PROVPORT

The ReNEWable Port

Benefit Cost Analysis

AN ENCONOMIC AND ENVIRONMENTAL IMPACT STUDY FOR THE PORT OF PROVIDENCE

A STUDY OF THE LONG TERM BENEFITS ON INCOME GENERATION,
JOB CREATION AND THE ENVIRONMENT

Prepared by:
Luanne S. Lemieux, Project Director
Dr. Joseph A. Ilacqua, Professor of Economics, Senior Researcher
Chafee Center for International Business at Bryant University

1150 Douglas Pike
Smithfield, RI 02917
Phone: 401 232-6407
Fax: 401 232-64156

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Any substantive errors are the responsibility of the author.

Dr. Joseph A. Ilacqua
Professor of Economics
Bryant University
Smithfield, RI 02917 USA
(401) 232-6098 Fax (401) 232-6319
http://economics.bryant.edu.

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Executive Summary

The Port of Providence in Rhode Island is a source of significant positive economic impact on the city of Providence and the State of Rhode Island. As Rhode Island's economy is rated amongst the weakest in the United States, the State of Rhode Island and the City of Providence seek to leverage the economic success fueled by ProvPort, the non-profit corporation that operates the Port of Providence.

ProvPort makes a substantial contribution to the area's local economy. During the past decade the direct and indirect jobs created by ProvPort have grown by more than 300 percent according to a study completed by the national maritime research firm, Martin Associates. Jobs created by ProvPort activities now exceed 2,400 high paying jobs.

The application to secure $39.5 million in TIGER grant dollars would provide funding allowing ProvPort to expand its activities and capacities, supply job growth in the region, and replace existing fossil fuel use with renewable energy sources. This initiative would serve as an innovative model that stresses both environmental and economic potential.

ProvPort The ReNEWable Port will provide multiple benefits to Providence, the State of Rhode Island, the Northeastern corridor region and the Nation. The very presence of an enterprise such as ProvPort creates other seldom considered, but equally important benefits beyond direct services through its economic impact on the community and the region. When in operation, the Port of Providence will generate $48.8 million in output in the region annually.

A more immediate effect of stimulus is the construction of ProvPort, which includes the construction or installation of the Wind Turbines, Solar Panels, and Barges. The Port, with a total proposed cost of $39.5 million, will generate substantial economic stimulus for Rhode Island and the region. The initial investment will generate more than $61 million of new income and more than 384 direct, indirect and induced employment opportunities locally. For the Northeastern corridor region, the stimulus will result in $72 million of new output and approximately 432 new jobs. Nationally, the project will generate $120 million in stimulus with 634 jobs.

The combined construction of the proposed ProvPort's - The ReNEWable Port, in its first expected year of full operation, will generate a financial contribution to the local economy of approximately $100 million of output and $121 million for the region. Most importantly, $43 million locally and more than $48 million regionally will be sustained as mid and long-term new income.

Benefit/Cost Analysis Figures

Costs			
Life Cycle	40		
Base Year	2009		
Total	$39,500,000.00		
Real Interest Rate	2.70%		
Annual (In 2009 $)	$987,500.00		
Future Value	$69,593,302.03		
Annualized Future Value	$1,739,832.55		
	Lower Bound		
Benefits	**Per Year**	**Present Value**	**Annualized**
Solar Energy Production	$308,097.60	$7,479,988.16	$186,999.70
Wind Energy Production	$521,600.32	$12,663,403.47	$316,585.09
Solar Carbon Reduction	$628,393.60	$15,256,128.86	$381,403.22
Wind Carbon Reduction	$1,063,860.60	$25,828,389.09	$645,709.73
Transportation (Diesel Emission)	$1,468,427.40	$35,650,454.80	$891,261.37
Fatality	$1,360,187.40	$33,022,605.97	$825,565.15
Total	**$3,990,379.52**	**$129,900,970.34**	**$2,421,959.11**
Benefit/Cost Ratio	**3.29**		
	Upper Bound		
Benefits	**Per Year**	**Present Value**	**Annualized**
Solar Energy Production	$308,097.60	$7,479,988.16	$186,999.70
Wind Energy Production	$521,600.32	$12,663,403.47	$316,585.09
Solar Carbon Reduction	$628,393.60	$15,256,128.86	$381,403.22
Wind Carbon Reduction	$1,063,860.60	$25,828,389.09	$645,709.73
Transportation	$1,468,427.40	$35,650,454.80	$891,261.37
Fatality	$3,585,948.60	$87,059,597.55	$2,176,489.94
Total	**$3,990,379.52**	**$183,937,961.92**	**$2,421,959.11**
Benefit/Cost Ratio	**4.66**		

Benefit/Cost Analysis Summary

The ReNEWable Port has much to offer the public, in a variety of ways. With the expansion of ProvPort, come multiple sustainable benefits to the people, environment, and economy. Gauging costs and benefits which occur in different periods of time have been calculated using a 2.7% annual effective interest rate, over an estimated 40-year life cycle.

The most direct benefit of the grant is long-term production of renewable energy. Once established, the wind turbines and solar panels require minimal maintenance, yet continue to supply cleaner energy. The combined output of the renewable system is slightly under $830,000 a year using the regional $0.16/kWh energy cost. The present value of this constant stream is $20.4 million, enough to cover half of the original investment.

The indirect benefit of renewable energy is the reduction of carbon emissions. For every kWh the systems produce, there is an associated reduction in emissions. The reduction in emissions reduces health care cost both locally and nationally. Using figures from the Journal of Transportation, Economics, and Policy and Alteris Inc., the total calculated emission reduction is estimated to be 2,357 tons per year. The emissions include carbon monoxide, carbon dioxide, nitrogen oxides, and other environmentally harmful compounds. The 2,357 tons of emission equates to approximately $1.69 million in health care costs. The present value of these benefits totals $41.6 million.

