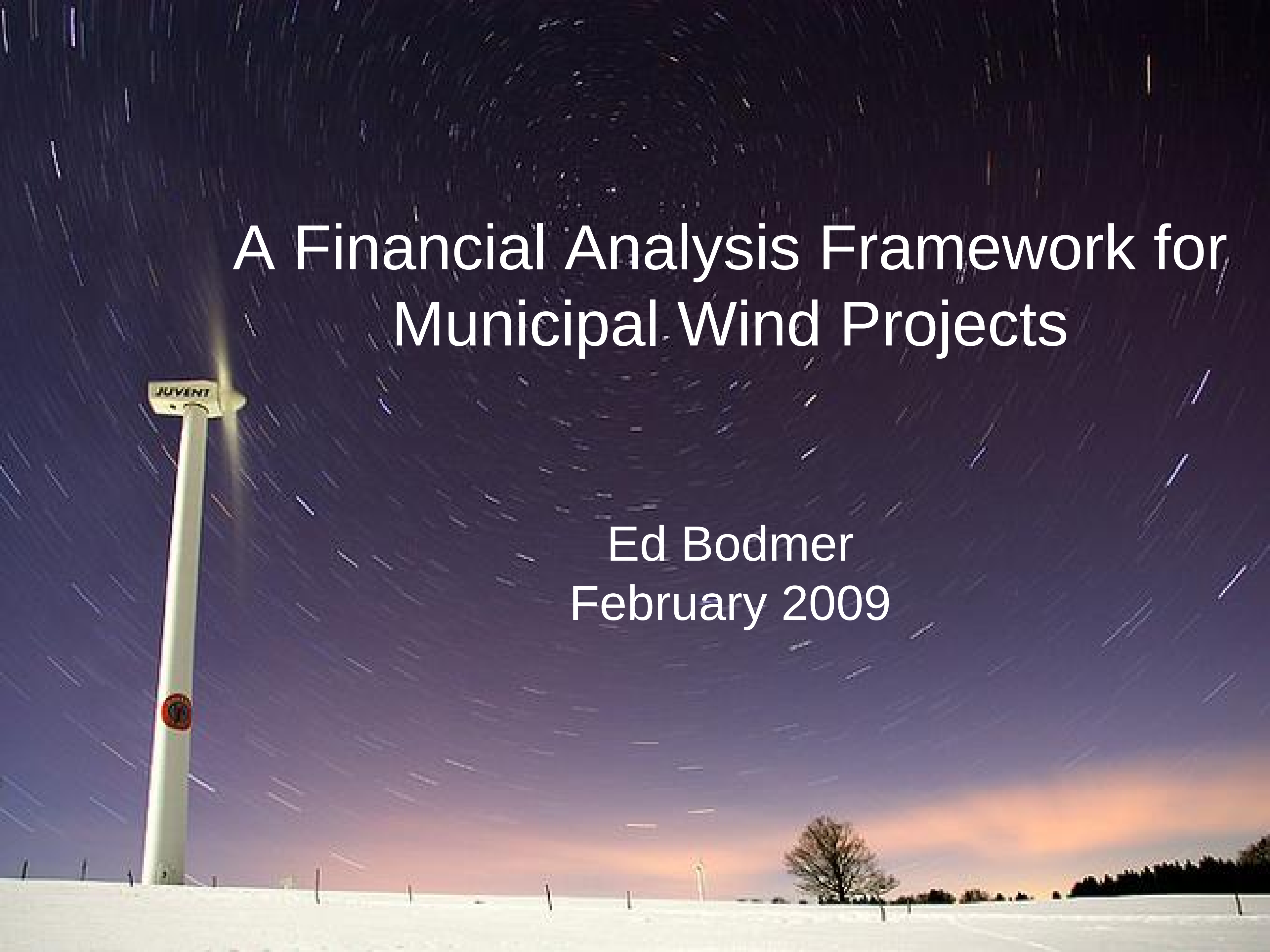


A Financial Analysis Framework for Municipal Wind Projects

Ed Bodmer
February 2009

Please Note

The models presented herein have not been reviewed, approved or otherwise vetted by either the Internal Revenue Service of the United States of America or the Massachusetts Department of Revenue. Because of the complexity of these models, the various financing structures that are not presented here but that may be available to facilitate renewable energy generation projects, and the potentially serious tax ramifications of selecting a particular model or structure, viewers of these models are very strongly encouraged to consult with a professional tax advisor before taking any other significant actions.

Introduction

General Objectives of Financial Analysis

- Will not go through details of financial models, but rather focus on how financial analysis should be interpreted and used in making investments.
- Focus is on the ***perspective of municipalities*** and how financial analysis can be used to assess wind project investments:
  - How to screen the cost and benefit of projects
  - How to analyze risk of projects with models
  - How to evaluate structuring options (e.g. private versus municipal ownership versus flip structure)

Financial Perspective on Community Wind Investments

- Lessons from Financial Crisis on Risk Assessment
  - Risk Analysis
    - Back to basics (break-even and sensitivity analysis)
    - Risks of physical factors such as wind easier to deal with than risks that involve human beings
  - Complex Structuring
    - Understand the basic economics of an investment before working on complicated structures
    - Understand the risks and the underlying sources of value in complex financial structures
  - Financing and Return Requirements
    - Required returns have increased because people and businesses are afraid of taking risk
    - Lenders may be more conservative in making loans to private investors and municipalities when assessing risk
- Evaluation of risks of capital investments
  - Capital Intensity of Renewable Projects
  - Which Risks are Most Important

Review of Some Terms in the Model

- Cost of Project: $/kW
- Operation and Maintenance: Cost/kW/Yr or Cost/MWH
- Wholesale Price of Electricity: $/MWH
- Renewable Energy Credits (RECs): $/MWH
- Net Metering: $/MWH
- Capacity Factor: Percent
- Availability Factor: Percent
- Production Tax Credit (PTC): $/MWH
- Accelerated Tax Depreciation Method (MACRS)
- Development Period
- Construction Period

Meaning of a Few Financial Statistics

- Cash Flow
  - Project Cash Flow (No Financing)
  - Equity Cash Flow (Including Debt Financing Effects)
- Project IRR
  - Compare return on free project cash flow to the town interest rate on debt issues
  - Use the town interest rate in break-even analysis
- Equity IRR
  - How much put in and how much take out of your pocket
  - Used by private investors
- Payback Period
  - Theory and practice
  - Equity or Free Cash Flow
- Discount Rate
  - Town
  - Private
- Net Present Value of Free Cash Flow
  - Related to the project IRR
  - See what it takes to make negative
- Net Present Value of Equity
  - Related to Equity IRR
  - Value to Investors

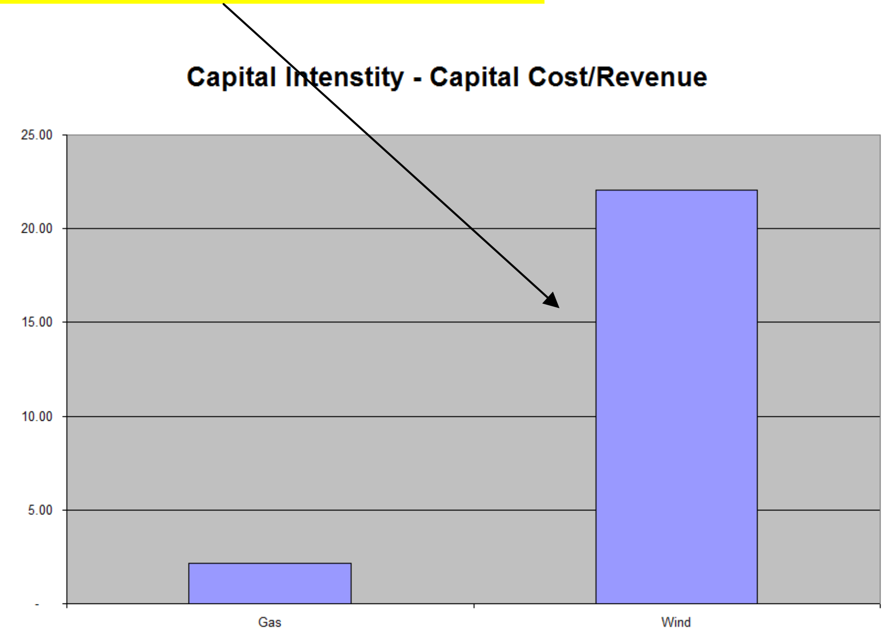
Structuring Terms

- Town or Municipal Ownership
  - Town owns the wind project and realizes savings in electric bills or sells power to the grid
- Private Financing
  - A private entity builds the project and acquires funds for the project. In return, the town signs a contract for power with the private investor to compensate for costs.
- Hybrid Financing
  - A private entity and a municipality both retain ownership in the project in one form or another. The precise form of mixed ownership is constrained by income tax regulations which can be restrictive when it comes to combining a non-tax paying municipality with a taxable investor.

