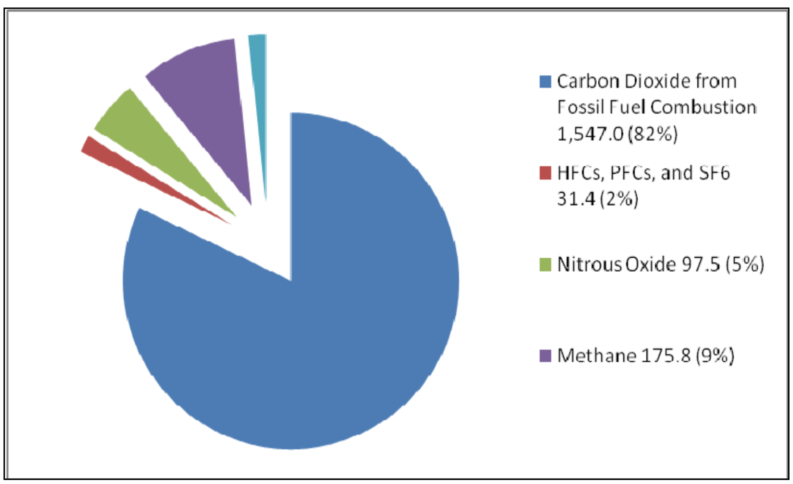
Section 7
Greenhouse Gases

7. Greenhouse Gases

Many chemical compounds found in the Earth's atmosphere act as "greenhouse gases." These gases allow sunlight to enter the atmosphere freely. When sunlight strikes the Earth's surface, some of it is reflected back towards space as infrared radiation (heat). Greenhouse gases absorb this infrared radiation and trap the heat in the atmosphere. Without this natural greenhouse effect, temperatures on earth would be much lower.

An increase of greenhouse gas emissions (GHG) from anthropogenic (man-made) sources since the beginning of industrialization has been shown to correlate with an increase in global average temperature. This has led to concerns that the global climate is changing. The concern is that higher levels of GHGs in the atmosphere and the resultant increase in trapped heat results in the phenomenon of global warming.