In addition to the renewable energy systems, the installation of two electric cranes will reduce emissions at the Port. The electric cranes will enable ProvPort to load and unload containerized cargo. The movement of containers by barge to and from the port rather than by truck increases the efficiency of transporting goods. The efficiency translates into a reduction in diesel emissions. Research has determined the total reduction in emissions resulting from removing these trucks from the road should result in approximately $1.46 million a year. Assuming these figures for the next 40 years, the present value would be $36 million. To ensure reasonable data, all emissions were assumed to be carbon oxide and nitrogen oxide excluding all other more costly chemicals prevents an over-estimation.

The barge shipping also helps keep people safe. According to the Appalachian Regional Commission there are an additional 0.83 deaths per billion ton-miles while shipping by truck rather than by barge. This figure translates into a difference of 0.49 deaths per year. Using the Lower and Upper Bound of the VSL (Value of a Statistical Life) we calculate an annual reduction to be $1.36 million and $3.58 million respectively, with present values of $33.4 million and $88.2 million. Both the lower and upper bound were calculated into separate benefit/cost ratios to produce a range from 3.33 to 4.72.

ProvPort Employment and Output Model Projections *at a glance.*

Output ProvPort: The Renewable Port			
		Total Yearly Output	Employment
Direct		$28,366,181.00	360.2
Rhode Island		$43,196,886.49	553
Regional		$48,792,468.09	624.2
United States		$71,857,523.00	929.6
		Regional Yearly Output	
Barge/Crane Income		$47,775,829.30	624.2
Renewable Energy			
	Solar	$353,605.37	
	Wind	$663,033.42	
		$48,792,468.09	624.2
		Local Yearly Output	
Barge/Crane Income		$42,483,697.00	553.0
Renewable Energy			
	Solar	$325,784.00	
	Wind	$607,777.00	
		$43,417,258.00	553.0
		National Yearly Output	
Barge/Crane Income		$70,484,397.00	929.6
Renewable Energy			
	Solar	$472,987.00	
	Wind	$900,139.00	
		$71,857,523.00	929.6
Building ProvPort: The Renewable Port			
		Total Construction Output	Employment
Rhode Island		$61,119,473.00	384.5
Regional		$72,354,289.96	431.9
United States		$120,562,949.00	634.4
		Regional Construction Output	Employment
Barge/Cranes		$36,101,343.81	101.3
Wind Turbines		$8,414,142.78	77.8
Solar Panels		$20,615,949.20	186.1
Other		$7,222,854.18	66.7
		$72,354,289.96	431.9
		Local Construction Output	Employment
Barge/Cranes		$30,096,838.00	85.4
Wind Turbines		$7,188,931.00	70.4
Solar Panels		$17,662,594.00	168.3
Other		$6,171,110.00	60.4
		$61,119,473.00	384.5
		National Construction Output	Employment
Barge/Cranes		$61,866,710.00	169.3
Wind Turbines		$13,671,533.00	108.9
Solar Panels		$33,288,812.00	262.7
Other		$11,735,894.00	93.5
		$120,562,949.00	634.4

Economic Impact Results

Although projects such as the ReNEWable Port are generally regarded as an asset to a community, the extended economic impact of an innovative organization such as ProvPort deserves special recognition. The economic and environmental benefits described in this document reveal that the Port of Providence, in addition to the direct service it will provide locally, will contribute substantially to the economic wellbeing of the Northeastern Corridor Water Freight Region and the Nation. Simply stated the Port generates income, creates wealth and employment for the citizens of the region, builds tax revenue and will advance the environmental and social wellbeing of the Northeastern corridor region. The Nations Atlantic Sea Adjacent Region from Norfolk, Virginia to Boston Massachusetts contains a population of 62.7 million needing product transportation services. As a multi- modal transportation facility ProvPort is very well positioned for the coming future of product transportation.

Direct Effects

Represents the impacts (e.g. change in employment) for the expenditures and/or production values specified as direct final demand changes.

Indirect Effects

Represents the impact (e.g. change in employment) caused by the iteration of industries purchasing from industries resulting from direct final demand changes.

Induced Effects

Represents the impact (e.g. change in employment) on all local industries caused by the expenditure of new household income generated by the direct and indirect of direct final demand changes.

ProvPort will provide multiple benefits to Providence, the State of Rhode Island, the Northeast Region and the Nation. The very presence of an enterprise such as ProvPort creates other seldom considered, but equally important benefits beyond direct services through its economic impact on the community and the region. In delivering transportation services to the region, ProvPort will purchase labor, and millions of dollars worth of materials, supplies, and services annually, while providing additional income for area businesses and residents through continuing investment and job creation.

Long-Term Economic Impact

The value and strength of ProvPort's contribution to the local community and the region is very impressive, even on the simplest level of analysis. When in full operation, the Port will directly generate $28,366,181.00 in output of services with employment of up to 360 at the facility. In Rhode Island alone, this will lead to more than 550 jobs and a total of over $43 million in new income. For the Northeastern Corridor Region this will multiply to well over 600 jobs and more than $49 million in new income. Carrying this new annual activity to its national impact, the proposed ProvPort project, when it is up and in full production, will advance income by approximately $72 million in income and close to 930 new jobs.

Long-Term Income Multiplier at Work

Income generation is comprised of expenditures by ProvPort, the total employee payroll and benefits of the company. However, these factors alone do not represent the total amount of income generated.

Economic studies find that many additional jobs are created indirectly as a result of the financial transactions of a business, its suppliers, customers and employees. Job creation during the construction activity of ProvPort adds more than 380 jobs in Rhode Island, 430 to the region and more than 630 nationally. The predicted new job creation expands well beyond the 250 or so initial direct jobs, according to the RIMSII final demand multiplier.

Combining the construction of the proposed ReNEWable Port and its first expected year of full production, mid-term income and job impact for the project is estimated. This initial impact of the proposed ProvPort generates a financial contribution to the local economy of approximately $105 million of income and 940 jobs in Rhode Island. This grows to more than $120 million of new mid-term income and well over 1,000 new jobs for the Northeastern Corridor Water Freight Region. Most importantly, $43 million locally, $48 million regionally and $71 million nationally will be sustained over time as mid and long-term new income. All this new income and employment will be adding up each year as the return on an original investment of $39.5 million.