Importance of Structuring Issues Given the High Capital Cost Relative to Total Cost

- Structuring Issues
  - Municipal Ownership or Private Ownership
  - REC Contracts
  - Capital Grants
  - Hybrid Private and Municipal Ownership
- Capital Intensity
  - The adjacent graph shows the capital intensity of Wind versus Natural Gas (natural gas is from a utility presentation and is lower because of the high amount of fuel costs in the total)

High capital intensity of wind means that fluctuations in revenues aggravate the variation in returns for wind investments



Cost Benefit Analysis in Making Wind Investment

- Cost and Benefit Analysis from Town Perspective
  - Savings from Lower Electricity Costs and Incentives
    - Versus
  - Capital Costs (Interest Expense and Debt Repayment)
  - Operating and Maintenance Costs
  - Other Costs
- Example:

Free Cash Flow

	2009	2010	2011	2012	2013	2014
Net Cash Flow to Town						
Savings from Reduced Electricity Rates	$ -	$ 473,040	$ 473,040	$ 474,336	$ 473,040	$ 473,040
Less: Operating Expenses	$ -	$ (61,000)	$ (61,000)	$ (61,000)	$ (61,000)	$ (61,000)
Less: Cap Exp and WC Change	$ (4,565,363)	$ -	$ -	$ -	$ -	$ -
Net Savings or Costs without Financing	$ (4,565,363)	$ 412,040	$ 412,040	$ 413,336	$ 412,040	$ 412,040
Less: Debt Financing Costs	$ -	$ (363,734)	$ (363,734)	$ (363,734)	$ (363,734)	$ (363,734)
Plus: Debt Financing Benefits	$ 4,565,362	$ -	$ -	$ -	$ -	$ -
Net Cash Flow to Town	$ (0)	$ 48,306	$ 48,306	$ 49,602	$ 48,306	$ 48,306

Equity Cash Flow to Town

Project Finance and Wind Power

- Relevance of Project Finance
  - The amount of debt issued by lenders – debt capacity -- in project finance establishes the risk of a project
  - From a private investor perspective, the debt capacity and the equity return requirement determine the private cost of capital which should be compared to the municipal cost of capital
  - Schemes to allocate tax in private transactions (so called flip structures) may have application to municipalities
- Basic Terms and Concepts in Project Finance
  - Non-recourse Debt Associated with Project
  - Debt Service Coverage Ratio (DSCR) and Bank Assessment of Risk
  - Equity IRR Requirement for Investors
  - Debt Capacity Driven by Risk Allocation to Different Parties
  - Banks and Investors Concentrate on Cash Flow

Town Risk and Value Analysis

Town Analysis

- There can be a lot of complicated analysis of taxes, private financing and mixing of public and private analysis, but the most important part of financial analysis is evaluating the costs and benefits in a case where the town builds and finances the project.
- A second essential part of an analysis is understanding the risks to a town that occur from making an investment in a wind project.

Components of Savings and Costs

- Savings Depend on:
  - Utility Rates and Wholesale Electricity Prices
    - Net Metering
    - Wholesale Power Rates (ISO-NE)
    - Capacity Factor of Turbines
    - Operational Availability of Turbines
  - Operating Costs

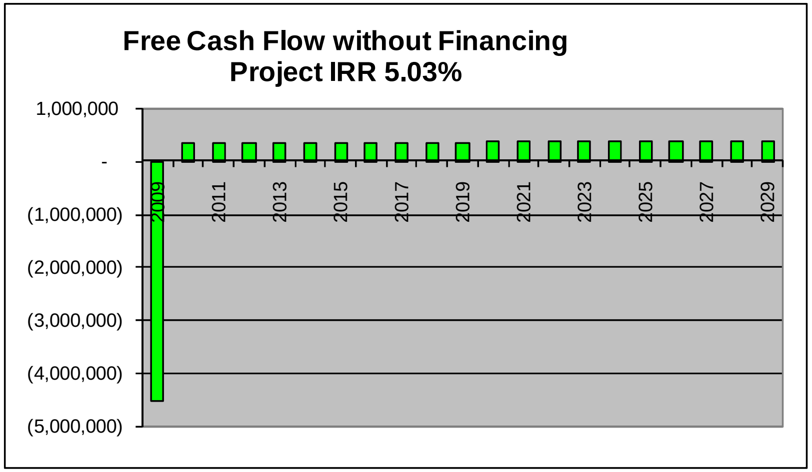
	2009	2010	2011	2012	2013	2014	2015	2016
Revenue Build-Up								
Spot Revenues	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Net-Metering Revenues	$ -	$ 378,432	$ 378,432	$ 379,469	$ 378,432	$ 378,432	$ 378,432	$ 379,469
REC Revenues	$ -	$ 94,608	$ 94,608	$ 94,867	$ 94,608	$ 94,608	$ 94,608	$ 94,867
Other Grants	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Revenues	$ -	$ 473,040	$ 473,040	$ 474,336	$ 473,040	$ 473,040	$ 473,040	$ 474,336
Total Operating Costs								
Warranty Expenses	$ -	$ -	$ -	$ 26,685	$ 27,426	$ 28,112	$ 28,815	$ 29,537
Post Warranty Expenses	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Other Expenses	$ -	$ 16,299	$ 16,706	$ 17,125	$ 17,553	$ 17,992	$ 18,442	$ 18,904
Insurance Expense	$ -	$ 13,370	$ 13,704	$ 14,048	$ 14,399	$ 14,759	$ 15,128	$ 15,507
Land and Right of Way	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Payment In Lieu of Taxes	$ -	$ 25,467	$ 26,103	$ 26,758	$ 27,426	$ 28,112	$ 28,815	$ 29,537
Property Taxes	$ -	$ 21,330	$ 20,663	$ 19,330	$ 17,997	$ 16,664	$ 15,331	$ 13,998
Total Operating Expenses	$ -	$ 76,465	$ 77,177	$ 103,945	$ 104,802	$ 105,639	$ 106,530	$ 107,483
Capital Expenditures and Other Costs								
Capital Expenditures	$ 4,565,363	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Net Working Capital Change	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Pre-paid Warranty Costs	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Other Costs	$ 4,565,363	$ -	$ -	$ -	$ -	$ -	$ -	$ -

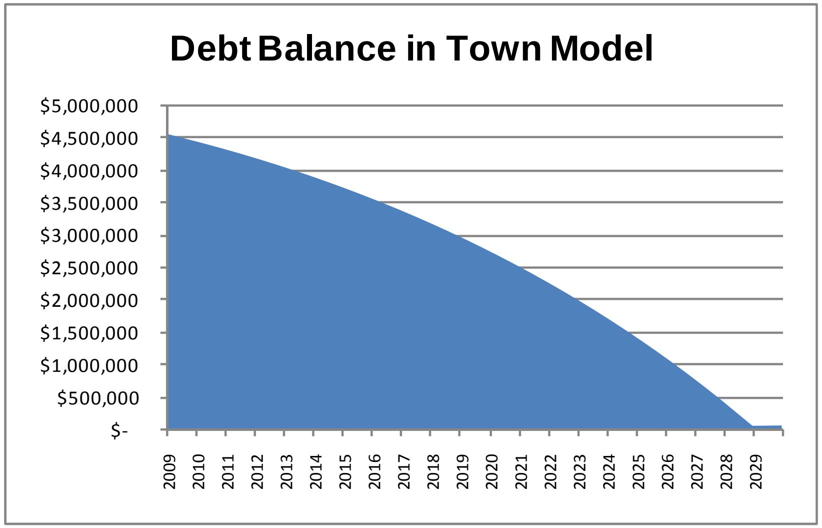
Town Risk and Value Analysis

- Analysis of Costs and Benefits of Investment from the Perspective of Municipality
- Basic Investment Rule
  - Investment Makes Sense when
    - Project IRR > Interest Rate on Municipal Bonds
  - Example
    - Say the rate of return is 5% and the interest rate for the town is also 5%. The town could invest money in a bank or loan money at rate of 5%. If all of the cash from the project is used to payoff a loan for the entire investment, then at the end of the project, the loan will just be paid back – no more and no less.
- Risk Analysis
    - Consider what changes in variables could make project IRR less than the municipal interest rate

Town Analysis Cash with Financing – Project IRR Equals the Town Interest Rate

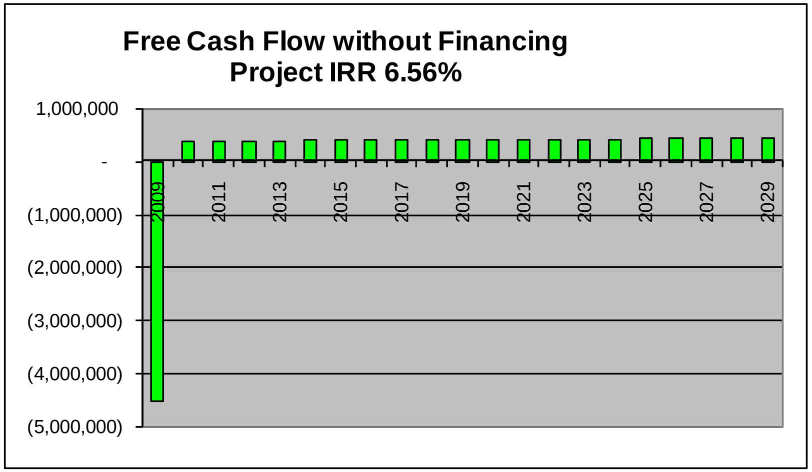
- The reason for using the project IRR to test the economics of the project is illustrated by the case of 100% town debt financing
- If the project IRR is the same as the interest rate, then the net present value is zero, when the discount rate is the town interest rate.
- If the returns just equal the municipal interest rate, then the town does not receive any cash, and there is no need for other town funds; all cash is used to pay off debt.
- The adjacent example shows that in the case with the return equal to the interest rate, the debt is just paid by the end of the project.

