. The biomass boiler to be installed, will have a capacity of 13 MW.

Source - http://www.worldbank.org

Bringing EE to Poland

The objective of the Poland GEF Energy Efficiency Proposed project is to increase public and private sector investments in energy efficiency in buildings. The project has the following three components: Component 1) A partial guarantee facility with US$5.7 million in reserves will be established with GEF funds as a risk-sharing mechanism that will provide commercial banks partial coverage of risk exposure against loans made for energy efficiency projects for buildings throughout Poland. Component 2) The Grant Facility will support investments of US$6.67 million in bundled Energy Efficient (EE) projects in the Krakow region. Component 3) Technical assistance will be provided for several barrier removal activities, including: support for deployment of guarantee mechanism and building the capacity of Bank Gospodarstwa Krajowego (BGK), which is a state-owned development bank that falls directly under the Ministry of Finance, to administer the guarantee; support to ESCO Subsidiary of MPEC (POE ESCO) in the development of the performance contracting model in the Krakow region and to build its pipeline of potential investments; provision of training to local banks; activities to increase awareness and demand for efficiency investments among building owners including municipalities; and collection of project monitoring data and broad dissemination of results.

Source - http://www.worldbank.org

Project Profiles

Global Environment Facility Commits $18mm to Chinese Buildings

The Heat Reform and Building Energy Efficiency Project for China aims to achieve substantial, sustained and growing increases in energy efficiency in urban residential buildings and central heating systems in China's cold climate regions. The project has the following three components: Component 1) will provide the project's first operational demonstrations that the greatest energy efficiency gains and cost savings in residential space heating can be achieved through an integrated effort that simultaneously addresses the thermal integrity of buildings, the operational efficiency of heat supply systems, the provision of means for heat control by consumers, and the implementation of heat metering, cost-based heat pricing and consumption-based heat billing. Component 2) will provide the vehicle to support the critical role of the central government to provide policy direction to localities, bring the best national and international expertise to bear on issues surrounding implementation of reform and development of new technical approaches, coordinate and guide implementation of local project activities, undertake central project management and monitoring functions, and disseminate successful ideas and results outside of participating cities. Component 3) will promote simultaneous development of both heating sector reforms and building energy efficiency improvements in 4-6 additional northern Chinese municipalities, achieving broad, national impact.

Source - http://www.worldbank.org

Conserving Heat in Lithuania

The GEF Heat Demand Management Project will support a broader, and more sustainable Energy Conservation Program (ECP) for the City of Vilnius, by promoting demand-side energy efficiency in residential buildings connected to the district heating system, and develop an energy efficiency market. The objective of the Project is to reduce the emissions of greenhouse gases from the Vilnius District Heating System by reducing barriers, and implementing, financially sustainable and replicable energy efficiency investments in the residential sector of the Vilnius City. This would be achieved by: co-financing demand management programs which would demonstrate the benefits of automatic, and consumer-controlled use of heat in homes, and consumption-based billing at the apartment level; a limited grant (or capital subsidy) financing from the GEF, that would cover the cost of down-payments (connection fees) for Apartment Level Demand Side Management equipment - particularly, for low-income customers. A commercially sustainable (revolving) financial facility will be created - ECP Commercial Fund - to support the implementation of investments aimed at reducing heat losses from the City's housing stock. The facility would provide both financing, and technical assistance for such investments, mobilizing additional financing from commercial sources as appropriate. Moreover, monitoring, evaluation, and information dissemination activities will be implemented, aimed at facilitating the replication of the Project's experience.

Source - http://www.worldbank.org

Project Profiles

Grid Support in Vietnam

The objective of the Project is to improve the overall efficiency of power system services, particularly to the poor in rural areas, by optimizing the transmission systems, and upgrading sub-transmissions, and medium voltage distribution lines for rural electrification. The project components are as follows: 1) Power system efficiency will be improved by upgrading the 500 KV, and 200 KV transmission networks, and associated substations, which includes the installation of capacitors to selected substations. The system peak load will be reduced, through the implementation of several demand-side management (DSM) measures - to be supported by an associated DSM and Energy Efficiency Project, financed by the Global Environment Facility and the private sector - in an aim to further DSM impacts, and catalyze the development of sustainable energy efficiency. 2) Rural electricity access will be improved by upgrading, and strengthening the 110 KV sub-transmission line, and substations, restoring five existing hydropower plants, and, by construction of a small-scale hybrid wind-diesel power plant at Phu Quoc Island. Moreover, a pilot of twenty community-based hybrid renewable-energy grids in remote areas, will be tried and developed. 3) Sector reform, and institutional development will be pursued, through improvements in the management information system, the creation of one District, and several commune-level joint-stock distribution companies, and, by strengthening the regulation, planning, and implementation capacity for renewable electricity.

