STATE AND LOCAL ECONOMIC IMPACTS OF A PROPOSED BI-DIRECTIONAL LNG TERMINAL IN WASHINGTON COUNTY, MAINE

May 2014

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Commissioned by: Downeast LNG

Results of the study show that:

- ⇨ Constructing a bi-directional liquefied natural gas (LNG) facility, with an annual processing capacity of two million tonnes, will require an estimated $1.3 billion upfront investment.
- ⇨ Over a three-year construction period, the proposed LNG terminal will generate a total statewide economic impact—including multiplier effects—of an estimated $970 million in output, an average of 2,350 full- and part-time jobs, and a three-year total of $375 million in labor income.
- ⇨ The impact of facility construction on the Washington County economy—including multiplier effects—will be an estimated $440 million in output, an average of 1,464 full- and part-time jobs, and a three-year total of $177 million in labor income.
- ⇨ After the proposed LNG terminal is completed, the permanent statewide impact of its annual operations—including multiplier effects—will be an estimated $68.0 million in output, 337 full- and part-time jobs, and $21.6 million in labor income.
- ⇨ The permanent impact of the LNG terminal's annual operations on the Washington County economy—including multiplier effects—will be an estimated $46.4 million in output, 207 full- and part-time jobs, and $14.0 million in labor income.

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1. BACKGROUND AND INTRODUCTION

Downeast LNG is proposing to build and operate a bi-directional liquefied natural gas (LNG) terminal in Robbinston, Maine. The facility would include a pier; one or more LNG storage tanks; equipment used to convert natural gas into a liquid (i.e., liquefaction) and to transform LNG from a liquid to a gas; and a natural gas pipeline. The proposed LNG terminal would take three years to build and, once operational, it would have the capacity to process two million tonnes of LNG per year (MMtpy).

The purpose of this study is to examine the state and local (i.e., Washington County) economic impacts of the proposed bi-directional LNG terminal in Robbinston, Maine.[2] Economic impact is defined as the output (i.e., revenue), employment and labor income (e.g., wages and salaries) that are directly related to the project's spending, as well as the multiplier effects supported by the expenditures made in Maine (and Washington County) by companies and workers that are associated with the LNG facility. Separate economic impact assessments will be conducted for the terminal's temporary construction phase and its permanent operations. The economic impact analysis is based on data and information from a variety of sources, including studies of other LNG facilities that have been proposed elsewhere in the United States.

[2] A similar study (see Gabe et al., in the references section) was conducted in 2005, although the proposed facility at that time was a $400 million LNG import terminal—and not a bi-directional facility with liquefaction equipment.

A key factor influencing the proposed facility's impact on the state and local economies—in both the construction and permanent operations phases of the project—is the amount of spending that is likely to occur in the region. This is determined by the total amounts of spending required for the construction and operations of a 2 MMtpy bi-directional LNG facility, and the percentages of these expenditures that are likely to take place in Maine and Washington County.

Table 1 shows the estimated construction costs for a 2 MMtpy LNG terminal and its estimated annual operating expenditures. The estimated construction cost of $661.4 million per million tonnes of annual processing capacity is an average figure calculated using information from the following sources: "LNG: A Liquid Market," published in *The Economist* magazine; "LNG Ready for Export: Shale Gas Ignites Change," published in *EnergyBiz* magazine; "An Economic Impact Analysis of the Construction of an LNG Terminal and Natural Gas Pipeline in Oregon," prepared by ECONorthwest for the Jordan Cove Energy Project, L.P.; and "Current State & Outlook for the LNG Industry," presented at the Rice University Global E&C Forum. The estimated operating expenditures of $31.5 million per million tonnes of annual processing capacity are based on figures from "An Economic Impact Analysis of the Oregon LNG Project in Northwest Oregon," prepared by ECONorthwest. The annual operating expenditures cover the wages and salaries of individuals employed by the facility, as well as expenditures on—among other things—contract services and maintenance, and vessel services.