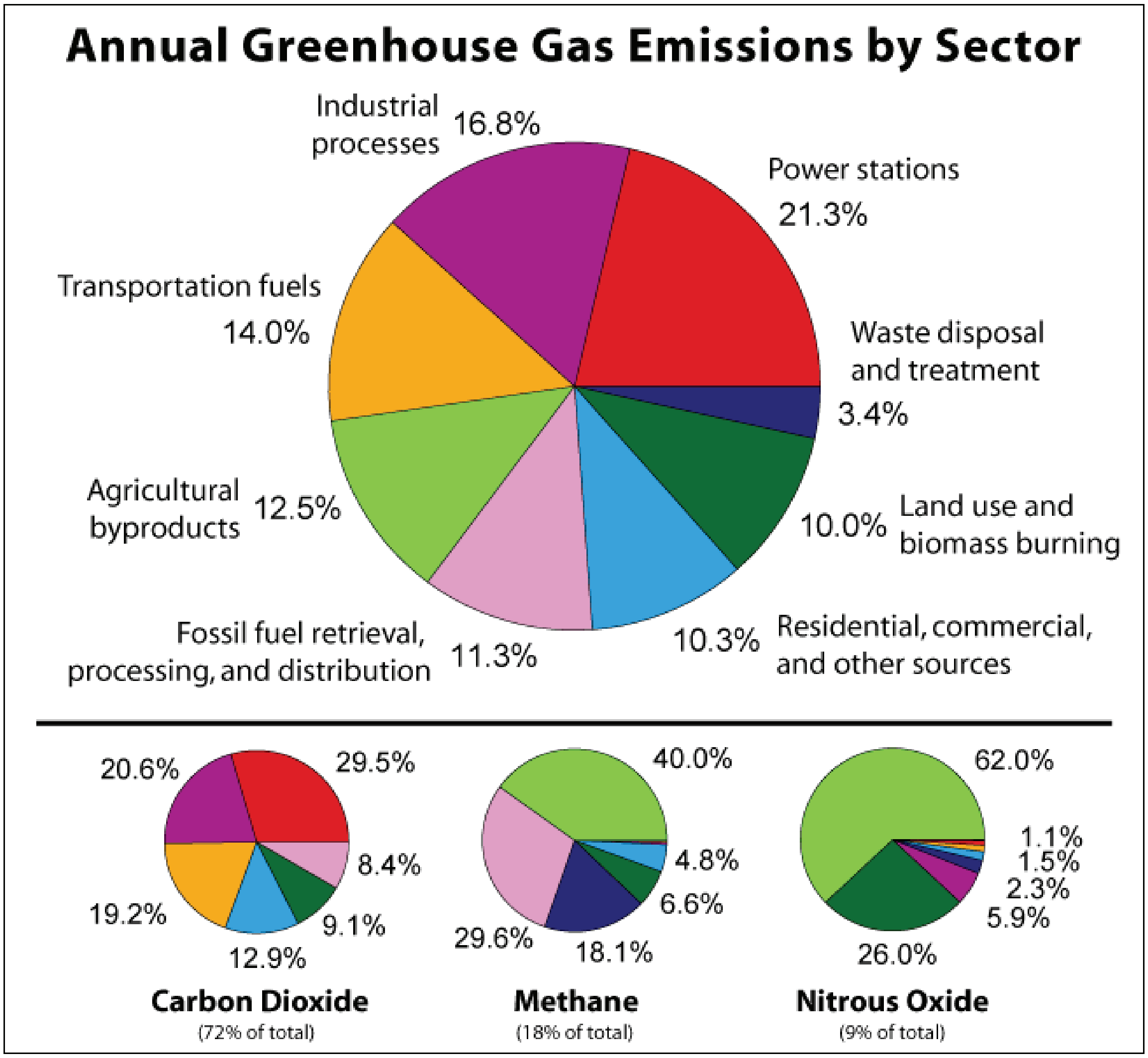
Many gases exhibit these "greenhouse" properties. The majority of greenhouse gases come mostly from natural sources including carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Human activity also contributes to GHG emissions and includes compounds that are not naturally emitted, such as halocarbons (compounds of carbon with fluorine, chlorine, bromine, or iodine) and sulfur hexafluoride (SF_6), and estimated emissions from the United States are shown in **Figure 7.0-1**. It is not possible to state that a specific gas causes a certain percentage of the greenhouse effect because the influences of the various gases are not additive.



Source: EIA 2003

Figure 7.0-1. Greenhouse Gas Emissions Sources

Figure 7.0-2 displays the annual GHG by sector in the United States. Since the USEPA has not promulgated an ambient standard or *de minimis* level for CO_2 emissions for Federal actions, there is no standard value to compare an action against in terms of meeting or violating the standard. The proposed Project would contribute directly to emissions of greenhouse gases from the combustion of fossil fuels for the transportation of the LNG, to the Port site in the SRV, the combustion of natural gas for vaporization of the LNG and from generation of electric power used to power the vaporization and send-out of the vaporized natural gas.



Source: Rosmarino 2006

Figure 7.0-2. Annual Greenhouse Gas Emissions by Sector

The potential effects of a change in atmospheric concentration of greenhouse gases on global climate has been studied extensively and reported by the Intergovernmental Panel on Climate Change (IPCC). The IPCC has released a series of reports. The most recent is the Fourth Assessment Report (Forster et al. 2007). Since GHGs are emitted by every country and because the potential impacts of climate change would be felt worldwide, climate change is a global issue. IPCC reports have documented a wide range of potential impacts including sea level rise, changes in weather patterns, and changes in temperature and moisture distributions. These changes can then produce related changes in biological communities on land and in the oceans.

Studies were also conducted by the U.S. Global Change Research Program (USGCRP) focusing on the GOM. (Ning et al. 2003). This integrated assessment of climate change on the GOM concluded that climate change could have a wide range of impacts from fisheries to coastal ecosystems due to changes in salinity and temperature and by habitat changes.

