



## **Economic Impact Analysis of the Cape Wind Off-Shore Renewable Energy Project**

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April 2, 2003

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## **Executive Summary**

Based upon our analysis, there would be a number of economic and fiscal impacts on the mainland cities and towns located in Barnstable County, especially Barnstable and Yarmouth, and also in the Commonwealth of Massachusetts resulting from the construction and operation of the proposed wind farm by Cape Wind Associates.

### **Manufacturing/Assembly (M/A) and Construction/Installation (C/I) Phase Impacts**

There will be a number of positive economic and fiscal impacts during the M/A and C/I phase of the project:

- Between 597 and 1,013 direct, indirect, and induced full-time jobs will be created.
- Total State economic output will increase by between \$85 million and \$137 million annually.
- Value added will increase by between \$44 million and \$71 million annually.
- Labor income will increase by between \$32 million and \$52 million annually.
- Personal income tax revenues will increase by between \$4.8 million and \$7.8 million during the M/A and C/I phase.
- Other property income, comprised of rent, dividends and interest, and corporate profits, will increase by between \$9.2 million and \$14.8 million annually.
- Corporate income tax revenues will increase by between \$1.3 million and \$2.1 million during the M/A and C/I phase.
- Employment in Barnstable County will increase by 75 construction jobs.
- In the long run, there should be no appreciable increase in the demand for locally or state provided government services.
- Barnstable and Yarmouth will receive one-time building permit fees during the M/A and C/I phase.

### **Operation Phase Impacts**

The positive economic and fiscal impacts associated with the project will extend beyond the M/A and C/I phase. During the operation phase, the following economic and fiscal impacts will accrue:

- There will be an annual permanent employment increase of 154 jobs beginning in 2007.
- Total State economic output will increase by \$22 million annually.
- Labor income will increase by \$6.9 million annually.
- Personal income tax revenues will increase by \$346,500 annually.
- Corporate income tax revenues will increase by \$113,900 annually.
- Barnstable will receive \$62,510 in annual property tax revenues.
- Yarmouth will receive \$217,168 in annual property tax revenues.
- Based upon a study by La Capra Associates, the Cape Wind project will generate annual savings in wholesale power costs in New England of \$25 million, which would result in an annual increase in New England economic output of between \$5.1 million and \$6.1 million and a permanent increase in employment of between 142 and 215 jobs.

## **1. Introduction**

The purpose of this analysis is to estimate, quantitatively where possible, the economic and fiscal impacts that would occur in the mainland cities and towns located in Barnstable County, especially Barnstable and Yarmouth, and also in the Commonwealth of Massachusetts during the M/A and C/I and operation phases of the proposed action. The characteristics of the local and state economies that will determine the magnitude and composition of the economic impacts generated by the proposed action are described in Section 2, while the corresponding economic impacts are presented in Section 3.

### **Background**

The applicant has estimated the total capital costs, including engineering and design fees, contingency, etc. of the proposed action to be approximately \$700 million, or about \$1,666 per kilowatt (KW) of gross generating capacity. Total labor cost is estimated at \$135.2 million while total non-labor cost is estimated at \$564.8 million. The output from each wind turbine generator (WTG) will be conveyed to a centrally located electric service platform, from which a submarine 115 kV transmission line will convey the power to the mainland, coming ashore near Yarmouth. From that point, an underground 115 kV transmission line will go 4 miles to an existing transmission right of way (ROW), and then another 1.9 miles underground to the existing Barnstable switching station.

The proposed action would be constructed in 27 months, and require a total of 10,558 person-months of M/A and C/I labor. This is equivalent to 391 full-time jobs during the 2-¼ year M/A and C/I phase. The manpower requirements for the M/A and C/I phases of the project are shown in Table 1.1.

The regional distribution of the on-shore support facilities needed to support the M/A and C/I and operation activities is described briefly below because it shows that local economic impacts produced by the hiring of new workers and purchases of goods and services will occur in several communities located well away from the M/A and C/I sites. The fabrication and assembly of WTG components will be performed at a suitable port facility in Southern New England. Workers engaged in offshore construction work will likely assemble each day at the support facility on Cape Cod and then be taken by boat to the Horseshoe Shoal site. The maintenance and parts operations will be conducted out of a support facility in New Bedford, while the crew boats would likely depart from a smaller support base on Cape Cod. The applicant estimates up to 3 maintenance teams will be required each day, 252 days per year, with each team comprised of 9 maintenance personnel and 2 crew members. With the other maintenance jobs that are created, there will be a total of 50 full time maintenance jobs. Annual operating costs would be approximately \$16.0 million, including annual payments in wages & salaries of \$2.64 million. The total annual non-labor operation and maintenance (O&M) expenditures would be about \$10.45 million.

