What to Consider When Planning for Local Energy Development
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For local communities faced with the prospect of new energy development, knowing which sources to encourage can be a daunting task. Indeed, because of their far-reaching consequences for the economy and the environment at the local, national, and global level, the process of choosing among various energy technologies can confound even the most informed policymakers. To this end, researchers from the Cornell University College of Engineering recently completed a report (see George et al. 2012) which will assist communities around the northeastern United States in planning their energy future. While the report does not take decision makers from start to finish in developing new forms of energy, it does inform the first steps of any successful planning process. The following summarizes some of the recommendations made in their report.

Local energy planning often begins with three key pieces of information, each unique to the community in question: the community’s demand—or expected demand—for energy; the community’s goals as they relate to energy, sustainability, and the environment; and the community’s financial situation. Once goals are defined, it is sometimes necessary to make public investments in order to achieve them. For this reason, having an accurate idea of the amount and types of funding available for energy programs and projects is critical. While small local governments may not have all the aforementioned information at their disposal, collecting the data that is available, and identifying goals, are important first steps in the planning process.

Technology Characteristics

The various costs associated with different energy technologies are important to consider. Financial parameters include, at a minimum:
- the costs associated with purchasing and installing generating equipment
- operating costs
- marginal capital costs
- anticipated lifetime of the technology
- subsidies
- number of operating hours

The productivity ratio of a given technology—or the ratio of the amount of power actually produced to the 24-hour, 365-day production capacity—is an additional metric used to measure the operating efficiency of a technology. In addition, implicit costs such as the opportunity cost of a given technology excluding another, the time it takes to develop a certain energy resource, and the costs of determining whether or not a given technology is feasible should be taken into account as well.

It is also important to consider several characteristics of energy development that are not typically represented on a balance sheet, and are more commonly measured in qualitative terms. These features include:

- **Environmental effects**, or the amount of carbon emissions generated by energy generation as well as local environmental impacts such as ground pollution, erosion, deforestation, noise pollution, disruptions to wildlife.
- **Energy systems raise both local and global security concerns**; at the local level, risks related to theft, vandalism, and public safety should be addressed during any planning process. Though more elusive, global security concerns often include national security as it relates to dependence on foreign oil.
- **Two measures of reliability** are important to consider when choosing a particular energy technology: **flexibility** measures the ability of a given power source to produce energy when it is most needed, while **regularity** describes the degree to which the occurrence of generation can be anticipated.¹
- **Connectivity** describes the ability of a power technology to attach to the transmission grid, and is important for determining what interconnection options are available and how much it costs to install them.
- **Zoning and planning regulations** sometimes represent additional costs of development; local zoning codes should be consulted before proposing an energy project.
- **Energy projects lead to varying community and economic impacts**; characteristics related to job growth potential and local spending should be

¹ George et al. (2012) recommend rating technologies according to these factors on a scale of none, low, and high.
considered when choosing an energy technology.

The following table summarizes the characteristics of the most common alternative and conventional energy technologies, ranking the four categories of cost effectiveness, environmental friendliness, local sustainability, and energy independence.

<table>
<thead>
<tr>
<th>Energy Technology</th>
<th>Cost Effective</th>
<th>Environment</th>
<th>Sustainable</th>
<th>Energy Independent</th>
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<td>Solar photovoltaic</td>
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<td>Wind</td>
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<td>Nuclear</td>
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<td>Concentrated solar</td>
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<td>Biomass</td>
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<td>Household biodiesel</td>
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<td>Commercial biodiesel</td>
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<td>Natural gas</td>
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<td>Coal</td>
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<td>Deep geothermal</td>
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<td>Micro hydroelectric</td>
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<td>Geothermal heat pumps</td>
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Armed with this information, a community can easily use a spreadsheet model developed by the Cornell team to generate useful information for making both household and community-level energy choices. The model, which is available at (will eventually live on CaRDI website) generates the following parameters: total cost (with and without subsidization); community affordability, based on government or household financials; spare generating capacity; payback period; and the net present value of any public investment.²

Communities intending to finance their own energy development have several options available for raising the necessary capital. Funding may be available immediately or in the future, and may come from subsidies or from revenue generated by selling power. Funding options recommended for consideration in the Cornell report include issuing taxes, bond levies, forms of individual ownership, grants, and power purchasing commitments.

**Energy Conservation & Efficiency**

Energy planning not only addresses the generation of new energy, but also considers the efficiency and conservation of existing energy generation and consumption. By conserving energy in both residential and commercial uses, and increasing the efficiency of generating technologies, demand for electricity in a community can be lowered even in the face of economic or population growth.

George et al. (2012) recommend relatively low-cost energy-saving improvements to buildings as the first step to decreasing overall energy demand. Collectively, measures such as properly insulating homes to using energy efficient appliances and lighting can have a major impact on the amount of energy a community consumes in addition to saving money for the property owner. Similarly, pursuing energy efficiency and conservation measures can dramatically alter a community’s energy calculus, sometimes removing the need for new energy development.

Not mentioned in the Cornell report but also effective at decreasing a community’s demand for energy are initiatives that reduce vehicle miles traveled. This can be achieved by investing in public transportation and implementing Smart Growth principles. When community residents are able to access more of the things they need without a vehicle, the energy they demand for transportation purposes is decreased.

**Conclusion**

Local energy planning often occurs best through a “bottom-up” process, whereby feasible resources are identified only after defining a strict set of financial and technical constraints to work within. Attempting to target specific, “pie-in-the-sky” projects before fully understanding their limitations, conversely, can lead to poor investment choices and less-than-favorable energy and sustainability outcomes.

² The net present value of an investment reflects the net economic gain or loss resulting from the purchase and installation of a certain energy technology after accounting for inflation and annual discounting.