Energy and Economically Efficient - The ReNEWable Port

The core of The ReNEWable Port is the new environmentally friendly shallow-draft water transportation barge use and barge/crane project as well as the highly efficient wind turbine and solar panel energy systems. The new use of barge transport coming into the port each year will generate $27 million of new direct income annually multiplying to $31 million in Rhode Island and $37 million of new income for the region. 250 jobs at ProvPort will become well over 400 for the state and more than 480 sustainable long-term jobs for the region.

The new wind turbine and solar panel energy systems for ProvPort will yield close to $765,000 worth of environmentally friendly energy each year covering virtually all energy needs of The ReNEWable Port. There is a good possibility of an electrical surplus being supplied into the electrical grid. The energy saving efficiency of the proposed project can yield multiplier impact of savings close to a million dollars annually for the region.

There are additional ways to evaluate the savings as well as employment and income creation that can be viewed as coming from ProvPort The ReNEWable Port. The construction and coming online of two new electrical barge-supported cranes for use at the port for container, bulk and scrap loading and unloading, will not only save fossil energy but reduce energy dependence. The savings and independence arises through using electrical energy produced on-site, most likely leaving a surplus from the $765,000 worth of environmentally friendly energy produced each year. Further, the barge use by itself will generate direct, indirect and induced employment income of close to $41 million and about 420 in new employment in Rhode Island. This long-term economic gain will be preceded by the important economic stimulus of the initial development of The ReNEWable Port.

Economic Stimulus Impact

The construction of The ReNEWable Port with a proposed cost of $39.5 million in investment will generate substantial stimulus impact on the State of Rhode Island, as well as the Region. The income multiplier impact for Rhode Island alone will turn the initial investment into more than $61 million of new short term income and an excess of 385 direct, indirect and induced stimulus employment opportunities. For the Northeastern Corridor Region the stimulus results in $72 million in new income and more than 430 new stimulus jobs. The national stimulus impact of the proposed project alone will add $120 million to the United States GDP and close to 635 new employment opportunities nationally.

The construction and preparation of two barge supported electric powered cranes for use at ProvPort brings important stimulus muscle into Rhode Island and the Region. The barge construction, assembly of the working cranes and their operational delivery to Providence will stimulate new direct output valued at approximately $19 million which would generate a total of $30 million of output in the local area. The direct output also translates into a regional output increase of $36 million, or a national output increase of $61.8 million. This part of the project will directly create approximately 47 jobs while it is in progress, including the direct, indirect, and induced job creation of the project, which leaves Rhode Island with a total job increase of approximately 85. While the job creation scope for the region and the country are 101 and 169 respectively.

According to the Organization for Economic Co-Operation and Development, the United States' Tax-to-GDP ratio is 25.4%. Our research generated a total output increase for the construction plus one year of business of ProvPort to be about $196 million for the United States. Applying the Tax-to-GDP ratio to the added GDP shows that the income generated from taxation pays for the original investment after only one year. In addition, the yearly added output due to ProvPort will generate approximately $18 million in taxes per year in the long run

(Organization for Economic Co-Operation and Development)

Multiplier Model Analysis

Yearly Output of ProvPort: The Renewable Port

Barge Employment

	Rhode Island Output per Year	Rhode Island Employment	United States Output per Year	United States Employment	Regional Output per Year	Regional Employment
Direct	$20,845,682.00	259	$20,845,682.00	259	$20,845,682.00	259.0
Indirect	$4,582,669.00	69.2	$17,369,990.00	199.7	$6,999,472.67	93.9
Induced	$6,316,090.00	90.4	$22,109,682.00	294.4	$9,301,078.89	129.0
Total	**$31,744,441.00**	**418.6**	**$60,325,354.00**	**753.1**	**$37,146,233.56**	**481.8**

Barge Income

	Rhode Island Output per Year	Rhode Island Add. Employ.	United States Output per Year	United States Add. Employ.	Regional Output per Year	Regional Add. Employ.
Direct	$27,600,000.00	101.2	$27,600,000.00	101.2	$27,600,000.00	101.2
Indirect	$3,643,786.00	7	$10,735,341.00	15.8	$4,984,089.90	8.6632
Induced	$11,739,911.00	26.2	$32,649,056.00	59.5	$15,691,739.41	32.4937
Total	**$42,483,697.00**	**134.4**	**$70,484,397.00**	**176.5**	**$47,775,829.30**	**142.4**

Wind Turbine Yearly Production

	Rhode Island Output	United States Output	Regional Output
Direct	$496,596.00	$496,596.00	$496,596.00
Indirect	$24,810.00	$141,945.00	$46,948.52
Induced	$86,371.00	$261,598.00	$119,488.90
Total	**$607,777.00**	**$900,139.00**	**$663,033.42**

Solar Panels Yearly Production

	Rhode Island Output	United States Output	Regional Output
Direct	$269,585.00	$269,585.00	$269,585.00
Indirect	$11,033.00	$68,569.00	$21,907.30
Induced	$45,166.00	$134,833.00	$62,113.06
Total	**$325,784.00**	**$472,987.00**	**$353,605.37**

Yearly Production

	Rhode Island Output	Rhode Island Employment	United States Output	United States Employment	Regional Output	Regional Employment
Direct	$28,366,181.00	360.2	$28,366,181.00	360.2	$28,366,181.00	360.2
Indirect	$6,235,959.00	76.2	$10,945,855.00	215.5	$5,052,945.71	102.5277
Induced	$8,594,746.49	116.6	$33,045,487.00	353.9	$15,873,341.37	161.4497
Total	**$43,196,886.49**	**553**	**$71,857,523.00**	**929.6**	**$48,792,468.09**	**624.1774**