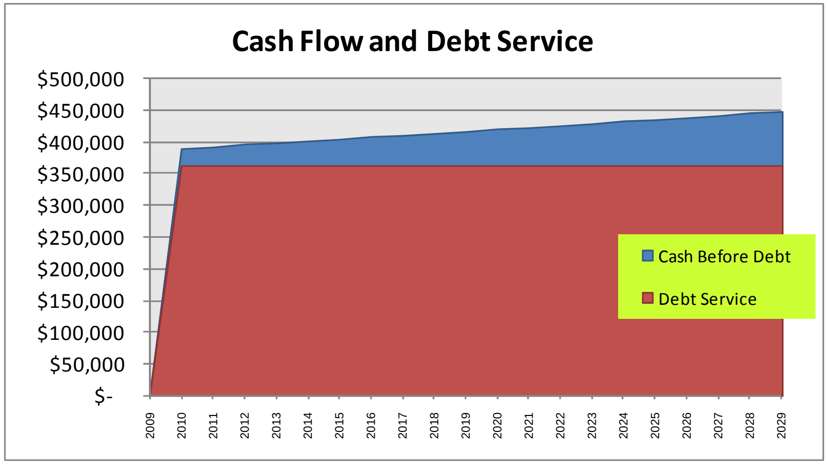




Town Case with Financing – Project IRR is Higher than the Town Interest Rate

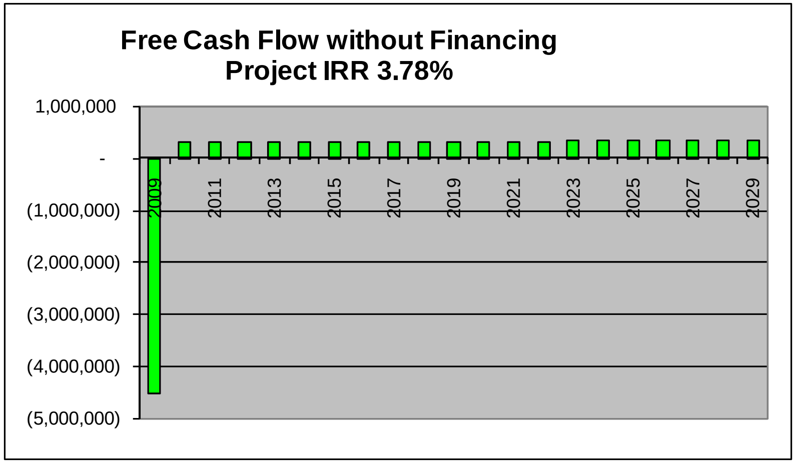
- This example shows a case where the project IRR is higher than the interest rate of 5%. This implies there is surplus cash flow that can be paid above the interest rate.
- The manner in which cash is received by the town depends on the repayment structure of the debt.
- In the adjacent example, the repayment (the red area) applies an annuity approach, meaning that the debt is repaid in equal installments and the town receives some cash in each period (the blue area).
- The blue area in the graph is the equity cash flow to the town.

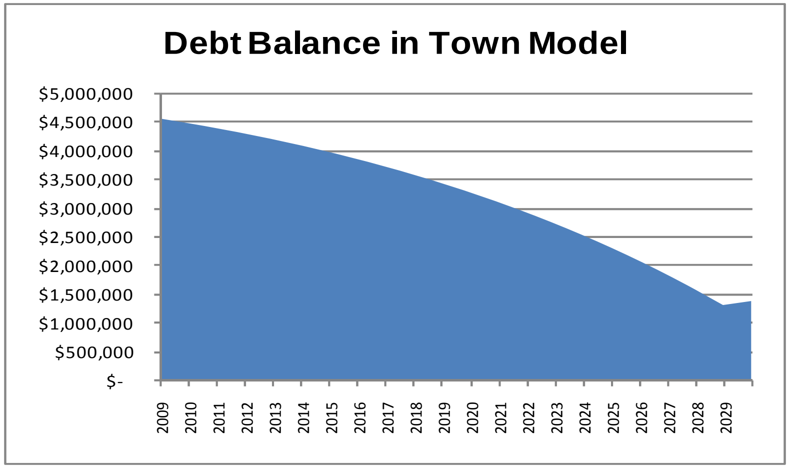




Town Cash with Financing – Cash where Project IRR is Below the Town Interest Rate

- This example shows a case where the project IRR is lower than the interest rate of 5%.
- With an interest rate of 5%, the 3.78% IRR implies that there is not enough cash to pay off debt raised for the project and the town must make up deficits from other cash.
- When there is not enough cash to make all the debt payments, there is a debt default in the model.
- In the adjacent example, the debt cannot be paid by cash by the project meaning that debt is still outstanding at the end of the project.





Analysis of Costs and Benefits of Project

- The first step and the main use of a model is to evaluate the costs and benefits of a project in a base case.
- The most important factors that drive the costs and benefits of a project include:
  - Project Capital Cost
  - Capacity Factor (Wind Speed and Turbine Type)
  - Electricity Generation Price (Explicit or implicit long-term forecast of price)
  - Cost of Operating and Maintaining Project
  - Interest Rate Paid on Debt Financing

Example of Capacity Cost Estimates from Feasibility Studies

- The table below shows the range in project cost estimates from various MA Community Wind projects. For studies in 2008, the range is from $2,800/kW to $3,290/kW – a difference of 17%. Capacity costs are important factors in overall project economics, but can be hard to estimate in advance of bids. Estimates may vary from study to study due to factors such as the size and height of turbine in question, supply and demand for particular turbine models, method of procurement, number purchased, etc.

• Location A – GE 1.5MW (2005)	$1,852/kW
• Location B – Vestas RRB 600kW (2008)	$2,800/kW
• Location B – GE 1.5sle @ 80m (2008)	$3,000/kW
• Location C – Fuhr 1500 (2008)	$3,006/kW
• Location D – GE 1.5sle @ 65m (2008)	$3,020/kW
• Location D – GE 1.5sle @ 80m (2008)	$3,153/kW
• Location D – GE 1.5sle @ 80m (2008)	$3,290/kW

Capacity Factor

- The capacity factor depends on both the wind speed at various turbine heights and the characteristics of the turbine.

• Location A – GE 1.5sle @ 80m	32.2%
• Location A – Vestas V80 1.8 MW @ 80m	29.8%
• Location B – Vestas RRB 600 kW @ 50m	16.1%
• Location B – GE 1.5sle @ 65m	21.3%
• Location C - Fuhr 1500 @ 65m	21.1%
• Location D – GE 1.5sle @ 65m	22.5%
• Location D – GE 1.5sle @ 80m	25.0%

- The cost and benefit analysis must evaluate the tradeoffs between higher costs and higher capacity factors.

Cost and Benefit Analysis with Different Capital Costs and Capacity Factors

- Analysis should be performed to evaluate the point at which the project IRR becomes less than the interest rate on municipal debt.
- The example below shows the IRR for different capital costs and capacity factors in a sensitivity analysis.
- The range in capital cost and capacity factors causes a change in IRR from 5.3% to 23.1% -- the criteria is <=10% for the results in red.

Rate of Return to Town

Cost of Project ($/kW)	Capacity Factor								
	18.0%	19.5%	21.0%	22.5%	24.0%	25.5%	27.0%	28.5%	30.0%
$3,100.00	5.3%	6.4%	7.5%	8.5%	9.6%	10.5%	11.5%	12.4%	13.4%
$3,000.00	5.7%	6.8%	7.9%	9.0%	10.0%	11.0%	12.0%	13.0%	13.9%
$2,900.00	6.1%	7.3%	8.4%	9.5%	10.5%	11.6%	12.6%	13.5%	14.5%
$2,800.00	6.5%	7.7%	8.9%	10.0%	11.1%	12.1%	13.1%	14.1%	15.1%
$2,700.00	7.0%	8.2%	9.4%	10.5%	11.6%	12.7%	13.7%	14.8%	15.8%
$2,600.00	7.5%	8.7%	9.9%	11.1%	12.2%	13.3%	14.4%	15.4%	16.5%
$2,500.00	8.0%	9.3%	10.5%	11.7%	12.8%	14.0%	15.1%	16.1%	17.2%
$2,400.00	8.5%	9.8%	11.1%	12.3%	13.5%	14.7%	15.8%	16.9%	18.0%
$2,300.00	9.1%	10.5%	11.8%	13.0%	14.2%	15.4%	16.6%	17.7%	18.9%
$2,200.00	9.8%	11.1%	12.5%	13.8%	15.0%	16.2%	17.5%	18.6%	19.8%
$2,100.00	10.4%	11.9%	13.2%	14.6%	15.9%	17.1%	18.4%	19.6%	20.8%
$2,000.00	11.2%	12.6%	14.0%	15.4%	16.8%	18.1%	19.4%	20.7%	21.9%
$1,900.00	12.0%	13.5%	14.9%	16.4%	17.8%	19.1%	20.5%	21.8%	23.1%