**Table 1.1: M/A and C/I Phase Labor Requirements by Activity and Year**

<b>Labor Category</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Total</b>
WTG Facility Work	297	0	0	297
Manufacturing-Blades	1232	1078	0	2310
Assembly-Nacellas	420	540	0	960
Monopile Fabrication	306	282	0	588
Transition Piece Fabrication	282	261	0	543
Tower Fabrication	282	261	0	543
Re-Fitting of Vessels	1234	10	0	1244
Vessel's Crew	102	598	0	700
Staging Area Operations	56	516	0	572
Installation of Monopiles and Transition Pieces	0	192	0	192
Installation of Towers and Turbines	0	198	18	216
Scour Protection	0	144	0	144
Commissioning	0	550	50	600
115 kV Cable Installation ((land)	389	0	0	389
115 kV Cable Installation (offshore)	20	40	0	60
33 kV Cable Installation	0	200	40	240
<b>Total Labor</b>	<b>4620</b>	<b>4870</b>	<b>108</b>	<b>9598</b>
Contingency	462	487	11	960
Man-months	<b>5082</b>	<b>5357</b>	<b>119</b>	<b>10558</b>
Man-years	424	446	10	880
Full-time jobs	<b>188</b>	<b>198</b>	<b>4</b>	<b>391</b>

In order to calculate the economic impacts generated by the newly hired M/A and C/I workers, the labor rates presented in Table 1.2 were used. These labor rates were obtained from Global Insight's Pricing and Purchasing Service.

**Table 1.2: Annual Labor Rates**

<b>Labor Category</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>
Ironworkers	37.003	37.877	38.700	39.870	41.090	42.290	43.514	44.725	45.924	47.189	48.492	49.806
Operating Engineers	34	34.975	36.052	37.23	38.46	39.72	40.991	42.292	43.624	44.997	46.441	47.987
Millwrights	34.06	34.864	35.621	36.7	37.82	38.98	40.062	41.167	42.271	43.435	44.634	45.844
Electricians	39.798	40.737	41.622	42.89	44.2	45.49	46.8	48.102	49.392	50.753	52.154	53.567
Painters	30.818	31.545	32.231	33.21	34.22	35.22	36.24	37.249	38.247	39.301	40.366	41.48
Carpenters	33.246	34.028	34.860	35.88	36.99	38.11	39.19	40.26	41.33	42.45	43.61	44.78
Laborers	26.495	27.118	27.783	28.59	29.48	30.37	31.235	32.088	32.94	33.832	34.755	35.698
Miscellaneous Supervision	43.74	44.769	45.866	47.200	48.67	50.14	51.566	52.974	54.379	56.853	57.376	58.925

## **2. Local Economy**

### **Region of Impact**

Global Insight defined the region of impact (ROI) as Barnstable County, Massachusetts, which contains a total of 15 cities and towns. Most of Barnstable County is located in the Barnstable-Yarmouth Primary Metropolitan Statistical Area (PMSA), which consists of Barnstable and the following towns: Brewster, Chatham, Dennis, Eastham, Harwich, Mashpee, Orleans, Sandwich, and Yarmouth. The other towns in Barnstable County outside the PMSA are: Bourne, Falmouth, Provincetown, Truro, and Wellfleet. However, the Barnstable New England County Metropolitan Area (NECMA) is the same as Barnstable County, so the Barnstable NECMA also comprises the ROI. The remainder of this analysis uses the term Barnstable County.

Barnstable County was selected as the ROI because the majority of the direct M/A and C/I and operation impacts will be concentrated there, including: the hiring of M/A and C/I workers, purchase of non-labor goods and services during M/A and C/I and operation phases, presence of an on-shore support base to support offshore construction and annual operation and maintenance activities (O&M), and the presence of on-shore infrastructure such as the 115 kV transmission line that would convey power from the project to the existing regional transmission and distribution (T&D) system. Southeastern Massachusetts and possibly Rhode Island would also benefit from on-shore facilities that may be established there during M/A and C/I, including the fabrication of blades and other components, the assembly of the WTGs, and the stockpiling of M/A and C/I materials. Barnstable County is located within easy daily commuting distance of both the Boston and Providence PMSAs, so any skilled M/A and C/I workers not available from the ROI would be obtainable from these two PMSAs, suggesting that no in-migration of M/A and C/I workers would occur.