Greenhouse Gas Regulations and NEPA Requirements. Currently there are no climate change regulations controlling or requiring a permit for emissions of GHG. Other CAA requirements indirectly limit or prohibit emissions of some GHG. Use of halocarbons is regulated under Title VI of the CAA. NO_2 is regulated under Title I, and control of NO_2 indirectly reduces other nitrogen oxides compounds, including N_2O.

In April 2007, the U.S. Supreme Court declared that CO_2 and other greenhouse gases are air pollutants under the CAA. The Court declared that the USEPA therefore has the authority to regulate emissions of CO_2 and other greenhouse gases. In December 2007, the U.S. Congress required USEPA to promulgate a national GHG reporting regulation and create a GHG registry. Final rules are not due until 2009.

The overall goal of an EIS being prepared under NEPA is to take a hard look at environmental issues that are known or emerging regardless of whether rules have been promulgated to regulate the issue. Climate change and the emissions of GHG are in the forefront of environmental issues being examined around the world. The importance of examining the GHG and climate change issues in an EIS was recently emphasized in a court ruling that emphasized the NEPA goal of taking a hard look at GHG and Climate Change issues in more depth to allow decisionmakers to include consideration of these issues in their decisions (U.S District Court of Appeals, Ninth District, Center for Biological Diversity v. National Highway Traffic Safety Administration, November 15, 2007).

Estimating Project GHG Air Emissions Inventory. Both USEPA and DOE have emissions factors for CO_2 and methane (CH_4). USEPA's factors are documented in different chapters of its AP 42 *Compilation of Air Pollutant Emission Factors* (USEPA 2000). DOE's factors are presented in "Technical Guidelines Voluntary Reporting of Greenhouse Gases (1605(b)) Program, January 2007". The CO_2 emissions based on USEPA and DOE factors are very close (within 10 percent difference). USEPA and DOE factors for CH_4 are quite different; the DOE factors are more industry-specific. Some of the DOE factors are cross-referenced to data published by IPCC. This indicates that DOE has also adopted a global approach for the greenhouse gas issue. Based on these considerations, DOE factors for CO_2 and CH_4 have been chosen for this analysis.

Project GHG. The United States currently receives about 3 percent of its natural gas from overseas via LNG tankers. Another 17 percent is imported from Canada through pipelines. The remaining 80 percent is produced domestically and is currently declining in overall production. It is anticipated that natural gas imports will rise to 30 percent of overall U.S. consumption by 2030. The Project would import a daily average of 800 MMscfd of natural gas or less than .0004 percent of U.S. consumption in 2005 (EIA 2007b) and 18.6 percent of current Florida natural gas consumption (Port Dolphin 2007b).

Construction emissions would be generated by onshore pipeline and interconnection construction, offshore pipeline construction, and construction of the STL buoys. Emissions sources include the following construction equipment: a pipelay/derrick barge, AHTS vessel, crew boat, diving barges, jack-up barge, pipe burial barge, dragline, pipe pull barge, and supply boat. Onshore pipeline construction would involve trenching and backfill equipment, pipe-handling equipment, welding equipment and generators, and supply and support vehicles. During the construction of the Port and pipeline, different tasks would require the use of a variety of vessels and each vessel would contribute to the total air emissions. The main sources of emissions during construction would be the diesel engines used onboard each vessel for propulsion and electricity generation. **Table 7.0-1** presents the total emissions of CO_2 and CH_4 from construction activities.

Emissions of CO_2 and CH_4 from operational activities include power generation and propulsion engines and vaporization steam boilers, support vessel emissions, and minor emissions associated with the onshore portions of the Project. **Table 7.0-2** summarizes the CO_2 and CH_4 emissions during routine operations. Combustion of natural gas in boilers and internal combustion engines is highly efficient; emissions of unburned methane are lower than emissions of CO_2 by more than a factor of 1,000.

