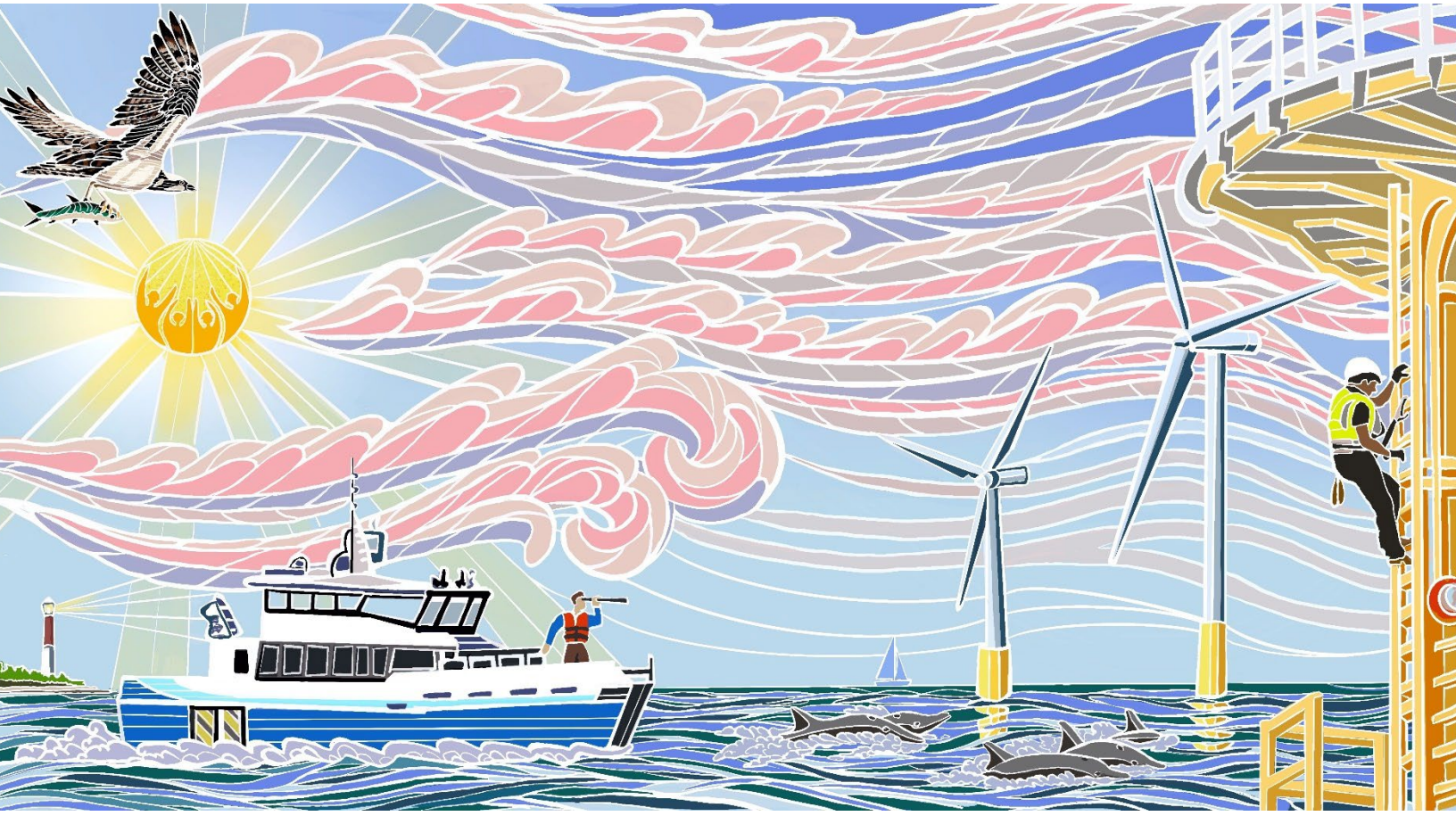

Appendix II-C

Air Emissions Calculation Methodology

March 2024

Appendix II-C – Air Emissions Calculation Methodology

This Appendix presents a description of how the air emissions of the Project, as reported in Section 3.1, were calculated, including all assumptions used in preparing estimates of direct emissions. Emissions are predominantly from internal combustion engines[1], and are quantified using a three-step process:

1. Detailed plans for each Project activity.
2. Load factors.
3. Emission factors.

Air emissions are broadly calculated as the product of: engine rated capacity; hours operating; load factor; and emission factor.

Plans for each Project Activity

Construction activities are based on the same strategies that were previously developed by Offshore Construction Associates (OCA) for Atlantic Shores for the COP for Lease Area OCS-A 0499 in close association with Atlantic Shores. These strategies were then refined and updated by the Atlantic Shores team to match the new Project size and specifics. The construction strategy presented is based on gravity-based structure (GBS) installation, with heavy vessels using the New Jersey Wind Port (NJWP) and Paulsboro. Crew Transfer Vessels (CTVs) will use the port of Atlantic City, and (weather permitting) some crew transfers will use helicopters. Helicopter use is conservatively not included in the emissions totals because any helicopter trip would avoid a marine vessel trip, and on-the-whole would reduce air emissions. Offshore construction also includes fuel bunkering which involves a tug and barge combination making trips to port twice a month to load up on fuel for the offshore vessels rather than having each individual vessel make a trip into port for refueling as needed. Offshore construction also includes potential stationary generators on the OSS and each WTG for commissioning activities with engine emissions based on Tier 4 nonroad engine standards. Miscellaneous activities during offshore construction include emissions of volatile organic compounds (VOC) from the evaporation of marine

[1] Helicopters and certain other vessels may be powered by turbines instead of engines, but the calculation methodology is unchanged.

paint and fuel. Fuel evaporation is based on a fuel evaporation factor of 0.014 lb/Mgal of fuel consumed per AP-42 Chapter 5.2 Table 5.2-5. Marine paint evaporation is assumed as 5 lb/gal of marine paint with 300 gallons of marine paint used.

Onshore construction estimates include cable landings, horizontal directional drilling, duct bank installation, substation installation, material handling at ports, and worker commute activity; equipment sizes and operating days/hours are from Epsilon experience with cable landings, onshore facility construction, and onshore linear construction projects, reviewed by Atlantic Shores.

Operation & Maintenance (O&M) activities are based on the same logistical concepts that were developed by PEAK Wind for Atlantic Shores for Lease Area OCS-A 0499, These logistical concepts were then refined and updated by the Atlantic Shores team to match the new Project size and specifics The O&M methodology includes all vessels, helicopters, generators, and construction equipment that are expected to be used during the Project's operation. The refined and scaled model inputs were developed with the goal of making practical conservative assumptions about the wind farm characteristics that most impact operations activity. Atlantic Shores provided Geographic Information Systems (GIS) files that offered a basis for the transit time and distance calculations used in the original PEAK Wind models. The presented logistical concepts are based on the primary use of CTVs or based on use of a dedicated Service Operations Vessel (SOV), supported by CTVs. Again, helicopters could be used but would decrease total air emissions so are conservatively excluded from the calculations. Lighter vessels would use the port of Atlantic City, and heavier support and repair vessels would use the NJWP.

Operations estimates include routine and non-routine operations. Some repairs use a jack-up vessel; for these operations, PEAK Wind has modeled the use of an existing European vessel for the first three years of operation, followed by a new-construction US-flagged vessel. The Atlantic Shores team maintained that assumption for the new Project.

Operations and maintenance emissions estimations also included miscellaneous activities. The two miscellaneous activities that were included in the calculations are the operation of generators on the OSS and the loss of sulfur hexafluoride (SF_6) from the OSS switchgear. The generators are calculated using Tier 4 engine emissions factors and an assumed operating time of each of the 4 engines operating at 75% load for 24 hours per year. The loss of SF_6 from the switchgear is conservatively based on 0.5% loss of the initial charge of SF_6 every year of operation with an initial charge of 1,500 kg of SF_6 to each of the OSS switchgears.

For all calculations, a joint effort by all parties involved was made to develop consistent calculations for vessel sizes, vessel engine sizes and types, days and hours/day of activity, and number of transits

to appropriate ports. Engines powering equipment, and onshore vehicles and equipment, were calculated similarly.

Load Factors

Engines do not operate at full power all the time, but instead vary their power output to provide the mechanical energy needed to perform the engine's task. The amount of energy used by each engine while doing work, expressed as a fraction of the maximum capacity. Load factors use published factors from the Bureau of Ocean Energy Management (BOEM) and EPA factors. The load factor for O&M SOV operation was provided by PEAK Wind based on experience with prior projects.

Emission Factors

The air emissions of CO2 and SO2 are a direct function of the carbon and sulfur in the fuel and are calculated based on EPA factors or mass balances as appropriate. Emissions of NOx and PM2.5 are calculated taking into account engine size, operation, and controls as described above to minimize and mitigate emissions. Emission rates are from regulatory limits (which depend on engine size, age, and operation) and published BOEM and EPA factors.

Other estimates and assumptions are per the attached spreadsheets and the following bulleted list.

Construction Assumptions:

Onshore

- Assumed average of 15 miles per commute trip per https://www.bts.gov/bts/sites/rita.dot.gov.bts/files/publications/omnistats/volume_03_issue_04/pdf/entire.pdf
- Assumed fleetwide average mpg of 22.3 mpg from https://www.bts.gov/content/average-fuel-efficiency-us-passenger-cars-and-light-trucks
    - Assumed 10 ppm sulfur in gasoline starting in 2017 per https://www.epa.gov/gasoline-standards/gasoline-sulfur
    - GHG Emissions based on fuel content in Tables C-1 and C-2 of 40 CFR 98
    - Gasoline density assumed as 6.17 lb/gal per sds range of 0.7-0.78 specific gravity. The average would be 0.74 times water density of 8.34 lb/gal = 6.17 lb/gal https://www.hess.com/docs/us-safety-data-sheets/gasoline-all-grades.pdf?sfvrsn=2
    - Emission factors for commuting vehicles are assumed as 2018 light duty vehicles from Table 4-43 of "Estimated U.S. Average Vehicle emissions Rates per Vehicle by

Vehicle Type Using Gasoline and Diesel" at https://www.bts.gov/content/estimated-national-average-vehicle-emissions-rates-vehicle-vehicle-type-using-gasoline-and

- Emission factors for construction equipment engines are assumed as the best available engine tier from 40 CFR 89.112 Table 1 for the appropriate engine size range

- NOx emissions are conservatively assumed as 100% of NMHC + NOx
- VOC emissions are assumed as 12% of NMHC + NOx based on ratio of HC to NOX+HC for engine tiers that have both values split out separately
    - Global Warming Potentials for GHG compounds are from Table A-1 of 40 CFR 98
    - OSS Engines are 2 Tier 4 engines for each OSS at 500 kW

- Offshore
    - Emission factors for vessels are BOEM Default factors
    - Load factors are BOEM Default load factors for main engines and auxiliary engines
    - SOV Load factors are based on sample vessel data
    - Fuel use factors are from "Current Methodologies and Best Practices in Preparing Port Emission Inventories" April 2009, Table 2-9: Emission Factors for OGV Main Engines, Table 2-16: Auxiliary Engine Emission Factors
- Cat 1&2 marine engines are calculated based on the BOEM CO2 emission rate and fuel information such as Marine Diesel Fuel Density of 7.10 lb/gal, higher heating value of 0.138 MMBtu/gal, and CO2 emission factor in kg/MMBtu from 40 CFR 98 Table C-1.
    - Global Warming Potentials for GHG compounds are from Table A-1 of 40 CFR 98
    - Non-Vessel Equipment engines (hammer engine, air compressors, motion compensation, etc.) are assumed to meet the best available engine tier from 40 CFR 89.112 Table 1 for the appropriate engine size range
- NOx emissions are conservatively assumed as 100% of NMHC + NOx
- VOC emissions are assumed as 12% of NMHC + NOx based on ratio of HC to NOX+HC for engine tiers that have both values split out separately
    - OSS Installation trips include foundation and topside
    - CTV OSS install trips one every four days for crew transfer
    - Scour protection vessels only travel to Project Area once with no resupply trips
    - Barge master engine is assumed as 500 kw
    - All vessels transiting at 10 knots except CTVs (29 knots) and foundation install barges/tugs which have case specific speeds from model (3 and 7 knots for the 2 cases)

  - Fuel Bunkering by barge/tug every 2 weeks
  - For vessels with several large engines listed as the only engines, it was assumed that all but 1 were main engine and 1 was auxiliary engine
  - Barges are assumed as having no main engine (Tugs do transit)
  - Vessels that are large work vessels are assumed to have 1 trip out to site and then sit out there for duration of project activity
  - All vessel engines are assumed as Category 1&2 except jackup vessels are assumed to use Category 3 engines
  - GBS Foundations pulled out with all 6 tugs for each trip
  - Vessels assumed as operating on maneuvering load factor for 24 hr/day for operating days
  - WTG Commissioning Engines are assumed to be needed with a count of 1 engine per WTG location. These Engines are estimated at 300 kVA and an assumed power factor of 0.8.
  - Paint VOC
- 5 lb/gal, 100 gallons per year, 3 year construction, 2000 lb/ton = 0.75 ton
  - Fuel Evaporation
- 0.014 lb/1000 gallon distillate fuel #2 per AP-42 Chapter 5.2 Table 5.2-5

<u>O&M Assumptions:</u>

- General for Total PDE
  - SF6 loss from switchgear
- 1500 kg SF6 charge per OSS, 0.5% loss per year, 22,800 GWP
  - 0.5% loss based on IEC standard cited in EPA document here: https://www.epa.gov/sites/production/files/2016-02/documents/leakrates_circuitbreakers.pdf
  - Environmental Monitoring Campaign
- Once a month trip with 8 hour in Project Area time using a CTV
  - Seabed Survey
- Assumed to be minimal and covered under normal routine CTV/SOV campaigns
  - Assumed 0.1 TPY of VOC from miscellaneous painting touch up activities

National and State Ambient Air Quality Standards

The nation's first Federal efforts at controlling air pollution began in 1963 with passage of the Clean Air Act (CAA). Four amendments followed in 1967, 1970, 1977, and 1990. The CAA was enacted by Congress to protect the health and welfare of the public from the adverse effects of air pollution. As required by the CAA, EPA promulgated NAAQS for six criteria pollutants: nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM_{10} and $PM_{2.5}$), carbon monoxide (CO), ozone (O_3), and lead (Pb). The NAAQS are listed in Table II-C-1.

The NAAQS presented in Table II-C-1 specify concentration levels for various averaging times. The NAAQS includes both "primary" and "secondary" standards. The primary standards are intended to protect human health; whereas, the secondary standards are intended to protect public welfare from any known or anticipated adverse effects associated with the presence of air pollutants, such as damage to vegetation.

Table II-C-1 National Ambient Air Quality Standards

Pollutant	Averaging Period	NAAQS ($\mu g/m^3$)	
		Primary	Secondary
NO_2	Annual [1]	100	Same
	1-Hr [2]	188	None
SO_2	3-Hr [3]	None	1300
	1-Hr [4]	196	None
$PM_{2.5}$	Annual [1]	12	15
	24-Hr [5]	35	Same
PM_{10}	24-Hr [3][6]	150	Same
CO	8-Hr [3]	10,000	Same
	1-Hr [3]	40,000	Same
Ozone	8-Hr [7]	137.4	Same
Pb	3-month [1]	0.15	Same

[1] Not to be exceeded.
[2] 98th percentile of one-hour daily maximum concentrations, averaged over three years.
[3] Not to be exceeded more than once per year.
[4] 99th percentile of one-hour daily maximum concentrations, averaged over three years.
[5] 98th percentile, averaged over three years.
[6] Not to be exceeded more than once per year on average over three years.
[7] Annual fourth-highest daily maximum eight-hour concentration, averaged over three years.
Source: http://www.epa.gov/ttn/naaqs/criteria.html

The NAAQS also reflect various durations of exposure. The short-term periods (24 hours or less) refer to exposure levels not to be exceeded more than once a year. Long-term periods refer to limits that cannot be exceeded for exposure averaged over three months or longer.

Attainment Status

Section 107 of the 1977 CAA Amendment requires that the EPA publish a list of the geographic areas in compliance with the NAAQS, and those areas not in compliance with the NAAQS. Areas not in NAAQS compliance are deemed non-attainment areas. Areas that have insufficient data to make a determination are deemed unclassified and are treated as being attainment areas until proven otherwise. An area's designation is based on the data collected by the state monitoring network on a pollutant-by-pollutant basis.

Title 40 CFR 81 presents all the attainment designations for each of the states. This information is consolidated in EPA's "Green Book", which breaks the information down by state, county, area, and pollutant. There are currently no attainment designations made for the 1-hour NO_2 NAAQS. The attainment status of each port's county is presented in the table at the end of this appendix alongside a table that provides the approximate maximum emissions and fuel consumption in each region.

Total Emissions													
Activity Group	# of Vessels	Fuel Consumption (gal)	Emissions (tons)										
			NOx	VOC	CO	PM10	PM2.5	SO2	CO2	CH4	N2O	CH4 as CO2e	N2O as CO2e	CO2e
Foundation Installation (FOU)	8	21,021,051.2	3,479.6	65.2	837.6	120.2	116.5	11.7	234,898.1	1.5	11.3	36.5	3,370.6	238,305.1
Offshore Substation Installation (OSS)	9	3,271,928.6	596.4	22.7	119.8	19.9	18.9	8.7	35,512.0	0.4	1.5	11.0	452.4	35,975.4
Scour Protection	2	809,956.4	135.1	3.1	32.1	4.7	4.6	0.9	8,981.5	0.1	0.4	1.4	129.9	9,112.8
Inter Array Cable Installation	6	2,610,848.6	435.9	9.5	103.9	15.1	14.6	2.5	28,994.8	0.2	1.4	4.5	418.6	29,418.0
WTG Installation	7	9,974,708.7	1,723.4	32.1	430.6	55.6	53.9	3.5	116,959.6	1.0	5.3	25.9	1,565.1	118,550.6
Export Cable Installation	4	2,927,857.6	491.1	10.1	118.2	16.8	16.3	2.4	32,587.8	0.2	1.6	5.1	469.5	33,062.3
Fuel Bunkering	2	3,100,161.2	424.7	13.5	136.5	15.4	15.0	1.3	34,863.8	0.6	1.3	14.0	380.2	35,258.1
Stationary Generators	0	1,018,182.9	10.5	3.0	55.0	0.3	0.3	0.1	11,621.2	0.5	0.1	11.8	28.1	11,661.1
Miscellaneous	0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	38	44,734,695.2	7,296.8	160.2	1,833.5	248.0	240.2	31.1	504,418.8	4.4	22.9	110.3	6,814.3	511,343.4

Vessel Emissions													
Activity Group	# of Vessels	Fuel Consumption (gal)	Emissions (tons)										
			NOx	VOC	CO	PM10	PM2.5	SO2	CO2	CH4	N2O	CH4 as CO2e	N2O as CO2e	CO2e
Foundation Installation (FOU)	8	21,021,051.2	3,479.6	65.2	837.6	120.2	116.5	11.7	234,898.1	1.5	11.3	36.5	3,370.6	238,305.1
Offshore Substation Installation (OSS)	9	2,727,537.9	560.1	18.1	90.4	18.2	17.3	8.6	29,298.5	0.2	1.5	4.7	437.3	29,740.6
Scour Protection	2	809,956.4	135.1	3.1	32.1	4.7	4.6	0.9	8,981.5	0.1	0.4	1.4	129.9	9,112.8
Inter Array Cable Installation	6	2,610,848.6	435.9	9.5	103.9	15.1	14.6	2.5	28,994.8	0.2	1.4	4.5	418.6	29,418.0
WTG Installation	7	9,179,280.1	1,674.3	26.0	387.6	53.1	51.5	3.4	107,880.8	0.7	5.2	16.7	1,543.2	109,440.7
Export Cable Installation	4	2,927,857.6	491.1	10.1	118.2	16.8	16.3	2.4	32,587.8	0.2	1.6	5.1	469.5	33,062.3
Fuel Bunkering	2	2,219,708.2	370.4	6.8	88.9	12.7	12.3	1.2	24,814.6	0.2	1.2	3.9	355.9	25,174.3
Stationary Generators	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miscellaneous	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	38	41,496,240.0	7,146.5	138.8	1,658.6	240.8	233.1	30.8	467,456.0	2.9	22.6	72.8	6,725.0	474,253.8

Non-Vessel Emissions													
Activity Group	# of Vessels	Fuel Consumption (gal)	Emissions (tons)										
			NOx	VOC	CO	PM10	PM2.5	SO2	CO2	CH4	N2O	CH4 as CO2e	N2O as CO2e	CO2e
Foundation Installation (FOU)	8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offshore Substation Installation (OSS)	9	544,390.7	36.3	4.5	29.4	1.7	1.7	0.1	6,213.5	0.3	0.1	6.3	15.0	6,234.8
Scour Protection	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Inter Array Cable Installation	6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WTG Installation	7	795,428.6	49.1	6.1	43.0	2.5	2.5	0.1	9,078.8	0.4	0.1	9.2	21.9	9,109.9
Export Cable Installation	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel Bunkering	2	880,453.0	54.3	6.7	47.6	2.7	2.7	0.1	10,049.2	0.4	0.1	10.2	24.3	10,083.7
Stationary Generators	0	1,018,182.9	10.5	3.0	55.0	0.3	0.3	0.1	11,621.2	0.5	0.1	11.8	28.1	11,661.1
Miscellaneous	0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	38	3,238,455.2	150.3	21.4	174.9	7.2	7.2	0.3	36,962.8	1.5	0.3	37.5	89.4	37,089.6
Engines Only			150.3	20.3	174.9	7.2	7.2	0.3	36,962.8	1.5	0.3	37.5	89.4	37,089.6

