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How to Build a Small Wind Energy Business: Lessons from California

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HOW TO BUILD A SMALL WIND ENERGY BUSINESS – LESSONS FROM CALIFORNIA

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ABSTRACT

Incentives for small wind turbine installations, either residential or non-residential, are currently available in a number of states. The purpose of these incentives is to stimulate the market for this technology and provide financial assistance for early adopters. Without such incentives, small wind systems are not likely to be cost effective, depending on the local utility electricity rates and the available wind resource.

While incentives can stimulate the market, local permitting requirements are also a key factor in whether systems can be easily installed. Reducing barriers to small wind turbine system installations can also contribute to localized economic development.

This paper highlights the experience of one installer, whose business is focused in one county in California. As a result of a number of factors converging, the installer has been instrumental in installing over 1MW in small wind system capacity in just over 6 years, growing his business from 1 full-time equivalent (FTE) to 6.75 FTE.

The purpose of the paper is to highlight market expansion factors, not to endorse any particular turbine product. Testimonials from local customers provide insight into why over 100 turbines have been installed in one county since 2000, including economic, environmental, and national security reasons.

1. INTRODUCTION

Approximately 11 states currently provide financial incentives for small wind turbine installations (see Forsyth, et al). These incentives include rebates, tax credits and grants (Table 1). In California, residential customers installing small wind turbine systems are eligible for a state buy down rebate of $21,150, which could amount to 40% of initial project costs. Coupled with high local utility rates, above average electricity consumption, and efforts to reduce permitting costs and time, an independent PV and small wind system installer identified local opportunities resulting in over 100 installations (as of March 2007). These systems have helped the owners offset, or in some cases eliminate, their dependency on electricity from the local utility.

TABLE 1. STATE FINANCIAL INCENTIVES

STATE	SWT INCENTIVE
CA	Rebate
HI	Tax Credit
MA	Rebate
MT	Property Tax Exemption, Tax Credit, Revolving Loan Program
NJ	Rebate
NY	Rebate
NC	Tax Credit
OH	Grants
UT	Tax Credit
VT	Rebate
WI	Productivity Incentive, Grants

Source: DSIRE, as of 4/13/07

This paper will explore the impact state incentives, streamlined county permitting requirements and a willing installer, coupled with high electricity and high utility rates, can have on both facilitating system installations and, ultimately, the positive economic development benefits derived by the local county.

2. BACKGROUND

Within the Department of Energy's (DOE) Wind Program, goals have been set for the Distributed Wind Turbine (DWT) Program that require gradual increases in the number of small wind systems installed nationwide (Table 2). At present, DOE's goal is to expand the number of small distributed turbines deployed in the US five-fold by 2015, from a 2007 baseline. Some criteria needed to facilitate these goals currently exist, such as high utility rates and individual customer interest. On the other hand, limited financial incentives and permitting barriers make it more difficult. In order to meet these goals, incentives will be necessary and barriers to installation will need to be reduced.

TABLE 2. DOE DWT PROGRAM GOALS

Fiscal Year	Distributed Wind Units[1]
2007	2200[2]
2008	2706
2009	3328
2010	4094
2011	5035
2012	6194
2013	7618
2014	9370
2015	11524

1 Current DOE goal, subject to change
2 Base year count is still being validated.

The case study highlighted in this paper illustrates how turbine installations can be increased when all the necessary factors for success are in place. Replication of the success highlighted here will be paramount in ensuring DOE meets its DWT goals.

3. NUMEROUS FACTORS CONVERGE AT THE RIGHT TIME

Several factors have come together to fuel and develop what began as a personal interest into a prosperous business. Combining personal interest, high local utility rates/high customer electricity consumption, state incentives, local permitting requirements, and customer needs to satisfy economic, environmental and national security interests, Joe Guasti has grown an interest into a thriving small wind turbine installation business.

3.1 Personal Interest

Joe Guasti has long been interested in small wind turbines (Photo 1). After purchasing his first Bergey 10-kW turbine, he encountered issues with the local permitting agency. Eventually gaining approval to install his wind turbine, he expanded his construction business to include small wind turbines. As a distributor for Bergey Windpower Company, he began installing the 10kW model in two California counties, Riverside and San Bernardino.

NREL PIX #14987
Photo 1. Joe Guasti shows off one of two turbines on his property.

3.2 High Local Utility Rates/High Electricity Consumption

Southern California Edison (SCE) provides service for residential customers in San Bernardino and Riverside Counties. Electricity consumption is relatively high, in large part due to summer air conditioning needs. In addition, many residents are all electric. SCE has implemented a 5-tier residential rate structure (Table 3), aimed at encouraging conservation from its customers.