Table 7.0-1. Estimated Greenhouse Gas Emissions During Construction (Proposed Route)

Construction Phase	CO_2 Emissions (tons)	CH_4 Emissions (tons)
Offshore Pipeline	72,215	16.5
STL Buoys	8,085	1.8
Onshore construction	158	86.6
Total Construction	80,458	105

Table 7.0-2. Operations Emissions of Greenhouse Gases

Operations Phase	CO_2 Emissions (tons/yr)	CH_4 Emissions (tons/yr)
Port	718,642	586
Onshore pipeline	25	< 0.01
SRV Transit	16,135	13
Total Operations	734,802	599

Decommissioning of the deepwater Port will generate CO_2 and CH_4 emissions from the vessels associated with this event; decommissioning of onshore equipment will include the release of residual natural gas (largely CH_4) from the pipeline. **Table 7.0-3** summarizes the emissions, including dive barges, equipment-removal vessels, trucks, and equipment to remove aboveground components onshore, and support vessels.

Table 7.0-3. Estimated Greenhouse Gas Emissions During Decommissioning (Proposed Route)

Decommissioning Phase	CO_2 Emissions (tons)	CH_4 Emissions (tons)
Offshore	2,538	0.6
Onshore	21	1299.7
Total Decommissioning	2,559	1300

Project GHG Emissions compared to Florida Baseline, and United States Baseline. The FDEP estimated the state's GHG in a September 2007 report entitled "Preliminary Inventory of Florida Greenhouse Gas Emissions: 1990-2004." The results of the inventory are expressed in $MMTCO_2E$ for a number of economic sectors including the Energy sector. Estimated emissions of CO_2 from the state of Florida for 2004 were 258 million metric tons, and total Florida GHG emissions in 2004 were 289 $MMTCO_2E$. Therefore, the expected GHG emissions from operation of the Port, 0.9 $MMTCO_2E$, represent less than 1 percent of the existing GHG for Florida. Estimated national emissions of CO_2 for the U.S. were 5,957 million metric tons in 2004, and total GHG emissions were 7,133.5 $MMTCO_2E$. Approximately 83.5 percent of these emissions represent CO_2 emissions from combustion of fossil fuels (USDOE 2006).

No Action Alternative. As discussed in **Section 1.2**, natural gas used for power generation would displace other fuels, including coal and fuel oil, for generation. If the license is denied, then alternative sources of energy would replace the natural gas that would have been provided by the Project. The current fuel mix for power generation in the Tampa Bay area relies heavily on coal and fuel oil. If the natural gas is replaced by a fuel mix similar to the current fuel mix, then additional emissions of GHG would result. Natural gas is a preferred option for power generation when considering GHG and other pollutant emissions. **Table 7.0-4** compares fossil fuel emissions in pounds per billion Btu of Energy Input for natural gas, oil, and coal. .

Table 7.0-4. Estimated Fossil Fuel Emissions (in pounds per billion Btu)

Pollutant	Natural Gas	Oil	Coal
Carbon Dioxide	117,000	164,000	208,000
Nitrogen Oxides	92	448	457

Assuming an average heat content of 1,020 Btu/scf for delivered natural gas and 7,600 Btu/KWh for electricity generation by natural gas, this is enough gas to generate approximately 39.2 million MWh per year. Comparison of the CO_2 emissions for equivalent electrical generation from the current fuel mix in the Tampa Bay area to emissions for the same power generation using natural gas shows that an additional 10.8 million metric tons per year would be emitted if the project's natural gas were not available to generate electrical power (Port Dolphin 2008a).

Alternative Pipeline Routes. The Southern Route Alternative for the pipeline is longer than the Proposed Route. Emissions during construction and decommissioning would therefore be greater for this alternative, compared to the Proposed Route. Emissions of CO_2 and CH_4 for pipeline construction would be 12 percent higher for the Southern Route Alternative, compared to the Proposed Route. Similarly, the CH_4 release associated with decommissioning would be larger for the Southern Route Alternative.

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