The purchases of construction labor, and non-labor inputs such as concrete and aggregates, steel, and support services such as the crew boats and barges used to support the offshore construction activities, will be concentrated in Barnstable County. However, according to the applicant, the purchase of much of the specialized equipment that will comprise the WTGs such as the rotors, generators, and nacellas etc. will occur outside the ROI, and likely outside Massachusetts. In addition, the fabrication and assembly of the WTG's components and other support or assembly facilities may be located in southeastern Massachusetts. Assembly and fabrication activities at these locations, along with spending by C/I workers, would generate significant temporary increases in employment and income in their host counties during the M/A and C/I phase.

### **The Structure of the Local Economy**

Table 2.1 presents recent economic data for Barnstable County from Global Insight's Fall 2002 forecast; since our forecasts for New England's metropolitan areas are based on the New England County Metropolitan Areas (NECMAs), the data in this table is for all of Barnstable County. Barnstable County's total population on April 1, 2000 according to the 2000 Census was 222,230 persons; the most recent estimate as of July 1, 2001 places the County's total population at 226,809 persons. Barnstable County's population grew at an annual rate of 1.76% between 1990 and 2001, well above the statewide growth rate of 0.5%. The Massachusetts Division of Employment and Training (MDET) estimates that the total non-seasonally adjusted (NSA) labor force in Barnstable County during the 2<sup>nd</sup> quarter of 2002 was 115,752 workers, while the total resident labor force in the Cape and Islands Workforce Area, which also includes Nantucket and Martha's Vineyard, was 129,043 workers. The NSA unemployment rate in the Islands Workforce Area during the 2<sup>nd</sup> quarter of 2002 was 3.6%, up from 3.3% a year ago, but still below the statewide unemployment rate of 4.5%. Finally, the SA unemployment rate in Barnstable County in November 2002 was 3.9%; again well below the Massachusetts and US unemployment rates of 5% and 5.5% respectively

**Table 2.1 Barnstable County Baseline Conditions**

<b>Barnstable County</b>					
	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>
<b>Personal Income (Billions \$)</b>					
Total Personal Income	6.3	6.9	7.4	8.1	9.3
Ann. Pct. Change	6.6	9.8	7.5	9.3	14.5
Wages and Salaries	2.2	2.4	2.7	2.8	2.9
Nonwage Income	4.1	4.6	4.7	5.3	6.4
Real Personal Income (96\$)	6.2	6.7	7.1	7.6	8.5
Ann. Pct. Change	4.6	8.6	5.8	6.6	12.4
Per Capita Income (Ths.)	30.3	32.5	34.2	36.5	41.2
Real Per Capita Income (96\$)	29.7	31.6	32.6	34.0	37.6
Average Annual Wage (Ths.)	26.1	27.8	30.7	30.9	31.0
Ann. Pct. Change	4.0	6.6	10.5	0.5	0.2
<b>Establishment Employment (Place of Work, Thousands, SA)</b>					
Total Employment	81.2	83.2	86.6	89.4	91.9
Ann. Pct. Change	3.1	2.5	4.0	3.3	2.7
Manufacturing	3.3	3.5	3.7	3.6	3.5
Ann. Pct. Change	1.7	5.9	5.9	-4.8	-2.3
Durables	2.4	2.5	2.6	2.5	2.5
Nondurables	0.9	1.0	1.1	1.0	1.0
Nonmanufacturing	77.8	79.7	82.8	85.9	88.4
Ann. Pct. Change	3.2	2.4	3.9	3.7	2.9
Trade	26.7	27.5	28.6	29.6	29.9
Ann. Pct. Change	1.8	3.2	3.8	3.7	0.9
Retail	24.9	25.6	26.3	27.3	27.7
Wholesale	1.7	1.9	2.3	2.3	2.2
Trans., Comm., & Util.	3.9	3.9	4.0	4.0	4.0
Ann. Pct. Change	2.4	-1.6	3.1	0.7	0.1
Fin., Ins., & Real Estate	4.1	3.9	4.2	4.3	4.4
Ann. Pct. Change	2.5	-4.9	10.1	1.9	1.4
Services	27.1	27.9	28.6	29.3	30.8
Ann. Pct. Change	3.5	2.9	2.6	2.6	5.1
Federal Government	1.8	1.9	1.8	2.0	1.8
Ann. Pct. Change	1.0	2.5	-1.5	8.3	-8.7
State & Local Govt.	10.6	10.9	11.2	11.7	12.1
Ann. Pct. Change	5.2	2.8	3.1	3.8	3.8
Construction	3.5	3.7	4.3	4.8	5.2
Ann. Pct. Change	7.8	4.9	15.0	13.4	8.1
Mining	0.1	0.1	0.1	0.1	0.1
Ann. Pct. Change	15.2	-15.5	-8.5	-14.3	8.7
<b>Other Economic Indicators</b>					
Population (Ths)	208.1	212.4	217.4	222.5	225.9
Ann. Pct. Change	1.8	2.1	2.4	2.3	1.5
Total Housing Permits	1896.5	2122.1	2229.7	1876.4	1614.7
Single-Family	1796.2	1934.1	2084.5	1777.8	1505.7