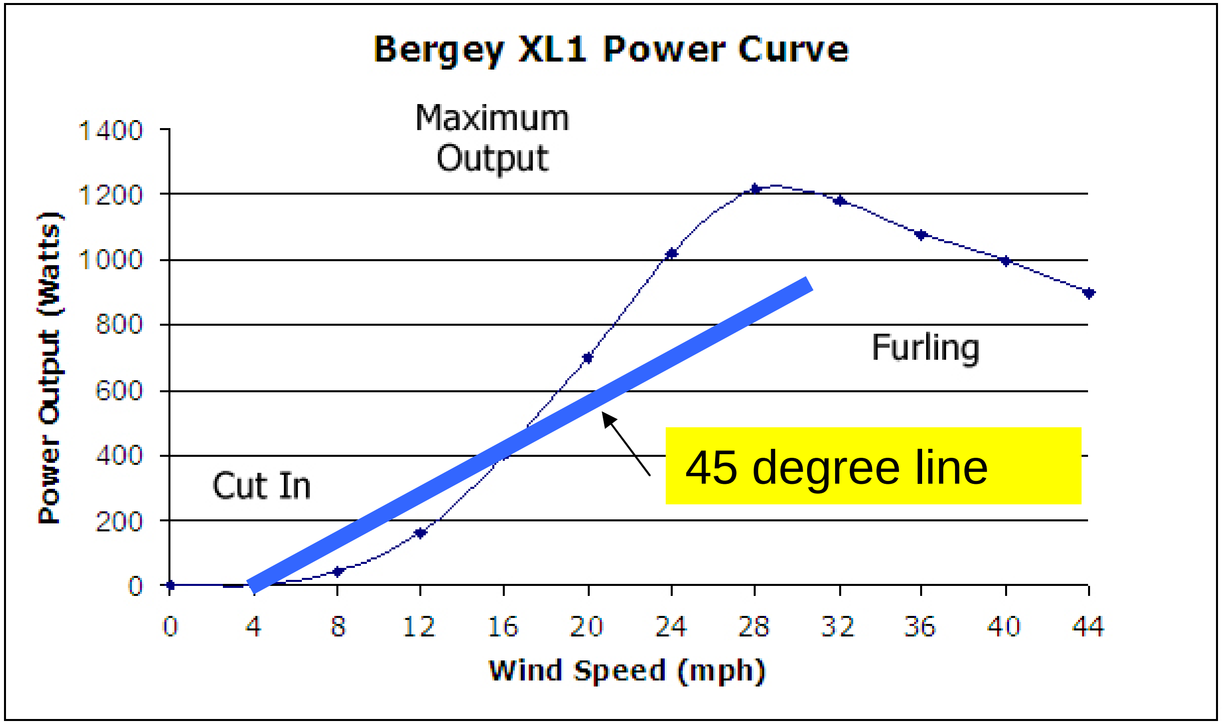
Risks Analysis of Wind Projects

- Once the basic inputs for evaluating the overall costs and benefits are established, the risks can be evaluated.

- To consider risks, begin with value drivers:
  - Construction Costs
    - Turbine Cost
    - Permitting Cost
    - Transmission Cost
    - Road Construction
    - Turbine Erection
    - O&M Building
  - Electricity Prices
    - Spot and forward wholesale electricity prices in NEPOOL
    - Changes in net metering rates
      - Changes in default rates
      - Changes in distribution rates
  - Wind Speed and Capacity Factor
  - Operation and Maintenance Cost
  - Equipment Breakdown and Availability

Power Curve and Assessment of Wind Speed Risk

- When wind speed changes by 1%, the amount of power changes by more than 1% due to the power curve of a turbine which is driven by a cubic relationship between power output and wind speed. The change in power output on the y axis is bigger than the change in the x-axis on the diagram below.



Wind Variability Risk

- To illustrate the wind speed risk, the adjacent example shows capacity factors and IRR for a MA project.
- Typical sensitivity analysis is based on P90 or P95 case.
- If the P90 or P95 cases represent variability in one year, this is too conservative for probability assessment over the life of the project. (A worst case 10% wind speed will probably not occur for every year into the future.)
- Variability in capacity factor can come from imprecision in wind studies or variability in wind speed from year to year. This difference is important in risk analysis. The wind speed difference is easier to evaluate than study risk.

Effect on IRR of ranges in capacity factors

Probability	Capacity Factor	Project IRR	Vs Base
1%	30.50%	13.51%	4.65%
5%	28.30%	12.16%	3.30%
10%	27.20%	11.48%	2.62%
25%	25.30%	10.32%	1.46%
50%	23.30%	8.86%	0.00%
75%	21.40%	7.61%	-1.25%
90%	19.70%	6.37%	-2.49%
95%	18.80%	5.69%	-3.17%
99%	17.10%	4.84%	-4.02%

Sensitivity Analysis for Measuring Risk of Capacity Factor and Electricity Price

- The example below illustrates the capacity factor and electricity price sensitivity. The idea of the table is to show how low the electricity price can go before the IRR falls below the municipal interest rate. More variation is driven by the electricity price than the capacity factor in this example.

- P90 capacity factor versus P50 uncertainty could cause returns to vary by 3-4% while electricity uncertainty could be higher.

Electricity Price ($/MWH)	Capacity Factor								
	18.0%	**18.5%**	**19.0%**	**19.5%**	**20.0%**	**20.5%**	**21.0%**	**21.5%**	**22.0%**
$160.00	8.9%	9.4%	9.8%	10.2%	10.6%	11.0%	11.4%	11.8%	12.2%
$155.00	8.6%	9.0%	9.4%	9.8%	10.2%	10.6%	11.0%	11.4%	11.8%
$150.00	8.2%	8.6%	9.0%	9.4%	9.8%	10.2%	10.5%	10.9%	11.3%
$145.00	7.7%	8.2%	8.6%	8.9%	9.3%	9.7%	10.1%	10.5%	10.9%
$140.00	7.3%	7.7%	8.1%	8.5%	8.9%	9.3%	9.7%	10.0%	10.4%
$135.00	6.9%	7.3%	7.7%	8.1%	8.5%	8.8%	9.2%	9.6%	9.9%
$130.00	6.5%	6.9%	7.3%	7.6%	8.0%	8.4%	8.8%	9.1%	9.5%
$125.00	6.1%	6.4%	6.8%	7.2%	7.6%	7.9%	8.3%	8.6%	9.0%
$120.00	5.6%	6.0%	6.4%	6.7%	7.1%	7.5%	7.8%	8.2%	8.5%
$115.00	5.2%	5.6%	5.9%	6.3%	6.6%	7.0%	7.3%	7.7%	8.0%
$110.00	4.7%	5.1%	5.5%	5.8%	6.2%	6.5%	6.9%	7.2%	7.5%
$105.00	4.2%	4.6%	5.0%	5.3%	5.7%	6.0%	6.4%	6.7%	7.0%
$100.00	3.8%	4.1%	4.5%	4.8%	5.2%	5.5%	5.8%	6.2%	6.5%

Importance of Electricity Price Risk in Investment Analysis

- There is a difference in the nature of risk for electricity price and for capacity factor risk – electricity price is more difficult to measure because it is driven by human activities and economics rather than weather and technical conditions.
- Methods of evaluating the electricity price risk are difficult and it is useful to find the break-even price
- The adjacent table shows an example of electricity price risk sensitivity and break-even analysis – the table measures how much cushion in electricity price do you have compared to the current price before the IRR falls to 5%.
- The top table shows changes in the wholesale price of electricity from August 2008 to January 2009 – there was as much as a 35% difference.

NYMEX Forward Prices for ISO - NE, August 2008					
	2008	**2009**	**2010**	**2011**	**2012**
Off Peak	66.92	72.83	72.48	70.40	69.19
On Peak	86.83	94.75	94.15	91.07	89.62
Weighted Average	76.87	83.79	83.32	80.74	79.41

NYMEX Forward Prices for ISO - NE, January 2009					
	2008	**2009**	**2010**	**2011**	**2012**
Off Peak	55.73	55.35	59.94	60.64	60.36
On Peak	64.24	68.75	75.68	76.99	76.72
Weighted Average	59.99	62.05	67.81	68.82	68.54

Difference in Prices					
Difference	16.89	21.74	15.50	11.92	10.87
Pct of Jan 2009	28%	35%	23%	17%	16%

	Break-Even Price $/MWH
Base Case	$115.60
20% Increase in Capital Cost	$142.70
P95 Capacity Factor	$133.02
35% Increase in O&M Cost	$124.04
Combined Case	$172.90

Wholesale Power Rates and Net Metering Prices

- The Green Communities Act of 2008 allows the energy produced at customer-sited generation facilities of up to 2 MW to be sold to the grid as if it were offsetting the energy used at the customer's meter.
- Previous Massachusetts law only allowed facilities of up to 60 kW to benefit from net metering while for larger facilities only the portion of the production that coincided with load could be credited at the retail rate.
- Each municipality can net meter up to 10 MW of generating capacity, provided that no individual unit exceeds 2 MW.
- According to the legislation, the net metering credit for generation used to offset load at a customer's meter is credited at a rate equal to the "default service" kilowatt-hour charge in the ISO-NE load zone where the customer is located.

