OWNERSHIP AND TAX STRUCTURE IMPLICATIONS FOR WIND ENERGY INVESTMENT*

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INTRODUCTION

In recent years three main factors have led to increased development of wind power: greater awareness that fossil fuel supplies are limited and alternative sources are needed, increased concerns over global warming, and the increasing economic competitiveness of wind energy. All three factors are likely to remain important, necessitating a thorough understanding of the conditions that drive development of the wind energy industry. Recent research on wind energy has focused on its environmental impact, the rate of development, the economic impact on communities and states, and technical studies on future advances, but little study has focused on how incentives depend on ownership and tax structures. Understanding these differences will give greater insight into why the industry has developed the way it has, as well as help develop strategies to guide future development.

Over the past two decades, wind power has gone from a novel concept among environmentalists to the second fastest growing component of the United States electrical system. Wind production in the United States has increased from ten Megawatts (MW) in 1981 to 11,575 MW in 2006 (Wiser and Bolinger, 2007). Much of this expansion has occurred in recent years; installed capacity increased by 36 percent in 2005, 27 percent in 2006, and 45 percent in 2007 (Wiser and Bolinger, 2007; American Wind Energy Association [AWEA], 2008). Wind power accounted for 19 percent of new capacity added to the United States electrical grid in 2006, second only to natural gas production (Wiser and Bolinger, 2007).

Worldwide, wind production is by far the fastest growing source of new energy, increasing 29 percent in 2004 compared to 2.5 percent for natural gas, 2.3 percent for coal, and 1.9 percent for nuclear power. From 2000 to 2005, worldwide production of ethanol increased 165 percent (Brown, 2006), while worldwide wind energy production increased by 200 percent (Wiser and Bolinger, 2007). The United States has added more wind energy capacity than did any other nation in 2005 and 2006, but the European Union (EU) as a whole added more than three times the capacity added by the United States during the same time. The EU had over four times as much installed capacity as did the United States at the end of 2006. Because of this and other energy strategies, Europeans consume half as much oil per capita as Americans (Phillips, 2006). Despite recent growth, wind production still accounts for only 0.9 percent of worldwide electrical output and 0.8 percent of United States output (Wiser and Bolinger, 2007).

Due to environmental considerations and the national energy security advantages of wind power, it has received a significant amount of media attention and government support in recent years (Runge and Tiffany, 2007). With these considerations in mind, the United States Department of Energy has set a goal of 100,000 MW of wind capacity to be installed by 2020 (National Renewal Energy Laboratory [NREL], 2004). Achieving this goal will require annual capacity growth of 18 percent (Runge and Tiffany, 2007), creating \$60 billion in private capital investment, \$1.2 billion in new farm income, and 80,000 well-paying jobs (NREL, 2004). This newly important resource provides welcome relief for rural communities that have seen their populations and economies dwindle (Chiles, 2000), providing increased property taxes, more construction and maintenance jobs, returns on new direct investments, and new lease payments to land owners.

Government Incentives

The most important current United States wind energy incentive is the federal Production Tax Credit (PTC), first established by the Energy Policy Act of 1992. The PTC provides a ten year tax

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credit originally set at 1.5 cents per KWh of wind energy that adjusts with inflation and in 2006 was 1.9 cents per KWh (Wiser and Bolinger, 2007). Feasibility of proposed projects is often decided by availability of this credit (Kildegaard and Myers-Kuykindall, 2006), as is evident in the industry's significant growth slowdown when the credit was allowed to expire during parts of 1999, 2002, and 2004 (Wiser and Bolinger, 2007). See Figure 1 and Table 1.