Table 1. Estimated Construction and Operating Expenditures

Construction Costs ($ / MMtpy)	$661,430,210
Proposed Capacity	2 MMtpy
Estimated Construction Costs	$1,322,860,420
Annual Operating Expenditures ($ / MMtpy)	$31,456,889
Proposed Capacity	2 MMtpy
Estimated Operating Expenditures	$62,913,778

Notes. Construction costs of $661,430,210 per MMtpy are based on figures from the following sources: "LNG: A Liquid Market," published in *The Economist* magazine; "LNG Ready for Export: Shale Gas Ignites Change," published in *EnergyBiz* magazine; "An Economic Impact Analysis of the Construction of an LNG Terminal and Natural Gas Pipeline in Oregon," prepared by ECONorthwest for the Jordan Cove Energy Project, L.P.; and "Current State & Outlook for the LNG Industry," presented by Gerald Humphrey at the Rice University Global E&C Forum. Annual operating expenditures of $31,456,889 per MMtpy are based on figures from "An Economic Impact Analysis of the Oregon LNG Project in Northwest Oregon," prepared by ECONorthwest.

2. ECONOMIC IMPACT ANALYSIS

Table 2 presents information on the temporary statewide economic impacts associated with the construction of Downeast LNG's proposed bi-directional LNG facility in Robbinston, Maine. The economic impact analysis is based on a three-year construction period, with expenditures evenly split across the three years (i.e., $441 million per year).[3] The construction costs cover a wide variety of expenditure categories, including—among other things—the berthing facility and tugboats, trestle and pier, the LNG terminal, and engineering and management services.

[3] Actual expenditures will differ in each year of construction. This means that the employment and labor income impacts, shown later in the report, will also vary by year; however, the estimated impacts over the entire three-year construction project will be similar to those implied in Tables 2 and 3.

The direct output of $204 million is interpreted as the estimated amount of project investment (of the $441 million per year) that would take place in Maine (estimated by the Maine IMPLAN model, which is described below). In-state spending of $204 million is equivalent to 46 percent of the proposed LNG facility's annual construction costs. The direct employment of 1,101 full- and part-time jobs, and $79.2 million in labor income are the estimated (by the Maine IMPLAN model) in-state labor market activity that would be supported by the $204 million of construction spending.[4]

The multiplier effects shown in Table 2 are the additional output (i.e., revenue), employment and labor income (e.g., wages and salaries) in Maine that are supported by the purchases of businesses and workers that are impacted by the LNG facility's construction. The IMPLAN model, used to estimate the multiplier effects, is an input-output framework that traces the flows of expenditures and income through the Maine economy with a complex system of accounts that are uniquely tailored to the region. Underlying these accounts is information regarding transactions occurring among businesses located in Maine, the spending patterns of households, and transactions occurring between Maine business and households and the rest of the world. Some of the data sources used to develop the IMPLAN model include County Business Patterns of the U.S. Census Bureau, Regional Economic Information System (REIS) data and input-output accounts from the U.S. Bureau of Economic Analysis, and ES-202 statistics from the U.S. Bureau of Labor Statistics.

[4] The IMPLAN model is based on an employment headcount, which does not distinguish between full- and part-time workers.

Table 2. Estimated Temporary Statewide Economic Impacts of LNG Terminal Construction: Years 1 to 3

	Direct Impact	Multiplier Effects	Total Impact
Output	$203,609,044 per year	$119,607,820 per year	$323,216,864 per year
Employment	1,101	1,249	2,350
Labor Income	$79,165,767 per year	$45,777,535 per year	$124,943,302 per year
Output	$610,827,131 3-year impact	$358,823,460 3-year impact	$969,650,591 3-year impact
Employment	1,101	1,249	2,350
Labor Income	$237,497,302 3-year impact	$137,332,605 3-year impact	$374,829,907 3-year impact

Notes: Direct output of $203.6 million (or $610.8 million over three years) is interpreted as the estimated amount of construction expenditures that would take place in Maine. The direct impact estimates are based on an overall project cost of $1.3 billion (see Table 1); figures from "The Economic Impacts of Increased LNG Import Capacity on Louisiana, 2004-2009," published by the Tulane-Entergy Energy Institute; figures from "Application of Elba Liquefaction Company, L.L.C., and Southern LNG Company, L.L.C., for Authorization Under Section 3 of the Natural Gas Act and Application of Southern LNG Company, L.L.C. for Abandonment Under Section 7 of the Natural Gas Act," submitted to the Federal Energy Regulatory Commission by Elba Liquefaction Company, L.L.C., and Southern LNG Company, L.L.C; and information from the Maine IMPLAN model. Multiplier effects are estimated by the Maine IMPLAN model. The "3-year impact" figures for output and labor income are the "per year" impacts multiplied by three. The "3-year impacts" for employment are average figures, because some of the construction jobs could last over the entire period.