Activity	Representative Vessel Type	Engine Type	Engine Count	Engine Size (kW)	Total Size (kW)	Engine Category	Home Port	Vessel Trips	One-Way Trip Distance (NM)	Total Distance Traveled (NM)	Vessel Transit Speed (knots)	Hours in Transit	Operating Days	Operating Hours/Day	Total Non-Transit Hours	Total Operating Hours	Emission Factors Ref
Emissions During Construction																	
Foundation Installation (FOU)																	
Bulk Carrier	Bulk Carrier	Main Engine (Transit)	1	7,010	7,010	1 & 2 main	Europe	15	250	7,500	10	750	0	0	0	750	10M
		Main Engine (Maneuvering)	1	7,010	7,010	1 & 2 main		0	250	0	10	0	189	24	4,536	4,536	10M
		Auxiliary Engine (Transit)	3	1,050	3,150	1 & 2 auxiliary		15	250	7,500	10	750	0	0	0	750	10A
		Auxiliary Engine (Maneuvering)	3	1,050	3,150	1 & 2 auxiliary		0	250	0	10	0	189	24	4,536	4,536	10A
Tug	Tug	Main Engine (Transit)	2	2,525	5,050	1 & 2 main	NJWP	157	113	35,485	3	11,828	0	0	0	11,828	11M
		Main Engine (Maneuvering)	2	2,525	5,050	1 & 2 main		0	113	0	3	0	80	24	1,920	1,920	11M
		Auxiliary Engine (Transit)	3	79	236	1 & 2 auxiliary		157	113	35,485	3	11,828	0	0	0	11,828	11A
		Auxiliary Engine (Maneuvering)	3	79	236	1 & 2 auxiliary		0	113	0	3	0	80	24	1,920	1,920	11A
Tug	Tug	Main Engine (Transit)	2	2,525	5,050	1 & 2 main	NJWP	157	113	35,485	3	11,828	0	0	0	11,828	11M
		Main Engine (Maneuvering)	2	2,525	5,050	1 & 2 main		0	113	0	3	0	80	24	1,920	1,920	11M
		Auxiliary Engine (Transit)	3	79	236	1 & 2 auxiliary		157	113	35,485	3	11,828	0	0	0	11,828	11A
		Auxiliary Engine (Maneuvering)	3	79	236	1 & 2 auxiliary		0	113	0	3	0	80	24	1,920	1,920	11A
Tug	Tug	Main Engine (Transit)	2	2,525	5,050	1 & 2 main	NJWP	157	113	35,485	3	11,828	0	0	0	11,828	11M
		Main Engine (Maneuvering)	2	2,525	5,050	1 & 2 main		0	113	0	3	0	80	24	1,920	1,920	11M
		Auxiliary Engine (Transit)	3	79	236	1 & 2 auxiliary		157	113	35,485	3	11,828	0	0	0	11,828	11A
		Auxiliary Engine (Maneuvering)	3	79	236	1 & 2 auxiliary		0	113	0	3	0	80	24	1,920	1,920	11A
Tug	Tug	Main Engine (Transit)	2	2,525	5,050	1 & 2 main	NJWP	157	113	35,485	3	11,828	0	0	0	11,828	11M
		Main Engine (Maneuvering)	2	2,525	5,050	1 & 2 main		0	113	0	3	0	80	24	1,920	1,920	11M
		Auxiliary Engine (Transit)	3	79	236	1 & 2 auxiliary		157	113	35,485	3	11,828	0	0	0	11,828	11A
		Auxiliary Engine (Maneuvering)	3	79	236	1 & 2 auxiliary		0	113	0	3	0	80	24	1,920	1,920	11A
Tug	Tug	Main Engine (Transit)	2	2,525	5,050	1 & 2 main	NJWP	157	113	35,485	3	11,828	0	0	0	11,828	11M
		Main Engine (Maneuvering)	2	2,525	5,050	1 & 2 main		0	113	0	3	0	80	24	1,920	1,920	11M
		Auxiliary Engine (Transit)	3	79	236	1 & 2 auxiliary		157	113	35,485	3	11,828	0	0	0	11,828	11A
		Auxiliary Engine (Maneuvering)	3	79	236	1 & 2 auxiliary		0	113	0	3	0	80	24	1,920	1,920	11A
Tug	Tug	Main Engine (Transit)	2	2,525	5,050	1 & 2 main	NJWP	157	113	35,485	3	11,828	0	0	0	11,828	11M
		Main Engine (Maneuvering)	2	2,525	5,050	1 & 2 main		0	113	0	3	0	80	24	1,920	1,920	11M
		Auxiliary Engine (Transit)	3	79	236	1 & 2 auxiliary		157	113	35,485	3	11,828	0	0	0	11,828	11A
		Auxiliary Engine (Maneuvering)	3	79	236	1 & 2 auxiliary		0	113	0	3	0	80	24	1,920	1,920	11A
SOV	Service Operation Vessel	Main Engine (Transit)	4	1,200	4,800	1 & 2 main	Paulsboro	3	144	864	10	86	0	0	0	86	3M
		Main Engine (Maneuvering)	4	1,200	4,800	1 & 2 main		0	144	0	10	0	76	24	1,824	1,824	3M
		Auxiliary Engine (Transit)	1	800	800	1 & 2 auxiliary		3	144	864	10	86	0	0	0	86	3A
		Auxiliary Engine (Maneuvering)	1	800	800	1 & 2 auxiliary		0	144	0	10	0	76	24	1,824	1,824	3A
Offshore Substation Installation (OSS)																	
	Large HLV	Main Engine (Transit)	11	5,833	64,167	1 & 2 main	Europe	1	250	500	10	50	0	0	0	50	2M
		Main Engine (Maneuvering)	11	5,833	64,167	1 & 2 main		0	250	0	10	0	57	24	1,368	1,368	2M
		Auxiliary Engine (Transit)	1	5,833	5,833	1 & 2 auxiliary		1	250	500	10	50	0	0	0	50	2A
		Auxiliary Engine (Maneuvering)	1	5,833	5,833	1 & 2 auxiliary		0	250	0	10	0	57	24	1,368	1,368	2A
	Bubble Curtain Support Vessel	Main Engine (Transit)	1	5,530	5,530	1 & 2 main	NJWP	1	113	226	10	23	0	0	0	23	11M
		Main Engine (Maneuvering)	1	5,530	5,530	1 & 2 main		0	113	0	10	0	57	24	1,368	1,368	11M
		Auxiliary Engine (Transit)	1	5,530	5,530	1 & 2 auxiliary		1	113	226	10	23	0	0	0	23	11A
		Auxiliary Engine (Maneuvering)	1	5,530	5,530	1 & 2 auxiliary		0	113	0	10	0	57	24	1,368	1,368	11A
Transport Barge 1	Barge	Main Engine (Transit)	0	0	0	1 & 2 main	Gulf Island	12	250	6,000	10	600	0	0	0	600	2M
		Main Engine (Maneuvering)	0	0	0	1 & 2 main		0	250	0	10	0	57	24	1,368	1,368	2M
		Auxiliary Engine (Transit)	1	50	50	1 & 2 auxiliary		12	250	6,000	10	600	0	0	0	600	2A
		Auxiliary Engine (Maneuvering)	1	50	50	1 & 2 auxiliary		0	250	0	10	0	57	24	1,368	1,368	2A
Transport Barge 2	Barge	Main Engine (Transit)	0	0	0	1 & 2 main	Gulf Island	12	250	6,000	10	600	0	0	0	600	2M
		Main Engine (Maneuvering)	0	0	0	1 & 2 main		0	250	0	10	0	57	24	1,368	1,368	2M
		Auxiliary Engine (Transit)	1	50	50	1 & 2 auxiliary		12	250	6,000	10	600	0	0	0	600	2A
		Auxiliary Engine (Maneuvering)	1	50	50	1 & 2 auxiliary		0	250	0	10	0	57	24	1,368	1,368	2A
Transport Barge 3	Barge	Main Engine (Transit)	0	0	0	1 & 2 main	Gulf Island	12	250	6,000	10	600	0	0	0	600	2M
		Main Engine (Maneuvering)	0	0	0	1 & 2 main		0	250	0	10	0	57	24	1,368	1,368	2M
		Auxiliary Engine (Transit)	1	50	50	1 & 2 auxiliary		12	250	6,000	10	600	0	0	0	600	2A
		Auxiliary Engine (Maneuvering)	1	50	50	1 & 2 auxiliary		0	250	0	10	0	57	24	1,368	1,368	2A
US Towing Tug 1	US Towing Tug	Main Engine (Transit)	2	2,525	5,050	1 & 2 main	Gulf Island	12	250	6,000	10	600	0	0	0	600	11M
		Main Engine (Maneuvering)	2	2,525	5,050	1 & 2 main		0	250	0	10	0	57	24	1,368	1,368	11M
		Auxiliary Engine (Transit)	3	79	236	1 & 2 auxiliary		12	250	6,000	10	600	0	0	0	600	11A
		Auxiliary Engine (Maneuvering)	3	79	236	1 & 2 auxiliary		0	250	0	10	0	57	24	1,368	1,368	11A
US Towing Tug 2	US Towing Tug	Main Engine (Transit)	2	2,525	5,050	1 & 2 main	Gulf Island	12	250	6,000	10	600	0	0	0	600	11M
		Main Engine (Maneuvering)	2	2,525	5,050	1 & 2 main		0	250	0	10	0	57	24	1,368	1,368	11M
		Auxiliary Engine (Transit)	3	79	236	1 & 2 auxiliary		12	250	6,000	10	600	0	0	0	600	11A
		Auxiliary Engine (Maneuvering)	3	79	236	1 & 2 auxiliary		0	250	0	10	0	57	24	1,368	1,368	11A
US Towing Tug 3	US Towing Tug	Main Engine (Transit)	2	2,525	5,050	1 & 2 main	Gulf Island	12	250	6,000	10	600	0	0	0	600	11M
		Main Engine (Maneuvering)	2	2,525	5,050	1 & 2 main		0	250	0	10	0	57	24	1,368	1,368	11M
		Auxiliary Engine (Transit)	3	79	236	1 & 2 auxiliary		12	250	6,000	10	600	0	0	0	600	11A
		Auxiliary Engine (Maneuvering)	3	79	236	1 & 2 auxiliary		0	250	0	10	0	57	24	1,368	1,368	11A
Motion Compensation 1	Motion Compensation	Main Engine (Transit)	1	500	500	Tier 3 Non-Road	Gulf Island	0	250	0	0	0	57	24	1,368	1,368	17

Activity	Representative Vessel Type	Engine Type	Engine Count	Engine Size (kW)	Total Size (kW)	Engine Category	Home Port	Vessel Trips	One-Way Trip Distance (NM)	Total Distance Traveled (NM)	Vessel Transit Speed (knots)	Hours in Transit	Operating Days	Operating Hours/Day	Total Non-Transit Hours	Total Operating Hours	Emission Factors Ref
Motion Compensation 2	Motion Compensation	Main Engine (Transit)	1	500	500	Tier 3 Non-Road	Gulf Island	0	250	0	0	0	57	24	1,368	1,368	17
Motion Compensation 3	Motion Compensation	Main Engine (Transit)	1	500	500	Tier 3 Non-Road	Gulf Island	0	250	0	0	0	57	24	1,368	1,368	17
Crew Transfer Vessel / PSO Vessel / Noise Monitoring	Crew Transfer Vessel	Main Engine (Transit)	4	522	2,088	1 & 2 main	Atlantic City	57	22	2,506	29	88	0	0	0	88	4M
		Main Engine (Maneuvering)	4	522	2,088	1 & 2 main		0	22	0	29	0	57	24	1,368	1,368	4M
		Auxiliary Engine (Transit)	2	27	54	1 & 2 auxiliary		57	22	2,506	29	88	0	0	0	88	4A
		Auxiliary Engine (Maneuvering)	2	27	54	1 & 2 auxiliary		0	22	0	29	0	57	24	1,368	1,368	4A
	Bubble Curtain Power	Air Compressor	20	399	7,980	Tier 3 Non-Road	N/A	0	0	0	0	0	57	10	570	570	16
	Hydraulic Hammer Power	Hammer Engine	3	597	1,791	Tier 2 Non-Road	N/A	0	0	0	0	0	57	10	570	570	18
Scour Protection																	
	Fall Pipe Vessel	Main Engine (Transit)	8	4 x 3350kW 4 x 2000kW	21,400	1 & 2 main	Bayside	1	250	500	10	50	0	0	0	50	3M
		Main Engine (Maneuvering)	8	4 x 3350kW 4 x 2000kW	21,400	1 & 2 main		0	250	0	10	0	73	24	1,752	1,752	3M
		Auxiliary Engine (Transit)	1	2,950	2,950	1 & 2 auxiliary		1	250	500	10	50	0	0	0	50	3A
		Auxiliary Engine (Maneuvering)	1	2,950	2,950	1 & 2 auxiliary		0	250	0	10	0	73	24	1,752	1,752	3A
	US Dredger	Main Engine (Transit)	2	641	1,283	1 & 2 main	Boston	1	250	500	10	50	0	0	0	50	5M
		Main Engine (Maneuvering)	2	641	1,283	1 & 2 main		0	250	0	10	0	69	24	1,656	1,656	5M
		Auxiliary Engine (Transit)	0	0	954	1 & 2 auxiliary		1	250	500	10	50	0	0	0	50	5A
		Auxiliary Engine (Maneuvering)	0	0	954	1 & 2 auxiliary		0	250	0	10	0	69	24	1,656	1,656	5A
Inter Array Cable Installation																	
Cable Installation Vessel	Cable Installation Vessel	Main Engine (Transit)	4	2 x 2666kW 2 x 2000kW	9,332	1 & 2 main	Europe	1	250	500	10	50	0	0	0	50	3M
		Main Engine (Maneuvering)	4	2 x 2666kW 2 x 2000kW	9,332	1 & 2 main		0	250	0	10	0	368	24	8,832	8,832	3M
		Auxiliary Engine (Transit)	1	1,432	1,432	1 & 2 auxiliary		1	250	500	10	50	0	0	0	50	3A
		Auxiliary Engine (Maneuvering)	1	1,432	1,432	1 & 2 auxiliary		0	250	0	10	0	368	24	8,832	8,832	3A
Cable Installation Support Activities	Support Vessel/SOV	Main Engine (Transit)	4	1,200	4,800	1 & 2 main	Europe	1	250	500	10	50	0	0	0	50	3M
		Main Engine (Maneuvering)	4	1,200	4,800	1 & 2 main		0	250	0	10	0	212	24	5,088	5,088	3M
		Auxiliary Engine (Transit)	1	800	800	1 & 2 auxiliary		1	250	500	10	50	0	0	0	50	3A
		Auxiliary Engine (Maneuvering)	1	800	800	1 & 2 auxiliary		0	250	0	10	0	212	24	5,088	5,088	3A
Sand Wave Clearance	TSHD (Dredger)	Main Engine (Transit)	2	641	1,283	1 & 2 main	Europe	1	250	500	10	50	0	0	0	50	5M
		Main Engine (Maneuvering)	2	641	1,283	1 & 2 main		0	250	0	10	0	223	24	5,352	5,352	5M
		Auxiliary Engine (Transit)	0	0	954	1 & 2 auxiliary		1	250	500	10	50	0	0	0	50	5A
		Auxiliary Engine (Maneuvering)	0	0	954	1 & 2 auxiliary		0	250	0	10	0	223	24	5,352	5,352	5A
Pre Lay Grapnel Run AHTS 1	AHTS	Main Engine (Transit)	2	4,500	9,000	1 & 2 main	NJWP	1	113	226	10	23	0	0	0	23	11M
		Main Engine (Maneuvering)	2	4,500	9,000	1 & 2 main		0	113	0	10	0	53	24	1,272	1,272	11M
		Auxiliary Engine (Transit)	2	410	820	1 & 2 auxiliary		1	113	226	10	23	0	0	0	23	11A
		Auxiliary Engine (Maneuvering)	2	410	820	1 & 2 auxiliary		0	113	0	10	0	53	24	1,272	1,272	11A
Pre Lay Grapnel Run AHTS 2	AHTS	Main Engine (Transit)	2	4,500	9,000	1 & 2 main	NJWP	1	113	226	10	23	0	0	0	23	11M
		Main Engine (Maneuvering)	2	4,500	9,000	1 & 2 main		0	113	0	10	0	53	24	1,272	1,272	11M
		Auxiliary Engine (Transit)	2	410	820	1 & 2 auxiliary		1	113	226	10	23	0	0	0	23	11A
		Auxiliary Engine (Maneuvering)	2	410	820	1 & 2 auxiliary		0	113	0	10	0	53	24	1,272	1,272	11A

Activity	Representative Vessel Type	Engine Type	Engine Count	Engine Size (kW)	Total Size (kW)	Engine Category	Home Port	Vessel Trips	One-Way Trip Distance (NM)	Total Distance Traveled (NM)	Vessel Transit Speed (knots)	Hours in Transit	Operating Days	Operating Hours/Day	Total Non-Transit Hours	Total Operating Hours	Emission Factors Ref
Post-Install Rock Protection	Rock Dumping Vessel (Fall Pipe Vessel)	Main Engine (Transit)	8	4 x 3350kW 4 x 2000kW	21,400	1 & 2 main	Europe	1	250	500	10	50	0	0	0	50	3M
		Main Engine (Maneuvering)	8	4 x 3350kW 4 x 2000kW	21,400	1 & 2 main		0	250	0	10	0	21	24	504	504	3M
		Auxiliary Engine (Transit)	1	2,950	2,950	1 & 2 auxiliary		1	250	500	10	50	0	0	0	50	3A
		Auxiliary Engine (Maneuvering)	1	2,950	2,950	1 & 2 auxiliary		0	250	0	10	0	21	24	504	504	3A
WTG Installation																	
WTG Installation Vessel	Jackup Vessel	Main Engine (Transit)	7	4 x 3,535kW 3 x 2,650kW	22,090	3 main	NJWP	1	113	226	10	23	0	0	0	23	7M
		Main Engine (Maneuvering)	7	4 x 3,535kW 3 x 2,650kW	22,090	3 main		0	113	0	10	0	688	24	16,512	16,512	7M
		Auxiliary Engine (Transit)	1	2,650	2,650	1 & 2 auxiliary		1	113	226	10	23	0	0	0	23	7A
		Auxiliary Engine (Maneuvering)	1	2,650	2,650	1 & 2 auxiliary		0	113	0	10	0	688	24	16,512	16,512	7A
Barge 1	Barge	Main Engine (Transit)	0	0	0	1 & 2 main	NJWP	79	113	17,742	10	1,774	0	0	0	1,774	2M
		Main Engine (Maneuvering)	0	0	0	1 & 2 main		0	113	0	10	0	464	24	11,136	11,136	2M
		Auxiliary Engine (Transit)	1	50	50	1 & 2 auxiliary		79	113	17,742	10	1,774	0	0	0	1,774	2A
		Auxiliary Engine (Maneuvering)	1	50	50	1 & 2 auxiliary		0	113	0	10	0	464	24	11,136	11,136	2A
Barge 2	Barge	Main Engine (Transit)	0	0	0	1 & 2 main	NJWP	79	113	17,742	10	1,774	0	0	0	1,774	2M
		Main Engine (Maneuvering)	0	0	0	1 & 2 main		0	113	0	10	0	464	24	11,136	11,136	2M
		Auxiliary Engine (Transit)	1	50	50	1 & 2 auxiliary		79	113	17,742	10	1,774	0	0	0	1,774	2A
		Auxiliary Engine (Maneuvering)	1	50	50	1 & 2 auxiliary		0	113	0	10	0	464	24	11,136	11,136	2A
Motion Compensation 1	Motion Compensation	Main Engine (Transit)	1	500	500	Tier 3 Non-Road	NJWP	0	113	0	0	0	464	24	11,136	11,136	17
Motion Compensation 2	Motion Compensation	Main Engine (Transit)	1	500	500	Tier 3 Non-Road	NJWP	0	113	0	0	0	464	24	11,136	11,136	17
Towing Tug 1	Tug	Main Engine (Transit)	2	2,525	5,050	1 & 2 main	NJWP	79	113	17,742	10	1,774	0	0	0	1,774	11M
		Main Engine (Maneuvering)	2	2,525	5,050	1 & 2 main		0	113	0	10	0	464	24	11,136	11,136	11M
		Auxiliary Engine (Transit)	3	79	236	1 & 2 auxiliary		79	113	17,742	10	1,774	0	0	0	1,774	11A
		Auxiliary Engine (Maneuvering)	3	79	236	1 & 2 auxiliary		0	113	0	10	0	464	24	11,136	11,136	11A
Towing Tug 2	Tug	Main Engine (Transit)	2	2,525	5,050	1 & 2 main	NJWP	79	113	17,742	10	1,774	0	0	0	1,774	11M
		Main Engine (Maneuvering)	2	2,525	5,050	1 & 2 main		0	113	0	10	0	464	24	11,136	11,136	11M
		Auxiliary Engine (Transit)	3	79	236	1 & 2 auxiliary		79	113	17,742	10	1,774	0	0	0	1,774	11A
		Auxiliary Engine (Maneuvering)	3	79	236	1 & 2 auxiliary		0	113	0	10	0	464	24	11,136	11,136	11A
Crew Transfer	Crew Transfer Vessel	Main Engine (Transit)	4	522	2,088	1 & 2 main	Atlantic City	688	22	30,245	29	1,061	0	0	0	1,061	4M
		Main Engine (Maneuvering)	4	522	2,088	1 & 2 main		0	22	0	29	0	688	24	16,512	16,512	4M
		Auxiliary Engine (Transit)	2	27	54	1 & 2 auxiliary		688	22	30,245	29	1,061	0	0	0	1,061	4A
		Auxiliary Engine (Maneuvering)	2	27	54	1 & 2 auxiliary		0	22	0	29	0	688	24	16,512	16,512	4A
WTG Commissioning SOV	Service Operation Vessel	Main Engine (Transit)	4	1,200	4,800	1 & 2 main	NJWP	1	113	226	10	23	0	0	0	23	3M
		Main Engine (Maneuvering)	4	1,200	4,800	1 & 2 main		0	113	0	10	0	688	24	16,512	16,512	3M
		Auxiliary Engine (Transit)	1	800	800	1 & 2 auxiliary		1	113	226	10	23	0	0	0	23	3A
		Auxiliary Engine (Maneuvering)	1	800	800	1 & 2 auxiliary		0	113	0	10	0	688	24	16,512	16,512	3A
Export Cable Installation																	
Cable Installation Vessel 1		Main Engine (Transit)	4	2 x 2560kW 2 x 1913kW	8,946	1 & 2 main	Goose Creek	1	250	500	10	50	0	0	0	50	3M
		Main Engine (Maneuvering)	4	2 x 2560kW 2 x 1913kW	8,946	1 & 2 main		0	250	0	10	0	243	24	5,832	5,832	3M
		Auxiliary Engine (Transit)	2	1,400	2,800	1 & 2 auxiliary		1	250	500	10	50	0	0	0	50	3A
		Auxiliary Engine (Maneuvering)	2	1,400	2,800	1 & 2 auxiliary		0	250	0	10	0	243	24	5,832	5,832	3A
Cable Installation Vessel 2		Main Engine (Transit)	4	2 x 2560kW 2 x 1913kW	8,946	1 & 2 main	Goose Creek	1	250	500	10	50	0	0	0	50	3M
		Main Engine (Maneuvering)	4	2 x 2560kW 2 x 1913kW	8,946	1 & 2 main		0	250	0	10	0	243	24	5,832	5,832	3M
		Auxiliary Engine (Transit)	2	1,400	2,800	1 & 2 auxiliary		1	250	500	10	50	0	0	0	50	3A
		Auxiliary Engine (Maneuvering)	2	1,400	2,800	1 & 2 auxiliary		0	250	0	10	0	243	24	5,832	5,832	3A
AHTS	Tug	Main Engine (Transit)	2	4,500	9,000	1 & 2 main	NJWP	1	113	226	10	23	0	0	0	23	11M
		Main Engine (Maneuvering)	2	4,500	9,000	1 & 2 main		0	113	0	10	0	81	24	1,944	1,944	11M
		Auxiliary Engine (Transit)	2	410	820	1 & 2 auxiliary		1	113	226	10	23	0	0	0	23	11A
		Auxiliary Engine (Maneuvering)	2	410	820	1 & 2 auxiliary		0	113	0	10	0	81	24	1,944	1,944	11A
Post-Install Rock Protection	Rock Dumping Vessel (Fall Pipe Vessel)	Main Engine (Transit)	8	4 x 3350kW 4 x 2000kW	21,400	1 & 2 main	Europe	1	250	500	10	50	0	0	0	50	3M
		Main Engine (Maneuvering)	8	4 x 3350kW 4 x 2000kW	21,400	1 & 2 main		0	250	0	10	0	5	24	120	120	3M
		Auxiliary Engine (Transit)	1	2,950	2,950	1 & 2 auxiliary		1	250	500	10	50	0	0	0	50	3A
		Auxiliary Engine (Maneuvering)	1	2,950	2,950	1 & 2 auxiliary		0	250	0	10	0	5	24	120	120	3A
Fuel Bunkering																	
Towing Tug	Tug	Main Engine (Transit)	2	2,525	5,050	1 & 2 main	NJWP	72	113	16,273	10	1,627	0	0	0	1,627	11M
		Main Engine (Maneuvering)	2	2,525	5,050	1 & 2 main		0	113	0	10	0	1,027	24	24,653	24,653	11M
		Auxiliary Engine (Transit)	3	79	236	1 & 2 auxiliary		72	113	16,273	10	1,627	0	0	0	1,627	11A
		Auxiliary Engine (Maneuvering)	3	79	236	1 & 2 auxiliary		0	113	0	10	0	1,027	24	24,653	24,653	11A