As shown in Table 2.1, Barnstable County's real Personal Income (in 1996 dollars) was estimated at \$8.45 billion in 2001, representing a 12.4% increase over the previous year. Growth in Real Per Capita Income (In 1996 dollars) was even more dramatic, reaching an estimated \$41,180 in 2001, a 12.9% increase over 2000. By comparison, per capita personal income in Massachusetts in 2001 was \$38,860, up only 2.4% over the 2000 figure of \$37,950.

In 2001, total non-agricultural employment, on a place of work basis, was 91,870 employees, with the non-manufacturing sector accounting for 88,400 employees. The remaining 3,470 employees worked in the manufacturing sector. Retail Trade and Services had the largest shares of non-manufacturing employment, accounting for 27,700 and 30,850 workers respectively.

According to the Bureau of Labor Statistics, the average annual pay per covered worker in Barnstable County during 2001 was \$31,020, up 0.2% from the year before. Barnstable County's average pay per worker ranked 144<sup>th</sup> out of 317 MSAs. By comparison, the average pay per covered worker in the Boston and Providence PMSAs were \$45,768 and \$33,390 respectively.

According to the MDET, there were a total of 5,634 construction related workers employed in the Cape and Islands Workforce area in the 4<sup>th</sup> quarter of 2001. More recent data from the Bureau of Labor Statistics indicates that the total seasonally adjusted (SA) employment of construction and mining workers in Barnstable County in November 2002 was approximately 6,200 workers. Global Insight estimates that total M/A and C/I employment in the ROI in 2002 was distributed as follows: 34.4% in general building contractors (SIC 15); 9.7% in Heavy M/A and C/I, excluding Building (SIC 16), and 55.9% in Special Trade Contractors (SIC 17). Given the relatively small size of the M/A and C/I labor pool located in Barnstable County, the relatively low unemployment rate, and the specialized, high-skill M/A and C/I trades that will be needed to construct the proposed wind park, a significant share of the M/A and C/I workers will likely come from the Boston and Providence PMSAs.

Table 2.2 presents the economic structure and growth rates for the ROI and the Commonwealth of Massachusetts for 2002 for employment, nominal output, and number of establishments. The data was obtained from Global Insight's Business Demographics Navigator database, which in turn is based on a number of published sources, such as detailed ES202 employment data, databases of companies by zip code, and input-output tables. The table confirms that Barnstable County's employment is concentrated in the retail sector – 28.8% and services – 31.6%, with the retail trade employment share much higher than for Massachusetts, while the service sector share is slightly lower. The table also shows that the construction sector accounted for 7.1% of total MSA employment in 2002, well above the statewide share of 4.2%. The table also shows that the annual growth rates in employment, nominal output (i.e., gross output on a sales basis compared to the value added basis which is used for gross domestic product and gross state product), and the number of establishments in Barnstable County between 1990 and 2002 was greater than in the Commonwealth of Massachusetts. Finally, confirming the difference in economic growth, the annual growth rate in nominal personal income in Barnstable County between 1990 and 2002 was 6.7%; again well above the statewide growth rate of 5.4% over the same period.