National Grid Rate Tariff	G-3		Creditable Under Net Metering
Customer Charge	72.06	$	
Generation/Supply	0.15802	$/kWh	x
Distribution Demand	3.87	$/kW	
Distribution Energy			
Peak	0.01363	$/kWh	x
Off-peak	0.00108	$/kWh	x
Transmission	0.00749	$/kWh	x
Transition Demand	0.52	$/kW	
Transition Energy	0.00142	$/kWh	x
DSM	0.00250	$/kWh	
RE	0.00050	$/kWh	
Total Net Metering Credit:	**0.17481**	**$/kWh**	

Reasons for difference:

Capacity prices, losses, Ancillary services, load shape, risk premium

PRICES (as of September 28th, 2007)	Units	2004 [1]	2005 [1]	2006 [1]	2007 [5]	2008 [6]	2009 [6]
PJM West Hub ATC	($/MWh)	42.35 [2]	60.92 [2]	51.07 [2]	57.21	61.75	64.46
PJM NiHub ATC	($/MWh)	30.15 [2]	46.39 [2]	41.42 [2]	43.71	46.77	48.70
NEPOOL MASS Hub ATC	($/MWh)	52.13 [2]	76.65 [2]	59.68 [2]	64.70	73.81	76.59
ERCOT North On-Peak	($/MWh)	49.53 [3]	76.90 [3]	60.87 [3]	59.52	70.71	75.85
Henry Hub Natural Gas	($/MMBTU)	5.85 [4]	8.85 [4]	6.74 [4]	6.97	7.95	8.27
WTI Crude Oil	($/bbl)	41.48 [4]	56.62 [4]	66.38 [4]	67.90	76.94	73.75
PRB 8800	($/Ton)	5.97	8.06	13.04	9.66	10.85	11.65
NAPP 3.0	($/Ton)	60.25	52.42	43.87	46.33	49.50	50.75

Further Details on Net Metering

- Caveat: If a municipality sells power under net metering and it has multiple different accounts, it is possible that the utility company will not attempt to allocate the wind power generation to individual accounts.
- The reasons net metering rates are so much higher than wholesale prices include:
  - Energy component of distribution rates and transmission rates
  - Energy losses that are factored in the generation portion of the bill, meaning that an electricity bill includes make-up for line losses while the wholesale price does not include losses
  - Capacity prices and prices of ancillary services, meaning that the rate in an electricity bill includes more than just wholesale energy prices.
  - Load following, meaning the usage pattern of the town is not the same as the pattern as if energy was used evenly throughout the year
  - Risk premiums that may be added into the generation price to lock in contracts for multiple years
- In rough terms, these factors add about $40/MWH or 4 cents per kWh to a bill.
- Net metering does not mean that risk of changing electricity prices is avoided. The net metering rates can change over the life of a project.

Risk Analysis on Electricity Price

- Rather than examining the rate of return, one can derive the electricity price that is required in alternative risk scenarios. This chart shows the maximum electricity price can be derived from alternative inputs.

Required Electricity Price										
		Capacity Factor								
		18.0%	**19.5%**	**21.0%**	**22.5%**	**24.0%**	**25.5%**	**27.0%**	**28.5%**	**30.0%**
Cost of Project ($/kW)	**$3,100**	141.12	127.20	115.25	104.90	95.84	87.85	80.75	74.39	68.67
	$3,000	136.26	122.70	111.08	101.01	92.19	84.42	77.51	71.32	65.75
	$2,900	131.39	118.21	106.91	97.11	88.54	80.98	74.26	68.25	62.83
	$2,800	126.52	113.72	102.74	93.22	84.89	77.55	71.02	65.17	59.91
	$2,700	121.66	109.23	98.57	89.33	81.24	74.11	67.77	62.10	56.99
	$2,600	116.79	104.73	94.39	85.43	77.59	70.68	64.53	59.02	54.07
	$2,500	111.92	100.24	90.22	81.54	73.94	67.24	61.28	55.95	51.15
	$2,400	107.05	95.75	86.05	77.65	70.29	63.80	58.04	52.88	48.23
	$2,300	102.19	91.25	81.88	73.75	66.64	60.37	54.79	49.80	45.31
	$2,200	97.32	86.76	77.71	69.86	62.99	56.93	51.55	46.73	42.39
	$2,100	92.46	82.26	73.53	65.96	59.34	53.50	48.30	43.65	39.47
	$2,000	87.58	77.77	69.36	62.07	55.69	50.06	45.06	40.58	36.55
	$1,900	82.72	73.28	65.19	58.18	52.04	46.63	41.81	37.51	33.63

Scenario Analysis

- "Back to basics" risk analysis can be accomplished through a consistent scenario analysis. For risk analysis, the downside case is important where a realistic number of variables should be developed including electricity price and other variables (bankers use a rule of thumb of 20% probability)
- Evaluate whether the project IRR in the downside case is above the municipal bond rate (i.e. is the NPV above zero)

	Spot Electricity Price	REC Spot Price	Capacity Factor	O&M Cost	O&M Inflation	Project IRR
Base Case	80.00	20.00	21.10%	56,000	2.00%	10.57%
Downside Case	64.00	15.00	18.80%	75,600	2.50%	5.74%
Upside Case	80.00	25.00	28.30%	52,000	1.00%	16.14%
Low Energy Price Case	64.00	15.00	21.10%	56,000	2.00%	10.22%
High Cost Case	80.00	25.00	21.10%	56,000	2.00%	11.73%
Low Wind Case	80.00	20.00	18.80%	56,000	2.00%	8.90%
High Wind Case	80.00	20.00	28.30%	56,000	2.00%	15.40%
High Capital Cost Case	80.00	20.00	21.10%	56,000	2.00%	7.25%
Low Capital Cost Case	80.00	20.00	21.10%	52,000	1.00%	10.57%
No Net Metering Case	80.00	20.00	21.10%	56,000	2.00%	4.79%

Analysis with Private Ownership

Private/Municipal Contract Structure

- Private entity constructs, finances, owns, and operates the project.
- Municipality pays developer for the power produced. This contract can take different forms and allocate different risks to private investor or municipality (e.g. fixed price per kWh).
  - Private investor benefits from the use of production tax credits and accelerated tax depreciation to offset taxes that would otherwise be paid.

Background – Public Private Partnerships

- Private ownership in the context of Community Wind Projects is an example of Public/Private Partnerships (PPP) projects that have been used in other capital intensive projects:

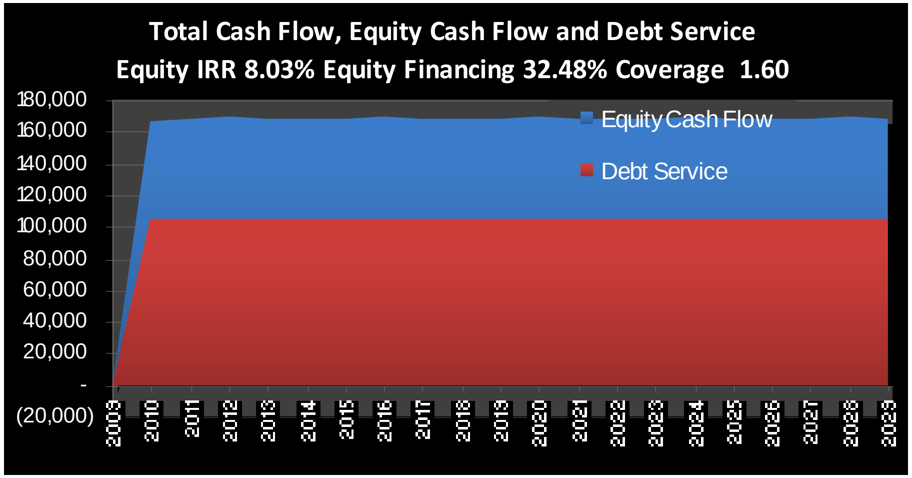
- Examples
  - U.S. Toll-roads
  - Infrastructure projects – ports, airports, bridges, tunnels
  - Schools, Hospitals, Municipal Buildings in the U.K.
- Cost and Benefits of Private versus Public Ownership
  - Risk Analysis
  - Optimism Bias
  - Tax Effects
  - Property Taxes and Other
- Application Cost and Benefit Concepts to Community Wind Projects

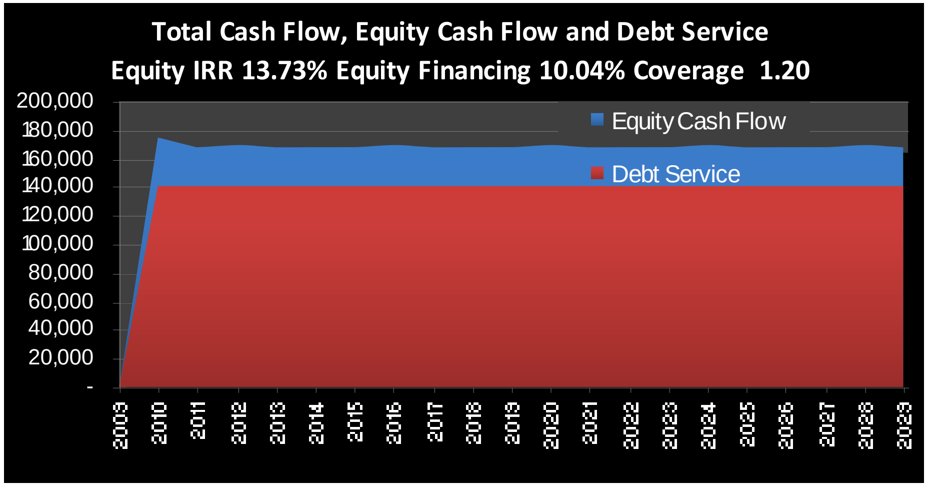
Fundamental Issues in Cost/Benefit Analysis

- Inherent benefits and costs in using private financing
  - Possible Benefits
    - Income tax benefits
    - Risk allocation (e.g. private investor takes capacity factor risk)
    - Cost efficiency and allocation (e.g. private investor takes risk of O&M risk after warranty expires.)
  - Possible Costs
    - Private entities may not qualify for net metering
    - Higher cost of capital for private investor
    - Tax payments made by private investor even after benefits
    - Potential for private investor to earn returns above cost of capital with high contract power price
    - Fees paid by private investor
  - Possible Conflict between Net Metering and PTC
    - If a project is using net metering to realize savings (recall the higher savings from net metering relative to spot rates), it may not also qualify for PTC because it is not theoretically selling power to the grid.