Additional Barge/Crane Output by Category

Containers

	Rhode Island Output per Year
Direct	$10,400,000.00
Indirect	$1,398,353.30
Induced	$4,505,353.30
Total	**$16,303,706.60**

	United States Output per Year
Direct	$10,400,000.00
Indirect	$4,119,835.66
Induced	$12,529,527.03
Total	**$27,049,362.69**

	Regional Output per Year
Direct	$10,400,000.00
Indirect	$1,912,713.47
Induced	$6,021,922.13
Total	**$18,334,635.60**

Bulk

	Rhode Island Output per Year
Direct	$11,200,000.00
Indirect	$1,505,918.94
Induced	$4,851,918.94
Total	**$17,557,837.87**

	United States Output per Year
Direct	$11,200,000.00
Indirect	$4,436,746.10
Induced	$13,493,336.80
Total	**$29,130,082.89**

	Regional Output per Year
Direct	$11,200,000.00
Indirect	$2,059,845.27
Induced	$6,485,146.91
Total	**$19,744,992.18**

Scrap

	Rhode Island Output per Year
Direct	$5,500,000.00
Indirect	$739,513.76
Induced	$2,382,638.76
Total	**$8,622,152.53**

	United States Output per Year
Direct	$5,500,000.00
Indirect	$2,178,759.24
Induced	$6,626,192.18
Total	**$14,304,951.42**

	Regional Output per Year
Direct	$5,500,000.00
Indirect	$1,011,531.16
Induced	$3,184,670.36
Total	**$9,696,201.52**

Building ProvPort: The Renewable Port

Wind Turbine Construction

	Rhode Island		United States		Regional	
	Output	Employment	Output	Employment	Output	Employment
Direct	$4,600,000.00	48.4	$4,600,000.00	48.5	$4,600,000.00	48.5
Indirect	$737,722.00	5.4	$3,251,561.00	17.8	$1,212,837.57	7.7
Induced	$1,851,209.00	16.6	$5,819,972.00	42.6	$2,601,305.21	21.5
Total	**$7,188,931.00**	**70.4**	**$13,671,533.00**	**108.9**	**$8,414,142.78**	**77.8**

Solar Panel Construction

	Rhode Island		United States		Regional	
	Output	Employment	Output	Employment	Output	Employment
Direct	$11,043,500.00	110.9	$11,043,500.00	110.9	$11,043,500.00	110.9
Indirect	$2,224,935.00	18	$8,282,678.00	49.6	$3,369,848.43	24.0
Induced	$4,394,159.00	39.4	$13,962,634.00	102.2	$6,202,600.78	51.3
Total	**$17,662,594.00**	**168.3**	**$33,288,812.00**	**262.7**	**$20,615,949.20**	**186.1**

Barge/Crane Construction

	Rhode Island		United States		Regional	
	Output	Employment	Output	Employment	Output	Employment
Direct	$19,907,776.00	47.2	$19,907,776.00	47.2	$19,907,776.00	47.2
Indirect	$3,900,224.00	11.3	$20,123,402.00	45.8	$6,966,404.64	17.8
Induced	$6,288,838.00	26.9	$21,835,532.00	76.3	$9,227,163.17	36.2
Total	**$30,096,838.00**	**85.4**	**$61,866,710.00**	**169.3**	**$36,101,343.81**	**101.3**

Total Outputs

Initial Investment

	Rhode Island			United States			Regional	
	Output	Employment		Output	Employment		Output	Employment
Direct	$35,551,276.00	206.5	Direct	$35,551,276.00	206.6	Direct	$35,551,276.00	206.6
Indirect	$6,862,881.00	34.7	Indirect	$31,657,641.00	113.2	Indirect	$11,549,090.64	49.5
Induced	$12,534,206.00	82.9	Induced	$41,618,138.00	221.1	Induced	$18,031,069.15	109.0
Total	**$54,948,363.00**	**324.1**	**Total**	**$108,827,055.00**	**540.9**	**Total**	**$65,131,435.79**	**365.2**

Other Initial Investments

	Rhode Island			United States			Regional	
	Output	Employment		Output	Employment		Output	Employment
Direct	$3,948,724.00	41.7	Direct	$3,948,724.00	41.7	Direct	$3,948,724.00	41.7
Indirect	$633,274.00	4.6	Indirect	$2,791,199.00	15.2	Indirect	$1,041,121.83	6.6
Induced	$1,589,112.00	14.2	Induced	$4,995,971.00	36.6	Induced	$2,233,008.35	18.4
Total	**$6,171,110.00**	**60.4**	**Total**	**$11,735,894.00**	**93.5**	**Total**	**$7,222,854.18**	**66.7**

Total Initial Investment

	Rhode Island			United States			Regional	
	Output	Employment		Output	Employment		Output	Employment
Direct	$39,500,000.00	248.2	Direct	$39,500,000.00	248.3	Direct	$39,500,000.00	2483
Indirect	$7,496,155.00	39.3	Indirect	$34,448,840.00	128.4	Indirect	$12,590,212.47	56.1
Induced	$14,123,318.00	97.1	Induced	$46,614,109.00	257.7	Induced	$20,264,077.50	127.5
Total	**$61,119,473.00**	**384.5**	**Total**	**$120,562,949.00**	**634.4**	**Total**	**$72,354,289.96**	**431.9**

Yearly Production

	Rhode Island			United States			Regional	
	Output	Employment		Output	Employment		Output	Employment
Direct	$28,366,181.00	360.2	Direct	$28,366,181.00	360.2	Direct	$28,366,181.00	360.2
Indirect	$6,235,959.00	76.2	Indirect	$10,945,855.00	215.5	Indirect	$5,052,945.71	102.5
Induced	$8,594,746.49	116.6	Induced	$33,045,487.00	353.9	Induced	$15,873,341.37	161.4
Total	**$43,196,886.49**	**553**	**Total**	**$71,857,523.00**	**929.6**	**Total**	**$48,792,468.09**	**624.2**

Total One Year (Initial Cost plus One Year of Output)