**Table 2.2: Barnstable County and Massachusetts Baseline Conditions**

Industry	% Distribution by Sector in 2002			Annual Growth Rates 1990 to 2002		
	Employment	Number of Establishments	Output	Employment	Number of Establishments	Output
<b>Barnstable MSA</b>	%	%	%	%	%	%
Agriculture, Forestry, and Fishing	1.8%	4.0%	1.3%	-0.36%	2.68%	1.49%
Mining	0.1%	0.0%	0.1%	3.44%	-1.88%	8.28%
Construction	7.1%	13.6%	10.7%	5.80%	4.71%	6.37%
Manufacturing	4.1%	3.0%	5.1%	-0.07%	2.18%	4.20%
Transportation and Public Utilities	3.9%	3.8%	5.0%	-1.61%	1.32%	0.44%
Wholesale Trade	2.7%	4.2%	7.9%	3.71%	4.63%	6.54%
Retail Trade	28.8%	27.9%	25.5%	1.11%	1.21%	4.15%
Finance, Insurance, and Real Estate	4.1%	6.3%	17.1%	0.88%	2.67%	7.04%
Services	31.6%	33.6%	20.9%	3.27%	4.03%	7.09%
Public Administration	15.9%	3.6%	6.5%	2.33%	2.36%	6.12%
Total Industries	100.0%	100.0%	100.0%	2.03%	2.88%	5.38%
<b>Massachusetts</b>	%	%	%	%	%	%
Agriculture, Forestry, and Fishing	1.5%	4.1%	0.7%	1.5%	2.1%	2.1%
Mining	0.0%	0.1%	0.0%	0.5%	-0.2%	3.3%
Construction	4.2%	11.4%	5.2%	2.9%	4.1%	5.3%
Manufacturing	12.0%	5.0%	16.6%	-2.1%	-0.5%	2.4%
Transportation and Public Utilities	4.9%	3.8%	5.8%	0.6%	1.4%	4.3%
Wholesale Trade	4.7%	5.7%	12.5%	-0.6%	0.0%	3.2%
Retail Trade	16.8%	21.6%	15.6%	0.5%	0.7%	4.5%
Finance, Insurance, and Real Estate	6.9%	6.9%	16.4%	0.7%	1.7%	6.2%
Services	36.1%	36.0%	22.2%	2.4%	2.9%	6.8%
Public Administration	12.7%	5.4%	5.0%	0.5%	0.5%	4.2%
Total Industries	100.0%	100.0%	100.0%	0.8%	1.8%	4.6%

Source: Global Insight's Business Demographics Navigator, 2002.

Table 2.3 presents baseline data for Barnstable and Yarmouth from the “Community Report Builder” databases maintained by the Massachusetts Department of Revenue, Division of Local Services. Barnstable and Yarmouth are the two municipalities in the ROI where the direct effects of M/A and C/I and operation would be most concentrated. Barnstable had an estimated population of 47,821 persons in 2000 according to the US Census, while Yarmouth’s population was 24,807 persons. Yarmouth was also the most densely populated municipality in Barnstable County in 2000 with a density of 1,028 persons per square mile. Barnstable’s 2001 unemployment rate was in the vicinity of 2.5% while Yarmouth’s was 3%. Finally, the table shows that both Barnstable and Yarmouth are classified as growth communities.



<b>Table 2.3: Barnstable and Yarmouth CCCConditionsConditionsConditions</b>		
TOWN - (As of 4/16/02)	BARNSTABLE	YARMOUTH
Socioeconomic		
County	BARNSTABLE	BARNSTABLE
Kind of Community	Growth Community	Growth Community
School Structure	K to 12	Non-Operating
Regional Schools	•CAPE COD	•DENNIS YARMOUTH & CAPE COD
Form of Government	•Town Manager	•CAPE COD
	•Council	•Selectmen
		•Town Administrator
		•Open Town Meeting
2000 Population	47,821	24,807
2001 Labor Force	24,039	10,830
1989 Per Capita Income	\$ 17,376	\$ 15,042
Population Per Square Mile	795	1,028
2001 Unemployment Rate	2.5	3
2000 EQV Per Capita	\$ 127,949	\$ 104,233
Moody's Bond Rating	Aa3	A1
<b>FY2002 Cherry Sheet</b>		
Estimated State Aid		
Education Aid	\$ 12,845,862	\$ -
General Government	\$ 2,879,873	\$ 1,729,485
Total Receipts	\$ 15,725,735	\$ 1,729,485
Total Assessments	\$ 2,360,841	\$ 568,669
Net State Aid	\$ 13,364,894	\$ 1,160,816
<b>FY2002 Tax Classification</b>		
Tax Classification	Tax Rate	Tax Rate
Residential	9.26	11.10
Open Space		11.10
Commercial	9.26	11.10
Industrial	9.26	11.10
Personal Property	9.26	11.10
Total		
<b>FY2002 Revenue Sources</b>		
Revenue Sources		
Tax Levy	\$ 69,349,434	\$ 32,070,726
State Aid	\$ 16,235,873	\$ 1,869,377
Local Receipts	\$ 29,153,818	\$ 20,138,185
Other Available	\$ 8,995,349	\$ 5,003,872
Total	\$ 123,734,474	\$ 59,082,160
<b>FY2002 Proposition 2 1/2 Levy Capacity</b>		
New Growth	\$ 1,151,310	\$ 449,238
Override		
Debt Exclusion	\$ 4,814,133	\$ 3,302,700
Levy Limit	\$ 69,356,539	\$ 32,562,353
Excess Capacity	\$ 7,105	\$ 491,627
Ceiling	\$ 187,228,491	\$ 72,231,365
Override Capacity	\$ 122,686,085	\$ 42,971,712
<b>FY02 Average Single Family Tax Bill</b>		
Number of Single Family Parcels	20,521	\$ 12,480
Assessed Value of Single Family	\$ 5,765,148,600	\$ 2,027,482,800
Average Single Family Tax Bill	\$ 2,601	\$ 1,803
<b>FY00 Schedule A - Actual Revenues and Expenditures</b>		
	General Fund	General Fund
Revenues	\$ 91,354,146	\$ 38,819,857
Expenditures	\$ 88,583,967	\$ 40,946,008
Police	\$ 7,294,264	\$ 3,711,981
Fire	\$ -	\$ 2,620,551
Education	\$ 52,889,421	\$ 15,080,169
Public Works	\$ 4,253,568	\$ 2,724,109
All Other	\$ 24,146,714	\$ 16,809,198