Background on Cost of Capital, Return and Financing in Private Analysis

- The relative cost of capital for private investors depends on the amount of debt financing and the equity return demanded by the equity investor.
- Private investors focus on the return they can earn on the money they invest as measured by the equity IRR, which depends on the amount of debt financing.
- The adjacent charts illustrate different scenarios with alternative debt structures – the total free cash flow is the same in both charts, but the split between equity and debt is different.
- Note the higher equity return with the lower debt service coverage – even though the total project cash is the same. The difference in return arises because there is a smaller equity investment in the bottom graph (even though the dividends are lower, the first investment is smaller)





Comments on Debt Service Coverage by Banker

- The following comments illustrate the basis for evaluating debt service coverage by a banker
  - We always have some margin of safety when we decide how much the project should pay us back each year (and thus how much it can borrow) to cover for the statistical wind risk
  - Typically, we want revenues after all operating costs and taxes to be about 40% higher than what we actually need to repay the debt. This means that on any given period, revenues can be a third lower for any reason (whether lower wind, poor operating performance, or lower electricity prices) and we will still have enough money to repay debt.

Simple Example of Added or Reduced Savings to Town from Private Investors

- Begin with net cash flow to town after financing as comparison.
  - Example: Equity cash after debt service: $40,000 per year
- Without PILOT, if the town has no ownership, then the savings realized from a project depend simply on the contract power price relative to the amount of savings realized from paying lower electricity bills.
  - Example:
    Contract Price: $100/MWH
    Net Metering Rate: $150/MWH
    MWH Produced: 10,000 MWH
    Town Savings: $50 x 10,000 = $50,000 per year
- Here, the town's savings from choosing to work with a private investor exceed the savings from town financing by $10,000 per year.

Cost Benefit Analysis with Private Investment

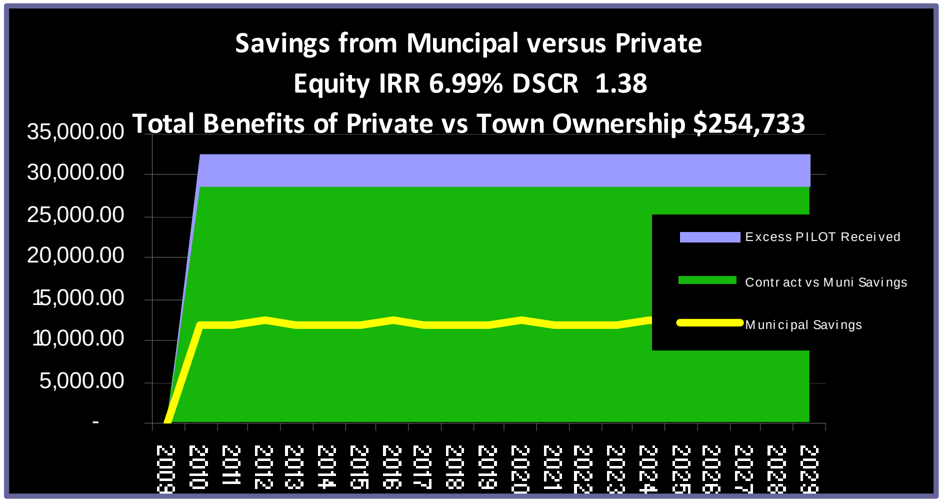
- In evaluating whether private investors should be used, the basic idea is to evaluate whether the town can achieve lower costs by having a private investor construct and operate the project.

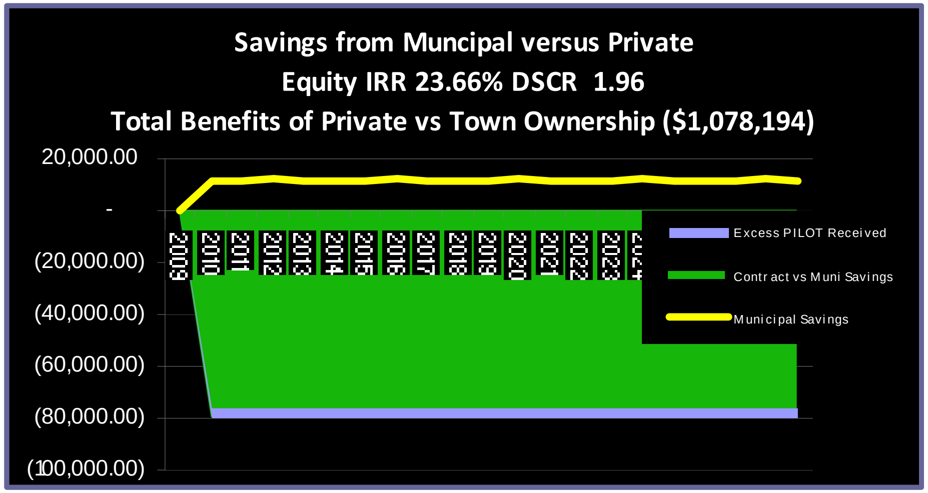
- Step by step approach for private analysis

Step 1:	NPV to town (equity cash flows after financing)
Step 2:	NPV of difference between private contract and savings in town case
Step 3:	NPV of PILOT cash accruing to town
Step 4:	Savings from private versus town ownership is the difference between savings or costs computed in Step 2 + Step 3 versus Step 1
Step 5:	Evaluate whether there are risk benefits or cost advantages that are not included above.

Graphic Depiction of Town Savings under Private Ownership

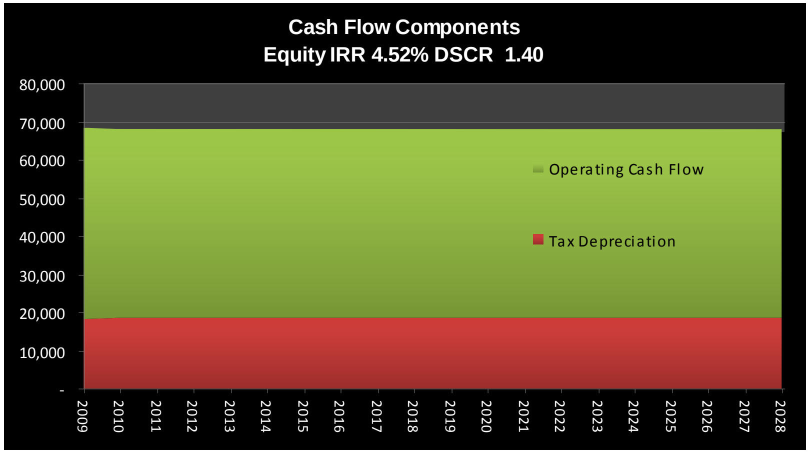
- The two adjacent charts illustrate the effect of the private cost of capital on the town savings analysis. In the first chart with low private cost of capital, there are savings from using private investors. In the second chart where a higher return and lower debt increases cost of capital, the savings are negative.
- The green area in the graph is the savings or costs from the contract versus net metering prices, and the yellow line is the equity cash flow that would be realized under town ownership. The blue line is the property taxes paid by private investors to the town.