	Rhode Island			United States			Regional	
	Output	Employment		Output	Employment		Output	Employment
Direct	$67,866,181.00	608.4	Direct	$67,866,181.00	608.5	Direct	$67,866,181.00	608.5
Indirect	$13,732,114.00	115.5	Indirect	$45,394,695.00	343.9	Indirect	$17,643,158.18	158.6676
Induced	$22,718,064.49	213.7	Induced	$79,659,596.00	611.6	Induced	$36,137,418.87	288.9031
Total	**$104,316,359.49**	**937.5**	**Total**	**$192,420,472.00**	**1564**	**Total**	**$121,146,758.05**	**1056.1**

Long-Term Outcomes

The Port of Providence in Rhode Island already contributes significantly to the economic well-being of the city and the metropolitan region, the State of Rhode Island, the Northeast Region and the Nation. According to a 2009 study by the Martin Associates, jobs directly related to activity at the Port totals 2,359. The long-term employment figures include jobs at the port, jobs supporting local purchases made by the employees of the port at grocery stores, retail outlets, restaurants, local government services, schools, hospitals, etc., firms that provide services to the port such as office supplies and equipment, utilities, communications, professional services and others, and jobs influenced by the cargo exported and imported through the marine terminal.

TIGER grant dollars will provide funding allowing ProvPort to expand its current maritime activities, presenting substantial short term, mid-term, and most importantly, long-term employment growth to its local, regional and national stakeholders. In addition to job creation, other long-term outcomes include; innovations in clean energy technology solutions that will provide public health and economic benefits and the installation of new cargo handling equipment that will rehabilitate and upgrade the operations of cargo movement. And through the utilization of short sea shipping concepts, the project will provide national economic and environmental benefits. The reduction of traffic congestion and diesel fuel emissions associated with the movement of cargo and the associated fuel exhausts created by the running of the port will offer environmental benefits. Additional economic benefits are realized through an increase in higher paying jobs related to international trade and the movement of imports and exports through the port.

Short-term employment reflects the need to employ workers engaged in the direct and indirect construction of marine barges and the assembly of the new crane equipment. The short to mid-term employment opportunities include the workforce utilized for the installation of clean energy sources. The personnel related to the manufacture, shipping, finance, sub-contracting and installation of the wind turbines and solar panels includes a workforce, directly and indirectly employed for the duration of each project, could span the course of 12 to 24 months.

State of Good Repair

The project will improve the facility's performance and long-term cost structure with the introduction of new efficient cargo handling equipment and the utilization of renewable energy sources. Lifecycle costs will be minimized as the newly installed equipment will add to the existing transportation system's capacity and will provide efficiencies to meet the regional and national demand for handling growing volumes of cargo using renewable energy sources.

New Cargo Handling Equipment

In the last fifteen years, ProvPort has increased its marine cargo throughput from 750,000 tons to 3.2 million tons per year. This growth has come from existing break bulk cargoes and automobile exports. The new electric cranes will allow the introduction of a new container line

operation that will be capable of loading and unloading 1,000 containers per week, resulting in the creation of an additional of 256 long-term, high-wage jobs in crane operations, mechanical, bulk terminal operations, container terminal operations, container trucking and container barge services, supporting an average salary with benefits totaling $81,000.00 (ILA), that will provide a sustainable source of revenue to the region.

Clean Energy Technology

The port will also introduce clean energy technologies at the facility with the installation of two wind turbines and five solar panel grids, producing energy efficiencies for the port to sustain itself and also provide a surplus of electricity.

Two 150 to 200 foot wind turbines will be installed on the south side of the Port of Providence. According to Alteris Renewables, Inc., the location, and height of these turbines will provide the best return on investment as well as offer the most environmental carbon offsets. The annual energy value will result in $231,998 energy cost savings.

A photovoltaic system will be installed on 5 buildings on the ProvPort Campus to serve as a turn-key solar energy solution. According to gro Solar, an annual energy savings of $269,585 will be realized through the use of this system.

Solar Energy is clean, renewable and sustainable, helping to protect the environment. It does not pollute the air by releasing carbon dioxide, nitrogen oxide, sulphur dioxide or mercury into the atmosphere like many traditional forms of electrical generations do. Therefore solar energy does not contribute to global warming, acid rain or smog. It actively contributes to the decrease of harmful green house gas emissions. It is generated where it is needed. By not using any fuel, solar energy does not contribute to the cost and problems of the recovery and transportation of fuel or the storage of radioactive waste.

Wind energy is clean and cost competitive to other fuel sources. Electricity generated by wind turbines does not foul the air we breathe or emit pollutants like other energy sources—that means less smog, less acid rain and fewer greenhouse gas emissions. For more than a decade wind energy has been the world's fastest renewable energy source, with an average annual growth rate of over 20 percent. In 2008, the United States had a record breaking year by increasing generating capacity by 50 percent. According to the American Wind Energy Association, wind energy in the United States could provide as much as 10,777 billion kWh annually—more than twice the electricity generated in the U.S. today.

Economic Competitiveness and Sustainability

The introduction of a container line service will contribute to long-term job creation by the Port. The Port of Providence is located in the Northeast Corridor Region and is home to 31 of the top 150 marine ports in the United States. Containerized traffic has increased dramatically in and around the ports in the northeast region that consists of New York, New Jersey, Baltimore, Philadelphia, Wilmington, Boston, Richmond and Portland.

One of the most promising approaches to meet the need for growing volumes of cargo is the greater utilization of Short Sea Shipping, particularly along the Northeast corridor.

As the Northeast region of the U.S. represents more than 100 million citizens and approximately 40 percent of the nation's disposable income and is a region with a high demand for consumer goods and industry materials, continued expansion of economic activity and environmental well-being will be dependent on having adequate transportation capacity and efficiencies.