### 3. Impacts on the Local Economy

#### Economic Impacts During M/A and C/I

The direct economic impacts in the ROI and Massachusetts (MA) during M/A and C/I would consist of the hiring of M/A and C/I workers and the purchase of non-labor goods and services. The applicant indicates that most of the specialized components of the wind turbine generators (WTGs) such as the nacells (i.e., the portion of the WTGs that contain the drive train and the electromotive generating systems), and the rotors will be purchased outside the ROI and very likely outside of Massachusetts. Other non-labor goods and services will be bought in Massachusetts such as concrete, steel, and barge services. The temporary increase in economic activity within the ROI and MA during the M/A and C/I phase will be the sum of the: 1) direct economic impacts – hiring of M/A and C/I workers and purchases of non-labor goods and services; 2) indirect effects – the additional demands for inputs from the industries that sell non-labor goods and services directly to the project; and 3) induced effects – the increases in employment, income, etc. generated by the expenditure of disposable income of the newly hired M/A and C/I workers. The size of the temporary increase in economic activity in the ROI and MA during M/A and C/I and operation will depend on the proportion of direct expenditures that take place within these regions. Once the plant begins operating, the direct, indirect and induced economic effects would be permanent changes to the state and ROI economies.

There will be two types of activities during the 27-month M/A and C/I phase:

- **Manufacture & assembly** of the blades and other WTG components in southern New England before being barged to the project site on Horseshoe Shoal. According to the applicant, approximately 80% of the labor inputs required during the M/A and C/I phase will be needed for manufacturing and assembly operations.
- **Construction & installation** of the WTGs on Horseshoe Shoal, includes the installation of the undersea monopile foundations that will support the WTGs, the on-site assembly of the WTGs; the construction of the electric service platform (ESP); and installation of the offshore and onshore components of the transmission line that convey the project's electric power to the region's existing electric transmission and distribution system. About 20% of the labor inputs required during the M/A and C/I phase will be needed for construction and installation activities.

The impact assessment presented below addresses both the manufacture & assembly activities conducted onshore, and the construction & installation activities that will occur offshore and along the transmission line right-of-way (ROW).

Based on the applicant's estimate of total person-months of M/A and C/I-phase labor required, Global Insight finds that a total of 880 person-years of labor will be required during the M/A and C/I phase, 711 for manufacture & assembly operations and 169 for construction & installation activities. Assuming a 27-month M/A and C/I phase, this translates into an annual average of 391 full-time jobs during the 27-month period, consisting of 316 for the manufacturing & assembly activities, and 75 for construction and installation activities. However, in actuality the M/A and C/I activities will not be evenly distributed across the M/A and C/I phase, but will instead peak during year 2 when the maximum employment at the two locations at one time will be about 600 workers. Given the size of the regional M/A and C/I labor market, and proximity of M/A and C/I phase operations to both the Boston and Providence MSAs, Global Insight estimates that 75% of the construction and installation workers will be from Massachusetts, while 25% of the manufacturing & assembly workers will be from Massachusetts. The latter proportion could rise if some or all of the manufacturing & assembly operations are conducted in Fall River, MA, or possibly southeastern Massachusetts. Global Insight estimates that total payments of wages and salaries to Massachusetts' residents hired during the M/A and C/I phase will be about \$17.158 million.

The applicant has determined that about 20% of the project's total capital cost of \$700 million will be needed for labor inputs, while 80% will be required for non-labor goods and services, including the WTG components; electric equipment including transmission lines; environmental studies and licensing costs; materials; legal service; construction materials such as steel; and transportation services. The unique characteristics of the proposed action make the percent shares of the total capital cost for labor and non-labor inputs different from those required for the construction of a fossil-fueled, electric generating plant. The 80% share for non-labor costs means that the temporary increase in economic activity in the ROI and MA, and even in New England, during the M/A and C/I-phase will depend primarily on the value of non-labor items purchased within these regions. Based on the location of likely suppliers for the WTG components as identified by the applicant, Global Insight estimates that between \$150 million and \$250 million in purchases on non-labor inputs will occur in MA during the M/A and C/I phase.