Activity	Representative Vessel Type	Engine Type	Engine Count	Engine Size (kW)	Total Size (kW)	Engine Category	Home Port	Vessel Trips	One-Way Trip Distance (NM)	Total Distance Traveled (NM)	Vessel Transit Speed (knots)	Hours in Transit	Operating Days	Operating Hours/Day	Total Non-Transit Hours	Total Operating Hours	Emission Factors Ref
Barge	Barge	Main Engine (Transit)	0	0	0	1 & 2 main	NJWP	72	113	16,273	10	1,627	0	0	0	1,627	2M
		Main Engine (Maneuvering)	0	0	0	1 & 2 main		0	113	0	10	0	1,027	24	24,653	24,653	2M
		Auxiliary Engine (Transit)	1	50	50	1 & 2 auxiliary		72	113	16,273	10	1,627	0	0	0	1,627	2A
		Auxiliary Engine (Maneuvering)	1	50	50	1 & 2 auxiliary		0	113	0	10	0	1,027	24	24,653	24,653	2A
Motion Compensation	Motion Compensation	Motion Compensation Engine	1	500	500	Tier 3 Non-Road	NJWP	0	113	0	0	0	1,027	24	24,653	24,653	17
Stationary Generators																	
OSS Commissioning Generators	Generator	Tier 4 Generator	8	500	4,000	Tier 4 Non-Road	N/A	0	0	0	0	0	57	12	684	684	30
WTG Commissioning Generators	Generator	Tier 4 Generator	157	240	37,680	Tier 4 Non-Road	N/A	0	0	0	0	0	57	12	684	684	30
Miscellaneous																	
Marine Paint	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fuel Evaporation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Activity	Representative Vessel Type	Engine Type	Load Factor	Fuel Consumption (gal)	Emissions (tons)											
					NOx	VOC	CO	PM10	PM2.5	SO2	CO2	CH4	N2O	CH4 as CO2e	N2O as CO2e	CO2e
Emissions During Construction																
Foundation Installation (FOU)																
Bulk Carrier	Bulk Carrier	Main Engine (Transit)	0.83	277,134	45.41	0.82	11.02	1.54	1.49	0.13	3,100.55	0.02	0.15	0.48	44.44	3,145.47
		Main Engine (Maneuvering)	0.20	403,882	66.18	1.19	16.05	2.24	2.17	0.20	4,518.58	0.03	0.22	0.70	64.76	4,584.04
		Auxiliary Engine (Transit)	0.10	15,004	2.72	0.04	0.65	0.08	0.08	0.00	168.80	0.00	0.01	0.03	2.41	171.24
		Auxiliary Engine (Maneuvering)	0.10	90,744	16.43	0.22	3.91	0.50	0.49	0.01	1,020.93	0.01	0.05	0.16	14.55	1,035.64
Tug	Tug	Main Engine (Transit)	0.83	3,148,544	520.26	9.84	125.15	18.03	17.49	1.80	35,175.27	0.22	1.69	5.46	504.85	35,685.58
		Main Engine (Maneuvering)	0.20	123,153	20.35	0.38	4.89	0.71	0.68	0.07	1,375.86	0.01	0.07	0.21	19.75	1,395.82
		Auxiliary Engine (Transit)	0.43	76,231	13.36	0.19	3.28	0.42	0.41	0.01	857.65	0.01	0.04	0.13	12.22	870.01
		Auxiliary Engine (Maneuvering)	0.43	12,374	2.17	0.03	0.53	0.07	0.07	0.00	139.22	0.00	0.01	0.02	1.98	141.22
Tug	Tug	Main Engine (Transit)	0.83	3,148,544	520.26	9.84	125.15	18.03	17.49	1.80	35,175.27	0.22	1.69	5.46	504.85	35,685.58
		Main Engine (Maneuvering)	0.20	123,153	20.35	0.38	4.89	0.71	0.68	0.07	1,375.86	0.01	0.07	0.21	19.75	1,395.82
		Auxiliary Engine (Transit)	0.43	76,231	13.36	0.19	3.28	0.42	0.41	0.01	857.65	0.01	0.04	0.13	12.22	870.01
		Auxiliary Engine (Maneuvering)	0.43	12,374	2.17	0.03	0.53	0.07	0.07	0.00	139.22	0.00	0.01	0.02	1.98	141.22
Tug	Tug	Main Engine (Transit)	0.83	3,148,544	520.26	9.84	125.15	18.03	17.49	1.80	35,175.27	0.22	1.69	5.46	504.85	35,685.58
		Main Engine (Maneuvering)	0.20	123,153	20.35	0.38	4.89	0.71	0.68	0.07	1,375.86	0.01	0.07	0.21	19.75	1,395.82
		Auxiliary Engine (Transit)	0.43	76,231	13.36	0.19	3.28	0.42	0.41	0.01	857.65	0.01	0.04	0.13	12.22	870.01
		Auxiliary Engine (Maneuvering)	0.43	12,374	2.17	0.03	0.53	0.07	0.07	0.00	139.22	0.00	0.01	0.02	1.98	141.22
Tug	Tug	Main Engine (Transit)	0.83	3,148,544	520.26	9.84	125.15	18.03	17.49	1.80	35,175.27	0.22	1.69	5.46	504.85	35,685.58
		Main Engine (Maneuvering)	0.20	123,153	20.35	0.38	4.89	0.71	0.68	0.07	1,375.86	0.01	0.07	0.21	19.75	1,395.82
		Auxiliary Engine (Transit)	0.43	76,231	13.36	0.19	3.28	0.42	0.41	0.01	857.65	0.01	0.04	0.13	12.22	870.01
		Auxiliary Engine (Maneuvering)	0.43	12,374	2.17	0.03	0.53	0.07	0.07	0.00	139.22	0.00	0.01	0.02	1.98	141.22
Tug	Tug	Main Engine (Transit)	0.83	3,148,544	520.26	9.84	125.15	18.03	17.49	1.80	35,175.27	0.22	1.69	5.46	504.85	35,685.58
		Main Engine (Maneuvering)	0.20	123,153	20.35	0.38	4.89	0.71	0.68	0.07	1,375.86	0.01	0.07	0.21	19.75	1,395.82
		Auxiliary Engine (Transit)	0.43	76,231	13.36	0.19	3.28	0.42	0.41	0.01	857.65	0.01	0.04	0.13	12.22	870.01
		Auxiliary Engine (Maneuvering)	0.43	12,374	2.17	0.03	0.53	0.07	0.07	0.00	139.22	0.00	0.01	0.02	1.98	141.22
Tug	Tug	Main Engine (Transit)	0.83	3,148,544	520.26	9.84	125.15	18.03	17.49	1.80	35,175.27	0.22	1.69	5.46	504.85	35,685.58
		Main Engine (Maneuvering)	0.20	123,153	20.35	0.38	4.89	0.71	0.68	0.07	1,375.86	0.01	0.07	0.21	19.75	1,395.82
		Auxiliary Engine (Transit)	0.43	76,231	13.36	0.19	3.28	0.42	0.41	0.01	857.65	0.01	0.04	0.13	12.22	870.01
		Auxiliary Engine (Maneuvering)	0.43	12,374	2.17	0.03	0.53	0.07	0.07	0.00	139.22	0.00	0.01	0.02	1.98	141.22
SOV	Service Operation Vessel	Main Engine (Transit)	0.16	4,213	0.69	0.02	0.16	0.02	0.02	0.01	46.43	0.00	0.00	0.01	0.68	47.11
		Main Engine (Maneuvering)	0.10	57,910	9.54	0.25	2.21	0.34	0.33	0.09	638.28	0.00	0.03	0.10	9.29	647.67
		Auxiliary Engine (Transit)	0.16	702	0.12	0.00	0.03	0.00	0.00	0.00	7.90	0.00	0.00	0.00	0.11	8.01
		Auxiliary Engine (Maneuvering)	0.10	9,652	1.66	0.02	0.42	0.05	0.05	0.00	108.59	0.00	0.01	0.02	1.55	110.15
Offshore Substation Installation (OSS)																
	Large HLV	Main Engine (Transit)	0.83	169,118	39.95	1.85	4.11	1.32	1.23	1.06	1,728.64	0.01	0.09	0.29	27.12	1,756.05
		Main Engine (Maneuvering)	0.20	1,114,958	263.38	12.19	27.09	8.71	8.13	7.01	11,396.50	0.08	0.60	1.94	178.78	11,577.21
		Auxiliary Engine (Transit)	0.56	10,373	2.26	0.03	0.45	0.06	0.06	0.00	116.70	0.00	0.01	0.02	1.66	118.39
		Auxiliary Engine (Maneuvering)	0.56	283,808	61.92	0.69	12.22	1.58	1.53	0.03	3,193.04	0.02	0.15	0.49	45.51	3,239.04
	Bubble Curtain Support Vessel	Main Engine (Transit)	0.83	6,588	1.09	0.02	0.26	0.04	0.04	0.00	73.60	0.00	0.00	0.01	1.06	74.67
		Main Engine (Maneuvering)	0.20	96,089	15.88	0.30	3.82	0.55	0.53	0.06	1,073.50	0.01	0.05	0.17	15.41	1,089.07
		Auxiliary Engine (Transit)	0.43	3,413	0.60	0.01	0.15	0.02	0.02	0.00	38.40	0.00	0.00	0.01	0.55	38.95
		Auxiliary Engine (Maneuvering)	0.43	206,592	36.22	0.50	8.89	1.15	1.11	0.02	2,324.30	0.01	0.11	0.36	33.13	2,357.79
Transport Barge 1	Barge	Main Engine (Transit)	0.83	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Main Engine (Maneuvering)	0.20	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Auxiliary Engine (Transit)	0.43	819	0.18	0.00	0.04	0.00	0.00	0.00	9.22	0.00	0.00	0.00	0.13	9.35
		Auxiliary Engine (Maneuvering)	0.43	1,868	0.41	0.00	0.08	0.01	0.01	0.00	21.02	0.00	0.00	0.00	0.30	21.32
Transport Barge 2	Barge	Main Engine (Transit)	0.83	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Main Engine (Maneuvering)	0.20	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Auxiliary Engine (Transit)	0.43	819	0.18	0.00	0.04	0.00	0.00	0.00	9.22	0.00	0.00	0.00	0.13	9.35
		Auxiliary Engine (Maneuvering)	0.43	1,868	0.41	0.00	0.08	0.01	0.01	0.00	21.02	0.00	0.00	0.00	0.30	21.32
Transport Barge 3	Barge	Main Engine (Transit)	0.83	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Main Engine (Maneuvering)	0.20	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Auxiliary Engine (Transit)	0.43	819	0.18	0.00	0.04	0.00	0.00	0.00	9.22	0.00	0.00	0.00	0.13	9.35
		Auxiliary Engine (Maneuvering)	0.43	1,868	0.41	0.00	0.08	0.01	0.01	0.00	21.02	0.00	0.00	0.00	0.30	21.32
US Towing Tug 1	US Towing Tug	Main Engine (Transit)	0.83	159,714	26.39	0.50	6.35	0.91	0.89	0.09	1,784.31	0.01	0.09	0.28	25.61	1,810.20
		Main Engine (Maneuvering)	0.20	87,747	14.50	0.27	3.49	0.50	0.49	0.05	980.30	0.01	0.05	0.15	14.07	994.52
		Auxiliary Engine (Transit)	0.43	3,867	0.68	0.01	0.17	0.02	0.02	0.00	43.51	0.00	0.00	0.01	0.62	44.13
		Auxiliary Engine (Maneuvering)	0.43	8,817	1.55	0.02	0.38	0.05	0.05	0.00	99.19	0.00	0.00	0.02	1.41	100.62
US Towing Tug 2	US Towing Tug	Main Engine (Transit)	0.83	159,714	26.39	0.50	6.35	0.91	0.89	0.09	1,784.31	0.01	0.09	0.28	25.61	1,810.20
		Main Engine (Maneuvering)	0.20	87,747	14.50	0.27	3.49	0.50	0.49	0.05	980.30	0.01	0.05	0.15	14.07	994.52
		Auxiliary Engine (Transit)	0.43	3,867	0.68	0.01	0.17	0.02	0.02	0.00	43.51	0.00	0.00	0.01	0.62	44.13
		Auxiliary Engine (Maneuvering)	0.43	8,817	1.55	0.02	0.38	0.05	0.05	0.00	99.19	0.00	0.00	0.02	1.41	100.62
US Towing Tug 3	US Towing Tug	Main Engine (Transit)	0.83	159,714	26.39	0.50	6.35	0.91	0.89	0.09	1,784.31	0.01	0.09	0.28	25.61	1,810.20
		Main Engine (Maneuvering)	0.20	87,747	14.50	0.27	3.49	0.50	0.49	0.05	980.30	0.01	0.05	0.15	14.07	994.52
		Auxiliary Engine (Transit)	0.43	3,867	0.68	0.01	0.17	0.02	0.02	0.00	43.51	0.00	0.00	0.01	0.62	44.13
		Auxiliary Engine (Maneuvering)	0.43	8,817	1.55	0.02	0.38	0.05	0.05	0.00	99.19	0.00	0.00	0.02	1.41	100.62
Motion Compensation 1	Motion Compensation	Main Engine (Transit)	1.00	48,857	3.02	0.37	2.64	0.15	0.15	0.01	557.64	0.02	0.00	0.57	1.35	559.55

Activity	Representative Vessel Type	Engine Type	Load Factor	Fuel Consumption (gal)	Emissions (tons)											
					NOx	VOC	CO	PM10	PM2.5	SO2	CO2	CH4	N2O	CH4 as CO2e	N2O as CO2e	CO2e
Motion Compensation 2	Motion Compensation	Main Engine (Transit)	1.00	48,857	3.02	0.37	2.64	0.15	0.15	0.01	557.64	0.02	0.00	0.57	1.35	559.55
Motion Compensation 3	Motion Compensation	Main Engine (Transit)	1.00	48,857	3.02	0.37	2.64	0.15	0.15	0.01	557.64	0.02	0.00	0.57	1.35	559.55
Crew Transfer Vessel / PSO Vessel / Noise Monitoring	Crew Transfer Vessel	Main Engine (Transit)	0.83	9,677	1.54	0.02	0.39	0.05	0.05	0.00	108.86	0.00	0.01	0.02	1.55	110.43
		Main Engine (Maneuvering)	0.20	36,280	5.76	0.09	1.45	0.20	0.19	0.00	408.15	0.00	0.02	0.06	5.82	414.03
		Auxiliary Engine (Transit)	0.43	130	0.02	0.00	0.01	0.00	0.00	0.00	1.46	0.00	0.00	0.00	0.02	1.48
		Auxiliary Engine (Maneuvering)	0.43	2,017	0.36	0.00	0.09	0.01	0.01	0.00	22.70	0.00	0.00	0.00	0.32	23.02
	Bubble Curtain Power	Air Compressor	1.00	324,900	20.06	2.51	17.55	1.00	1.00	0.03	3,708.32	0.15	0.03	3.76	8.96	3,721.04
	Hydraulic Hammer Power	Hammer Engine	1.00	72,919	7.20	0.89	3.94	0.23	0.23	0.01	832.28	0.03	0.01	0.84	2.01	835.14
Scour Protection																
	Fall Pipe Vessel	Main Engine (Transit)	0.83	56,402	9.29	0.24	2.15	0.33	0.32	0.08	621.66	0.00	0.03	0.10	9.04	630.80
		Main Engine (Maneuvering)	0.20	476,224	78.44	2.07	18.18	2.81	2.73	0.70	5,248.91	0.03	0.26	0.83	76.36	5,326.10
		Auxiliary Engine (Transit)	0.56	5,246	0.90	0.01	0.23	0.03	0.03	0.00	59.02	0.00	0.00	0.01	0.84	59.87
		Auxiliary Engine (Maneuvering)	0.56	183,813	31.55	0.45	7.91	1.02	0.99	0.02	2,068.03	0.01	0.10	0.32	29.47	2,097.83
	US Dredger	Main Engine (Transit)	0.83	3,380	0.56	0.02	0.12	0.02	0.02	0.01	37.00	0.00	0.00	0.01	0.54	37.55
		Main Engine (Maneuvering)	0.20	26,978	4.50	0.13	1.00	0.17	0.16	0.05	295.29	0.00	0.01	0.05	4.33	299.67
		Auxiliary Engine (Transit)	0.56	1,697	0.29	0.00	0.07	0.01	0.01	0.00	19.10	0.00	0.00	0.00	0.27	19.37
		Auxiliary Engine (Maneuvering)	0.56	56,215	9.61	0.14	2.42	0.31	0.30	0.01	632.46	0.00	0.03	0.10	9.01	641.58
Inter Array Cable Installation																
Cable Installation Vessel	Cable Installation Vessel	Main Engine (Transit)	0.83	24,596	4.05	0.11	0.94	0.15	0.14	0.04	271.09	0.00	0.01	0.04	3.94	275.08
		Main Engine (Maneuvering)	0.20	1,046,880	172.44	4.54	39.98	6.18	6.00	1.54	11,538.66	0.07	0.56	1.82	167.86	11,708.34
		Auxiliary Engine (Transit)	0.56	2,546	0.44	0.01	0.11	0.01	0.01	0.00	28.65	0.00	0.00	0.00	0.41	29.06
		Auxiliary Engine (Maneuvering)	0.56	449,804	77.21	1.09	19.36	2.50	2.42	0.05	5,060.62	0.03	0.24	0.78	72.12	5,133.52
Cable Installation Support Activities	Support Vessel/SOV	Main Engine (Transit)	0.16	2,439	0.40	0.01	0.09	0.01	0.01	0.00	26.88	0.00	0.00	0.00	0.39	27.27
		Main Engine (Maneuvering)	0.10	161,539	26.61	0.70	6.17	0.95	0.93	0.24	1,780.47	0.01	0.09	0.28	25.90	1,806.65
		Auxiliary Engine (Transit)	0.16	406	0.07	0.00	0.02	0.00	0.00	0.00	4.57	0.00	0.00	0.00	0.07	4.64
		Auxiliary Engine (Maneuvering)	0.10	26,923	4.62	0.07	1.16	0.15	0.14	0.00	302.90	0.00	0.01	0.05	4.32	307.27
Sand Wave Clearance	TSHD (Dredger)	Main Engine (Transit)	0.83	3,380	0.56	0.02	0.12	0.02	0.02	0.01	37.00	0.00	0.00	0.01	0.54	37.55
		Main Engine (Maneuvering)	0.20	87,191	14.53	0.42	3.22	0.54	0.51	0.17	954.36	0.01	0.05	0.15	13.98	968.49
		Auxiliary Engine (Transit)	0.56	1,697	0.29	0.00	0.07	0.01	0.01	0.00	19.10	0.00	0.00	0.00	0.27	19.37
		Auxiliary Engine (Maneuvering)	0.56	181,682	31.06	0.44	7.82	1.01	0.98	0.02	2,044.05	0.01	0.10	0.32	29.13	2,073.50
Pre Lay Grapnel Run AHTS 1	AHTS	Main Engine (Transit)	0.83	10,722	1.77	0.03	0.43	0.06	0.06	0.01	119.79	0.00	0.01	0.02	1.72	121.53
		Main Engine (Maneuvering)	0.20	145,409	24.03	0.45	5.78	0.83	0.81	0.08	1,624.50	0.01	0.08	0.25	23.32	1,648.07
		Auxiliary Engine (Transit)	0.43	506	0.09	0.00	0.02	0.00	0.00	0.00	5.69	0.00	0.00	0.00	0.08	5.78
		Auxiliary Engine (Maneuvering)	0.43	28,484	4.99	0.07	1.23	0.16	0.15	0.00	320.47	0.00	0.02	0.05	4.57	325.08
Pre Lay Grapnel Run AHTS 2	AHTS	Main Engine (Transit)	0.83	10,722	1.77	0.03	0.43	0.06	0.06	0.01	119.79	0.00	0.01	0.02	1.72	121.53
		Main Engine (Maneuvering)	0.20	145,409	24.03	0.45	5.78	0.83	0.81	0.08	1,624.50	0.01	0.08	0.25	23.32	1,648.07
		Auxiliary Engine (Transit)	0.43	506	0.09	0.00	0.02	0.00	0.00	0.00	5.69	0.00	0.00	0.00	0.08	5.78
		Auxiliary Engine (Maneuvering)	0.43	28,484	4.99	0.07	1.23	0.16	0.15	0.00	320.47	0.00	0.02	0.05	4.57	325.08