To this end, operational training, and technical assistance will be provided.

Source - http://www.worldbank.org

Carbon Fund Funds Brazilian Cogeneration

The objective of the Prototype Carbon Fund - PCF - Sugar Bagasse Cogeneratioon Project is to reduce emissions by generating energy from renewable resources. It is designed to facilitate the implementation of several subprojects in Brazil, of which two sugar bagasse cogeneration projects are presented for approval. The Alta Mogiana Bagasse Cogeneration Project is hosted by Usina Alta Mogiana S.A., and focuses on increasing efficiency in the cogeneration process to produce more steam, and increase electricity output to supply the national grid. In the first phase, two 21 bar pressure boilers are refurbished and a new 25 MW turbo generator installed. The Guarani Cruz Alta Bagasse Cogeneration project is hosted by Azucar Guarani S.A. and focuses on installing new facilities to increase the electricity output from its generation plant. Under Phase I, a 21.8 MW backpressure turbo-generator will be installed and a 63 bar boiler. In Phase II a 25 MW pressure turbo-generator will be installed, as well as a 63 Bar boiler. The project will receive carbon finance, and project preparation and processing from the Prototype Carbon Fund (PCF).

Source - http://www.worldbank.org

Project Profiles

Turkey Supports Distributed Generation

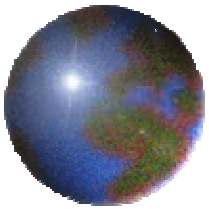
The project objective is to increase privately owned and operated distributed power generation from renewable sources, without the need for government guarantees, and within the market-based framework of the new Turkish Electricity Market Law. The project has the following two components: Component 1) The SPDF is a term lending facility which will be established and will be operated by the two financial intermediaries (Fls). The two Fls selected are: (a) Turkiye Sinai Kalkinma Bankasi (TSKB) - the Turkish Industrial Development Bank (private); (b) Turkiye Kalkinma Bankasi (TKB) - the Turkish Development Bank (Government) The World Bank loan for the SPDF will be on-lent from Treasury (the Borrower) to the Fls. The Fls will utilize the SPDF to provide long-term debt financing to private sponsors of renewable energy projects. The SPDF is intended to leverage equity investment from local private developers, export credit financing and other financing for the construction and operation of qualified renewable generation projects. Component 2) In order to support the implementation of the Project, Ministry of Energy and Natural Resources (MENR), General Directorate of State Hydraulic Works (DSI) and General Directorate of Electrdic Power Resources (EIE) will undertake various institutional development activities. These activities will be financed through internal sources and grants. The World Bank and the Government will work together to obtain the required grant financing for these activities.

The principal institutional development activities that will be pursued include: (a) Renewable Energy Development Capacity: For the immediate to medium-term (next 2-3 years) there is a substantial potential pipeline of projects which are at an advanced stage of development by private sponsors. (b) Legislation for Renewable Energy Resource Development: Apart from the Electricity Market Law (EML) and the MENR-DSI Regulation on Principles and Procedures for Obtaining a Water-Use Rights Agreement, Turkey does not have a specific and comprehensive law for renewable energy resource development. (c) Mechanisms for Public-Private Hydropower Development: With the implementation of the new Electricity Market Law (Law No. 4628), the responsibilities for developing new hydropower generation will tend to shift towards the private sector.

Source - http://www.worldbank.org

Links to Additional Resources

- Sources for more information
  - **www.globalenergycenter.org**
  - **www.eere.energy.gov/buildings/building_america/**
  - **rehabadvisor.pathnet.org/index.asp**
  - **www.energystar.gov**
  - **www.energysavers.gov/**
  - **www.rebuild.gov/index.asp**
  - **www.energytaxincentives.org/**
  - **www.dsireusa.org**
  - **www.poweryourdesign.com/index.html**
  - **www.ase.org/**
  - **www.munee.org/**
  - **www.fypower.org/index.html**
  - **www.adb.org**
  - **www.ebrd.com**
  - **www.eib.org**
  - **www.base**
  - **www.reeep.org**
  - **www.nadbank.org**
  - **www.unep.org**
  - **www.energy-base.org/**
  - **www.sefi.unep.org**



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