In order to estimate the temporary increase in economic activity during the M/A and C/I phase, Global Insight used the IMPLAN input/output (I/O) model for Massachusetts. This model was chosen because it enables the direct economic impacts (i.e., expenditures for labor and non-labor inputs) to be allocated into specific economic sectors (i.e., 3-digit and 4-digit SIC codes). Global Insight's Energy Group identified the appropriate final demand 3-digit SIC code sectors for the purchases of the non-labor goods and services, while the payments of wages & salaries were allocated to the household sector. The IMPLAN model produces multipliers for the total statewide increases in employment, output, value added, and income. We obtained the year 2000 structural matrices for MA, and then used the I/O model to derive the appropriate multiplier impacts at the state level. The multiplier effects within the ROI will be lower than at the state level due to the leakage of expenditures from the local economy, and because most of \$150 million to \$250 million in purchases of non-labor goods and services will be made outside the ROI such as in the Boston MSA. .

Since the total purchases of labor and non-labor inputs will occur over a three-year period, Global Insight performed three separate simulations with the I/O model, one for each year of the M/A and C/I phase, and allocated the probable purchases of both labor and non-labor inputs to each year based on the labor schedule prepared by the applicant. We averaged the model results to give a range of average annual economic impacts that would occur during M/A and C/I, recognizing that at any point in time during the M/A and C/I phase the actual total economic impacts would be higher or lower. Unless noted otherwise, impacts are stated in current 2002 dollars, with the gross domestic product deflator used to convert results from the IMPLAN model to current 2002 dollars. Global Insight estimates the following average annual changes in Massachusetts during the M/A and C/I phase of the Cape Wind Park:

- Between 597 and 1,013 full-time jobs will be created in MA, with the range of the increase varying based on the value of non-labor purchases of goods and services made in MA.
- Total output in MA will increase by between \$85.0 million and \$137.4 million annually, while the annual increase in value added will range between \$43.9 million and \$71.0 million.
- Total labor income (consisting of wages & salaries, and income to sole proprietors) will increase by an average of between \$32.1 million and \$52.0 million annually, generating an annual increase in MA personal income tax revenues of between \$1.6 and \$2.6 million, or a total of between \$4.8 and \$7.8 million during the entire M/A and C/I phase.
- Other property income, comprised of rent, dividends & interest, and corporate profits, would rise by between \$9.2 million and \$14.8 million annually, producing an annual increase in corporate income taxes of between \$434,900 and \$702,200 if half of the increase were taxable corporate net income. The total increase in corporate income tax revenues during the M/A and C/I phase could range between \$1.304 million and \$2.106 million.

### **Economic Impacts During Operation**

Once the plant begins operation, the applicant estimates that the annual O&M purchases would be approximately \$16 million, including \$2.644 million for wages & salaries paid to the 50 workers required to maintain the facility. The 50 O&M workers would earn, on average, \$52,880 in annual salary and wages. The annual purchase of O&M services would generate additional permanent increases in economic activity in the ROI and Massachusetts. Global Insight assumed that 90% of the O&M workers would be residents of Massachusetts. The combination of the direct, indirect and induced effects as described above would generate the following permanent increases in MA, most of which would be concentrated in the ROI:

- Annual permanent increases, starting in 2007, of 154 jobs, \$21.8 million in output, \$10.2 million in value added, and \$6.93 million in labor income.
- The annual increase in Massachusetts personal income tax revenues would be \$346,500, while the rise in corporate income tax revenues would be approximately \$113,900. We have assumed that the scheduled reduction of Massachusetts' personal income tax rate to 5% in 2003 occurs as planned; however due to the state's budget deficit, this reduction may be delayed.
- The on-land improvements of the transmission line and related facilities located in Barnstable and Yarmouth would have an assessed value of \$26,250,000, and generate annual property tax revenues of \$62,510 in Barnstable and \$217,168 in Yarmouth.

The multiplier effects in the ROI during the operations phase would be larger than during the M/A and C/I phase for two reasons: 1) a higher share of the O&M workers would likely be residents of the ROI; and 2) experience at other energy facility sites shows that over time local vendors develop the expertise, and add the required product lines, to provide an increasing share of the specialized goods and services required to operate and maintain new facilities, thus increasing the local permanent economic impacts. Overall, we forecast that the operation and maintenance of the Cape Wind Farm would have a positive, effect on the economy of both the Barnstable MSA and the Commonwealth of Massachusetts.