Short Sea Shipping is an extremely viable option for the Port of Providence as it is located along the Northeast corridor. The East Coast has multiple coastal and inland waterways to support freight transportation by water. Excess road capacity is being rapidly exhausted by the rising population, which is expected to grow approximately 25 percent by 2025 and increasing goods volume, estimated to increase by approximately 50 percent. A modal shift by freight to waterway has the potential to mitigate some of the effects of road congestion, also reducing trucking activity to move freight.

Increased Import and Export Activity

Global trade is increasingly a significant part of the United States' economic well-being. It is estimated that international trade will more than double over the next two decades. The success of international trade transactions for the nation is directly dependent on having an efficient and effective international gateway and an internal intermodal transportation system for freight movement.

U.S. manufacturers export more than $60 billion in goods every month. Exports from the United States have increased by 57 percent over the past ten years, with manufacturing responsible for nearly two-thirds of total exports. The vast bulk of global trade is 77 percent—in the form of manufactured goods.

Higher Wages

Employees in the most trade intensive industries where combined exports and imports amount to at least 60 percent of their domestic industrial output earn an annual compensation package that averages about $80,000. This is 60 percent more than average compensation in the least trade engaged sectors of manufacturing. Industries in this most trade-engaged category account for over half of U.S. manufacturing trade. The premium pay of trade-engaged industries also extends to other manufacturing and service companies in the supply chain. Employers at these companies—where jobs are directly supported by exporting—also enjoy higher pay than their peers at domestic-only companies. (Source: NAM calculations from U.S. Department of Commerce data).

Additionally, the importing and exporting of goods also contributes to enhanced efficiencies and an improved standard of living. International trade has become critical not only for economic development, but also creates a higher standard of living, and quality of life that includes community and environmental conditions.

More than 90 percent of international trade is carried by sea (IMO, 2005). The United States accounts for 28 percent of world's Gross Domestic Product (USDOT, 2007). Transportation is the third largest sector of the U.S. economy.

The expansion of international transportation services and significance of international trade has precipitously risen over the last several decades. In 1960, trade accounted for 9 percent of the U.S. GDP. Today the percentage has grown to 25 percent and is predicted to reach as much as one-third by 2020 (AAPA, 2007) and 60 percent by 2030 (AASHTO, 2007). In 2003 the value of U.S. international merchandise trade was approximately $2 trillion with a modal split of 41 percent for water, 26.5 percent for truck, 5 percent for rail, the remainder divided by other miscellaneous transportation modes. (USDOT, 2005).

Economic Impact

A Case in Point

The Port of New York, New Jersey is the largest transportation hub in the Northeast. In 2006, the Port moved 31.2 million metrics tons of general cargo mainly consisting of manufactured and processed goods shipped in containers. More than 3 million containers went through the port, as well as a steady stream of automobile imports and exports. The port handled 852,000 vehicles in 2006, an increase of 18 percent over the previous year. More than 55 million metric tons of ocean born bulk cargo, as petroleum products passed through the port. Overall, this is $150 billion worth of cargo generating approximately $25 billion of economic activity in the region. The international cargo movement produced the following:

- 122,000 direct full-time equivalent jobs in the region
- 233,000 full-time equivalent jobs in the metropolitan area
- $12,562 million for port-region workers (33% higher than 2000)
- $2.0 billion tax revenues in the region
- $3.8 billion to federal tax

The port's container traffic has held an average annual growth of over 7 percent per year for over a decade. It is anticipated that by 2026, the number entering the port will reach approximately 11.6 million containers.

The Port of Providence will be uniquely positioned to become an important part of this global supply chain. The capacity and scale of this global pipeline is changing with the expansion of global trade and ProvPort can support the pipeline as it will expand upon its multimodal capabilities for the region, offering waterways, terminals, intermodal connections and distribution and warehousing facilities.

Safety Factors to Consider

The new barge and crane design and installation will facilitate safe operation of the crane and its ability to drive on and off the barge, ensuring a safe and efficient method to handle cargoes.

In addition, the reduction in noxious emissions from the facility will be realized by the local and regional communities. Emissions from diesel engines include particulate matter, nitrogen oxides, greenhouse gases, and air toxins. These emissions contribute to unhealthy levels of air pollution in the Northeast, where millions of residents are affected.

Innovation

Through the combined use of new solar and wind energy technologies, and the addition of the new electric cargo handling equipment and Short Sea Shipping at the Port of Providence, substantial savings will be realized in the cost of running the facility as well as in the reductions to the amount of emissions produced by the facility each year.

According to a publication of the U.S. Department of Transportation, Maritime Administration, a measure of energy efficiency in transportation is the amount of energy used for the service provided. Studies comparing rail, truck, and water transportation, shallow-draft water transportation has been proven to be the most energy efficient method of freight transportation for moving bulk raw materials. This level of efficiency also extends to container transportation.

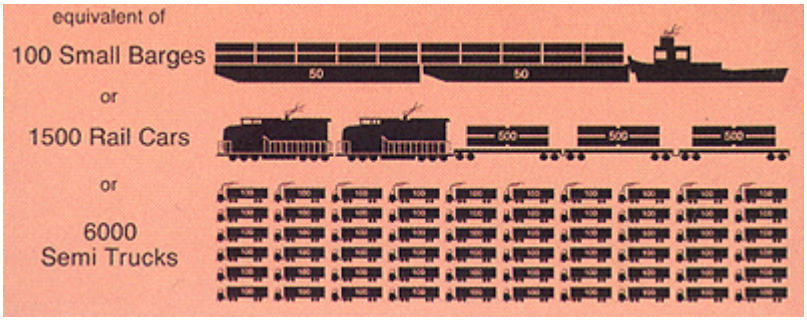
It is much more efficient to move cargo through water than over land. An analysis of rail and waterway fuel efficiency shows the average BTUs expended per ton-mile totals 433 for water transport, and 696 for rail transport. The barge transportation of containers and bulk along the Northeastern corridor waterway would use only about 62 percent of the carbon based energy of rail transportation and only about 11 percent of the fuel needed for truck transportation. The use of barge transportation thus yields a substantial reduction of the carbon footprint of cargo transportation along the northeastern coast. The cargo capacity of a barge is 15 times that of one rail car and 60 times that of a semi trailer.