Including multiplier effects, the construction of the proposed Downeast LNG terminal (based on a total investment of $1.3 billion) would have a statewide annual economic impact—in each of the three years—of an estimated $323 million in output, 2,350 full- and part-time jobs, and $125 million in labor income. These figures indicate that the workers directly and indirectly involved in the construction of the proposed bi-directional LNG facility would earn an average of $53,167 in labor income per year.

The statewide output multiplier of 1.58, defined as the ratio of total output ($323 million) to direct output ($204 million), suggests that every $1.00 of spending in Maine on the construction of the proposed LNG terminal would support a total of $1.58 in statewide economic activity; that is, the "initial" $1.00 in spending plus an additional $0.58 spread across other Maine locations and sectors of the economy. The statewide employment multiplier of 2.13, calculated as the ratio of total (2,350 jobs) to direct (1,101 jobs) employment, implies that the economic activity associated with each person directly related to the LNG facility's construction would support a total of 2.13 Maine jobs; that is, the person related to the terminal's construction and an additional 1.13 full- and part-time jobs elsewhere in the state.

The bottom panel of Table 2 shows the estimated aggregate statewide economic impacts of the proposed LNG terminal's construction over the entire construction phase. The employment impacts are reported as average values, and not the sum of impacts for all three years, because some of the construction jobs could last over the entire period. Including multiplier effects, the three-year statewide economic impacts of the proposed LNG facility's construction are an estimated $970 million in output, an average of 2,350 full- and part-time jobs, and a three-year total of $375 million in labor income.

Table 3. Estimated Temporary Washington County Economic Impacts of LNG Terminal Construction: Years 1 to 3

	Direct Impact	Multiplier Effects	Total Impact
Output	$117,399,484 per year	$29,264,854 per year	$146,664,338 per year
Employment	732	732	1,464
Labor Income	$45,646,402 per year	$13,474,457 per year	$59,120,859 per year
Output	$352,198,451 3-year impact	$87,794,562 3-year impact	$439,993,013 3-year impact
Employment	732	732	1,464
Labor Income	$136,939,206 3-year impact	$40,423,372 3-year impact	$177,362,578 3-year impact

Notes: Direct output of $117.4 million (or $352.2 million over three years) is interpreted as the estimated amount of construction expenditures that would take place in Washington County. The direct impact estimates are based on an overall project cost of $1.3 billion (see Table 1); figures from "The Economic Impacts of Increased LNG Import Capacity on Louisiana, 2004-2009," published by the Tulane-Entergy Energy Institute; figures from "Application of Elba Liquefaction Company, L.L.C., and Southern LNG Company, L.L.C., for Authorization Under Section 3 of the Natural Gas Act and Application of Southern LNG Company, L.L.C. for Abandonment Under Section 7 of the Natural Gas Act," submitted to the Federal Energy Regulatory Commission by Elba Liquefaction Company, L.L.C., and Southern LNG Company, L.L.C; and information from the Washington County IMPLAN model. Multiplier effects are estimated by the Washington County IMPLAN model. The "3-year impact" figures for output and labor income are the "per year" impacts multiplied by three. The "3-year impacts" for employment are average figures, because some of the construction jobs could last over the entire period.

Table 3 presents information on the temporary county-level economic impacts of the proposed bi-directional LNG terminal's construction. The local (i.e., Washington County) economic impacts are lower than those estimated for the entire state for a couple of reasons. First, IMPLAN estimates for the percentage of construction spending captured by the region are much higher for Maine than Washington County. Second, the multipliers are higher for Maine than Washington County because the state offers a wider variety of products and services that could be purchased by the companies involved in the construction project, and their suppliers and employees.

The direct output of $117 million is the estimated amount of annual construction expenditures (of the $441 million per year) that would take place in Washington County. This amount of local spending, along with the local employment of 732 full- and part-time jobs and labor income of $45.6 million per year, is estimated by the IMPLAN model for Washington County. Including multiplier effects, the three-year impact of the proposed LNG terminal's construction on the Washington County economy is an estimated $440 million in output, an average of 1,464 full- and part-time jobs, and a three-year total of $177 million in labor income.