Activity	Representative Vessel Type	Engine Type	Load Factor	Fuel Consumption (gal)	Emissions (tons)											
					NOx	VOC	CO	PM10	PM2.5	SO2	CO2	CH4	N2O	CH4 as CO2e	N2O as CO2e	CO2e
Post-Install Rock Protection	Rock Dumping Vessel (Fall Pipe Vessel)	Main Engine (Transit)	0.83	56,402	9.29	0.24	2.15	0.33	0.32	0.08	621.66	0.00	0.03	0.10	9.04	630.80
		Main Engine (Maneuvering)	0.20	136,996	22.57	0.59	5.23	0.81	0.78	0.20	1,509.96	0.01	0.07	0.24	21.97	1,532.17
		Auxiliary Engine (Transit)	0.56	5,246	0.90	0.01	0.23	0.03	0.03	0.00	59.02	0.00	0.00	0.01	0.84	59.87
		Auxiliary Engine (Maneuvering)	0.56	52,878	9.08	0.13	2.28	0.29	0.28	0.01	594.91	0.00	0.03	0.09	8.48	603.48
WTG Installation																
WTG Installation Vessel	Jackup Vessel	Main Engine (Transit)	0.83	23,805	4.58	0.06	1.05	0.14	0.14	0.01	295.58	0.00	0.01	0.05	4.22	299.85
		Main Engine (Maneuvering)	0.20	4,190,569	806.55	11.26	184.95	24.93	24.12	1.05	52,034.05	0.32	2.49	8.04	742.86	52,784.95
		Auxiliary Engine (Transit)	0.43	1,636	0.33	0.00	0.07	0.01	0.01	0.00	18.40	0.00	0.00	0.00	0.26	18.67
		Auxiliary Engine (Maneuvering)	0.43	1,194,943	239.55	2.90	51.44	6.64	6.43	0.12	13,443.96	0.08	0.64	2.07	191.60	13,637.64
Barge 1	Barge	Main Engine (Transit)	0.83	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Main Engine (Maneuvering)	0.20	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Auxiliary Engine (Transit)	0.43	2,423	0.53	0.01	0.10	0.01	0.01	0.00	27.26	0.00	0.00	0.00	0.39	27.65
		Auxiliary Engine (Maneuvering)	0.43	15,206	3.32	0.04	0.65	0.08	0.08	0.00	171.07	0.00	0.01	0.03	2.44	173.54
Barge 2	Barge	Main Engine (Transit)	0.83	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Main Engine (Maneuvering)	0.20	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Auxiliary Engine (Transit)	0.43	2,423	0.53	0.01	0.10	0.01	0.01	0.00	27.26	0.00	0.00	0.00	0.39	27.65
		Auxiliary Engine (Maneuvering)	0.43	15,206	3.32	0.04	0.65	0.08	0.08	0.00	171.07	0.00	0.01	0.03	2.44	173.54
Motion Compensation 1	Motion Compensation	Main Engine (Transit)	1.00	397,714	24.55	3.04	21.48	1.23	1.23	0.04	4,539.40	0.18	0.04	4.60	10.97	4,554.97
Motion Compensation 2	Motion Compensation	Main Engine (Transit)	1.00	397,714	24.55	3.04	21.48	1.23	1.23	0.04	4,539.40	0.18	0.04	4.60	10.97	4,554.97
Towing Tug 1	Tug	Main Engine (Transit)	0.83	472,282	78.04	1.48	18.77	2.71	2.62	0.27	5,276.29	0.03	0.25	0.82	75.73	5,352.84
		Main Engine (Maneuvering)	0.20	714,288	118.03	2.23	28.39	4.09	3.97	0.41	7,979.97	0.05	0.38	1.24	114.53	8,095.74
		Auxiliary Engine (Transit)	0.43	11,435	2.00	0.03	0.49	0.06	0.06	0.00	128.65	0.00	0.01	0.02	1.83	130.50
		Auxiliary Engine (Maneuvering)	0.43	71,770	12.58	0.17	3.09	0.40	0.39	0.01	807.46	0.00	0.04	0.12	11.51	819.10
Towing Tug 2	Tug	Main Engine (Transit)	0.83	472,282	78.04	1.48	18.77	2.71	2.62	0.27	5,276.29	0.03	0.25	0.82	75.73	5,352.84
		Main Engine (Maneuvering)	0.20	714,288	118.03	2.23	28.39	4.09	3.97	0.41	7,979.97	0.05	0.38	1.24	114.53	8,095.74
		Auxiliary Engine (Transit)	0.43	11,435	2.00	0.03	0.49	0.06	0.06	0.00	128.65	0.00	0.01	0.02	1.83	130.50
		Auxiliary Engine (Maneuvering)	0.43	71,770	12.58	0.17	3.09	0.40	0.39	0.01	807.46	0.00	0.04	0.12	11.51	819.10
Crew Transfer	Crew Transfer Vessel	Main Engine (Transit)	0.83	116,801	18.55	0.28	4.66	0.63	0.61	0.01	1,314.02	0.01	0.06	0.20	18.73	1,332.95
		Main Engine (Maneuvering)	0.20	437,910	69.55	1.06	17.48	2.36	2.28	0.05	4,926.50	0.03	0.24	0.76	70.22	4,997.47
		Auxiliary Engine (Transit)	0.43	1,565	0.28	0.00	0.07	0.01	0.01	0.00	17.61	0.00	0.00	0.00	0.25	17.86
		Auxiliary Engine (Maneuvering)	0.43	24,350	4.39	0.06	1.05	0.14	0.13	0.00	273.95	0.00	0.01	0.04	3.90	277.90
WTG Commissioning SOV	Service Operation Vessel	Main Engine (Transit)	0.16	1,102	0.18	0.00	0.04	0.01	0.01	0.00	12.15	0.00	0.00	0.00	0.18	12.33
		Main Engine (Maneuvering)	0.10	524,238	86.35	2.27	20.02	3.09	3.00	0.77	5,778.13	0.04	0.28	0.91	84.06	5,863.10
		Auxiliary Engine (Transit)	0.16	184	0.03	0.00	0.01	0.00	0.00	0.00	2.07	0.00	0.00	0.00	0.03	2.10
		Auxiliary Engine (Maneuvering)	0.10	87,373	15.00	0.21	3.76	0.49	0.47	0.01	983.01	0.01	0.05	0.15	14.01	997.17
Export Cable Installation																
Cable Installation Vessel 1		Main Engine (Transit)	0.83	23,578	3.88	0.10	0.90	0.14	0.14	0.03	259.88	0.00	0.01	0.04	3.78	263.70
		Main Engine (Maneuvering)	0.20	662,689	109.16	2.88	25.30	3.91	3.80	0.98	7,304.12	0.05	0.36	1.15	106.26	7,411.53
		Auxiliary Engine (Transit)	0.56	4,979	0.85	0.01	0.21	0.03	0.03	0.00	56.02	0.00	0.00	0.01	0.80	56.83
		Auxiliary Engine (Maneuvering)	0.56	580,760	99.69	1.41	25.00	3.23	3.12	0.06	6,533.97	0.04	0.31	1.01	93.12	6,628.09
Cable Installation Vessel 2		Main Engine (Transit)	0.83	23,578	3.88	0.10	0.90	0.14	0.14	0.03	259.88	0.00	0.01	0.04	3.78	263.70
		Main Engine (Maneuvering)	0.20	662,689	109.16	2.88	25.30	3.91	3.80	0.98	7,304.12	0.05	0.36	1.15	106.26	7,411.53
		Auxiliary Engine (Transit)	0.56	4,979	0.85	0.01	0.21	0.03	0.03	0.00	56.02	0.00	0.00	0.01	0.80	56.83
		Auxiliary Engine (Maneuvering)	0.56	580,760	99.69	1.41	25.00	3.23	3.12	0.06	6,533.97	0.04	0.31	1.01	93.12	6,628.09
AHTS	Tug	Main Engine (Transit)	0.83	10,722	1.77	0.03	0.43	0.06	0.06	0.01	119.79	0.00	0.01	0.02	1.72	121.53
		Main Engine (Maneuvering)	0.20	222,230	36.72	0.69	8.83	1.27	1.23	0.13	2,482.73	0.02	0.12	0.39	35.63	2,518.75
		Auxiliary Engine (Transit)	0.43	506	0.09	0.00	0.02	0.00	0.00	0.00	5.69	0.00	0.00	0.00	0.08	5.78
		Auxiliary Engine (Maneuvering)	0.43	43,532	7.63	0.11	1.87	0.24	0.23	0.00	489.77	0.00	0.02	0.08	6.98	496.83
Post-Install Rock Protection	Rock Dumping Vessel (Fall Pipe Vessel)	Main Engine (Transit)	0.83	56,402	9.29	0.24	2.15	0.33	0.32	0.08	621.66	0.00	0.03	0.10	9.04	630.80
		Main Engine (Maneuvering)	0.20	32,618	5.37	0.14	1.25	0.19	0.19	0.05	359.51	0.00	0.02	0.06	5.23	364.80
		Auxiliary Engine (Transit)	0.56	5,246	0.90	0.01	0.23	0.03	0.03	0.00	59.02	0.00	0.00	0.01	0.84	59.87
		Auxiliary Engine (Maneuvering)	0.56	12,590	2.16	0.03	0.54	0.07	0.07	0.00	141.65	0.00	0.01	0.02	2.02	143.69
Fuel Bunkering																
Towing Tug	Tug	Main Engine (Transit)	0.83	433,175	71.58	1.35	17.22	2.48	2.41	0.25	4,839.40	0.03	0.23	0.75	69.46	4,909.61
		Main Engine (Maneuvering)	0.20	1,581,278	261.29	4.94	62.85	9.06	8.78	0.91	17,665.91	0.11	0.85	2.74	253.55	17,922.20
		Auxiliary Engine (Transit)	0.43	10,488	1.84	0.03	0.45	0.06	0.06	0.00	118.00	0.00	0.01	0.02	1.68	119.70
		Auxiliary Engine (Maneuvering)	0.43	158,883	27.85	0.39	6.84	0.88	0.85	0.02	1,787.55	0.01	0.09	0.28	25.48	1,813.30

Activity	Representative Vessel Type	Engine Type	Load Factor	Fuel Consumption (gal)	Emissions (tons)											
					NOx	VOC	CO	PM10	PM2.5	SO2	CO2	CH4	N2O	CH4 as CO2e	N2O as CO2e	CO2e
Barge	Barge	Main Engine (Transit)	0.83	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Main Engine (Maneuvering)	0.20	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Auxiliary Engine (Transit)	0.43	2,222	0.48	0.01	0.10	0.01	0.01	0.00	25.00	0.00	0.00	0.00	0.36	25.36
		Auxiliary Engine (Maneuvering)	0.43	33,662	7.34	0.08	1.45	0.19	0.18	0.00	378.72	0.00	0.02	0.06	5.40	384.17
Motion Compensation	Motion Compensation	Motion Compensation Engine	1.00	880,453	54.35	6.73	47.56	2.72	2.72	0.09	10,049.24	0.41	0.08	10.19	24.29	10,083.72
Stationary Generators																
OSS Commissioning Generators	Generator	Tier 4 Generator	0.50	97,714	1.01	0.29	5.28	0.03	0.03	0.01	1,115.28	0.05	0.01	1.13	2.70	1,119.11
WTG Commissioning Generators	Generator	Tier 4 Generator	0.50	920,469	9.52	2.70	49.72	0.28	0.28	0.10	10,505.96	0.43	0.09	10.65	25.40	10,542.02
Miscellaneous																
Marine Paint	N/A	N/A	N/A	N/A	N/A	0.75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fuel Evaporation	N/A	N/A	N/A	N/A	N/A	0.31	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Total	44,734,695	7,296.8	160.2	1,833.5	248.0	240.2	31.1	504,418.8	4.4	22.9	110.3	6,814.3	511,343.4

BOEM Emissions Tool Default Vessel Emissions Factors											
EF Ref	Vessel Type	Engine type	Emission Factors (g/kWh)								
			NOx	VOC	CO	PM10	PM2.5	SO2	CO2	CH4	N2O
1M	Anchor Handling Tugs	Main	9.26	0.24	2.16	0.34	0.33	0.079	636.09	0.004	0.031
1A		Auxiliary	9.88	0.14	2.48	0.32	0.31	0.006	648.20	0.004	0.031
2M	Barge	Main	13.61	0.63	1.40	0.45	0.42	0.362	588.90	0.004	0.031
2A		Auxiliary	12.57	0.14	2.48	0.32	0.31	0.006	648.20	0.004	0.031
3M	Cable Laying	Main	9.49	0.25	2.20	0.34	0.33	0.085	635.02	0.004	0.031
3A		Auxiliary	9.89	0.14	2.48	0.32	0.31	0.006	648.20	0.004	0.031
4M	Crew	Main	9.15	0.14	2.30	0.31	0.30	0.006	648.16	0.004	0.031
4A		Auxiliary	10.39	0.14	2.48	0.32	0.31	0.006	648.20	0.004	0.031
5M	Dredging	Main	9.60	0.28	2.13	0.36	0.34	0.112	630.62	0.004	0.031
5A		Auxiliary	9.85	0.14	2.48	0.32	0.31	0.006	648.20	0.004	0.031
6M	Ice Breaker	Main	9.92	0.45	1.78	0.40	0.38	0.230	610.83	0.004	0.031
6A		Auxiliary	10.09	0.14	2.48	0.32	0.31	0.006	648.20	0.004	0.031
7M	Jackup	Main	10.03	0.14	2.30	0.31	0.30	0.013	647.08	0.004	0.031
7A		Auxiliary	11.55	0.14	2.48	0.32	0.31	0.006	648.20	0.004	0.031
8M	Research / Survey	Main	9.86	0.22	2.25	0.34	0.33	0.066	638.26	0.004	0.031
8A		Auxiliary	10.21	0.14	2.48	0.32	0.31	0.006	648.20	0.004	0.031
9M	Shuttle Tanker	Main	9.05	0.63	1.40	0.45	0.42	0.362	588.90	0.004	0.031
9A		Auxiliary	9.80	0.14	2.48	0.32	0.31	0.006	648.20	0.004	0.031
10M	Supply Ship	Main	9.44	0.17	2.29	0.32	0.31	0.028	644.58	0.004	0.031
10A		Auxiliary	10.43	0.14	2.48	0.32	0.31	0.006	648.20	0.004	0.031
11M	Tug	Main	9.52	0.18	2.29	0.33	0.32	0.033	643.66	0.004	0.031
11A		Auxiliary	10.10	0.14	2.48	0.32	0.31	0.006	648.20	0.004	0.031

BOEM Emissions Tool Default Helicopter Emissions Factors											
EF Ref	Engine	Size (kW)	Emission Factors (lb/hr)								
			NOx	VOC	CO	PM10	PM2.5	SO2	CO2	CH4	N2O
12	Helicopter	Single	2.32	1.63	1.89	0.07	0.07	0.300	956.92	0.030	0.030
13	Helicopter	Twin Light	3.14	3.66	4.28	0.10	0.09	0.500	1589.69	0.040	0.050
14	Helicopter	Twin Medium	7.22	3.02	3.48	0.20	0.20	0.780	2459.92	0.070	0.080
15	Helicopter	Twin heavy	34.66	2.40	2.67	0.82	0.80	2.110	6640.46	0.190	0.220

Load Factors for Main Engines		
Vessel/Engine	Activity	Load Factor
Cat. 3 Main (Propulsion) Engine	Transit/cruise	0.83
Cat. 3 Main (Propulsion) Engine	Maneuvering	0.2
Cat. 3 Main (Propulsion) Engine	Hoteling	0
Cat. 1/2 Main (Propulsion) Engine	Transit/cruise	0.83
Cat. 1/2 Main (Propulsion) Engine	Maneuvering	0.2
Cat. 1/2 Main (Propulsion) Engine	Hoteling	0

Load Factors for Auxiliary Engines on Vessels w/ Cat. 3 Main Engines		
Vessel Type	Maneuver	Hotel
Bulk Carrier	0.45	0.1
Bulk Carrier, Laker	0.45	0.22
Buoy Tender	0.45	0.19
Container	0.48	0.26
Crude Oil Tanker	0.33	0.22
Drilling	0.45	0.22
Fishing	0.45	0.22
Floating Production and Storage Offloading	0.45	0.22
General Cargo	0.45	0.22
Icebreaker	0.45	0.22
Jackup	0.45	0.22
LNG Tanker	0.33	0.26
LPG Tanker	0.33	0.26
Misc.	0.45	0.22
Passenger	0.8	0.64
Pipelaying	0.45	0.22
Reefer	0.67	0.32
Research	0.45	0.22
RORO	0.45	0.26
Supply	0.45	0.22
Support	0.45	0.22
Tanker	0.33	0.26
Tug	0.45	0.22
Vehicle Carrier	0.45	0.22
Well stimulation	0.45	0.22

Table 4-120 of https://www.epa.gov/sites/production/files/2018-07/documents/nei2014v2_tsd_05jul2018.pdf

Emissions Factors for Engines											
EF Ref	Engine	Size (kW)	Emission Factors (g/kWh)								
			NOx[1]	VOC[2]	CO	PM10	PM2.5	SO2[3]	CO2[4]	CH4[4]	N2O[4]
16	Air Compressor Engines	~399	4	0.5	3.5	0.2	0.2	0.0068	739.60	0.030	0.0060
17	Motion Compensation Engines	500	4	0.495	3.5	0.2	0.2	0.0068	739.60	0.030	0.0060
18	Cat C18 Acert	597	6.4	0.8	3.5	0.2	0.2	0.0068	739.60	0.030	0.0060
19	Tier 2 Engines 0-8 kW	0-8	7.5	0.929	8	0.8	0.8	0.0068	739.60	0.030	0.0060
20	Tier 2 Engines 8-19 kW	8-19	7.5	0.929	6.6	0.8	0.8	0.0068	739.60	0.030	0.0060
21	Tier 2 Engines 19-37 kW	19-37	7.5	0.929	5.5	0.6	0.6	0.0068	739.60	0.030	0.0060
22	Tier 3 Engines 37-75 kW	37-75	4.7	0.582	5	0.4	0.4	0.0068	739.60	0.030	0.0060
23	Tier 3 Engines 75-130 kW	75-130	4	0.495	5	0.3	0.3	0.0068	739.60	0.030	0.0060
24	Tier 3 Engines 130-225 kW	130-225	4	0.495	3.5	0.2	0.2	0.0068	739.60	0.030	0.0060
25	Tier 3 Engines 225-450 kW	225-450	4	0.495	3.5	0.2	0.2	0.0068	739.60	0.030	0.0060
26	Tier 3 Engines 450-560 kW	450-560	4	0.495	3.5	0.2	0.2	0.0068	739.60	0.030	0.0060
27	Tier 2 Engines >560 kW	>560	6.4	0.792	3.5	0.2	0.2	0.0068	739.60	0.030	0.0060
30	Tier 4 Engine 130-560 kW	130-560	0.67	0.19	3.5	0.02	0.02	0.0068	739.60	0.030	0.0060

1 NOx emission values are assumed to be 100% of the the relevant tier standard for NOx+NMHC if no separate NOx standard

2 VOC emission values are assumed to be 12% of the the relevant tier standard for NOx+NMHC if no separate VOC/NMHC standard

3 Based on ULSD Fuel Sulfur of 0.0015%, fuel density of ~7lb/gal, fuel heat content of ~0.14 MMBtu/gal, and SO2:Sulfur ratio of 2.0

4 Based on GHG emissions and heat content of ULSD from 40 CFR 98 Tables C-1 and C-2 and an assumed engine efficiency of 10,000 Btu/kW

Commuting Emissions											
EF Ref	Engine	Fuel	Emission Factors (g/VMT)								
			NOx[1]	VOC[1]	CO[1]	PM10[1]	PM2.5[1]	SO2[2]	CO2[3]	CH4[3]	N2O[3]
28	Light-duty vehicles	Gasoline	0.289	0.35	3.94	0.012	0.012	0.0025	393.61	0.017	0.0034
29	Light-duty trucks	Gasoline	0.478	0.421	5.66	0.014	0.014	0.0025	393.61	0.017	0.0034

1 2018 values from Table 4-43 "Estimated U.S. Average Vehicle emissions Rates per Vehicle by Vehicle Type Using Gasoline and Diesel" at https://www.bts.gov/content/estimated-national-average-vehicle-emissions-rates-vehicle-vehicle-type-using-gasoline-and

2 Based on 10 ppm sulfur in gasoline, 6.07 lb/gal density, fleet average of 22.3 mpg, and SO2 to Sulfur weight ratio of 2.