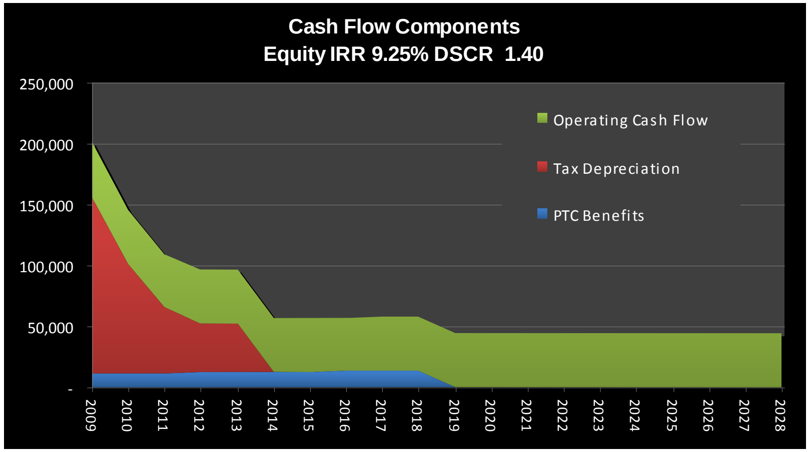




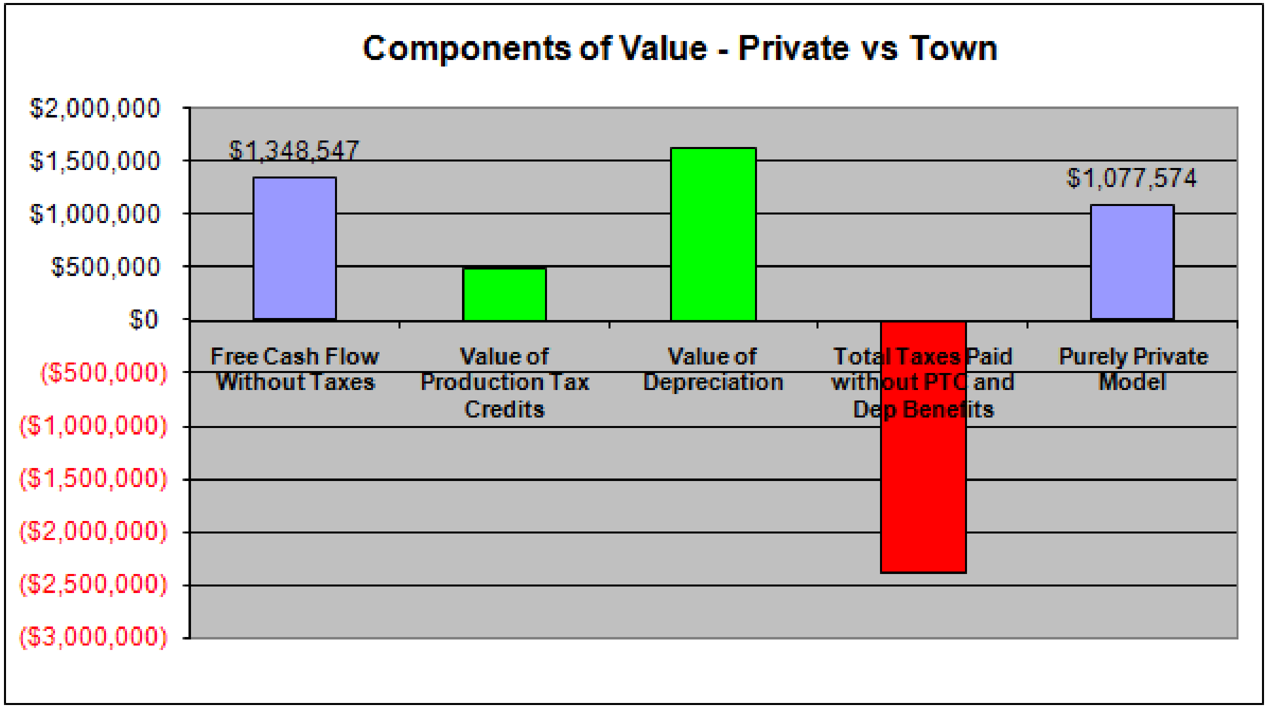
Benefits of Private Ownership with and without Tax Incentives

- The two adjacent graphs show the effects of tax incentives on the cash flow and rate of return earned in a private investor scenario. The rate of return increases from 3.07% to 9.15% when PTC and accelerated depreciation are used.
- These graphs show the effect on the private investor that should in turn be transferred to the town through a purchased power contract. (Note scales on Y axis.)
- In the top graph scenario, the price in the PPA contract would have to increase from $141/MWH to $191/MWH for the private investor to achieve an equity return of 9%.





Summary of Tax Benefits and Costs



- The benefits include the PTC and accelerated tax depreciation. The costs are that taxes must be paid on profits.
- The payment of taxes on profits (shown on the red bar) has a large negative effect in the later years of the project life.

Risk Allocation in Private Investor Case

- Begin with Major Risks
  - Capacity Factor Risk
  - Electricity Price Risk (Changes in Net Metering Rates)
  - Post Warranty Costs
  - Cost Over-Runs
- Some Risks can be Mitigated without Private Investor
  - Cost Over-run with Power Contract
  - Post Warranty with Maintenance Contract
- Mitigation of Capacity Factor and Metering Rate Depends on Structure of Power Contract
  - Fixed Price Take or Pay (Lease or $/kW Contract) – does not vary with power price.
    - Here the municipality takes all of the revenue risk.
  - Fixed Price per Energy Produced ($/MWH).
    - Here the municipality takes the power price risk, but the private investor takes the capacity factor risk
  - Shared Savings (Percent of Savings)
    - Here the private investor takes all of the revenue risk.

Hypothetical Case of Shared Savings

- If a private investor would offer a contract that guarantees a share of savings, the analysis would be very different. It would involve:
  - How much is the value of the savings under the share-of-savings contract
  - How much are the savings in the town case
    - What conditions could make the savings go away
  - If the savings are greater in the town case, are the risks that the savings could go away worth giving up and accepting the share-of-savings contract?

Scenario Analysis including Town Savings Reflecting Private Investor Case

- All of the risk techniques discussed for the town standalone analysis can be accomplished for both the private and the municipal ownership case to gage the effect of the risk allocation. The final column illustrates risk analysis to a town with a fixed price contract. One can compute the points at which the net present value goes to zero versus when the project IRR falls below the town interest rate.
- The analysis will show different break-even points for different contract structures. For example, if the private investor takes capacity factor risk, then the capacity factor can fall further in the private investor case than in the municipal ownership case before the net present value falls to zero.

	Spot Electricity Price	REC Spot Price	Capacity Factor	O&M Cost	O&M Inflation	Project IRR	Electricity Price	Savings - Private Case
Base Case	80.00	20.00	21.10%	56,000	2.00%	10.57%	210.77	122,004
Downside Case	64.00	15.00	18.80%	75,600	2.50%	5.74%	210.51	752,728
Upside Case	80.00	25.00	28.30%	52,000	1.00%	16.14%	238.36	(532,134)
Low Energy Price Case	64.00	15.00	21.10%	56,000	2.00%	10.22%	210.51	122,310
High Cost Case	80.00	25.00	21.10%	56,000	2.00%	11.73%	236.29	121,784
Low Wind Case	80.00	20.00	18.80%	56,000	2.00%	8.90%	210.77	316,847
High Wind Case	80.00	20.00	28.30%	56,000	2.00%	15.40%	210.77	(486,997)
High Capital Cost Case	80.00	20.00	21.10%	56,000	2.00%	7.25%	210.77	564,378
Low Capital Cost Case	80.00	20.00	21.10%	52,000	1.00%	10.57%	210.65	52,756
No Net Metering Case	80.00	20.00	21.10%	56,000	2.00%	4.79%	137.49	82,791

Combined Municipal and Private Ownership

Alternative Combined Private and Municipal Ownership Structures

- In theory there are a few ways to combine private and town ownership. Two alternatives:
  - **Partnership Structure:** The town and the private investor are equity owners of a partnership and the private owner receives the tax benefits, while the town owns the project after PTC or accelerated depreciation expire.
  - **Flip Structure:** A private investor initially owns the project and then sells the project to the town after the tax benefits expire. This structure adds an additional uncertainty into the analysis because a future sale price must be assumed in the analysis. Further, the private investor must pay taxes on the sale of the asset when the sale occurs.

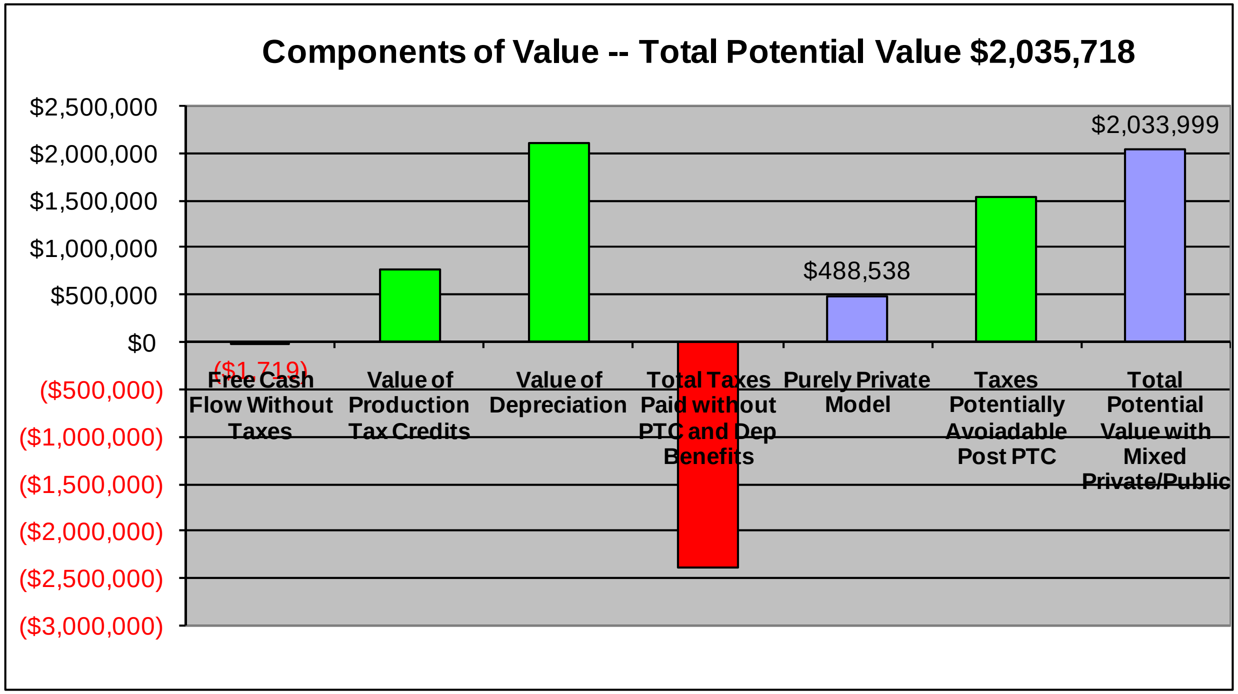
“Flip” Structure with Sale of Project from Private Investor to Town