The county-level output multiplier of 1.26, defined as the ratio of total output ($147 million) to direct output ($117 million), suggests that every $1.00 of spending in Washington County on the construction of the proposed LNG facility would support a total of $1.26 in local economic activity; that is, the "initial" $1.00 in spending plus an additional $0.26 spread across the county. The county-level employment multiplier of 2.00, calculated as the ratio of total (1,464 jobs) to direct (732 jobs) employment, implies that the economic activity associated with each person in Washington County directly related to the LNG facility's construction would

support a total of two local jobs; that is, the person related to the terminal's construction and one additional full or part-time job elsewhere in Washington County.

Permanent Impacts of the Proposed LNG Terminal's Annual Operations

After the three-year construction phase of the proposed LNG terminal is completed, the facility will provide ongoing impacts on the Maine and Washington County economies through its permanent operations. As shown in Table 1, the annual operating expenses—based on information from "An Economic Impact Analysis of the Oregon LNG Project in Northwest Oregon," prepared by ECONorthwest—are an estimated $62.9 million for a bi-directional LNG terminal with a proposed capacity of two million tonnes per year.

Table 4 shows information on the estimated county-level economic impact of the proposed LNG facility's permanent operations, starting in "year 4" and continuing into the future. The direct output of $37.3 million per year is interpreted as the estimated amount of annual operating expenditures that would take place "in and around" the terminal. These expenditures include—among other things—the wages and salaries paid to employees of the facility, vessel services, and contract services and maintenance. This amount of spending would support, based on figures from the Washington County IMPLAN model, an estimated 123 full- and part-time jobs (including the contract services and maintenance providers) and $11.3 million in labor income, which translates into an estimated $91,668 in labor income per (direct) employee.[5]

[5] The direct employment and labor income estimates are also based on figures from "An Economic Impact Analysis of the Oregon LNG Project in Northwest Oregon," prepared by ECONorthwest; and "Application

The total annual local (i.e., Washington County) economic impact of LNG terminal operations, including multiplier effects, is an estimated $46.4 million in output, 207 full- and part-time jobs, and $14.0 million in labor income. These figures indicate that the workers directly and indirectly involved in the local operations of the proposed bi-directional LNG facility would earn an average of $67,455 in labor income per year.

Table 4. Estimated Permanent Washington County Economic Impacts of LNG Terminal Operations: Year 4 and into the Future

	Direct Impact	Multiplier Effects	Total Impact
Output	$37,319,009 per year	$9,111,248 per year	$46,430,257 per year
Employment	123	83	207
Labor Income	$11,275,161 per year	$2,688,127 per year	$13,963,288 per year

Notes: Direct output of $37.3 million per year is interpreted as the estimated amount of operating expenditures that would take place "in and around" the facility. The direct impact estimates are based on figures from "An Economic Impact Analysis of the Oregon LNG Project in Northwest Oregon," prepared by ECONorthwest; figures from "Application of Elba Liquefaction Company, L.L.C., and Southern LNG Company, L.L.C., for Authorization Under Section 3 of the Natural Gas Act and Application of Southern LNG Company, L.L.C. for Abandonment Under Section 7 of the Natural Gas Act," submitted to the Federal Energy Regulatory Commission by Elba Liquefaction Company, L.L.C., and Southern LNG Company, L.L.C; and information from the Washington County IMPLAN model. Multiplier effects are estimated by the Washington County IMPLAN model.

of Elba Liquefaction Company, L.L.C., and Southern LNG Company, L.L.C., for Authorization Under Section 3 of the Natural Gas Act and Application of Southern LNG Company, L.L.C. for Abandonment Under Section 7 of the Natural Gas Act," submitted to the Federal Energy Regulatory Commission by Elba Liquefaction Company, L.L.C., and Southern LNG Company, L.L.C.