3 Based on GHG emissions and heat content of motor gasoline from 40 CFR 98 Tables C-1 and C-2 and fleet average of 22.3 mpg

4 Fleet average MPG is from Table 4-23M from Bureau of Transportation Statistics found here: https://www.bts.gov/content/average-fuel-efficiency-us-passenger-cars-and-light-trucks

Load Factors for Auxiliary Engines on Vessels w/ Cat. 1 & 2 Main	
Vessel Group	Auxiliary Operating Load Factor
Bulk Carrier	0.1
Commercial Fishing	0.43
Container Ship	0.19
Ferry Excursion	0.43
General Cargo	0.22
Government	0.43
Miscellaneous	0.43
Offshore support	0.56
Reefer	0.32
RORO	0.26
Tanker	0.26
Tug	0.43
Work Boat	0.43

Eastern Research Group. 2019. Category 1 and 2 Commercial Marine Vessel 2017 Emissions Inventory (2019). Table 4. Auxiliary and Boiler Power Surrogates.

Load Factors for Auxiliary Engines on Vessels w/ Cat. 3 Main Engines			
EPA Vessel Type (NEI Vessel Types)	Cruise	RSZ	Maneuver
Auto Carrier	0.15	0.3	0.45
Bulk Carrier	0.17	0.27	0.45
Container Ship	0.13	0.25	0.48
Cruise Ship (Passenger)	0.8	0.8	0.8
General Cargo (Supply, Vehicle Carrier)	0.17	0.27	0.45
Miscellaneous (Buoy Tender, Drilling, Fishing, FPSO, Icebreaker, Jackup, Miscellaneous, Pipelaying, Research, Support, Well Stimulation)	0.17	0.27	0.45
OG Tug (Tug)	0.17	0.27	0.45
Reefer	0.2	0.34	0.67
RORO	0.15	0.3	0.45
Tanker (LNG Tanker, LPG Tanker, Crude Oil Tanker)	0.24	0.28	0.33

Sources:

EPA. 2009. Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories: Final

EPA. 2015. Commercial Marine Vessels – 2014 NEI Commercial Marine Vessels Final. Table 4-17: Auxiliary

Fuel Use Factors		
Engine Type	**Fuel Use (g/kWh)**	**Fuel Use (gal/kWh)**
Slow-speed Diesel, Marine Diesel Oil[1]	185	0.057
Medium-speed Diesel, Marine Diesel Oil[1]	203	0.063
Medium-speed Diesel, Marine Diesel Oil Auxiliary[1]	217	0.067
Cat. 1 & 2 (main and auxiliary)[2]	N/A	0.064

1 From "Current Methodologies and Best Practices in Preparing Port Emission Inventories" April 2009, Table 2-9: Emission Factors for OGV Main Engines, Table 2-16: Auxiliary Engine Emission Factors
2 Calculated from BOEM CO2 emission rate for Cat. 1 & 2 Marine Engines below

Fuel Use Calculations	
Diesel Fuel Density (lb/gal)[1]	7.10
Distillate Fuel No. 2 Higher Heating Value (MMBtu/gal)[2]	0.138
Distillate Fuel No. 2 CO2 Emission Factor (kg CO2/MMBtu)[2]	73.96
Cat. 1 & 2 Main Engine CO2 Emission Factor (g/kW*hr)[3]	648.20
Cat. 1 & 2 (main and auxiliary)) fuel use (gal/kWh)	0.064

1 From Table 3.4-1 AP 42
2 From 40 CFR Part 98 Table C-1: Default CO2 Emission Factors and High Heat Values for Various Types of Fuel
3 From BOEM Offshore Wind Energy Facilities Emission Estimating Tool Technical Documentation Table 3: Weighted Marine Vessel Emission Factors

Global Warming Potentials[1]	
Compound	**GWP**
CH4	25
N2O	298

1 Table A-1 of 40 CFR 98

Overall COP North Port Distance			
Port Name	**Lookup**	**Port Distance (Mi)**	**Port Distance (NM)**
Atlantic City	Atlantic City	25	22
New Jersey Wind Port	NJWP	130	113
Europe	Europe	288	250
Paulsboro	Paulsboro	166	144
Gulf Island	Gulf Island	288	250
Bayside	Bayside	288	250
Columbus Terminal	Goose Creek	288	250
Boston	Boston	288	250

*port distances beyond 250 Nmi are capped at 250 Nmi

	Mode	Yearly Operating Time	Avg. Engine Load Factor	Average Fuel Consumption per Year (L)	% of In Field (maneuvering)	Weighted Maneuvering Load Factor
1	Dynamic Positioning / gangway operations	40%	10%	640,000	42.6%	4.3%
2	Standby in field / hotel	33%	8%	465,000	35.1%	2.8%
3	In field transit	21%	15%	486,000	22.3%	3.4%
4	Transit to/from harbor	2%	**16%**	46,000	0.0%	0.0%
5	Harbor	4%	4%	28,000	0.0%	0.0%
Maneuvering					100.0%	**10.4%**

*Preliminary results for assessment of logistics options

~94% of activities in windfarm each year

85 m “standard” European SOV with 60 PAX and diesel electric propulsion system

Total engine capacity of 6,600 kW made up of 4x 1,650 kW generators

Equipment Type	Activity Description	Equipment Count	Fuel Type	Individual Equipment Power		Operating Time Per Equipment			Commute Information		
				HP	kW	Days	Hour/Day	Total Hours	One-Way Trips	Distance per Trip (miles)	Total Distance (miles)
Onshore Substation Installation											
Crane	Lift/Set Substation Equipment	2	ULSD	1000	746	250	10	2,500	N/A	N/A	N/A
Excavator	Excavation/Land Leveling	2	ULSD	500	373	250	10	2,500	N/A	N/A	N/A
Front-end Loader	Material Transfer	2	ULSD	100	75	30	10	300	N/A	N/A	N/A
Bulldozer	Land Leveling/Misc	2	ULSD	250	186	30	10	300	N/A	N/A	N/A
Trencher	Land Leveling/Trenching	2	ULSD	100	75	30	10	300	N/A	N/A	N/A
Dump Truck	Material Transfer	2	ULSD	300	224	30	10	300	N/A	N/A	N/A
Bucket Truck	Build/Set Equipment	2	ULSD	200	149	250	10	2,500	N/A	N/A	N/A
Forklift	Build/Set Equipment	2	ULSD	150	112	250	10	2,500	N/A	N/A	N/A
Grader	Land Leveling	2	ULSD	300	224	250	10	2,500	N/A	N/A	N/A
Paver	Pave Foundation	2	ULSD	200	149	30	5	150	N/A	N/A	N/A
Concrete Truck	Mix/Pour Foundation	2	ULSD	300	224	30	5	150	N/A	N/A	N/A
Passenger Vehicles	Worker Commute	40	Gasoline	N/A	N/A	N/A	N/A	N/A	295	15	354,000
Horizontal Directional Drilling (HDD)											
Crane	Setup/Breakdown	3	ULSD	1000	746	50	10	500	N/A	N/A	N/A
Front-end Loader	Material Transfer	3	ULSD	100	75	50	10	500	N/A	N/A	N/A
HDD Drill Rig	HDD Boring	3	ULSD	600	447	25	24	600	N/A	N/A	N/A
Pumps	Pumping Mud	3	ULSD	100	75	25	24	600	N/A	N/A	N/A
Generator	Ancillary Power	3	ULSD	200	149	25	24	600	N/A	N/A	N/A
Slurry Handler	Slurry Handling	3	ULSD	100	75	25	24	600	N/A	N/A	N/A
Desilter	Removing Silt	3	ULSD	100	75	25	24	600	N/A	N/A	N/A
Passenger Vehicles	Worker Commute	60	Gasoline	N/A	N/A	N/A	N/A	N/A	120	15	216,000
Onshore Duct Bank Installation											
Crane	Equipment/Pipe Placement	2	ULSD	1000	746	464	10	4644	N/A	N/A	N/A
Excavator	Breaking Pavement/Excavating	2	ULSD	500	373	464	10	4644	N/A	N/A	N/A
Front-end Loader	Material Transfer	2	ULSD	100	75	464	10	4644	N/A	N/A	N/A
Bulldozer	Land Leveling/Misc	2	ULSD	250	186	464	10	4644	N/A	N/A	N/A
Trencher	Trenching	2	ULSD	100	75	464	10	4644	N/A	N/A	N/A
Dump Truck	Material Transfer	2	ULSD	300	224	464	10	4644	N/A	N/A	N/A
Grader	Land Leveling	2	ULSD	300	224	464	10	4644	N/A	N/A	N/A
Paver	Repaving roadways	2	ULSD	200	149	464	10	4644	N/A	N/A	N/A
Concrete Truck	Concrete Mixing/Pouring	2	ULSD	300	224	464	10	4644	N/A	N/A	N/A
Passenger Vehicles	Worker Commute	40	Gasoline	N/A	N/A	N/A	N/A	N/A	464	15	557,250
Onshore Cable Installation											
Winch Truck	Cable install	4	ULSD	200	149	144	10	1445	N/A	N/A	N/A
Generator	Power Production	2	ULSD	200	149	144	10	1445	N/A	N/A	N/A
Cable Reel Truck	Cable install/delivery	2	ULSD	200	149	144	10	1445	N/A	N/A	N/A
Support Trucks	Support Activities	4	ULSD	N/A	N/A	N/A	N/A	N/A	144	15	17,337
Crew Trucks	Crew Transit	4	ULSD	N/A	N/A	N/A	N/A	N/A	144	15	17,337
Port Activities											
Crane	Loading/Unloading	1	ULSD	1000	746	688	12	8,256	N/A	N/A	N/A
Crane	Loading/Unloading	1	ULSD	1000	746	190	12	2,280	N/A	N/A	N/A
Front-end Loader	Material Transfer	1	ULSD	100	75	190	12	2,280	N/A	N/A	N/A
Passenger Vehicles	Worker Commute	40	Gasoline	N/A	N/A	N/A	N/A	N/A	250	15	300,000

Equipment Type	Activity Description	Emission Factors Ref	Load Factor	Fuel Consumption (gal)	Emissions (tons)											
					NOx	VOC	CO	PM10	PM2.5	SO2	CO2	CH4	N2O	CH4 as CO2e	N2O as CO2e	CO2e
Onshore Substation Installation																
Crane	Lift/Set Substation Equipment	27	0.5	133,161	13.15	1.63	7.19	0.41	0.41	0.01	1,519.86	0.06	0.01	1.54	3.67	1,525.07
Excavator	Excavation/Land Leveling	25	0.5	66,580	4.11	0.51	3.60	0.21	0.21	0.01	759.93	0.03	0.01	0.77	1.84	762.54
Front-end Loader	Material Transfer	22	0.25	799	0.06	0.01	0.06	0.00	0.00	0.00	9.12	0.00	0.00	0.01	0.02	9.15
Bulldozer	Land Leveling/Misc	24	0.5	3,995	0.25	0.03	0.22	0.01	0.01	0.00	45.60	0.00	0.00	0.05	0.11	45.75
Trencher	Land Leveling/Trenching	22	0.5	1,598	0.12	0.01	0.12	0.01	0.01	0.00	18.24	0.00	0.00	0.02	0.04	18.30
Dump Truck	Material Transfer	24	0.5	4,794	0.30	0.04	0.26	0.01	0.01	0.00	54.71	0.00	0.00	0.06	0.13	54.90
Bucket Truck	Build/Set Equipment	24	0.5	26,632	1.64	0.20	1.44	0.08	0.08	0.00	303.97	0.01	0.00	0.31	0.73	305.01
Forklift	Build/Set Equipment	23	0.5	19,974	1.23	0.15	1.54	0.09	0.09	0.00	227.98	0.01	0.00	0.23	0.55	228.76
Grader	Land Leveling	24	0.5	39,948	2.47	0.31	2.16	0.12	0.12	0.00	455.96	0.02	0.00	0.46	1.10	457.52
Paver	Pave Foundation	24	0.5	1,598	0.10	0.01	0.09	0.00	0.00	0.00	18.24	0.00	0.00	0.02	0.04	18.30
Concrete Truck	Mix/Pour Foundation	24	0.5	2,397	0.15	0.02	0.13	0.01	0.01	0.00	27.36	0.00	0.00	0.03	0.07	27.45
Passenger Vehicles	Worker Commute	28	N/A	15,874	0.11	0.14	1.54	0.00	0.00	0.00	153.59	0.01	0.00	0.16	0.39	154.15
Horizontal Directional Drilling (HDD)																
Crane	Setup/Breakdown	27	0.5	39,948	3.95	0.49	2.16	0.12	0.12	0.00	455.96	0.02	0.00	0.46	1.10	457.52
Front-end Loader	Material Transfer	22	0.25	1,997	0.14	0.02	0.15	0.01	0.01	0.00	22.80	0.00	0.00	0.02	0.06	22.88
HDD Drill Rig	HDD Boring	25	0.5	28,763	1.78	0.22	1.55	0.09	0.09	0.00	328.29	0.01	0.00	0.33	0.79	329.42
Pumps	Pumping Mud	22	0.5	4,794	0.35	0.04	0.37	0.03	0.03	0.00	54.71	0.00	0.00	0.06	0.13	54.90
Generator	Ancillary Power	24	0.5	9,588	0.59	0.07	0.52	0.03	0.03	0.00	109.43	0.00	0.00	0.11	0.26	109.81
Slurry Handler	Slurry Handling	22	0.5	4,794	0.35	0.04	0.37	0.03	0.03	0.00	54.71	0.00	0.00	0.06	0.13	54.90
Desilter	Removing Silt	22	0.5	4,794	0.35	0.04	0.37	0.03	0.03	0.00	54.71	0.00	0.00	0.06	0.13	54.90
Passenger Vehicles	Worker Commute	28	N/A	9,686	0.07	0.08	0.94	0.00	0.00	0.00	93.72	0.00	0.00	0.10	0.24	94.06
Onshore Duct Bank Installation																
Crane	Equipment/Pipe Placement	27	0.5	247,346	24.43	3.02	13.36	0.76	0.76	0.03	2,823.14	0.11	0.02	2.86	6.82	2,832.83
Excavator	Breaking Pavement/Excavating	25	0.5	123,673	7.63	0.95	6.68	0.38	0.38	0.01	1,411.57	0.06	0.01	1.43	3.41	1,416.41
Front-end Loader	Material Transfer	22	0.25	12,367	0.90	0.11	0.95	0.08	0.08	0.00	141.16	0.01	0.00	0.14	0.34	141.64
Bulldozer	Land Leveling/Misc	24	0.5	61,837	3.82	0.47	3.34	0.19	0.19	0.01	705.78	0.03	0.01	0.72	1.71	708.21
Trencher	Trenching	22	0.5	24,735	1.79	0.22	1.91	0.15	0.15	0.00	282.31	0.01	0.00	0.29	0.68	283.28
Dump Truck	Material Transfer	24	0.5	74,204	4.58	0.57	4.01	0.23	0.23	0.01	846.94	0.03	0.01	0.86	2.05	849.85
Grader	Land Leveling	24	0.5	74,204	4.58	0.57	4.01	0.23	0.23	0.01	846.94	0.03	0.01	0.86	2.05	849.85
Paver	Repaving roadways	24	0.5	49,469	3.05	0.38	2.67	0.15	0.15	0.01	564.63	0.02	0.00	0.57	1.36	566.57
Concrete Truck	Concrete Mixing/Pouring	24	0.5	74,204	4.58	0.57	4.01	0.23	0.23	0.01	846.94	0.03	0.01	0.86	2.05	849.85
Passenger Vehicles	Worker Commute	28	N/A	24,989	0.18	0.21	2.42	0.01	0.01	0.00	241.78	0.01	0.00	0.26	0.62	242.65
Onshore Cable Installation																
Winch Truck	Cable install	24	0.5	30,781	1.90	0.24	1.66	0.10	0.10	0.00	351.32	0.01	0.00	0.36	0.85	352.53
Generator	Power Production	24	0.5	15,390	0.95	0.12	0.83	0.05	0.05	0.00	175.66	0.01	0.00	0.18	0.42	176.26
Cable Reel Truck	Cable install/delivery	24	0.5	15,390	0.95	0.12	0.83	0.05	0.05	0.00	175.66	0.01	0.00	0.18	0.42	176.26
Support Trucks	Support Activities	29	N/A	777	0.01	0.01	0.11	0.00	0.00	0.00	7.52	0.00	0.00	0.01	0.02	7.55
Crew Trucks	Crew Transit	28	N/A	777	0.01	0.01	0.08	0.00	0.00	0.00	7.52	0.00	0.00	0.01	0.02	7.55
Port Activities																
Crane	Loading/Unloading	27	0.5	219,875	21.72	2.69	11.88	0.68	0.68	0.02	2,509.59	0.10	0.02	2.54	6.07	2,518.20
Crane	Loading/Unloading	27	0.5	60,721	6.00	0.74	3.28	0.19	0.19	0.01	693.06	0.03	0.01	0.70	1.68	695.43
Front-end Loader	Material Transfer	22	0.25	3,036	0.22	0.03	0.23	0.02	0.02	0.00	34.65	0.00	0.00	0.04	0.08	34.77
Passenger Vehicles	Worker Commute	28	N/A	13,453	0.10	0.12	1.30	0.00	0.00	0.00	130.16	0.01	0.00	0.14	0.33	130.63
Total				**1,548,942**	**118.6**	**15.2**	**88.3**	**4.8**	**4.8**	**0.2**	**17,565.2**	**0.7**	**0.1**	**17.8**	**42.5**	**17,625.6**
Stationary Engines				**24,978**	**1.5**	**0.2**	**1.3**	**0.1**	**0.1**	**0.0**	**285.1**	**0.0**	**0.0**	**0.3**	**0.7**	**286.1**
Vehicles				**1,523,964**	**117.1**	**15.0**	**87.0**	**4.7**	**4.7**	**0.2**	**17,280.1**	**0.7**	**0.1**	**17.6**	**41.9**	**17,339.6**

Scenario	Fuel Consumption (gal/yr)	Emissions (tons per year)											
		NOx	VOC	CO	PM10	PM2.5	SO2	CO2	CH4	N2O	CH4 as CO2e	N2O as CO2e	CO2e
CTV Scenario	2,848,745.82	502.0	7.6	118.5	16.0	15.5	0.7	33,037.3	0.2	1.6	5.2	471.1	34,267.6
SOV Scenario	2,918,502.98	521.0	8.7	121.7	16.7	16.2	1.4	33,707.4	0.2	1.6	5.3	482.3	34,948.9