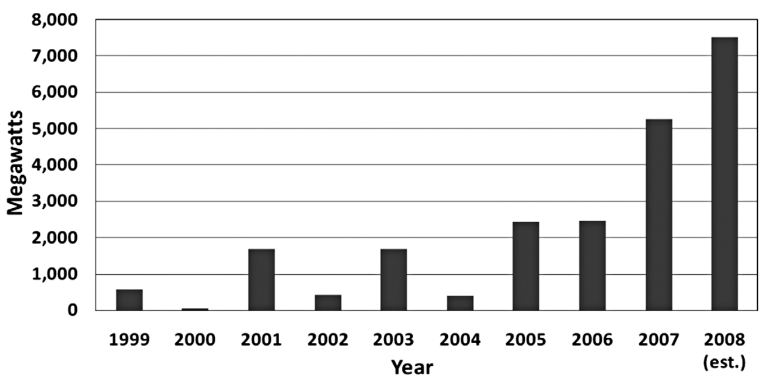
In recent years, other federal incentives have been enacted to aid the development of wind energy. An accelerated 5-year depreciation schedule for wind energy assets for federal tax purposes (Wiser and Bolinger, 2007) allows tax saving early in a project. Clean Renewable Energy Bonds (CREBs) (which can be issued by government bodies, Indian Tribal governments, and electric cooperatives) allow the bondholder to receive a tax credit equivalent to the interest that would have been received (Oswald and Larsen, 2005). During 2006 nearly $206 million worth of CREBs were awarded to wind projects. The USDA Renewable Energy and Energy Efficiency program makes grants to encourage farmers and rural businesses to utilize renewable energy sources and energy efficient technologies. During 2006, $4.075 million was dispersed to support 14 wind projects. State and local incentives may influence location decisions, but federal incentives are often necessary to make a wind energy facility viable (Wiser and Bolinger, 2007), so this paper focuses only on federal tax incentives.

Ownership Structures

Wind industry ownership structures run the gamut from small, privately or publicly financed entities to large-scale corporate-owned wind farms. In the most common form of local private ownership, land owners, farmers, and local investors form a limited liability corporation (LLC) that raises a portion of its financing through the sale of shares and the remainder through debt, and sells its power to utilities through a long-term power purchase agreement. LLCs' incomes are passed through to individual investors to be reported on their individual tax returns, thus subject to individuals' tax rates. Because income from the LLC is passive income for most shareholders, and the PTC can only be used against other passive tax liabilities, LLCs also suffer from inability to fully utilize the PTC (Kildegaard and Myers-Kuykindall, 2006). Despite this disadvantage, locally owned LLCs often generate more income for local land owners than do lease or royalty payments from corporate-owned facilities (Chiles, 2000).

Despite recent growth in community wind, large scale corporate-owned wind projects still account for over 95 percent of the wind capacity in the United States (Wiser and Bolinger, 2007). Under this structure, corporations such as Florida Power and Light, Goldman Sachs, British Petroleum, and others develop large scale wind farms often in excess of 100 MW (Wiser and Bolinger, 2007). Corporate-owned wind farms are often referred to as "balance sheet financed" since the wind project is simply added to the existing balance sheet of the

Figure 1: **U.S. Wind Power Capacity Installed**



Sources: 1999 - 2006: Union of Concerned Scientists, 2008.
2007 - 2008: American Wind Energy Association, 2008.

Table 1
Production Tax Credit History

Expired Jun 99, extended Dec 99
Expired Dec 01, extended Feb 02
Expired Dec 03, extended Oct 04
Extended Aug 05, before expiration
Extended Dec 06, before expiration
Extended Oct 08, before expiration

Source: Union of Concerned Scientists, 2008.

company and financed at the corporation's overall weighed average cost of capital (Bolinger, 2001).

MODEL

The goal of this study is to examine interactions among ownership structures and federal incentives, especially tax incentives, in influencing investors' choice of ownership. We do this by using a representative firm model to estimate Internal Rate of Return (IRR) and Net Present Value (NPV) for different ownership structures. This model follows the general approach of representative firm analyses, such as the AFTAX model (Papke, 1995; Papke, 1987; Papke and Papke, 1986) and the work of Fisher and Peters (1998). To focus on ownership, we assume the same revenue and cost structures for each alternative.

A firm with other income can depreciate a wind energy facility against its overall income from all operations, lowering its overall tax burden. Rapid depreciation in a project's early years may exceed that project's net revenue in those years, reducing the firm's taxable income, in effect raising the after-tax return from that particular project. This enhances the project's marginal return, where the "marginal" decision is whether to undertake or reject the entire project. The same applies to the firm's ability to apply a credit such as the PTC to tax liabilities incurred on income other than that generated by the project being studied.

To estimate tax effects, we add the wind-facility-produced increase in net income to the (individual or corporate) taxpayer's other income, apply applicable tax provisions including special provisions for the wind energy facility, then apply the tax rate schedule(s), producing total tax liability with the wind energy facility in operation. We use the same methodology to calculate tax without the wind energy facility. The difference in these two figures is the marginal tax effect of the wind facility investment. We assume no changes in the federal or state tax codes, including the three primary federal incentives for wind energy production—Section 179 expensing, MACRS depreciation, and the PTC—during the facility's 20-year expected life.