### **Fiscal Impacts During the M/A and C/I Phase**

This section describes the net fiscal impacts that would occur in Yarmouth, Barnstable, and the Commonwealth of Massachusetts during the M/A and C/I phase. Net fiscal impacts are the difference between the additional increases in annual local and state tax revenues and the demand for additional public services generated by the M/A and C/I workers. Potential demands for locally provided government services are discussed in order to define the potential net fiscal impacts on the affected local governments.

#### **Barnstable and Yarmouth**

Based on the proximity of the project to the Boston and Providence metropolitan statistical areas (MSAs), all of the M/A and C/I phase labor inputs will be obtainable from within a daily commuting distance, indicating that no M/A and C/I workers will have to relocate to either the Barnstable-Yarmouth MSA or to the onshore manufacturing & assembly sites in Fall River or Quonset Point. Depending on the location of the prime contractor, there may be a small number of management and supervisory personnel who would be required to relocate to the ROI for the M/A and C/I phase. Yarmouth and Barnstable would experience minimal, temporary increases in demand for local government services during the M/A and C/I phase for police and traffic control due to likely daily commuting by M/A and C/I & installation workers. Since we do not foresee any significant permanent in-migration by M/A and C/I workers and their dependents to the ROI during the M/A and C/I phase, there would be no corresponding increase in the demand for locally

provided government services. Therefore, there is likely to be a minimal net fiscal impact one way or the other on Yarmouth and Barnstable during M/A and C/I. Both jurisdictions would receive some one-time building permit fees during the M/A and C/I phase for the approximately \$20 million in on-shore facilities that would be constructed in these two jurisdictions.

### **Fiscal Impacts During Operation**

#### **Barnstable and Yarmouth**

As noted above, the \$26,250,000 of on-shore improvements would generate annual increases in real property tax revenues of \$62,510 in Barnstable and \$217,168 in Yarmouth.

There would be a minimal increase, if any, in the demand for locally provided government services in Barnstable and Yarmouth once the project begins operations, primarily because there would be no permanent in-migration of O&M workers; as noted above we assumed that 90% of these employees would be residents of Massachusetts and reside within daily commuting distance of the project. Since the O&M workers would commute daily to an on-shore support base, possibly located on Cape Cod before being transported to the offshore WTGs, there would be only a minimal net increase in demand for new, locally provided, public services. Finally, there would not be any increase in demand for government services in adjacent municipalities.

#### **Commonwealth of Massachusetts**

As noted above, the annual increase in Massachusetts' personal income tax revenues once the plant begins operation would be \$346,500, while the increase in corporate income tax revenues would be approximately \$113,900, for a combined permanent increase of \$460,400. The Commonwealth of Massachusetts could experience a moderate annual increase in sales tax revenues during operation, once again with the amount of sales and use revenues determined by two factors: 1) the share of the approximately \$10.44 million in annual O&M purchases that are made within Massachusetts, and 2) the extent to which project-related O&M expenditures would be subject to the sales and use tax since virtually all of the project is located outside state waters. Overall, the State would incur little, if any, increase in demand for government services attributable to the plant over those currently provided to the site. Therefore, the net fiscal impact to the State would be positive.

#### **Impacts of Savings in Wholesale Power Costs**

The applicant estimates that the project will produce annual savings in wholesale electric power costs in New England of \$25 million, with the following savings by sector: \$7.5 million – residential; \$15 million – commercial; and \$2.5 million – industrial. This assessment is based upon a study conducted by La Capra Associates entitled *The Cape Wind Project: Impact on New England Electricity Market Prices, February 2002 Analysis*. The actual cost saving in the three sectors is based upon the assumption that the cost reductions are passed through by wholesale power producers to the retail market, and eventually to the final consumers. In the residential sector, the savings would not be an increase in household income (i.e., no outward shift of the demand curve), but would free up some disposable income to be spent for goods and services other than electric power. The net economic impact of the shift in expenditures by households will depend upon which types of goods and services the freed-up disposable income is spent, compared to the economic impacts of purchasing electric power. For example, if households used the additional disposable income to eat at restaurants more often, it is probable that total output in MA would decline slightly, while total employment would rise. Within the non-residential sector, the reduction in power costs could increase corporate net income, with the extent of the increase depending on the share of the foregone power costs that go directly to the bottom line as compared to the share spent for other inputs.

Global Insight used the IMPLAN I/O model to estimate the net economic impact of the shift in expenditures. We shifted \$25 million in final demand from the electric power sector to other types of

expenditures by households and businesses to capture the net economic effect. Based upon the applicant's assumptions, we estimate the net economic effect of reducing wholesale power costs will be to generate an annual increase in output of between \$5.1 million and \$6.1 million; a decline in value added of between \$4.4 million and \$9.1 million, and a permanent increase in employment of between 142 and 215 jobs.