Activity	Representative Vessel Type	Engine Type	Engine Count	Engine Size (kW)	Total Size (kW)	Engine Category	Home Port	Vessel Round Trips (per year)	One-Way Trip Distance (NM)	Total Distance Traveled (NM)	Vessel Transit Speed (knots)	Hours in Transit/Year	Operating Days per Year	Operating Hours/Day	Total Non-Transit Hours	Total Operating Hours	Emission Factors Ref
Emissions During Operations (CTV Scenario)																	
WTG and BoP Crew logistics																	
CTV all-year 1	Crew Transfer Vessel	Main Engine (Transit)	4	522	2,088	1 & 2 main	Atlantic City	250	22	10,990	20	550	0	0	0	550	4M
		Main Engine (Maneuvering)	4	522	2,088	1 & 2 main		0	22	0	0	0	250	12	3,000	3,000	4M
		Auxiliary Engine (Transit)	2	27	54	1 & 2 auxiliary		250	22	10,990	20	550	0	0	0	550	4A
		Auxiliary Engine (Maneuvering)	2	27	54	1 & 2 auxiliary		0	22	0	0	0	250	12	3,000	3,000	4A
CTV all-year 2	Crew Transfer Vessel	Main Engine (Transit)	4	522	2,088	1 & 2 main	Atlantic City	250	22	10,990	20	550	0	0	0	550	4M
		Main Engine (Maneuvering)	4	522	2,088	1 & 2 main		0	22	0	0	0	250	12	3,000	3,000	4M
		Auxiliary Engine (Transit)	2		54	1 & 2 auxiliary		250	22	10,990	20	550	0	0	0	550	4A
		Auxiliary Engine (Maneuvering)	2	27	54	1 & 2 auxiliary		0	22	0	0	0	250	12	3,000	3,000	4A
CTV all-year 3	Crew Transfer Vessel	Main Engine (Transit)	4	522	2,088	1 & 2 main	Atlantic City	250	22	10,990	20	550	0	0	0	550	4M
		Main Engine (Maneuvering)	4	522	2,088	1 & 2 main		0	22	0	0	0	250	12	3,000	3,000	4M
		Auxiliary Engine (Transit)	2	27	54	1 & 2 auxiliary		250	22	10,990	20	550	0	0	0	550	4A
		Auxiliary Engine (Maneuvering)	2	27	54	1 & 2 auxiliary		0	22	0	0	0	250	12	3,000	3,000	4A
CTV all-year 4	Crew Transfer Vessel	Main Engine (Transit)	4	522	2,088	1 & 2 main	Atlantic City	250	22	10,990	20	550	0	0	0	550	4M
		Main Engine (Maneuvering)	4	522	2,088	1 & 2 main		0	22	0	0	0	250	12	3,000	3,000	4M
		Auxiliary Engine (Transit)	2	27	54	1 & 2 auxiliary		250	22	10,990	20	550	0	0	0	550	4A
		Auxiliary Engine (Maneuvering)	2	27	54	1 & 2 auxiliary		0	22	0	0	0	250	12	3,000	3,000	4A
CTV all-year 5	Crew Transfer Vessel	Main Engine (Transit)	4	522	2,088	1 & 2 main	Atlantic City	250	22	10,990	20	550	0	0	0	550	4M
		Main Engine (Maneuvering)	4	522	2,088	1 & 2 main		0	22	0	0	0	250	12	3,000	3,000	4M
		Auxiliary Engine (Transit)	2	27	54	1 & 2 auxiliary		250	22	10,990	20	550	0	0	0	550	4A
		Auxiliary Engine (Maneuvering)	2	27	54	1 & 2 auxiliary		0	22	0	0	0	250	12	3,000	3,000	4A
CTV Summer Campaign 1	Crew Transfer Vessel	Main Engine (Transit)	4	522	2,088	1 & 2 main	Atlantic City	124	22	5,451	20	273	0	0	0	273	4M
		Main Engine (Maneuvering)	4	522	2,088	1 & 2 main		0	22	0	0	0	124	12	1,488	1,488	4M
		Auxiliary Engine (Transit)	2	27	54	1 & 2 auxiliary		124	22	5,451	20	273	0	0	0	273	4A
		Auxiliary Engine (Maneuvering)	2	27	54	1 & 2 auxiliary		0	22	0	0	0	124	12	1,488	1,488	4A
CTV Summer Campaign 2	Crew Transfer Vessel	Main Engine (Transit)	4	522	2,088	1 & 2 main	Atlantic City	124	22	5,451	20	273	0	0	0	273	4M
		Main Engine (Maneuvering)	4	522	2,088	1 & 2 main		0	22	0	0	0	124	12	1,488	1,488	4M
		Auxiliary Engine (Transit)	2	27	54	1 & 2 auxiliary		124	22	5,451	20	273	0	0	0	273	4A
		Auxiliary Engine (Maneuvering)	2	27	54	1 & 2 auxiliary		0	22	0	0	0	124	12	1,488	1,488	4A
CTV Summer Campaign 3	Crew Transfer Vessel	Main Engine (Transit)	4	522	2,088	1 & 2 main	Atlantic City	124	22	5,451	20	273	0	0	0	273	4M
		Main Engine (Maneuvering)	4	522	2,088	1 & 2 main		0	22	0	0	0	124	12	1,488	1,488	4M
		Auxiliary Engine (Transit)	2	27	54	1 & 2 auxiliary		124	22	5,451	20	273	0	0	0	273	4A
		Auxiliary Engine (Maneuvering)	2	27	54	1 & 2 auxiliary		0	22	0	0	0	124	12	1,488	1,488	4A
CTV Summer Campaign 4	Crew Transfer Vessel	Main Engine (Transit)	4	522	2,088	1 & 2 main	Atlantic City	124	22	5,451	20	273	0	0	0	273	4M
		Main Engine (Maneuvering)	4	522	2,088	1 & 2 main		0	22	0	0	0	124	12	1,488	1,488	4M
		Auxiliary Engine (Transit)	2	27	54	1 & 2 auxiliary		124	22	5,451	20	273	0	0	0	273	4A
		Auxiliary Engine (Maneuvering)	2	27	54	1 & 2 auxiliary		0	22	0	0	0	124	12	1,488	1,488	4A
CTV Summer Campaign 5	Crew Transfer Vessel	Main Engine (Transit)	4	522	2,088	1 & 2 main	Atlantic City	124	22	5,451	20	273	0	0	0	273	4M
		Main Engine (Maneuvering)	4	522	2,088	1 & 2 main		0	22	0	0	0	124	12	1,488	1,488	4M
		Auxiliary Engine (Transit)	2	27	54	1 & 2 auxiliary		124	22	5,451	20	273	0	0	0	273	4A
		Auxiliary Engine (Maneuvering)	2	27	54	1 & 2 auxiliary		0	22	0	0	0	124	12	1,488	1,488	4A
CTV Summer Campaign 6	Crew Transfer Vessel	Main Engine (Transit)	4	522	2,088	1 & 2 main	Atlantic City	124	22	5,451	20	273	0	0	0	273	4M
		Main Engine (Maneuvering)	4	522	2,088	1 & 2 main		0	22	0	0	0	124	12	1,488	1,488	4M
		Auxiliary Engine (Transit)	2	27	54	1 & 2 auxiliary		124	22	5,451	20	273	0	0	0	273	4A
		Auxiliary Engine (Maneuvering)	2	27	54	1 & 2 auxiliary		0	22	0	0	0	124	12	1,488	1,488	4A
WTG heavy logistics / jack-up																	
US Jack-Up	Jack-Up Vessel	Main Engine (Transit)	5	4000	20,000	3 main	NJWP	8	113	1,808	10	181	0	0	0	181	7M
		Main Engine (Maneuvering)	5	4000	20,000	3 main		0	113	0	0	0	38	24	912	912	7M
		Auxiliary Engine (Transit)	1	4000	4,000	3 auxiliary		8	113	1,808	10	181	0	0	0	181	7A
		Auxiliary Engine (Maneuvering)	1	4000	4,000	3 auxiliary		0	113	0	0	0	38	24	912	912	7A
US Feeder Vessel	Feeder/Jack-up	Main Engine (Transit)	2	2350	4,700	3 main	NJWP	8	113	1,808	10	181	0	0	0	181	7M
		Main Engine (Maneuvering)	2	2350	4,700	3 main		0	113	0	0	0	38	24	912	912	7M
		Auxiliary Engine (Transit)	2	1000	2,000	3 auxiliary		8	113	1,808	10	181	0	0	0	181	7A
		Auxiliary Engine (Maneuvering)	2	1000	2,000	3 auxiliary		0	113	0	0	0	38	24	912	912	7A
European Jack-up	Jack-Up Vessel	Main Engine (Transit)	5	4000	20,000	3 main	Europe	8	250	4,000	10	400	0	0	0	400	7M
		Main Engine (Maneuvering)	5	4000	20,000	3 main		0	250	0	0	0	38	24	912	912	7M
		Auxiliary Engine (Transit)	1	4000	4,000	3 auxiliary		8	250	4,000	10	400	0	0	0	400	7A
		Auxiliary Engine (Maneuvering)	1	4000	4,000	3 auxiliary		0	250	0	0	0	38	24	912	912	7A
Cable repair vessel - export cable																	
Cable repair vessel	Cable Lay Vessel	Main Engine (Transit)	0	0	7,280	1 & 2 main	NJWP	1	113	226	10	23	0	0	0	23	3M
		Main Engine (Maneuvering)	0	0	7,280	1 & 2 main		0	113	0	0	0	25	24	600	600	3M
		Auxiliary Engine (Transit)	0	0	220	1 & 2 auxiliary		1	113	226	10	23	0	0	0	23	3A
		Auxiliary Engine (Maneuvering)	0	0	220	1 & 2 auxiliary		0	113	0	0	0	25	24	600	600	3A

Activity	Representative Vessel Type	Engine Type	Engine Count	Engine Size (kW)	Total Size (kW)	Engine Category	Home Port	Vessel Round Trips (per year)	One-Way Trip Distance (NM)	Total Distance Traveled (NM)	Vessel Transit Speed (knots)	Hours in Transit/Year	Operating Days per Year	Operating Hours/Day	Total Non-Transit Hours	Total Operating Hours	Emission Factors Ref
Cable repair vessel - arrray cable																	
Cable repair vessel	Cable Lay Vessel	Main Engine (Transit)	0	0	7,280	1 & 2 main	NJWP	1	113	226	10	23	0	0	0	23	3M
		Main Engine (Maneuvering)	0	0	7,280	1 & 2 main		0	113	0	0	0	10	24	240	240	3M
		Auxiliary Engine (Transit)	0	0	220	1 & 2 auxiliary		1	113	226	10	23	0	0	0	23	3A
		Auxiliary Engine (Maneuvering)	0	0	220	1 & 2 auxiliary		0	113	0	0	0	10	24	240	240	3A
Cable survey vessel - export cable																	
Cable survey vessel	Survey Vessel	Main Engine (Transit)	2	1,900	3,800	1 & 2 main	NJWP	2	113	452	10	45	0	0	0	45	8M
		Main Engine (Maneuvering)	2	1,900	3,800	1 & 2 main		0	113	0	0	0	51	24	1,224	1,224	8M
		Auxiliary Engine (Transit)	2	99	198	1 & 2 auxiliary		2	113	452	10	45	0	0	0	45	8A
		Auxiliary Engine (Maneuvering)	2	99	198	1 & 2 auxiliary		0	113	0	0	0	51	24	1,224	1,224	8A
Cable survey vessel - arrray cable																	
Cable survey vessel	Survey Vessel	Main Engine (Transit)	2	1,900	3,800	1 & 2 main	NJWP	1	113	226	10	23	0	0	0	23	8M
		Main Engine (Maneuvering)	2	1,900	3,800	1 & 2 main		0	113	0	0	0	19	24	456	456	8M
		Auxiliary Engine (Transit)	2	99	198	1 & 2 auxiliary		1	113	226	10	23	0	0	0	23	8A
		Auxiliary Engine (Maneuvering)	2	99	198	1 & 2 auxiliary		0	113	0	0	0	19	24	456	456	8A
Foundation below water inspection																	
Vessel for subsea inspection	Survey Vessel	Main Engine (Transit)	2	1,900	3,800	1 & 2 main	Atlantic City	3	22	132	10	13	0	0	0	13	8M
		Main Engine (Maneuvering)	2	1,900	3,800	1 & 2 main		0	22	0	0	0	22	24	528	528	8M
		Auxiliary Engine (Transit)	2	99	198	1 & 2 auxiliary		3	22	132	10	13	0	0	0	13	8A
		Auxiliary Engine (Maneuvering)	2	99	198	1 & 2 auxiliary		0	22	0	0	0	22	24	528	528	8A
Other vessels																	
Environmental monitoring vessel	Crew Transfer Vessel	Main Engine (Transit)	4	522	2,088	1 & 2 main	Atlantic City	12	22	528	20	26	0	0	0	26	4M
		Main Engine (Maneuvering)	4	522	2,088	1 & 2 main		0	22	0	0	0	12	8	96	96	4M
		Auxiliary Engine (Transit)	2	27	54	1 & 2 auxiliary		12	22	528	20	26	0	0	0	26	4A
		Auxiliary Engine (Maneuvering)	2	27	54	1 & 2 auxiliary		0	22	0	0	0	12	8	96	96	4A
SOV campaign (e.g., for retrofit campaign)	Service Operation Vessel	Main Engine (Transit)	4	2,306	9,224	1 & 2 main	NJWP	0.03	113	8	10	1	0	0	0	1	3M
		Main Engine (Maneuvering)	4	2,306	9,224	1 & 2 main		0	113	0	0	0	3	24	72	72	3M
		Auxiliary Engine (Transit)	4	2,000	8,000	1 & 2 auxiliary		0.03	113	8	10	1	0	0	0	1	3A
		Auxiliary Engine (Maneuvering)	4	2,000	8,000	1 & 2 auxiliary		0	113	0	0	0	3	24	72	72	3A
OSS repair vessel (major repair)	Jack-Up Vessel	Main Engine (Transit)	5	4000	20,000	3 main	NJWP	0.03	113	8	10	1	0	0	0	1	7M
		Main Engine (Maneuvering)	5	4000	20,000	3 main		0	113	0	0	0	3	24	72	72	7M
		Auxiliary Engine (Transit)	1	4000	4,000	3 auxiliary		0.03	113	8	10	1	0	0	0	1	7A
		Auxiliary Engine (Maneuvering)	1	4000	4,000	3 auxiliary		0	113	0	0	0	3	24	72	72	7A
Miscellaneous																	
SF6 Loss	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Misc VOC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OSS Generators	Generator	Tier 4 Generator	8	500	4,000	Tier 4 Non-Road	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	24	24	30

Activity	Representative Vessel Type	Engine Type	Load Factor	Fuel Consumption (gal)	Emissions (tons)											
					NOx	VOC	CO	PM10	PM2.5	SO2	CO2	CH4	N2O	CH4 as CO2e	N2O as CO2e	CO2e
Emissions During Operations (CTV Scenario)																
WTG and BoP Crew logistics																
CTV all-year 1	Crew Transfer Vessel	Main Engine (Transit)	0.83	60,480	9.61	0.15	2.41	0.33	0.31	0.01	680.41	0.00	0.03	0	10	690
		Main Engine (Maneuvering)	0.20	79,562	12.64	0.19	3.18	0.43	0.41	0.01	895.08	0.01	0.04	0	13	908
		Auxiliary Engine (Transit)	0.43	810	0.15	0.00	0.03	0.00	0.00	0.00	9.12	0.00	0.00	0	0	9
		Auxiliary Engine (Maneuvering)	0.43	4,424	0.80	0.01	0.19	0.02	0.02	0.00	49.77	0.00	0.00	0	1	50
CTV all-year 2	Crew Transfer Vessel	Main Engine (Transit)	0.83	60,480	9.61	0.15	2.41	0.33	0.31	0.01	680.41	0.00	0.03	0	10	690
		Main Engine (Maneuvering)	0.20	79,562	12.64	0.19	3.18	0.43	0.41	0.01	895.08	0.01	0.04	0	13	908
		Auxiliary Engine (Transit)	0.43	810	0.15	0.00	0.03	0.00	0.00	0.00	9.12	0.00	0.00	0	0	9
		Auxiliary Engine (Maneuvering)	0.43	4,424	0.80	0.01	0.19	0.02	0.02	0.00	49.77	0.00	0.00	0	1	50
CTV all-year 3	Crew Transfer Vessel	Main Engine (Transit)	0.83	60,480	9.61	0.15	2.41	0.33	0.31	0.01	680.41	0.00	0.03	0	10	690
		Main Engine (Maneuvering)	0.20	79,562	12.64	0.19	3.18	0.43	0.41	0.01	895.08	0.01	0.04	0	13	908
		Auxiliary Engine (Transit)	0.43	810	0.15	0.00	0.03	0.00	0.00	0.00	9.12	0.00	0.00	0	0	9
		Auxiliary Engine (Maneuvering)	0.43	4,424	0.80	0.01	0.19	0.02	0.02	0.00	49.77	0.00	0.00	0	1	50
CTV all-year 4	Crew Transfer Vessel	Main Engine (Transit)	0.83	60,480	9.61	0.15	2.41	0.33	0.31	0.01	680.41	0.00	0.03	0	10	690
		Main Engine (Maneuvering)	0.20	79,562	12.64	0.19	3.18	0.43	0.41	0.01	895.08	0.01	0.04	0	13	908
		Auxiliary Engine (Transit)	0.43	810	0.15	0.00	0.03	0.00	0.00	0.00	9.12	0.00	0.00	0	0	9
		Auxiliary Engine (Maneuvering)	0.43	4,424	0.80	0.01	0.19	0.02	0.02	0.00	49.77	0.00	0.00	0	1	50
CTV all-year 5	Crew Transfer Vessel	Main Engine (Transit)	0.83	60,480	9.61	0.15	2.41	0.33	0.31	0.01	680.41	0.00	0.03	0	10	690
		Main Engine (Maneuvering)	0.20	79,562	12.64	0.19	3.18	0.43	0.41	0.01	895.08	0.01	0.04	0	13	908
		Auxiliary Engine (Transit)	0.43	810	0.15	0.00	0.03	0.00	0.00	0.00	9.12	0.00	0.00	0	0	9
		Auxiliary Engine (Maneuvering)	0.43	4,424	0.80	0.01	0.19	0.02	0.02	0.00	49.77	0.00	0.00	0	1	50
CTV Summer Campaign 1	Crew Transfer Vessel	Main Engine (Transit)	0.83	29,998	4.76	0.07	1.20	0.16	0.16	0.00	337.48	0.00	0.02	0	5	342
		Main Engine (Maneuvering)	0.20	39,463	6.27	0.10	1.58	0.21	0.21	0.00	443.96	0.00	0.02	0	6	450
		Auxiliary Engine (Transit)	0.43	402	0.07	0.00	0.02	0.00	0.00	0.00	4.52	0.00	0.00	0	0	5
		Auxiliary Engine (Maneuvering)	0.43	2,194	0.40	0.01	0.09	0.01	0.01	0.00	24.69	0.00	0.00	0	0	25
CTV Summer Campaign 2	Crew Transfer Vessel	Main Engine (Transit)	0.83	29,998	4.76	0.07	1.20	0.16	0.16	0.00	337.48	0.00	0.02	0	5	342
		Main Engine (Maneuvering)	0.20	39,463	6.27	0.10	1.58	0.21	0.21	0.00	443.96	0.00	0.02	0	6	450
		Auxiliary Engine (Transit)	0.43	402	0.07	0.00	0.02	0.00	0.00	0.00	4.52	0.00	0.00	0	0	5
		Auxiliary Engine (Maneuvering)	0.43	2,194	0.40	0.01	0.09	0.01	0.01	0.00	24.69	0.00	0.00	0	0	25
CTV Summer Campaign 3	Crew Transfer Vessel	Main Engine (Transit)	0.83	29,998	4.76	0.07	1.20	0.16	0.16	0.00	337.48	0.00	0.02	0	5	342
		Main Engine (Maneuvering)	0.20	39,463	6.27	0.10	1.58	0.21	0.21	0.00	443.96	0.00	0.02	0	6	450
		Auxiliary Engine (Transit)	0.43	402	0.07	0.00	0.02	0.00	0.00	0.00	4.52	0.00	0.00	0	0	5
		Auxiliary Engine (Maneuvering)	0.43	2,194	0.40	0.01	0.09	0.01	0.01	0.00	24.69	0.00	0.00	0	0	25
CTV Summer Campaign 4	Crew Transfer Vessel	Main Engine (Transit)	0.83	29,998	4.76	0.07	1.20	0.16	0.16	0.00	337.48	0.00	0.02	0	5	342
		Main Engine (Maneuvering)	0.20	39,463	6.27	0.10	1.58	0.21	0.21	0.00	443.96	0.00	0.02	0	6	450
		Auxiliary Engine (Transit)	0.43	402	0.07	0.00	0.02	0.00	0.00	0.00	4.52	0.00	0.00	0	0	5
		Auxiliary Engine (Maneuvering)	0.43	2,194	0.40	0.01	0.09	0.01	0.01	0.00	24.69	0.00	0.00	0	0	25
CTV Summer Campaign 5	Crew Transfer Vessel	Main Engine (Transit)	0.83	29,998	4.76	0.07	1.20	0.16	0.16	0.00	337.48	0.00	0.02	0	5	342
		Main Engine (Maneuvering)	0.20	39,463	6.27	0.10	1.58	0.21	0.21	0.00	443.96	0.00	0.02	0	6	450
		Auxiliary Engine (Transit)	0.43	402	0.07	0.00	0.02	0.00	0.00	0.00	4.52	0.00	0.00	0	0	5
		Auxiliary Engine (Maneuvering)	0.43	2,194	0.40	0.01	0.09	0.01	0.01	0.00	24.69	0.00	0.00	0	0	25
CTV Summer Campaign 6	Crew Transfer Vessel	Main Engine (Transit)	0.83	29,998	4.76	0.07	1.20	0.16	0.16	0.00	337.48	0.00	0.02	0	5	342
		Main Engine (Maneuvering)	0.20	39,463	6.27	0.10	1.58	0.21	0.21	0.00	443.96	0.00	0.02	0	6	450
		Auxiliary Engine (Transit)	0.43	402	0.07	0.00	0.02	0.00	0.00	0.00	4.52	0.00	0.00	0	0	5
		Auxiliary Engine (Maneuvering)	0.43	2,194	0.40	0.01	0.09	0.01	0.01	0.00	24.69	0.00	0.00	0	0	25
WTG heavy logistics / jack-up																
US Jack-Up	Jack-Up Vessel	Main Engine (Transit)	0.83	172,419	33.19	0.46	7.61	1.03	0.99	0.04	2140.92	0.01	0.10	0	31	2,172
		Main Engine (Maneuvering)	0.20	209,557	40.33	0.56	9.25	1.25	1.21	0.05	2602.06	0.02	0.12	0	37	2,640
		Auxiliary Engine (Transit)	0.43	20,955	3.96	0.05	0.85	0.11	0.11	0.00	222.21	0.00	0.01	0	3	225
		Auxiliary Engine (Maneuvering)	0.43	105,696	19.97	0.24	4.29	0.55	0.54	0.01	1120.82	0.01	0.05	0	16	1,137
US Feeder Vessel	Feeder/Jack-up	Main Engine (Transit)	0.83	40,518	7.80	0.11	1.79	0.24	0.23	0.01	503.12	0.00	0.02	0	7	510
		Main Engine (Maneuvering)	0.20	49,246	9.48	0.13	2.17	0.29	0.28	0.01	611.48	0.00	0.03	0	9	620
		Auxiliary Engine (Transit)	0.45	10,965	2.07	0.03	0.44	0.06	0.06	0.00	116.27	0.00	0.01	0	2	118
		Auxiliary Engine (Maneuvering)	0.45	55,306	10.45	0.13	2.24	0.29	0.28	0.01	586.48	0.00	0.03	0	8	595
European Jack-up	Jack-Up Vessel	Main Engine (Transit)	0.83	381,431	73.41	1.02	16.83	2.27	2.20	0.10	4736.20	0.03	0.23	1	68	4,805
		Main Engine (Maneuvering)	0.20	209,557	40.33	0.56	9.25	1.25	1.21	0.05	2602.06	0.02	0.12	0	37	2,640
		Auxiliary Engine (Transit)	0.43	46,358	8.76	0.11	1.88	0.24	0.24	0.00	491.59	0.00	0.02	0	7	499
		Auxiliary Engine (Maneuvering)	0.43	105,696	19.97	0.24	4.29	0.55	0.54	0.01	1120.82	0.01	0.05	0	16	1,137
Cable repair vessel - export cable																
Cable repair vessel	Cable Lay Vessel	Main Engine (Transit)	0.83	8,673	1.43	0.04	0.33	0.05	0.05	0.01	95.60	0.00	0.00	0	1	97
		Main Engine (Maneuvering)	0.20	55,481	9.14	0.24	2.12	0.33	0.32	0.08	611.51	0.00	0.03	0	9	621
		Auxiliary Engine (Transit)	0.56	177	0.03	0.00	0.01	0.00	0.00	0.00	1.99	0.00	0.00	0	0	2
		Auxiliary Engine (Maneuvering)	0.56	4,695	0.81	0.01	0.20	0.03	0.03	0.00	52.82	0.00	0.00	0	1	54