In addition to reducing residential electricity consumption, many SCE customers seek to reduce their dependency on the utility by installing small wind turbines to generate some or all of their own electricity.

SCE also has a net metering program, which further benefits the customer. Reconciled annually, customers often produce more electricity than needed to meet their own needs, especially when the utility is faced with peak summer air conditioning demand. By feeding excess generation back into the utility grid, the utility limits its need to utilize very expensive, fossil-fuel based peaking generators and

customers 'bank' kWh, to be used when the wind is not sufficient to meet their needs.

TABLE 3: SCE RESIDENTIAL RATE COMPARISON (cents/kWh)

	Dec. '05	Current	Authorized Deferred	Jan. '07
Tier 1 Baseline allotment*	11.8¢	11.8¢	11.8¢	11.8¢
Tier 2 1%-30% more than baseline	13.7¢	13.7¢	13.7¢	13.7¢
Tier 3 31%-100%	16.6¢	22.3¢	22.8¢	**
Tier 4 101%-200%	19.8¢	31.2¢	35.2¢	**
Tier 5 More than 200% (over baseline)	19.8¢	31.2¢	47.5¢	**

*The baseline kWh allotment is set by the CPUC, and varies by climate zone. Law currently freezes baseline and tier-2 rates.
** Rates will be determined when 2007 forecasts are final later this year. Implemented levels likely will be lower than those originally authorized because of above-forecast 2006 revenues SCE has proposed applying to 2007 costs.

3.3 State Incentives

In 2000, the California Energy Commission (CEC) adopted incentives, in the form of buy down rebates, for small wind systems. With incentives in place, Guasti Construction's requests for system installations took off. Table 4 summarizes the number of systems installed by year.

Table 4 also shows the associated rebate available in each year. These data reflect the level of activity to Guasti's business as a function of the amount of the rebate. During the period 2001 – 2003, the rebate was 50% of the total system costs. Customer's decision to install, if influenced by the rebate amount, is not easy to tease out from these data. Beginning in 2004, the CEC formula for calculating the incentive changed, and was based on the size of the project. In addition, the amount of the incentive began decreasing, from $19,590 (2004) to $17,730 (late 2004), and to $13,870 at its lowest in early 2005.

Several factors caused the amount of the rebate to vary. Between 2001 and 2003, although the rebate was 50% of total system cost, the system cost varied due to differences in the height of the tower (ranging from 60 to 120 ft./18 to 36 m) as well as increased prices by the manufacturer. Although the calculation for the rebate was held constant at 50%, the absolute amount of the rebate increased.

With the decreasing incentive, small wind turbines were not likely to be installed except by those who had ample discretionary resources available. Guasti and others went to the CEC to testify, encouraging the Commission to increase the incentive. Much to their delight, the CEC increased the incentive to its current level of $21,150.
The two-tiered rebate for grid-connected small wind systems is available to customers in the utility service territories of SCE as well as Pacific Gas & Electric, San Diego Gas & Electric and Bear Valley Electric, with the first 7.5 kilowatts (kW) eligible for $2.50/watt and an additional $1.50/watt for installed capacity between >7.5kW and < 30kW. All customer classes are eligible (i.e., residential, commercial, institutional (such as schools), agricultural, and industrial).

TABLE 4: SMALL WIND TURBINE SYSTEMS INSTALLED, BY YEAR

YEAR	REBATE (Range)	UNITS INSTALLED	NOTES
2001	$16,325 to $16,870	6	Rebate = 50% system cost
2002	$16,325 to $23,498	18	Rebate = 50% system cost
2003	$16,325 to $25,125	16	Rebate = 50% system cost
2004	$21,450 at 50% rebate; $19,590 to $15,870	21	CEC changed basis for incentive; 5 installs in 2004 carryovers from orders placed in 2003 and eligible for the 50% rebate
2005	$17,730 to $14,010	11	CEC decreased incentive twice
2006	$21,150 to $21,450	17	Maximum CEC rebate
2007	$21,150	13	Maximum CEC rebate
		102	Total systems installed to date

Approximately 8 turbines were ordered at each of the 3 incentive levels during 2004 – 2005. Once the incentive increased to $21,150 (2006), orders increased over 50% from 11 in 2005 to 17 in 2006.

Table 5 summarizes the percentage change in orders placed. Based on the number of systems ordered thus far in 2007 (13 through March), Guasti Construction is on schedule to install over 50 systems, an estimated 3-fold increase between 2006 and 2007.

