

Design and Evaluation of Incentive Programs for Small Renewable Energy Systems

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Most states have an incentive program for small scale renewable energy, such as solar photovoltaics or distributed wind power. As many of these programs are new, many of these programs have not been evaluated for program effectiveness. As more programs mature and begin to consider evaluation activities, it is important to consider how program design can aid (or hinder) these activities.

The primary output of most programs can be expressed in terms of energy produced, such as program cost effectiveness. Without at least a basic knowledge of how much energy is being produced, programs must rely on engineering estimates. However, as shown by the authors' recent work in Massachusetts, this can lead to some overly optimistic assessments of program performance. For example, the authors' have evaluated the Small Renewables Initiative and found that small wind projects (10kW or less) were producing only about 30-40% of their expected output. This was due to a variety of factors, including inaccurate turbine performance information, inaccurate wind resource information, and an imperfect understanding of the impact of site conditions on system output. Though solar PV is a more mature technology than small wind, many solar PV installations will suffer from some of the same errors in estimating energy output. Evaluating the effectiveness of these installations, after the fact, can be very difficult unless the program is configured to insure that the necessary information is available. Generally, short term monitoring of system performance is not sufficient to conduct a valid monitoring and verification protocol. Necessary information for evaluating a small wind project includes:

- Energy production
- Wind speed (preferably at 2 heights on the tower)
- Wind direction
- Ambient temperature

This data can be collected using an onsite monitoring package (sensors, datalogger, accessories) and is sufficient to characterize the performance of a typical small wind project. There are several vendors on the market who are able to offer the necessary equipment at a cost of approximately \$1,500-\$2,500. Note, however, that installing equivalent equipment after the wind system is installed can easily double the cost. Therefore, if program evaluation is anticipated, it is worthwhile to require the installation of data monitoring equipment concurrent to installing the wind energy system. Doing this will greatly reduce the cost and complexity of future evaluation efforts.

Based upon the authors' experience, program designers have several means available to insure that their programs meet expectations and open to transparent evaluation processes:

- Track actual system energy output (at least on a monthly basis)
- Plan ahead for M&V needs
- Tie incentives to actual production
- If using engineering estimates, insure that they are based on reality

Though each program is different, following these guidelines can help to make programs more efficient and defensible. The knowledge gained through evaluation can greatly enhance a program-but only if the evaluators have access to the right information to verify true program performance.