Activity	Representative Vessel Type	Engine Type	Load Factor	Fuel Consumption (gal)	Emissions (tons)											
					NOx	VOC	CO	PM10	PM2.5	SO2	CO2	CH4	N2O	CH4 as CO2e	N2O as CO2e	CO2e
Cable repair vessel - arrray cable																
Cable repair vessel	Cable Lay Vessel	Main Engine (Transit)	0.83	8,673	1.43	0.04	0.33	0.05	0.05	0.01	95.60	0.00	0.00	0	1	97
		Main Engine (Maneuvering)	0.20	22,192	3.66	0.10	0.85	0.13	0.13	0.03	244.60	0.00	0.01	0	4	248
		Auxiliary Engine (Transit)	0.56	177	0.03	0.00	0.01	0.00	0.00	0.00	1.99	0.00	0.00	0	0	2
		Auxiliary Engine (Maneuvering)	0.56	1,878	0.32	0.00	0.08	0.01	0.01	0.00	21.13	0.00	0.00	0	0	21
Cable survey vessel - export cable																
Cable survey vessel	Survey Vessel	Main Engine (Transit)	0.83	9,054	1.55	0.03	0.35	0.05	0.05	0.01	100.31	0.00	0.00	0	1	102
		Main Engine (Maneuvering)	0.20	59,078	10.11	0.23	2.31	0.35	0.34	0.07	654.48	0.00	0.03	0	9	664
		Auxiliary Engine (Transit)	0.43	244	0.04	0.00	0.01	0.00	0.00	0.00	2.75	0.00	0.00	0	0	3
		Auxiliary Engine (Maneuvering)	0.43	6,618	1.17	0.02	0.28	0.04	0.04	0.00	74.46	0.00	0.00	0	1	76
Cable survey vessel - arrray cable																
Cable survey vessel	Survey Vessel	Main Engine (Transit)	0.83	4,527	0.77	0.02	0.18	0.03	0.03	0.01	50.15	0.00	0.00	0	1	51
		Main Engine (Maneuvering)	0.20	22,010	3.77	0.08	0.86	0.13	0.13	0.03	243.83	0.00	0.01	0	4	247
		Auxiliary Engine (Transit)	0.43	122	0.02	0.00	0.01	0.00	0.00	0.00	1.37	0.00	0.00	0	0	1
		Auxiliary Engine (Maneuvering)	0.43	2,466	0.44	0.01	0.11	0.01	0.01	0.00	27.74	0.00	0.00	0	0	28
Foundation below water inspection																
Vessel for subsea inspection	Survey Vessel	Main Engine (Transit)	0.83	2,642	0.45	0.01	0.10	0.02	0.02	0.00	29.27	0.00	0.00	0	0	30
		Main Engine (Maneuvering)	0.20	25,485	4.36	0.10	1.00	0.15	0.15	0.03	282.33	0.00	0.01	0	4	286
		Auxiliary Engine (Transit)	0.43	71	0.01	0.00	0.00	0.00	0.00	0.00	0.80	0.00	0.00	0	0	1
		Auxiliary Engine (Maneuvering)	0.43	2,855	0.51	0.01	0.12	0.02	0.02	0.00	32.12	0.00	0.00	0	0	33
Other vessels																
Environmental monitoring vessel	Crew Transfer Vessel	Main Engine (Transit)	0.83	2,903	0.46	0.01	0.12	0.02	0.02	0.00	32.66	0.00	0.00	0	0	33
		Main Engine (Maneuvering)	0.20	2,546	0.40	0.01	0.10	0.01	0.01	0.00	28.64	0.00	0.00	0	0	29
		Auxiliary Engine (Transit)	0.43	39	0.01	0.00	0.00	0.00	0.00	0.00	0.44	0.00	0.00	0	0	0
		Auxiliary Engine (Maneuvering)	0.43	142	0.03	0.00	0.01	0.00	0.00	0.00	1.59	0.00	0.00	0	0	2
SOV campaign (e.g., for retrofit campaign)	Service Operation Vessel	Main Engine (Transit)	0.16	71	0.01	0.00	0.00	0.00	0.00	0.00	0.78	0.00	0.00	0	0	1
		Main Engine (Maneuvering)	0.10	4,393	0.72	0.02	0.17	0.03	0.03	0.01	48.42	0.00	0.00	0	1	49
		Auxiliary Engine (Transit)	0.16	61	0.01	0.00	0.00	0.00	0.00	0.00	0.69	0.00	0.00	0	0	1
		Auxiliary Engine (Maneuvering)	0.10	3,810	0.65	0.01	0.16	0.02	0.02	0.00	42.86	0.00	0.00	0	1	43
OSS repair vessel (major repair)	Jack-Up Vessel	Main Engine (Transit)	0.83	718	0.14	0.00	0.03	0.00	0.00	0.00	8.92	0.00	0.00	0	0	9
		Main Engine (Maneuvering)	0.20	16,544	3.18	0.04	0.73	0.10	0.10	0.00	205.43	0.00	0.01	0	3	208
		Auxiliary Engine (Transit)	0.45	91	0.02	0.00	0.00	0.00	0.00	0.00	0.97	0.00	0.00	0	0	1
		Auxiliary Engine (Maneuvering)	0.45	8,733	1.65	0.02	0.35	0.05	0.04	0.00	92.60	0.00	0.00	0	1	94
Miscellaneous																
SF6 Loss	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	754
Misc VOC	N/A	N/A	N/A	N/A	N/A	0.10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OSS Generators	Generator	Tier 4 Generator	0.75	5,143	0.05	0.02	0.28	0.00	0.00	0.00	58.70	0.00	0.00	0	0	59
				Total/yr	2,848,746	502.03	7.61	118.50	15.99	15.48	0.72	33,037.32	0.21	1.58	5.16	471.11	34,267.57
				Total over Project Life	85,462,375	15,061.03	228.39	3,555.07	479.73	464.43	21.47	991,119.61	6.19	47.43	154.73	14,133.42	1,028,027.19

Activity	Representative Vessel Type	Engine Type	Engine Count	Engine Size (kW)	Total Size (kW)	Engine Category	Home Port	Vessel Round Trips (per year)	One-Way Trip Distance (NM)	Total Distance Traveled (NM)	Vessel Transit Speed (knots)	Hours in Transit/Year	Operating Days in WTA/Year	Operating Hours/Day	Total Non-Transit Hours	Total Operating Hours	Emission Factors Ref
Emissions During Operations (SOV Scenario)																	
WTG and BoP Crew logistics																	
CTV All-Year 1	Crew Transfer Vessel	Main Engine (Transit)	4	522	2,088	1 & 2 main	Atlantic City	211	22	9,276	20	464	0	0	0	464	4M
		Main Engine (Maneuvering)	4	522	2,088	1 & 2 main		0	22	0	0	0	211	12	2,532	2,532	4M
		Auxiliary Engine (Transit)	2	27	54	1 & 2 auxiliary		211	22	9,276	20	464	0	0	0	464	4A
		Auxiliary Engine (Maneuvering)	2	27	54	1 & 2 auxiliary		0	22	0	0	0	211	12	2,532	2,532	4A
CTV All-Year 2	Crew Transfer Vessel	Main Engine (Transit)	4	522	2,088	1 & 2 main	Atlantic City	211	22	9,276	20	464	0	0	0	464	4M
		Main Engine (Maneuvering)	4	522	2,088	1 & 2 main		0	22	0	0	0	211	12	2,532	2,532	4M
		Auxiliary Engine (Transit)	2		54	1 & 2 auxiliary		211	22	9,276	20	464	0	0	0	464	4A
		Auxiliary Engine (Maneuvering)	2	27	54	1 & 2 auxiliary		0	22	0	0	0	211	12	2,532	2,532	4A
SOV All-Year 1	Service Operation Vessel	Main Engine (Transit)	4	2,306	9,224	1 & 2 main	Atlantic City	24	22	1,055	20	53	0	0	0	53	3M
		Main Engine (Maneuvering)	4	2,306	9,224	1 & 2 main		0	22	0	0	0	341	24	8,184	8,184	3M
		Auxiliary Engine (Transit)	4	2,000	8,000	1 & 2 auxiliary		24	22	1,055	20	53	0	0	0	53	3A
		Auxiliary Engine (Maneuvering)	4	2,000	8,000	1 & 2 auxiliary		0	22	0	0	0	341	24	8,184	8,184	3A
SOV Daughter Craft 1	Crew Transfer Vessel	Main Engine (Transit)	4	522	2,088	1 & 2 main	N/A	0	0	0	20	0	0	0	0	0	4M
		Main Engine (Maneuvering)	4	522	2,088	1 & 2 main		0	0	0	0	0	186	8	1,488	1,488	4M
		Auxiliary Engine (Transit)	2	27	54	1 & 2 auxiliary		0	0	0	20	0	0	0	0	0	4A
		Auxiliary Engine (Maneuvering)	2	27	54	1 & 2 auxiliary		0	0	0	0	0	186	8	1,488	1,488	4A
WTG heavy logistics / jack-up																	
US Jack-Up	Jack-Up Vessel	Main Engine (Transit)	5	4000	20,000	3 main	NJWP	8	113	1,808	10	181	0	0	0	181	7M
		Main Engine (Maneuvering)	5	4000	20,000	3 main		0	113	0	0	0	38	24	912	912	7M
		Auxiliary Engine (Transit)	1	4000	4,000	3 auxiliary		8	113	1,808	10	181	0	0	0	181	7A
		Auxiliary Engine (Maneuvering)	1	4000	4,000	3 auxiliary		0	113	0	0	0	38	24	912	912	7A
US Feeder Vessel	Feeder/Jack-up	Main Engine (Transit)	2	2350	4,700	3 main	NJWP	8	113	1,808	10	181	0	0	0	181	7M
		Main Engine (Maneuvering)	2	2350	4,700	3 main		0	113	0	0	0	38	24	912	912	7M
		Auxiliary Engine (Transit)	2	1000	2,000	3 auxiliary		8	113	1,808	10	181	0	0	0	181	7A
		Auxiliary Engine (Maneuvering)	2	1000	2,000	3 auxiliary		0	113	0	0	0	38	24	912	912	7A
European Jack-up	Jack-Up Vessel	Main Engine (Transit)	5	4000	20,000	3 main	Europe	8	250	4,000	10	400	0	0	0	400	7M
		Main Engine (Maneuvering)	5	4000	20,000	3 main		0	250	0	0	0	38	24	912	912	7M
		Auxiliary Engine (Transit)	1	4000	4,000	3 auxiliary		8	250	4,000	10	400	0	0	0	400	7A
		Auxiliary Engine (Maneuvering)	1	4000	4,000	3 auxiliary		0	250	0	0	0	38	24	912	912	7A
Cable repair vessel - export cable																	
Cable repair vessel	Cable Lay Vessel	Main Engine (Transit)	0	0	7,280	1 & 2 main	NJWP	1	113	226	10	23	0	0	0	23	3M
		Main Engine (Maneuvering)	0	0	7,280	1 & 2 main		0	113	0	0	0	25	24	600	600	3M
		Auxiliary Engine (Transit)	0	0	220	1 & 2 auxiliary		1	113	226	10	23	0	0	0	23	3A
		Auxiliary Engine (Maneuvering)	0	0	220	1 & 2 auxiliary		0	113	0	0	0	25	24	600	600	3A

Activity	Representative Vessel Type	Engine Type	Engine Count	Engine Size (kW)	Total Size (kW)	Engine Category	Home Port	Vessel Round Trips (per year)	One-Way Trip Distance (NM)	Total Distance Traveled (NM)	Vessel Transit Speed (knots)	Hours in Transit/Year	Operating Days in WTA/Year	Operating Hours/Day	Total Non-Transit Hours	Total Operating Hours	Emission Factors Ref
Cable repair vessel - arrray cable																	
Cable repair vessel	Cable Lay Vessel	Main Engine (Transit)	0	0	7,280	1 & 2 main	NJWP	1	113	226	10	23	0	0	0	23	3M
		Main Engine (Maneuvering)	0	0	7,280	1 & 2 main		0	113	0	0	0	10	24	240	240	3M
		Auxiliary Engine (Transit)	0	0	220	1 & 2 auxiliary		1	113	226	10	23	0	0	0	23	3A
		Auxiliary Engine (Maneuvering)	0	0	220	1 & 2 auxiliary		0	113	0	0	0	10	24	240	240	3A
Cable survey vessel - export cable																	
Cable survey vessel	Survey Vessel	Main Engine (Transit)	2	1,900	3,800	1 & 2 main	NJWP	2	113	452	10	45	0	0	0	45	8M
		Main Engine (Maneuvering)	2	1,900	3,800	1 & 2 main		0	113	0	0	0	51	24	1,224	1,224	8M
		Auxiliary Engine (Transit)	2	99	198	1 & 2 auxiliary		2	113	452	10	45	0	0	0	45	8A
		Auxiliary Engine (Maneuvering)	2	99	198	1 & 2 auxiliary		0	113	0	0	0	51	24	1,224	1,224	8A
Cable survey vessel - arrray cable																	
Cable survey vessel	Survey Vessel	Main Engine (Transit)	2	1,900	3,800	1 & 2 main	NJWP	1	113	226	10	23	0	0	0	23	8M
		Main Engine (Maneuvering)	2	1,900	3,800	1 & 2 main		0	113	0	0	0	19	24	456	456	8M
		Auxiliary Engine (Transit)	2	99	198	1 & 2 auxiliary		1	113	226	10	23	0	0	0	23	8A
		Auxiliary Engine (Maneuvering)	2	99	198	1 & 2 auxiliary		0	113	0	0	0	19	24	456	456	8A
Foundation below water inspection																	
Vessel for subsea inspection	Survey Vessel	Main Engine (Transit)	2	1,900	3,800	1 & 2 main	Atlantic City	3	22	132	10	13	0	0	0	13	8M
		Main Engine (Maneuvering)	2	1,900	3,800	1 & 2 main		0	22	0	0	0	22	24	528	528	8M
		Auxiliary Engine (Transit)	2	99	198	1 & 2 auxiliary		3	22	132	10	13	0	0	0	13	8A
		Auxiliary Engine (Maneuvering)	2	99	198	1 & 2 auxiliary		0	22	0	0	0	22	24	528	528	8A
Other vessels																	
Environmental monitoring vessel	Crew Transfer Vessel	Main Engine (Transit)	4	522	2,088	1 & 2 main	Atlantic City	12	22	528	20	26	0	0	0	26	4M
		Main Engine (Maneuvering)	4	522	2,088	1 & 2 main		0	22	0	0	0	12	8	96	96	4M
		Auxiliary Engine (Transit)	2	27	54	1 & 2 auxiliary		12	22	528	20	26	0	0	0	26	4A
		Auxiliary Engine (Maneuvering)	2	27	54	1 & 2 auxiliary		0	22	0	0	0	12	8	96	96	4A
SOV campaign (e.g., for retrofit campaign)	Service Operation Vessel	Main Engine (Transit)	4	2,306	9,224	1 & 2 main	NJWP	0.03	113	8	10	1	0	0	0	1	3M
		Main Engine (Maneuvering)	4	2,306	9,224	1 & 2 main		0	113	0	0	0	3	24	72	72	3M
		Auxiliary Engine (Transit)	4	2,000	8,000	1 & 2 auxiliary		0.03	113	8	10	1	0	0	0	1	3A
		Auxiliary Engine (Maneuvering)	4	2,000	8,000	1 & 2 auxiliary		0	113	0	0	0	3	24	72	72	3A
OSS repair vessel (major repair)	Jack-Up Vessel	Main Engine (Transit)	5	4000	20,000	3 main	NJWP	0.03	113	8	10	1	0	0	0	1	7M
		Main Engine (Maneuvering)	5	4000	20,000	3 main		0	113	0	0	0	3	24	72	72	7M
		Auxiliary Engine (Transit)	1	4000	4,000	3 auxiliary		0.03	113	8	10	1	0	0	0	1	7A
		Auxiliary Engine (Maneuvering)	1	4000	4,000	3 auxiliary		0	113	0	0	0	3	24	72	72	7A
Miscellaneous																	
SF6 Loss	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Misc VOC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OSS Generators	Generator	Tier 4 Generator	8	500	4,000	Tier 4 Non-Road	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	24	24	30

Activity	Representative Vessel Type	Engine Type	Load Factor	Fuel Consumption (gal)	Emissions (tons)											
					NOx	VOC	CO	PM10	PM2.5	SO2	CO2	CH4	N2O	CH4 as CO2e	N2O as CO2e	CO2e
Emissions During Operations (SOV Scenario)																
WTG and BoP Crew logistics																
CTV All-Year 1	Crew Transfer Vessel	Main Engine (Transit)	0.83	51,045	8.11	0.12	2.04	0.27	0.27	0.01	574.26	0.00	0.03	0.09	8.18	582.54
		Main Engine (Maneuvering)	0.20	67,150	10.66	0.16	2.68	0.36	0.35	0.01	755.44	0.00	0.04	0.12	10.77	766.33
		Auxiliary Engine (Transit)	0.43	684	0.12	0.00	0.03	0.00	0.00	0.00	7.69	0.00	0.00	0.00	0.11	7.81
		Auxiliary Engine (Maneuvering)	0.43	3,734	0.67	0.01	0.16	0.02	0.02	0.00	42.01	0.00	0.00	0.01	0.60	42.61
CTV All-Year 2	Crew Transfer Vessel	Main Engine (Transit)	0.83	51,045	8.11	0.12	2.04	0.27	0.27	0.01	574.26	0.00	0.03	0.09	8.18	582.54
		Main Engine (Maneuvering)	0.20	67,150	10.66	0.16	2.68	0.36	0.35	0.01	755.44	0.00	0.04	0.12	10.77	766.33
		Auxiliary Engine (Transit)	0.43	684	0.12	0.00	0.03	0.00	0.00	0.00	7.69	0.00	0.00	0.00	0.11	7.81
		Auxiliary Engine (Maneuvering)	0.43	3,734	0.67	0.01	0.16	0.02	0.02	0.00	42.01	0.00	0.00	0.01	0.60	42.61
SOV All-Year 1	Service Operation Vessel	Main Engine (Transit)	0.16	4,945	0.81	0.02	0.19	0.03	0.03	0.01	54.50	0.00	0.00	0.01	0.79	55.30
		Main Engine (Maneuvering)	0.10	499,313	82.25	2.17	19.07	2.95	2.86	0.74	5,503.40	0.03	0.27	0.87	80.06	5,584.33
		Auxiliary Engine (Transit)	0.16	4,288	0.74	0.01	0.18	0.02	0.02	0.00	48.25	0.00	0.00	0.01	0.69	48.94
		Auxiliary Engine (Maneuvering)	0.10	433,055	74.34	1.05	18.64	2.41	2.33	0.05	4,872.18	0.03	0.23	0.75	69.44	4,942.37
SOV Daughter Craft 1	Crew Transfer Vessel	Main Engine (Transit)	0.83	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Main Engine (Maneuvering)	0.20	39,463	6.27	0.10	1.58	0.21	0.21	0.00	443.96	0.00	0.02	0.07	6.33	450.35
		Auxiliary Engine (Transit)	0.43	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Auxiliary Engine (Maneuvering)	0.43	2,194	0.40	0.01	0.09	0.01	0.01	0.00	24.69	0.00	0.00	0.00	0.35	25.04
WTG heavy logistics / jack-up																
US Jack-Up	Jack-Up Vessel	Main Engine (Transit)	0.83	172,419	33.19	0.46	7.61	1.03	0.99	0.04	2,140.92	0.01	0.10	0.33	30.56	2,171.81
		Main Engine (Maneuvering)	0.20	209,557	40.33	0.56	9.25	1.25	1.21	0.05	2,602.06	0.02	0.12	0.40	37.15	2,639.61
		Auxiliary Engine (Transit)	0.43	20,955	3.96	0.05	0.85	0.11	0.11	0.00	222.21	0.00	0.01	0.03	3.17	225.41
		Auxiliary Engine (Maneuvering)	0.43	105,696	19.97	0.24	4.29	0.55	0.54	0.01	1,120.82	0.01	0.05	0.17	15.97	1,136.97
US Feeder Vessel	Feeder/Jack-up	Main Engine (Transit)	0.83	40,518	7.80	0.11	1.79	0.24	0.23	0.01	503.12	0.00	0.02	0.08	7.18	510.38
		Main Engine (Maneuvering)	0.20	49,246	9.48	0.13	2.17	0.29	0.28	0.01	611.48	0.00	0.03	0.09	8.73	620.31
		Auxiliary Engine (Transit)	0.45	10,965	2.07	0.03	0.44	0.06	0.06	0.00	116.27	0.00	0.01	0.02	1.66	117.95
		Auxiliary Engine (Maneuvering)	0.45	55,306	10.45	0.13	2.24	0.29	0.28	0.01	586.48	0.00	0.03	0.09	8.36	594.93
European Jack-up	Jack-Up Vessel	Main Engine (Transit)	0.83	381,431	73.41	1.02	16.83	2.27	2.20	0.10	4,736.20	0.03	0.23	0.73	67.62	4,804.55
		Main Engine (Maneuvering)	0.20	209,557	40.33	0.56	9.25	1.25	1.21	0.05	2,602.06	0.02	0.12	0.40	37.15	2,639.61
		Auxiliary Engine (Transit)	0.43	46,358	8.76	0.11	1.88	0.24	0.24	0.00	491.59	0.00	0.02	0.08	7.01	498.67
		Auxiliary Engine (Maneuvering)	0.43	105,696	19.97	0.24	4.29	0.55	0.54	0.01	1,120.82	0.01	0.05	0.17	15.97	1,136.97
Cable repair vessel - export cable																
Cable repair vessel	Cable Lay Vessel	Main Engine (Transit)	0.83	8,673	1.43	0.04	0.33	0.05	0.05	0.01	95.60	0.00	0.00	0.02	1.39	97.00
		Main Engine (Maneuvering)	0.20	55,481	9.14	0.24	2.12	0.33	0.32	0.08	611.51	0.00	0.03	0.10	8.90	620.50
		Auxiliary Engine (Transit)	0.56	177	0.03	0.00	0.01	0.00	0.00	0.00	1.99	0.00	0.00	0.00	0.03	2.02
		Auxiliary Engine (Maneuvering)	0.56	4,695	0.81	0.01	0.20	0.03	0.03	0.00	52.82	0.00	0.00	0.01	0.75	53.58