Assumptions

The typical wind turbine installed in 2006 sits on a tower 70 to 100 meters high (Comis, 2006 and Brown, 2006) and has a production capacity of 1.5 MW (Wiser and Bolinger, 2007). Eighty percent of the cost per KW of wind power is initial capital expenses (AWEA, 2007). Estimated costs for this study are from the National Renewable Energy Laboratory's Jobs and Economic Development Impact (JEDI) model, which gives estimates of windmill capital cost per MW of \$1.65 million and breaks down the initial capital expense into its components, as detailed in Figure 2 (NREL, 2007).

Assumptions about annual operating costs per KWh are based on data compiled by Walford (2006). Because most projects have only been operational for a limited amount of time, the observed data was extrapolated to estimate operating costs in later years. Operating costs start at \$0.0031 per KWh in Year 1 and increase to \$0.0084per KWh by Year 20; four of the six costs stay flat while two increase significantly as the facility ages (Walford, 2006). See Table 2 and Figure 3. These data assume a 49.5 MW project consisting of 33 turbines with 1.5 MW capacity per turbine. This reflects the most popular size of turbine in use during 2006 and a medium-size wind development large enough to take advantage of many of the possible economies of scale (Wiser and Bolinger, 2007).

While some ideal sites in the United States nearly always have high wind speeds, most facilities on average utilize 35 percent of their capacity with winds that average 14+ miles per hour (Darack, 2005). For this study, we assume that wind farms use 36 percent of capacity, the average for projects developed since 2003 according to the United States Department of Energy (Wiser and Bolinger, 2007).

For over two decades, the wholesale price of wind energy steadily fell as projects became more efficient. However, 2006 saw about a 40 percent increase in wholesale prices for wind energy, with further increases expected. Wholesale prices typically have an 18-to-24 month lag between the contract being negotiated and the facility going

Figure 2: **Percent of Construction Cost**

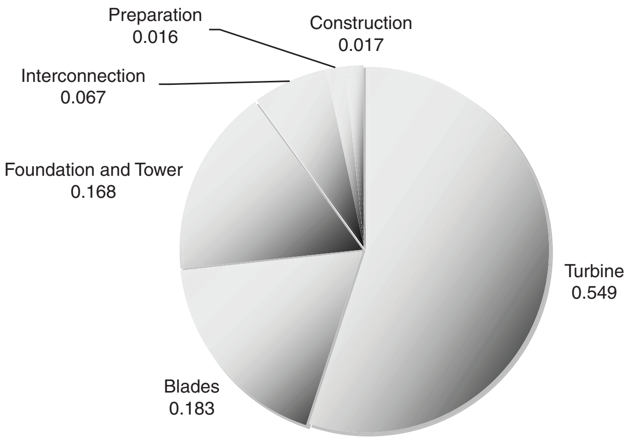
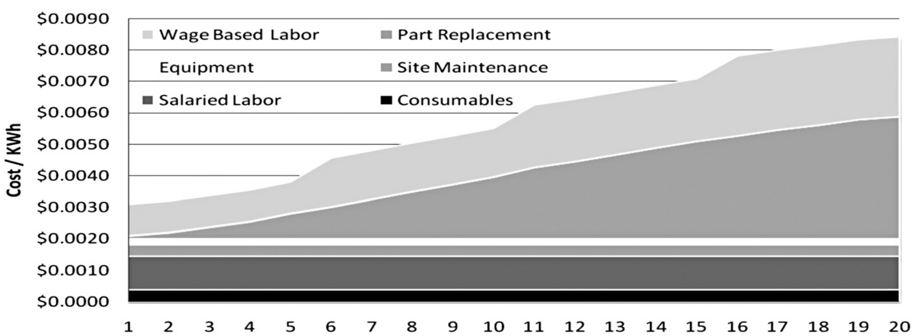


Table 2
O & M Costs

Category	*Constant/Variable*	*Description*
Parts Replacement	Variable	Costs for new and repaired parts, crane rental when required
Wage-Based Labor	Variable	Maintenance and service technicians
Consumables	Constant	Turbine lubricants, filters, and electricity consumed
Salaried Labor	Constant	Site manager and office staff
Site Maintenance	Constant	Roads, fences, buildings, meteorological equipment
Equipment	Constant	Trucks, tools, office, and shop supplies

Figure 3: **O & M Costs: First 20 Years of Operation**



Source: Walford, 2006

online. Thus, facilities entering production in 2007 reflect contracts negotiated in 2005 and 2006, just as these higher costs were entering the supply chain (Wiser and Bolinger, 2007). To be consistent with our 2007 cost estimates, we use a wholesale price of $0.060/KWh, assuming the price increase for 2007 was just over half the percentage increase for 2006. While the assumed price will affect the expected return, it should not affect the comparative results as long as it is high enough to ensure a before-tax profit in each year.