- General Structure
  - Private investor owns project for initial period
  - Private investor sells power to municipality for initial period
  - Municipality buys project after initial period at fair market value which may be different from initial estimated value
- General idea is that private investor maximizes tax benefits and minimizes tax costs
- Municipality receives cash flow benefits after initial period
- Municipal benefits depend on contract power price and project purchase price
  - Can be structured to provide IRR to private investor, but may contain risk of different sale prices

Considerations in Developing Flip Structure

- Building from principles in earlier discussion, the structure of the power contract and project resale price should consider:
  - The project IRR for the town portion must be greater than the municipal interest rate, otherwise it is not possible to repay loans
  - The equity IRR should be just sufficient to induce investment and the debt coverage should be aggressive. This can be accomplished by adjusting the contract price
  - After making the structuring adjustments, evaluate the savings relative to town savings on a standalone basis.

Tax Sources of Savings in Flip Structure



- To illustrate the reasons for considering the flip structure, review the tax components in a case where the economics of the project do not work. Here the net present value without tax benefits is negative, but after adding the tax benefits and avoiding taxes in the final 10 years, the present value is positive.

Simple Example of Added or Reduced Savings to Town from Combined Structure

- Begin with net cash flow to town after financing for basis of comparison as with all private case.
  - Example: Cash flow after financing: $40,000 per year for all years

- During the period of time that the private entity owns the project, the net benefits from contract price versus net metering rate are similar.
  - Example: Contract Price: $100/MWH
  - Net Metering Rate: $130/MWH
  - MWH Produced: 10,000
  - Savings: $30 x 10,000 = $30,000 per year for first period

- After the project is purchased by the town, then the town receives all of the savings net of financing costs:
  - Example: Assumed equity cash: $70,000 per year for second period

- Here, the savings from using a combined structure are negative $10,000 per year for the first period and then are positive $30,000 per year for the second period.

Cost Benefit Analysis with Private Investment

- The step by step approach for a combined private and municipal analysis is the same as for the private analysis, except that dividends to the town are included in the savings calculation:
  - Step 1: NPV to town (equity cash flows after financing)
  - Step 2: NPV of difference between private contract and savings in town case
  - Step 3: NPV of PILOT cash accruing to town
  - Step 4: NPV of equity cash flow received by town from ownership interest
  - Step 5: Savings from private versus town ownership is the difference between savings or costs computed in Step 2 + Step 3 + Step 4 versus Step 1

Example of Cost and Benefit Analysis with Alternative Power Contracts

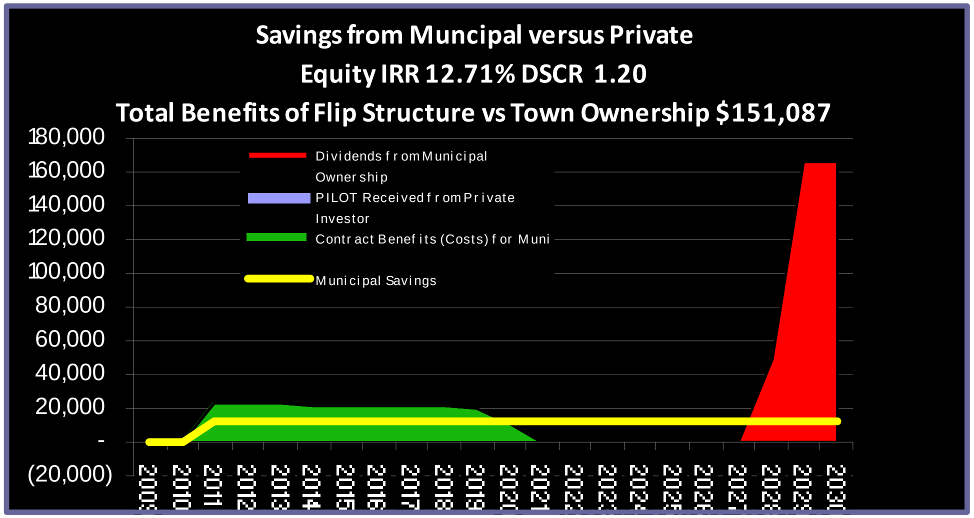
- The charts show the benefits to a town with alternative returns to private investors. Similar analysis could be performed with alternative ownership and split structures.
- The top line presents the present value of benefits under town ownership. The second and the third lines show savings under a private and/or a combined structure.
- In the first case, the private investor receives an equity IRR of 8%. This scenario produces savings for the town.
- The second case has a contract that produce an IRR of 15% to the private investor and less aggressive financing (a 2.5x coverage.) This scenario produces costs rather than benefits to the town.

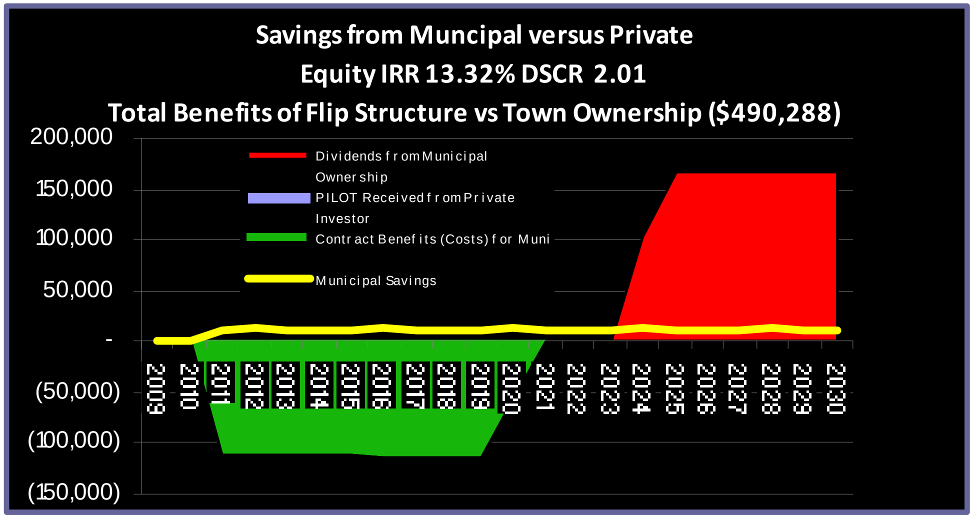
Value Analysis for Town		
	Disc Rate	Value
Net Benefits to Town - Municipal Ownership	5.00%	975,219
Savings from Contract versus Town Savings	5.00%	160,565
Plus: PV of Town Flows - Hybrid and PILOT	5.00%	966,374
PV to Town with Private and/or Hybrid		$1,126,940
Total Benefits of Private versus Town Ownership		$151,720
Percent Increase in Value		16%

Value Analysis for Town		
	Disc Rate	Value
Net Benefits to Town - Municipal Ownership	5.00%	975,219
Savings from Contract versus Town Savings	5.00%	(433,063)
Plus: PV of Town Flows - Hybrid and PILOT	5.00%	1,192,175
PV to Town with Private and/or Hybrid		$759,112
Total Benefits of Private versus Town Ownership		($216,107)
Percent Increase in Value		-22%

Savings and Costs in Two Flip Cases

- The accompanying graphs show the components of savings and costs in the two cases. The graphs are similar to the private analysis except that an additional red area is added for receipt of town cash flows from owning the project (the green area is the contract savings or cost and the yellow line is the town cash flow received from standalone ownership.)
- In the first case, the savings from the electricity contract with the private company are about the same as the savings the town would realize under standalone municipal ownership (the green area is about the same as the area under the yellow line), but there are additional savings from town ownership at the end of the life of the project (the red area after debt is repaid).
- In the second case, a higher required DSCR leads the private entity to charge a higher contract power price. The benefits to the town under the flip approach are less than the savings under town ownership. Here the yellow line is greater than the sum of the green and red areas when discounted at the town interest rate.





Summary of Key Points

Summary

- Use project IRR to evaluate risks with break-even analysis and scenario analysis
  - Risks of electricity price changes are very different than risks of wind speed varying from year to year
- Understand the perspective of private investors if considering using private ownership
  - Return earned by private investors
  - Debt capacity of private model
- Run similar risk analysis with private ownership and municipal ownership to understand the effect of risk allocation
- Consider the variation in key financial variables and review other studies
- Carefully consider risk allocation in private analysis
- Focus on the town savings components in the flip analysis