TABLE 5: PERCENTAGE INCREASE IN TURBINE SYSTEMS ORDERED, BY YEAR

Time Period	Total System Ordered	Percentage Change (over previous yr)
2001 - 2002	24 (12/yr avg)	
2003	21	75%
2004	16	-24%
2005	11	-31%
2006	17	55%
2007	13 (52 annual estimate)	206%

3.4 Permitting Requirements

Guasti Construction has been installing small wind systems since 2000. Based in San Bernardino County, California, a few of their initial small wind system customers were located in Riverside County. However, due to a significant difference in permitting requirements between the two counties, both in terms of cost and time, 99 out of 102 wind systems installed to date have been installed in unincorporated San Bernardino County.

While installing small wind turbines in San Bernardino County is permitted on a case-by-case basis, the process is fairly streamlined. Joe Guasti developed stock plans for different tower heights (60', 80', 100' and 120'), however each proposed installation is reviewed specific to the lot. Set back concerns are evaluated. Notices of intent to install a turbine must be sent to all neighbors adjoining the proposed site. The review of each project takes approximately 5 weeks.

Permitting costs in San Bernardino County are also well established. These include a planning permit ($495), stock plans ($247 when a 100' tower is used), torque inspection ($69), and a pre-site permit ($50 – $60), totaling under $1,000. Understanding what is required, what the process is, and how much this aspect of the project will cost provides certainty for the installer for both time and cost that can be passed on to the customer.

Other jurisdictions are not so transparent. In Riverside County, for example, the process may take a year or longer and cost upwards of $6,000. The process is not well defined and the costs not necessarily aligned with the project. These barriers limit the number of small turbines installed, especially when compared to San Bernardino County.

3.5 Economic Driver

When the Mitchel's were looking to purchase a home, the neighborhood they were interested in had several to choose from, but only one with a wind turbine (Photo 2).

Although the asking price made it the highest priced home ever sold in the neighborhood, and the real estate agent tried to convince them it was too high, the Mitchel's wanted the house. They knew the energy costs for the existing pool, hot tub, and the expected air conditioning costs would be high, and they hoped the existing wind turbine would help defray those costs.

Two years later, they now look forward to replacing the blades with newer blades that are expected to generate significantly more energy. As homeowner Andrea Mitchel says "we paid a premium to get the wind turbine. It was the best investment we could have made. Our electricity bill is 2/3 lower than they would be if we didn't have the wind turbine."

NREL PIX #14982

Photo 2. A. Mitchel with J. Gausti − This homeowner looks forward to replacing blades to increase output even more.

Another homeowner, Marc Schambers, also had a wind turbine installed to offset his utility bill. When he and his family decided to build a new house, they made sure they took their wind turbine with them. When asked why, Marc said "I was taking the wind turbine purely for the economic benefit. The savings are so substantial − I love this wind turbine." Marc also said "two of the 10 most pleasurable things to see is when your meter runs backwards and when you get a bill from the utility and it has a credit." The Schambers are spending about $12,000 to reinstall their turbine on their new property ($10,000 to move the turbine and another $2,000 in cables), an investment they are more than willing to make.

Kelly and Lisa Maxwell recently installed a wind turbine (Photo 3 and 4). With seasonally variable electricity loads, the Maxwell's opted to sign up for SCE's average billing plan, which resulted in $1,500/month bills. The wind turbine has significantly reduced their bills, by an estimated

50%. The Maxwell's are looking for opportunities to further reduce their dependency on the local utility, and want to produce their own electricity from environmentally friendly technology.

After purchasing the adjoining undeveloped lot, they decided to install a second turbine. However, they are facing some permitting barriers, which require a structure on the property. They continue to examine what opportunities they may have, which may include installing PV panels on a shed they plan to build. But their preference is for a second wind turbine.

NREL PIX #14984

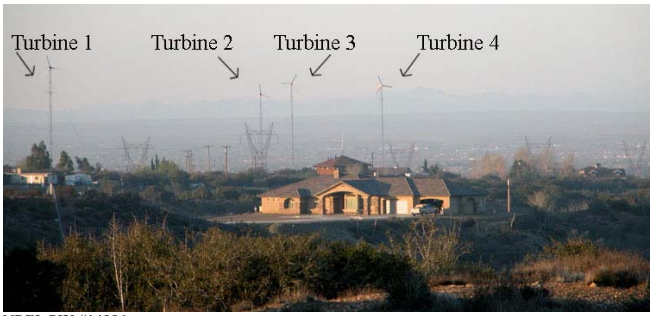
Photo 4. The Maxwells are considering installing a second wind turbine, and possibly a PV system to further offset energy needs.