As a low-energy form of transportation, barge transportation is consistent with the nation's energy conservation efforts. The environmental efficiency of water barge transportation should be weighed when evaluating the efficiency of a shift of cargo to the waterways from land transport.

Costal barge shipping adds to environmental wellbeing and the general quality of life. Shallow-draft water transportation has definite environmental advantages over competitive modes. There is a growing national commitment to restoring and preserving the environment and quality of life. Water transportation must become a priority in economic planning. Shallow-draft water transportation generally involves less urban exposure than either truck or rail, operates on a system that has few crossing junctures, and is relatively remote from population centers. There are factors that reduce both the number and impact of transportation events as well as exposure to pollutants, unpleasantness and danger.

Water transporting has many positive economic and social benefits and many beneficiaries. More than just the water transportation benefits from its promotion. Shallow-draft water transportation is part of a multi modal delivery system with varied major beneficiaries. An advanced navigation transportation infrastructure creates opportunities for new industries while it changes trade patterns that can have a major economic impact on local and regional development.

The economic and environmental efficiency is easily seen in the graphics below:



Number of miles one ton can be carried per gallon of fuel:

By truck will travel 59 miles

By rail will travel 202 miles

By barge 514 miles

Impact on the Environment – Reduction of the Carbon Footprint

Diesel Emission

Diesel engines emit a highly complex mixture of gaseous and particulate air pollutants. These pollutants include particulate matter, nitrogen oxides, volatile organic compounds and carbon monoxide. Of particular concern is diesel particulate matter (DPM), which is emitted as very small particles that can travel deep into the respiratory system. DPM consists of elemental carbon core embedded with a variety of organic and inorganic substances, many of which are highly toxic. The Environmental Protection Agency (EPA), the National Toxicology Program, and other international, federal and state organizations have determined that diesel particulate matter is a potent air toxic, causing both cancer and non-cancer health effects.

Exposure to elevated levels of DPM has been linked to a variety of health effects, including respiratory symptoms, chronic bronchitis, aggravation of asthma, increased respiratory and cardiovascular-related hospital admissions and emergency room visits, and premature death. Those most vulnerable to these include children, whose lungs are still developing, the elderly and people with chronic heart or lung diseases.

Nitrogen oxide (NOx) emissions from diesel vehicles are also of concern because NOx is a precursor to ground level ozone.

In addition to controlling diesel exhaust emissions for public health concerns, there is a high health care cost attributable to air pollution from diesel vehicles. Health cost impacts, per ton of emitted pollutant, have been estimated as follows:

Pollutant	Associated Health Costs (per ton emitted)
PM2.5	$109,000
NOx	$11,332
VOCs	$718
CO	$50

Annualized Associated Health Care Cost Reductions
(saved when moving 1,000 containers by barge vs. by truck)

	Tons of Emissions Saved	Associated Health Costs (per ton emitted)	Health Cost Savings (per ton emitted)
NOx	63.13	$11,332	$715,389
DPM	1.17	$109,000	$119,900
Carbon Monoxide	17.27	$50	$863.50
Hydrocarbons	5.83	$718	$4186
Net Savings	**87.40**	**$121,100**	**$840,339**

Economic Savings in Costs
(shipping from Newark, NJ to ProvPort, RI moving 1,000 containers per week @ $3.00 per gallon (assumption))

Truck	Cost	Barge	Cost
31.67 gallons	$95.00	3.48 gallons	$10.44
31,670 gallons	$95,000.00	3,480 gallons	$10,440

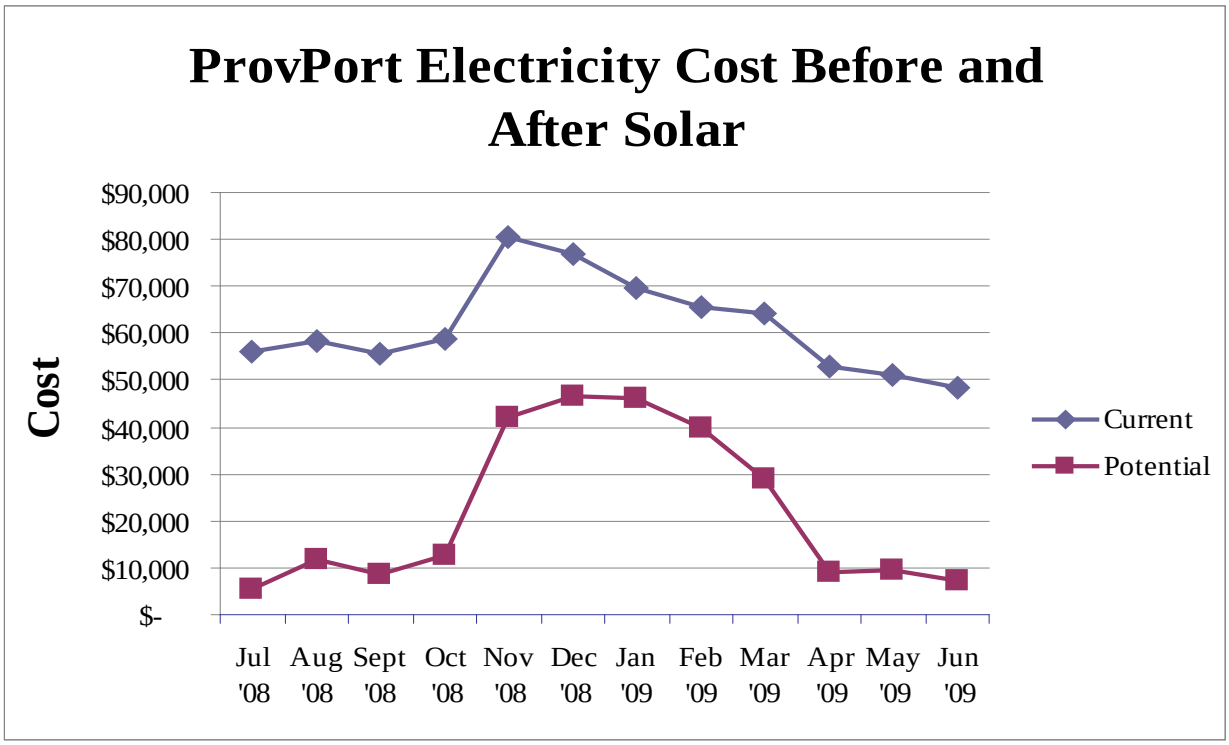
The use of Short Sea Shipping has a great impact on the reduction of annual diesel emissions from the movement of containers by truck. According to an Energy Assessment report prepared by the University of Rhode Island, the use of ships rather than trucks will decrease massively the amount of emissions per year. The produced emission by the movement of material and goods between northern New Jersey and Providence could be cut almost in half. Annual emissions when moving 1,000 containers by **truck** each week include; 116.35 tons of Nitrous Oxide, 2.73