We assume that inflation is zero to isolate the effects of varying tax structures and ownership models. Parts replacement and wage-based labor increase in real terms due to increased repairs as the facility ages. All other costs, as well as the wholesale price of the product, are fixed for the 20-year duration of the model.

The capital structure plays a crucial role in the tax effects generated by a wind facility as well as the return on investment. This study analyzes two ownership structures, corporation and LLC. Each scenario consists of 1.5 MW turbines with an initial capital outlay of $1.65 million per MW. Large corporations finance their projects through balance sheet financing, which results in the facility being added to the overall corporate capital structure with a small impact on the corporation's cost of capital. For a small locally owned LLC, the investors would choose the mix of debt and equity that brings risk to a level they view as acceptable while considering the tax benefits of debt financing. Recognizing that the capital funding structure of wind energy facilities will vary widely, we assume a mid-range combination of 50 percent debt financing and 50 percent equity financing for both large corporations and locally owned LLCs and an interest rate of 8 percent. Holding these factors constant allows us to specifically focus on how taxes affect the returns on investment.

We assume the corporation has $20,000,000 of other net income, enough to absorb the full effect of tax incentives and place the corporation in the 35 percent marginal tax bracket. For locally owned LLCs, we assume each individual taxpayer has $100,000 Adjusted Gross Income (AGI) before the effect of the wind power venture is added or subtracted, files a joint return, and has three exemptions and $21,000 itemized deductions.[1] For 2007, this places individual investors in the 25 percent marginal bracket, although depreciation allowances (discussed below) sometimes drop them into the 15 percent bracket.

Tax Provisions

The tax code allows expensing of up to $125,000 in 2007 for section 179 eligible property, including depreciable wind energy properties (U.S. Department of the Treasury, 2007a, Chapter 2; Commerce Clearing House [CCH], 2008, ¶ 1208). Depreciable costs that do not qualify under Section 179 or that exceed section 179 limits qualify for a further incentive under the Modified Accelerated Cost Recovery System (MACRS). Even though the expected lifetime of wind towers and turbines is about 20 years, they are classified as 5-year property for tax purposes and are thus subject to accelerated depreciation (U.S. Department of the Treasury, 2007a, Chapter 3; CCH, 2008, ¶ 1240).

The final component of federal tax incentives is the Production Tax Credit (PTC), which was 1.9 cents per KWh in 2006 (U.S. Department of the Treasury, 2007b). (This credit was extended in the Energy Improvement and Extension Act of 2008, Division B of H.R. 1424.) When passed through to individual investors in a partnership, the PTC can only be used against other passive income, while corporations are active investors and can offset taxes on other active income. As a result, large corporations are able to utilize the credit while investors in LLCs typically do not have enough passive income to fully use the credit.

Preliminary work not reported here indicates that because of the federal provisions already discussed, differences in ownership structures have much more effect on after-tax returns than do location-determined state and local tax differences. States run the gamut from no specific tax incentives for wind power investment to very generous incentives such as exempting or dramatically reducing sales and property taxes. Of the states studied so far, South Dakota's return is the median, so we use South Dakota's tax structure for both scenarios. South Dakota exempts about a quarter of property tax and half of contractor's excise tax.

RESULTS

Corporate Owned

Mid- to large-scale corporate ownership accounts for most American wind energy development. Figure 4 shows the tax effect for each year of corporate ownership of the wind energy facility described by the above assumptions.