NREL PIX #14983

Photo 3. Wind turbine at the Maxwell's 10-acre compound.

3.6 Environmental Drivers

One of the issues brought up by some homeowners is the aesthetic intrusion of small wind turbines. As seen in Photo 5, viewshed intrusion is a subjective issue. In more developed areas, many obstructions may already exist in the surrounding viewshed. The turbines themselves are often hard to see unless pointed out. In this example, a very large and expensive home is nestled in a landscape surrounded by transmission towers and basked in smog. The surrounding neighborhood supports 20+ small wind turbines.



NREL PIX #14986

Photo 5. Viewshed intrusion is a subjective issue.

In one neighborhood, a few homeowners banded together to try to influence the Planning Department to impose stricter regulations for approving the installation of small wind turbines. There concern was aesthetics. They gathered 300 signatures in support of stricter requirements, telling one neighbor (Gary Samples) that the changes would result in making him take down his wind turbine. On the other side of the issue, those in favor of the wind turbines gathered 3000 signatures. In the end, Gary kept his wind turbine, but the Planning Department did add a few additional requirements, including notifying neighbors of intent to install a turbine. As Gary put it, "maybe I'm not doing much, but I'm making a contribution in the right direction." His turbine has produced 27,334 kWh over a 24-month period, averaging a little more than 1,100 kWh/month. The turbine provides for all the homeowner's electricity needs.

3.7 National Security Driver

For some, national security is a real concern. Bob and Laura Breitel viewed installing their own wind system as one way they could contribute to reducing US dependency on foreign oil. But when they decided to subdivide their property, giving half to their son, they were told that due to existing permitting rules they would have to give up their turbine. The existing wind turbine would be too close to the new property line.

However, after some discussion with their original installer they found out that they could have it moved. The cost to relocate the turbine closer to their home, and retain its benefits was $7000 (Photo 6).

NREL PIX #14985

Photo 6. The Breitels with Mr. Guasti – these homeowners paid to relocate the turbine on their property after they subdivided it.

4. OTHER ISSUES TO CONSIDER

This case study focused on some of the key reasons homeowners are opting to invest in wind turbines in San Bernardino County. Since these systems have only been installed for a short period of time (<7 years), data on other decision criteria would be useful to get a better understanding of what factors will play a key role in expanding this market. For example, data on long-term reliability (including inverters), production, and safety over time would be valuable. Information on other environmental factors, including wildlife (including avian) impacts and noise would be beneficial. Return on investment and homeowner payback calculations would also be useful in understanding the basis for homeowner decisions to purchase small wind turbines.

5. ECONOMIC DEVELOPMENT IMPACTS

How does a local company stimulate economic development? Joe Guasti installed 6 systems in 2001 − his business is on track to install over 50 systems in 2007. In this case study, in just a few years, what started as a one-man operation (with some administrative support from his wife in the evenings) has now evolved into an opportunity for 6.75 FTE staff, expanding the participation of 2.75 FTE additional family members and 3 FTE additional installers.

While numerous factors contributed to the growth of this business, without state incentives and a well-defined permitting process, other factors would probably not have been sufficient to accelerate the growth in this business.

6. NEXT STEPS

The small wind turbine industry can contribute to economic development, both at the county level and at the state level. NREL is currently in the process of adapting the Jobs and Economic Development Impacts (JEDI) model (which was originally developed to estimate the economic impacts from large wind farms) to model the economic impacts from the small wind industry. It is anticipated that modifications to the JEDI model will be completed by the end of 2007, at which time we will conduct an analysis for San Bernardino County. Using assumptions based on this case study, JEDI will help us understand the direct, indirect and induced economic impacts resulting from a localized small wind industry. We also anticipate conducting a second analysis to estimate what the potential economic development impact could be on a statewide basis.

7. CONCLUSION

The success of one installer's small wind-turbine business is the result of both state rebates (currently at a maximum of $21,150 per system in CA) coupled with a more streamlined

permitting process in San Bernardino County (especially when compared to the installer's experience in Riverside County) and has resulted in a year round demand for new systems. High electricity consumption combined with high utility rates provide further incentive for homeowners to seriously consider installing their own wind turbine.

Generally, these customer's monthly electricity bills previously ranged from $200-$400 and up to $600 for some customers. However, with their load now being met by small wind turbines, these customers now have annual electric utility bills ranging from $0 to a few hundred dollars.

8. ACKNOWLEDGMENTS

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