tons of Particulate matter, 6.51 tons of Hydro carbons, 29.78 tons of Carbon Monoxide and 17,316 tons of Carbon Dioxide. Alternatively, the annual emissions by ship include 53.22 tons of Nitrous Oxide, 1.56 tons of Particulate matter, .68 tons of Hydro carbons, 12.51 tons of Carbon Monoxide and 8,889 tons of Carbon Dioxide. The use of Short Sea Shipping operations reduces the Port's carbon footprint by approximate 50%.

Solar and Wind Technologies

Additionally, through the proposed solar and wind projects the port will realize a savings in grid consumption and electricity costs. The implementation of the solar project will produce more than half of its current electricity consumption, resulting in a decrease in grid consumption of 58 percent. The solar installation will also result in a 64 percent reduction in electricity costs to the Port.

The potential reduction in electricity consumption on-site after the installation of both the solar panels and wind turbines is estimated to lead consumption decreases by 112 percent, leading to an excess of produced electricity being sold back to the grid. The decrease in costs with respect to this decrease in consumption is illustrated below:



Overall Cumulative Savings

It is estimated that The ReNEWable Port will produce enough energy through renewable means to relieve all dependency on grid electricity, possibly even putting its surplus generation back into the grid. Overall, the project could lead to ProvPort becoming a zero carbon footprint company. And with the introduction of a Short Sea Shipping operation, the total cumulative economic and energy savings is demonstrated below:

Type	Annual Energy Output (kWH)	Energy Cost per kWH	Total Energy Cost Saved per Year	Carbon Emission per MWH (lbs)	Total Carbon Footprint Reduction per year (lbs)	Tons of Carbon
Wind	3260002	$0.16	$521,600.32	909	2963342	1481.7
Solar	1925610	$0.16	$308,097.60	909	1750379	875.2
Total	**5185612**	**$0.16**	**$829,697.92**	**909**	**4713721**	2356.9
Type	**Annual Consumption (kWH)**	**Energy Cost per kWH**	**Total Spent on Electricity**	**Carbon Emission per MWH (lbs)**	**Total Carbon Footprint (lbs)**	**Tons of Carbon**
Current Use	4618168	$0.16	$737,918.00	909	4197914.7	2099.0
After Installation	**-567444**	**$0.16**	**-$91,779.92**	**909**	**-515807**	**-257.9**
Carbon Footprint After Wind and Solar		-257.9				

Conclusion

The usage and long-term benefits of the TIGER Grant are clearly realized, as funding for the project will provide and achieve economic stimulus by optimizing economic activity generated by the Port of Providence. This project will deliver results that will stimulate the economic activity, save existing jobs and create thousands of short, mid and long term jobs directly and indirectly related to port activities. Through the investment in transportation infrastructure with the installation of the new electric cargo handling cranes and barges, along with a technological investment in alternative energy solutions, numerous short term job benefits will be realized within the first 12 months of operation. The construction of the crane and barge equipment along with the wind turbines and solar panels will provide substantial stimulus in short term job creation for the U.S. economy - employing approximately 634 new workers and generating more than $120 million of economic output.

Long term employment benefits are substantial. TIGER Grant dollars will provide funding allowing ProvPort to expand its current maritime activities to create substantial long-term direct employment growth and provide a sustainable source of revenue to the region. New operations at the port will result in the creation of high-wage jobs, supporting an average salary with benefits totaling $81,000.00. Additional economic benefits are realized through increased import and export activity resulting in higher paying jobs related to international trade. Employment figures project almost 1,000 additional jobs created, that are directly and indirectly related to ProvPort operations, with an annual national economic stimulus output of $71,857,523.

The Port of Providence's investment in alternative energy solutions in wind and solar power will help foster energy independence and reduce its carbon footprint. The installation of the new wind turbines and solar panels will reduce energy costs annually by $830,000 and provide a surplus of electricity as the clean energy technologies will reduce consumption by 567,444 kHz per year. The environmental benefits realized through the installation of these clean energy technologies will greatly reduce and eliminate annual emissions by 258 metric tons at a health cost savings of more than $185,000 per year.

The investment in new transportation equipment will contribute to a new and innovative approach in cargo transport that supports its movement by sea. This new operation, called short sea shipping will greatly reduce fuel consumption and diesel emissions associated with the transit of cargo by truck. Diesel particulate matter contributes to various health issues associated with respiratory, cardiovascular-related hospital admissions, emergency room visits and premature death. When moving 1,000 containers per week by sea, projections show a reduction of 87.4 metric tons of dangerous, noxious emissions of diesel particulate matter, resulting in an overall health benefit that serves the public at an annualized associated health cost net savings of $840,339.

TIGER Grant dollars will provide funding that will act as a stimulus for long-term prosperity leading to substantial short term, mid-term, and most importantly, long-term job growth,

economic stimulus, long-term health benefits and provide a positive environmental impact serving the local, regional, national and international beneficiaries of the Port of Providence.