Figure 4: **Marginal Tax Effect of Wind Investment by Corp.**

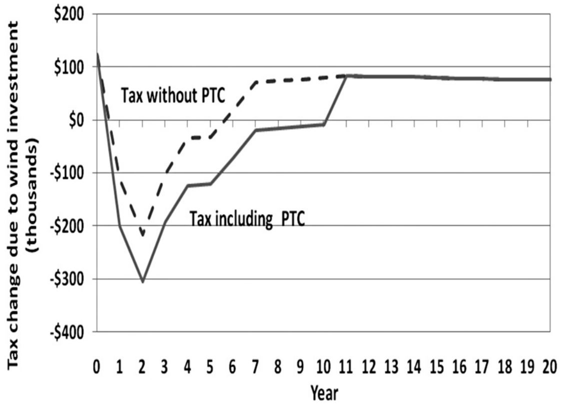
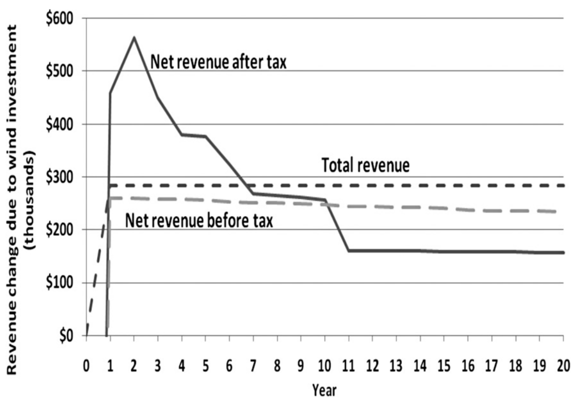


Figure 5: **Marginal Revenue Effect of Wind Investment by Corp.**



Taxes in Year 0, the year of construction, are our assumed state 4 percent sales tax and 1 percent contractor's excise tax. In Year 1 through Year 5, the rapid depreciation allowed by the MACRS 5-year schedule and the (much smaller) Section 179 expensing more than offset federal, state, and local taxes incurred on the wind power project alone, providing a tax subsidy to the corporate owner. Because the corporation is assumed to have other profits against which to apply this depreciation, its marginal tax effect is negative. In Year 1 through Year 10, the PTC further reduces the corporation's liability.

Figure 5 integrates tax effects with other cash flows to show this project's marginal effect on the entire corporation's cash flows. There is no revenue in Year 0, before the facility begins producing electricity, and revenue is constant through the project's lifetime because of assumed constant output and wholesale selling price. Before-tax cash flow is highly negative in Year 0, due to construction costs, turns positive as the firm sells electricity, and gradually declines as aging facilities require more operation and maintenance. After-tax cash flow shows the benefit of the tax subsidy during the project's first 10 years.

LOCALLY OWNED LLC

Locally owned LLCs account for about 4 percent of the wind development in the United States (Wiser and Bolinger, 2007). Most are structured as partnerships and thus taxed at individual income tax rates. As Figures 6 and 7 show, the patterns over the project's lifetime are much different from those for a corporation. Small investors typically have little or no other passive income against which to apply the MACRS accelerated depreciation or the PTC. Operating losses can offset only passive incomes, but can be carried forward to future years. Individual investors pay no added federal income tax in the project's early years, but they also cannot garner a tax subsidy the way a corporation can. Accelerated depreciation exceeds project revenue for the first five years, exactly offsetting net revenue, with excess depreciation carried forward. Operating losses carried forward in earlier years are exhausted in Year 14, when the project's passive taxable income turns positive, and investors pay federal income tax through the remaining years. In the first 13 years, taxes attributable to the project are limited to state and local taxes.

In summary, some benefits from MACRS accelerated depreciation are delayed for LLC investors,