Table 5 shows information on the estimated statewide annual economic impact of the proposed Downeast LNG bi-directional terminal in Robbinston, Maine. For this part of the analysis, the direct impact is—once again—the economic activity that is estimated to take place "in and around" the proposed facility. The multiplier effects are the additional output, employment and labor income that would be supported elsewhere in Maine as a result of the LNG terminal's operations. Results of the analysis indicate that, including multiplier effects, the proposed Downeast LNG terminal would have an ongoing annual impact on the Maine economy of an estimated $68.0 million in output, 337 full- and part-time jobs, and $21.6 million in labor income.

Table 5. Estimated Permanent Statewide Economic Impacts of LNG Terminal Operations: Year 4 and into the Future

	Direct Impact	Multiplier Effects	Total Impact
Output	$37,319,009 per year	$30,689,705 per year	$68,008,714 per year
Employment	123	213	337
Labor Income	$11,275,161 per year	$10,334,708 per year	$21,609,869 per year

Notes: Direct output of $37.3 million per year is interpreted as the estimated amount of operating expenditures that would take place at the facility. The direct impact estimates are based on figures from "An Economic Impact Analysis of the Oregon LNG Project in Northwest Oregon," prepared by ECONorthwest; figures from "Application of Elba Liquefaction Company, L.L.C., and Southern LNG Company, L.L.C., for Authorization Under Section 3 of the Natural Gas Act and Application of Southern LNG Company, L.L.C. for Abandonment Under Section 7 of the Natural Gas Act," submitted to the Federal Energy Regulatory Commission by Elba Liquefaction Company, L.L.C., and Southern LNG Company, L.L.C; and information from the Maine IMPLAN model. Multiplier effects are estimated by the Maine IMPLAN model.

The statewide employment multiplier of 2.74, defined as the ratio of total employment (337 jobs) to direct employment (123 jobs), suggests that the economic activity associated with each person involved in the proposed LNG facility's annual operations would support a total of 2.74 Maine jobs; that is, the person working "in and around" the facility—including contract services and maintenance employees—and an addition 1.74 full- and part-time jobs elsewhere in the state. This multiplier is larger than the one calculated for Washington County [i.e., 1.68, which is the ratio of total (207 jobs) to direct (123 jobs) employment] because the state offers a wider variety of products and services that could be purchased by the proposed LNG terminal, and its suppliers and employees.

3. SUMMARY AND CONCLUSIONS

The purpose of this study was to examine the state and local (i.e., Washington County) economic impacts of a proposed bi-directional LNG facility in Robbinston, Maine. This project, which involves a terminal with the capacity to process two million tonnes of LNG annually, would impact the economy through its temporary construction phase and the facility's permanent operations. The construction of a LNG facility of this size would have upfront costs of an estimated $1.3 billion, and an estimated $62.9 million per year in ongoing operating expenditures.

Results of the study show that the construction of the proposed LNG facility would generate $204 million in direct in-state expenditures per year. Including multiplier effects, the total annual statewide economic impact of this spending would be an estimated $323 million in output, 2,350 full- and part-time jobs, and $125 million in labor income for three years. Over the

entire three-year construction project, the total statewide economic impact—including multiplier effects—would be an estimated $970 million in output, an average of 2,350 full- and part-time jobs, and a three-year total of $375 million in labor income.

The total three-year impact of the proposed LNG facility's construction on the Washington County economy would be, including multiplier effects, an estimated $440 million in output, an average of 1,464 full- and part-time jobs, and a three-year total of $177 million in labor income. The impacts on the Washington County economy are lower than those determined for the entire state because the percentage of construction spending captured by the region would be much higher for Maine than Washington County. Likewise, the multiplier effects are higher for Maine than Washington County because the state offers a wider variety of products and services that could be purchased by the companies involved in the construction project, and their suppliers and employees.

After the proposed bi-directional LNG facility is completed, it would generate an ongoing economic impact through its expenditures on operations and maintenance, and the jobs created "in and around" the terminal (i.e., the LNG facility's employees, and contract services and maintenance workers). Including multiplier effects, the ongoing operations of the proposed LNG facility would have a permanent annual statewide economic impact of an estimated $68.0 million in output, 337 full- and part-time jobs, and $21.6 million in labor income. The LNG terminal's operations would have an annual impact on the Washington County economy, including multiplier effects, of an estimated $46.4 million in output, 207 full- and part-time jobs, and $14.0 million in labor income. This employment impact of 207 jobs in Washington County includes an estimated 123 positions available "in and around" the proposed LNG facility.

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