Figure 6: **Marginal Tax Effect of Wind Investment by LLC**

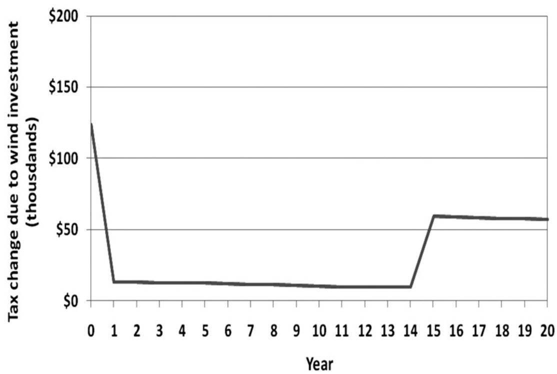


Figure 7: **Marginal Revenue Effect of Wind Investment by LLC**

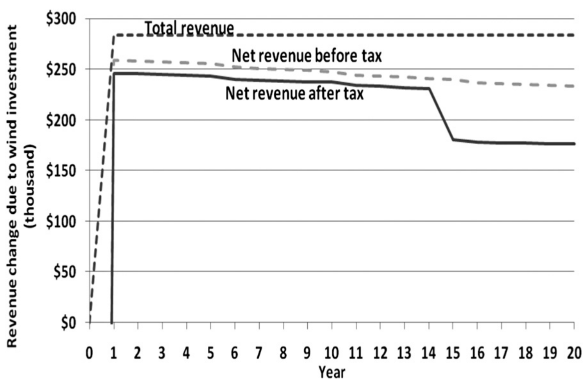


Table 3
Return and Net Present Value Measures

	Internal Rate of Return	*Total Taxes*	*NPV of Taxes*	*NPV of Cash Flows*
Corporate	11.16%	($148,448)	($439,272)	$421,696
Local LLC	6.12%	$634,575	$290,190	($307,767)

Discount rate = 8 percent

as compared to large corporations, and LLC investors do not benefit from the PTC because it applies to only passive income in Year 1 through Year 10. Both effects result in lower IRR and NPV for LLC investors. Summary measures in Table 3 show a considerably higher IRR for corporations.

CONCLUSION

Rapid development of wind power is becoming increasingly important as the United States seeks to reduce pollution from traditional energy sources and decrease reliance on foreign energy. This paper highlights flows of after-tax net revenues for the most common ownership structures in parts of the United States that have vast wind resource potential. The results clearly indicate that corporate ownership will be the structure of choice for adding to wind power capacity as long as current federal incentives remain in place. Unless locally owned LLCs are allowed to fully utilize the PTC, section 179 deductions, and MACRS deductions, corporate facilities will continue to dominate the landscape.

While these benefits allow for rapid progress on more aggressive national and state renewable energy goals, in most situations local ownership results in greater economic impact for the communities in which these facilities are located. For example, a locally owned LLC may be composed of many local land owners and each benefit from the revenue produced, while a large corporate-owned facility in the same area may use an out-of-state construction company to build hundreds of turbines on property owned by only a handful of landowners who see large returns while neighboring land owners and the local economy receive fewer benefits.

Recommendations for Future Study

Controlling all variables except ownership structure allows for effective study of tax implications, but it also limits the estimates of true cash flows. Economies of scale were not included in the analysis. It is impossible to predict the exact tax effects when cash flows are passed though to partners in local LLCs, so averages were used. Some sensitivity analysis—for example, with alternative assumptions about investors' incomes—could enhance our findings.

To circumvent the problem of less-than-full use of the PTC, local (and, increasingly, nonlocal) investors enter into a "flip structure" agreement with a partner that has a large enough tax liability to utilize the PTC (Kildegaard and Myers-Kuykindall, 2006). Although the flip structure is used by smaller projects, in recent years larger scale nonlocal investors, including foreign utilities and investment groups, have increasingly utilized it (Harper, Karcher, and Bolinger, 2007). Modeling the flip structure is much more complicated, but might also enhance our understanding of tax incentive effects.

With some modifications the model could be expanded to examine the induced and indirect economic effects of wind energy facilities, such as manufacturing activity, construction activity, and operation and maintenance jobs. The JEDI model currently examines many of these effects and, used in conjunction with the model developed for this study, could enhance policy decisions at local, state, and national levels. This study could be expanded to other states with extensive wind energy potential, to provide a more complete understanding of tax implications for wind energy development and how they compare to other incentives.

A more complete analysis would recognize the declining risk of the investment over the project's life, resulting in a declining required rate of return and discount rate. To simplify the analysis and isolate the key variables, the same required rate of return (8 percent) is used for both debt and equity capital and no consideration is given to declining leverage over the project's life and the attendant effects on the return analysis. The effect of these simplifications would be similar across the different states and projects being studied. Hence, the conclusions would probably remain essentially unchanged, especially since the cash flow patterns of the projects are relatively straightforward without multiple changes in signs over the years. Nevertheless, this could be a useful addition to our analysis.

Note

[1] The following considerations guide these assumptions. Our assumed AGI approximates twice the median U.S. household income in 2007 of $50,233 (U. S. Census Bureau, 2008), since investors in such facilities are presumably higher-income individuals. This places our hypothetical taxpayer in the 25 percent federal income tax bracket and at the 88th percentile for individual returns filed in 2006. Returns in the $75,000 - $100,000 and $100,000 - $200,000 classes averaged 2.75 exemptions and just over $21,000 (standard or itemized) deductions in 2006 (U.S. Department of the Treasury, 2008).

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