Activity	Representative Vessel Type	Engine Type	Load Factor	Fuel Consumption (gal)	Emissions (tons)											
					NOx	VOC	CO	PM10	PM2.5	SO2	CO2	CH4	N2O	CH4 as CO2e	N2O as CO2e	CO2e
Cable repair vessel - arrray cable																
Cable repair vessel	Cable Lay Vessel	Main Engine (Transit)	0.83	8,673	1.43	0.04	0.33	0.05	0.05	0.01	95.60	0.00	0.00	0.02	1.39	97.00
		Main Engine (Maneuvering)	0.20	22,192	3.66	0.10	0.85	0.13	0.13	0.03	244.60	0.00	0.01	0.04	3.56	248.20
		Auxiliary Engine (Transit)	0.56	177	0.03	0.00	0.01	0.00	0.00	0.00	1.99	0.00	0.00	0.00	0.03	2.02
		Auxiliary Engine (Maneuvering)	0.56	1,878	0.32	0.00	0.08	0.01	0.01	0.00	21.13	0.00	0.00	0.00	0.30	21.43
Cable survey vessel - export cable																
Cable survey vessel	Survey Vessel	Main Engine (Transit)	0.83	9,054	1.55	0.03	0.35	0.05	0.05	0.01	100.31	0.00	0.00	0.02	1.45	101.77
		Main Engine (Maneuvering)	0.20	59,078	10.11	0.23	2.31	0.35	0.34	0.07	654.48	0.00	0.03	0.10	9.47	664.06
		Auxiliary Engine (Transit)	0.43	244	0.04	0.00	0.01	0.00	0.00	0.00	2.75	0.00	0.00	0.00	0.04	2.79
		Auxiliary Engine (Maneuvering)	0.43	6,618	1.17	0.02	0.28	0.04	0.04	0.00	74.46	0.00	0.00	0.01	1.06	75.53
Cable survey vessel - arrray cable																
Cable survey vessel	Survey Vessel	Main Engine (Transit)	0.83	4,527	0.77	0.02	0.18	0.03	0.03	0.01	50.15	0.00	0.00	0.01	0.73	50.89
		Main Engine (Maneuvering)	0.20	22,010	3.77	0.08	0.86	0.13	0.13	0.03	243.83	0.00	0.01	0.04	3.53	247.39
		Auxiliary Engine (Transit)	0.43	122	0.02	0.00	0.01	0.00	0.00	0.00	1.37	0.00	0.00	0.00	0.02	1.39
		Auxiliary Engine (Maneuvering)	0.43	2,466	0.44	0.01	0.11	0.01	0.01	0.00	27.74	0.00	0.00	0.00	0.40	28.14
Foundation below water inspection																
Vessel for subsea inspection	Survey Vessel	Main Engine (Transit)	0.83	2,642	0.45	0.01	0.10	0.02	0.02	0.00	29.27	0.00	0.00	0.00	0.42	29.69
		Main Engine (Maneuvering)	0.20	25,485	4.36	0.10	1.00	0.15	0.15	0.03	282.33	0.00	0.01	0.04	4.09	286.46
		Auxiliary Engine (Transit)	0.43	71	0.01	0.00	0.00	0.00	0.00	0.00	0.80	0.00	0.00	0.00	0.01	0.81
		Auxiliary Engine (Maneuvering)	0.43	2,855	0.51	0.01	0.12	0.02	0.02	0.00	32.12	0.00	0.00	0.00	0.46	32.58
Other vessels																
Environmental monitoring vessel	Crew Transfer Vessel	Main Engine (Transit)	0.83	2,903	0.46	0.01	0.12	0.02	0.02	0.00	32.66	0.00	0.00	0	0	33
		Main Engine (Maneuvering)	0.20	2,546	0.40	0.01	0.10	0.01	0.01	0.00	28.64	0.00	0.00	0	0	29
		Auxiliary Engine (Transit)	0.43	39	0.01	0.00	0.00	0.00	0.00	0.00	0.44	0.00	0.00	0	0	0
		Auxiliary Engine (Maneuvering)	0.43	142	0.03	0.00	0.01	0.00	0.00	0.00	1.59	0.00	0.00	0	0	2
SOV campaign (e.g., for retrofit campaign)	Service Operation Vessel	Main Engine (Transit)	0.16	71	0.01	0.00	0.00	0.00	0.00	0.00	0.78	0.00	0.00	0	0	1
		Main Engine (Maneuvering)	0.10	4,393	0.72	0.02	0.17	0.03	0.03	0.01	48.42	0.00	0.00	0	1	49
		Auxiliary Engine (Transit)	0.16	61	0.01	0.00	0.00	0.00	0.00	0.00	0.69	0.00	0.00	0	0	1
		Auxiliary Engine (Maneuvering)	0.10	3,810	0.65	0.01	0.16	0.02	0.02	0.00	42.86	0.00	0.00	0	1	43
OSS repair vessel (major repair)	Jack-Up Vessel	Main Engine (Transit)	0.83	718	0.14	0.00	0.03	0.00	0.00	0.00	8.92	0.00	0.00	0	0	9
		Main Engine (Maneuvering)	0.20	16,544	3.18	0.04	0.73	0.10	0.10	0.00	205.43	0.00	0.01	0	3	208
		Auxiliary Engine (Transit)	0.45	91	0.02	0.00	0.00	0.00	0.00	0.00	0.97	0.00	0.00	0	0	1
		Auxiliary Engine (Maneuvering)	0.45	8,733	1.65	0.02	0.35	0.05	0.04	0.00	92.60	0.00	0.00	0	1	94
Miscellaneous																
SF6 Loss	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	754.0
Misc VOC	N/A	N/A	N/A	N/A	N/A	0.10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OSS Generators	Generator	Tier 4 Generator	0.75	5,143	0.05	0.02	0.28	0.00	0.00	0.00	58.70	0.00	0.00	0	0	58.9

Total/yr	2,918,503	521.0	8.7	121.7	16.7	16.2	1.4	33,707.4	0.2	1.6	5.3	482.3	34,948.9
Total over Project Life	87,555,089	15,631.4	262.4	3,650.5	501.0	485.3	42.4	1,011,221.0	6.3	48.6	158.4	14,469.0	1,048,467.8

Vessels	2,913,360	521.0	8.6	121.4	16.7	16.2	1.4	33,648.7	0.2	1.6	5.2	482.2	34,136.0
	87,400,804	15,629.8	258.9	3,642.1	500.9	485.3	42.4	1,009,460.0	6.3	48.5	156.6	14,464.7	1,024,081.3

Non-vessel	5,143	0.05	0.12	0.28	0.00	0.00	0.00	58.70	0.00	0.00	0.06	0.14	812.88
	154,286	1.6	3.5	8.3	0.0	0.0	0.0	1,761.0	0.1	0.0	1.8	4.3	24,386.4

Avoided Emissions

WTG Count	157
WTG Output (MW)	15
Total Capacity (MW)	2,355
Capacity Factor	50%
Transmission Loss Factor	4.0%
Hours per Year	8,760
Annual Power Generated (MW-hr)	9,902,304

	Avoided Emissions Factor (lb/MWh)[1]	Annual Power Displacement (MW-hr)	Annual Emissions Displacement (ton/yr)	Operating Term (years)	Lifetime Emission Displacement (tons)
NOx	0.708	9,902,304	3,505	30	105,162.47
SO2	0.669	9,902,304	3,312	30	99,369.62
CO2e	1,239.051	9,902,304	6,134,730	30	184,041,895.10
PM	0.048	9,902,304	238	30	7,147.81

1 RFCE Non-Baseload Annual Factors from EPA eGRID 2020 v2 data

Cars Removed Equivalency

6,134,730	US Tons CO2e per year
1.10231	Conversion Factor (US tons/metric ton)
5,565,340	Metric Tons CO2e per year
4.6	Metric tons CO2e per car per EPA[1]
1,209,857	Cars Removed from Road per year

1) Based on EPA Office of Transportation and Air Quality Report EPA-420-F-18-008 "Greenhouse Gas Emissions from a Typical Passenger Vehicle" (March 2018)

Data Year	eGRID subregion acronym	eGRID subregion name	eGRID subregion annual NOx non-baseload output emission rate (lb/MWh)	eGRID subregion ozone season NOx non-baseload output emission rate (lb/MWh)	eGRID subregion annual SO2 non-baseload output emission rate (lb/MWh)	eGRID subregion annual CO2 non-baseload output emission rate (lb/MWh)	eGRID subregion annual CH4 non-baseload output emission rate (lb/MWh)	eGRID subregion annual N2O non-baseload output emission rate (lb/MWh)	eGRID subregion annual CO2e non-baseload output emission rate (lb/MWh)	eGRID subregion annual Hg non-baseload output emission rate (lb/MWh)
YEAR	SUBRGN	SRNAME	SRNBNOX	SRNBNXO	SRNBSO2	SRNBCO2	SRNBCH4	SRNBN2O	SRNBC2E	SRNBHG
2020	AKGD	ASCC Alaska Grid	6.758	6.969	0.731	1,315.096	0.126	0.017	1,323.405	--
2020	AKMS	ASCC Miscellaneous	24.220	24.790	2.068	1,517.677	0.066	0.012	1,522.833	--
2020	AZNM	WECC Southwest	0.842	0.848	0.248	1,368.620	0.090	0.013	1,374.611	--
2020	CAMX	WECC California	0.861	0.891	0.072	1,006.543	0.053	0.007	1,009.918	--
2020	ERCT	ERCOT All	0.759	0.726	0.898	1,296.564	0.086	0.012	1,302.281	--
2020	FRCC	FRCC All	0.333	0.329	0.195	1,011.041	0.052	0.007	1,014.387	--
2020	HIMS	HICC Miscellaneous	11.387	11.441	5.015	1,542.053	0.134	0.022	1,551.844	--
2020	HIOA	HICC Oahu	4.547	4.499	7.887	1,753.514	0.175	0.027	1,766.006	--
2020	MROE	MRO East	1.123	1.146	0.402	1,628.850	0.143	0.021	1,638.466	--
2020	MROW	MRO West	1.333	1.297	1.639	1,809.950	0.185	0.027	1,822.510	--
2020	NEWE	NPCC New England	0.404	0.351	0.110	882.514	0.070	0.009	886.937	--
2020	NWPP	WECC Northwest	1.484	1.489	0.837	1,652.995	0.159	0.023	1,663.799	--
2020	NYCW	NPCC NYC/Westchester	0.359	0.357	0.010	970.210	0.021	0.002	971.421	--
2020	NYLI	NPCC Long Island	0.762	0.762	0.084	1,260.578	0.034	0.004	1,262.647	--
2020	NYUP	NPCC Upstate NY	0.403	0.378	0.127	877.939	0.042	0.005	880.510	--
2020	PRMS	Puerto Rico Miscellaneous	4.597	4.503	5.545	1,673.322	0.070	0.013	1,678.811	--
2020	RFCE	RFC East	0.708	0.674	0.669	1,233.441	0.085	0.012	1,239.051	--
2020	RFCM	RFC Michigan	1.062	1.085	1.600	1,725.700	0.163	0.023	1,736.543	--
2020	RFCW	RFC West	1.168	1.060	1.280	1,810.416	0.173	0.025	1,822.170	--
2020	RMPA	WECC Rockies	0.906	0.868	0.414	1,651.930	0.131	0.019	1,660.762	--
2020	SPNO	SPP North	1.033	1.027	0.379	1,969.947	0.205	0.030	1,983.865	--
2020	SPSO	SPP South	1.188	1.248	1.111	1,514.115	0.100	0.014	1,520.847	--
2020	SRMV	SERC Mississippi Valley	0.949	1.108	1.016	1,137.434	0.055	0.008	1,141.035	--
2020	SRMW	SERC Midwest	1.566	1.582	2.875	1,866.455	0.194	0.028	1,879.608	--
2020	SRSO	SERC South	0.691	0.641	0.311	1,336.891	0.094	0.013	1,343.223	--
2020	SRTV	SERC Tennessee Valley	0.672	0.649	0.857	1,511.842	0.135	0.019	1,520.961	--
2020	SRVC	SERC Virginia/Carolina	0.684	0.750	0.394	1,323.895	0.114	0.016	1,331.259	--

Year	eGRID subregion acronym	eGRID subregion name	Subregion annual net generation (MWh)	PM2.5 Emissions (tons)	PM2.5 Total Output Emission rate (lb/MWh)
YEAR	SUBRGN	SRNAME	SRNGENAN	SRPM25AN	SRPM25RTA
2018	AKGD	ASCC Alaska Grid	4,641,060	478	0.2059
2018	AKMS	ASCC Miscellaneous	1,603,241	628	0.7832
2018	AZNM	WECC Southwest	165,353,383	6,613	0.0800
2018	CAMX	WECC California	200,103,502	3,143	0.0314
2018	ERCT	ERCOT All	411,784,692	9,557	0.0464
2018	FRCC	FRCC All	233,469,406	7,555	0.0647
2018	HIMS	HICC Miscellaneous	2,743,591	1,270	0.9257
2018	HIOA	HICC Oahu	7,053,182	2,034	0.5766
2018	MROE	MRO East	24,091,646	441	0.0366
2018	MROW	MRO West	236,704,124	7,774	0.0657
2018	NEWE	NPCC New England	105,482,006	2,421	0.0459
2018	NWPP	WECC Northwest	294,782,039	5,496	0.0373
2018	NYCW	NPCC NYC/Westchester	43,455,637	1,588	0.0731
2018	NYLI	NPCC Long Island	10,573,426	325	0.0615
2018	NYUP	NPCC Upstate NY	84,997,204	703	0.0165
2018	RFCE	RFC East	297,325,701	7,154	0.0481
2018	RFCM	RFC Michigan	94,438,353	3,021	0.0640
2018	RFCW	RFC West	532,056,236	28,141	0.1058
2018	RMPA	WECC Rockies	65,413,620	790	0.0242
2018	SPNO	SPP North	70,807,115	1,779	0.0502
2018	SPSO	SPP South	160,677,686	4,112	0.0512
2018	SRMV	SERC Mississippi Valley	177,877,883	3,941	0.0443
2018	SRMW	SERC Midwest	128,388,555	4,163	0.0648
2018	SRSO	SERC South	262,135,271	4,609	0.0352
2018	SRTV	SERC Tennessee Valley	224,259,819	17,884	0.1595
2018	SRVC	SERC Virginia/Carolina	328,151,742	8,446	0.0515
2018	**U.S.**		**4,168,370,118**	**134,064**	**0.0643**

	Fuel Consumption (gal)	Emissions											
		NOx	VOC	CO	PM10	PM2.5	SO2	CO2	CH4	N2O	CH4 as CO2e	N2O as CO2e	CO2e
Area A - New England and Northern NY													
Offshore Construction (tons)	931,673.3	154.2	2.9	37.1	5.3	5.1	0.5	10,408.4	0.1	0.5	1.6	149.4	10,559.4
Onshore Construction (tons)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
O&M (ton/yr)	702,424.1	134.2	1.9	30.6	4.1	4.0	0.2	8,536.4	0.1	0.4	1.3	121.9	8,659.7
Area B - Southern NJ, DE, and MD													
Offshore Construction (tons)	31,870,821.4	5,296.2	119.0	1,310.8	178.9	173.3	23.3	360,616.4	3.2	16.3	79.2	4,869.5	365,565.1
Onshore Construction (tons)	927,558.7	73.7	9.4	52.9	2.9	2.9	0.1	10,516.1	0.4	0.1	10.7	25.5	10,552.3
O&M (ton/yr)	3,039,208.7	516.7	8.0	124.4	16.8	16.2	1.3	34,731.1	0.2	1.7	5.4	495.1	35,985.6
Area C - Northern NJ, Southern NY, and Southern CT													
Offshore Construction (tons)	690,948.4	118.1	2.6	26.7	4.1	3.9	0.7	7,664.1	0.0	0.4	1.2	110.8	7,776.1
Onshore Construction (tons)	927,558.7	73.7	9.4	52.9	2.9	2.9	0.1	10,516.1	0.4	0.1	10.7	25.5	10,552.3
O&M (ton/yr)	1,969,463.6	323.1	4.9	79.7	10.8	10.4	0.3	22,423.0	0.1	1.1	3.5	319.7	22,746.2
Area D - VA and SC													
Offshore Construction (tons)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Onshore Construction (tons)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
O&M (ton/yr)	2,458,484.4	469.5	6.6	106.9	14.4	14.0	0.7	29,877.6	0.2	1.4	4.6	426.7	30,308.9
Area E - TX and LA													
Offshore Construction (tons)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Onshore Construction (tons)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
O&M (ton/yr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Port	Location	County		LAT	LON	Region	2015 8hr O3	2010 1hr SO2	1971 3hr SO2	2012 Annual PM2.5
Port of Albany	Albany, New York	Albany	NY	42.6264202	-73.7564708	A	Attainment	Attainment	Attainment	Attainment
Port of Coeymans Marine Terminal	Coeymans, New York	Albany	NY	42.48888284	-73.7926904	A	Attainment	Attainment	Attainment	Attainment
New Jersey Wind Port	Lower Alloways Creek, New Jersey	Salem	NJ	39.46517005	-75.5080948	B	Marginal Nonattainment	Attainment	Attainment	Attainment
Port of Paulsboro	Paulsboro, New Jersey	Gloucester	NJ	39.85102743	-75.2372295	B	Marginal Nonattainment	Attainment	Attainment	Attainment
Repauno Port & Rail Terminal	Greenwich Township, New Jersey	Cumberland	NJ	39.83032444	-75.2929216	B	Marginal Nonattainment	Attainment	Attainment	Attainment
Arthur Kill Terminal	Staten Island, New York	Richmond	NY	40.55170783	-74.2350123	C	Moderate Nonattainment	Attainment	Attainment	Attainment
Portsmouth Marine Terminal	Portsmouth, Virginia	Norfolk	VA	36.85441567	-76.3281731	D	Attainment	Attainment	Attainment	Attainment
Ingleside	Ingleside, Texas	San Patricio	TX	27.84697343	-97.1870128	E	Attainment	Attainment	Attainment	Attainment

	Attainment Status				
Port	**2006 24hr PM2.5**	**1987 24hr PM10**	**2008 Quarterly Lead**	**1971 1hr CO**	**1971 Annual NO2**
Port of Albany	Attainment	Attainment	Attainment	Attainment	Attainment
Port of Coeymans Marine Terminal	Attainment	Attainment	Attainment	Attainment	Attainment
New Jersey Wind Port	Attainment	Attainment	Attainment	Maintenance	Attainment
Port of Paulsboro	Maintenance	Attainment	Attainment	Attainment	Attainment
Repauno Port & Rail Terminal	Attainment	Attainment	Attainment	Attainment	Attainment
Arthur Kill Terminal	Maintenance	Attainment	Attainment	Maintenance	Attainment
Portsmouth Marine Terminal	Attainment	Attainment	Attainment	Attainment	Attainment
Ingleside	Attainment	Attainment	Attainment	Attainment	Attainment

Year 1 Construction Emissions													
Activity Group	Fuel Consumption (gal)	Emissions (tons)											
		NOx	VOC	CO	PM10	PM2.5	SO2	CO2	CH4	N2O	CH4 as CO2e	N2O as CO2e	CO2e
Foundation Installation (FOU)	10,577,471.6	1,750.9	32.8	421.5	60.5	58.6	5.9	118,197.1	0.7	5.7	18.4	1,696.0	119,911.5
Offshore Substation Installation (OSS)	2,181,285.7	397.6	15.1	79.9	13.2	12.6	5.8	23,674.7	0.3	1.0	7.4	301.6	23,983.6
Scour Protection	407,557.7	68.0	1.5	16.1	2.4	2.3	0.4	4,519.3	0.0	0.2	0.7	65.3	4,585.4
Inter Array Cable Installation	1,313,739.1	219.3	4.8	52.3	7.6	7.4	1.3	14,589.7	0.1	0.7	2.3	210.6	14,802.7
WTG Installation	3,674,892.7	635.0	11.8	158.6	20.5	19.9	1.3	43,090.4	0.4	1.9	9.5	576.6	43,676.6
Export Cable Installation	1,882,194.1	315.7	6.5	76.0	10.8	10.5	1.6	20,949.3	0.1	1.0	3.3	301.8	21,254.4
Fuel Bunkering	1,522,093.4	208.5	6.6	67.0	7.6	7.4	0.6	17,117.2	0.3	0.6	6.9	186.7	17,310.7
Stationary Generators	404,262.9	4.2	1.2	21.8	0.1	0.1	0.0	4,614.1	0.2	0.0	4.7	11.2	4,630.0
Miscellaneous	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	21,963,497.2	3,599.2	80.9	893.2	122.7	118.8	16.9	246,751.9	2.1	11.2	53.1	3,349.8	250,154.8

Year 2 Construction Emissions													
Activity Group	Fuel Consumption (gal)	Emissions (tons)											
		NOx	VOC	CO	PM10	PM2.5	SO2	CO2	CH4	N2O	CH4 as CO2e	N2O as CO2e	CO2e
Foundation Installation (FOU)	10,443,579.6	1,728.7	32.4	416.1	59.7	57.9	5.8	116,700.9	0.7	5.6	18.1	1,674.6	118,393.6
Offshore Substation Installation (OSS)	1,090,642.9	198.8	7.6	39.9	6.6	6.3	2.9	11,837.3	0.1	0.5	3.7	150.8	11,991.8
Scour Protection	402,398.7	67.1	1.5	15.9	2.3	2.3	0.4	4,462.1	0.0	0.2	0.7	64.5	4,527.4
Inter Array Cable Installation	1,297,109.5	216.6	4.7	51.6	7.5	7.3	1.3	14,405.1	0.1	0.7	2.3	208.0	14,615.3
WTG Installation	4,462,369.7	771.0	14.4	192.6	24.9	24.1	1.6	52,324.0	0.5	2.3	11.6	700.2	53,035.8
Export Cable Installation	1,045,663.4	175.4	3.6	42.2	6.0	5.8	0.9	11,638.5	0.1	0.6	1.8	167.7	11,808.0
Fuel Bunkering	1,428,623.6	195.7	6.2	62.9	7.1	6.9	0.6	16,066.0	0.3	0.6	6.5	175.2	16,247.7
Stationary Generators	444,360.0	4.6	1.3	24.0	0.1	0.1	0.0	5,071.8	0.2	0.0	5.1	12.3	5,089.2
Miscellaneous	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	20,614,747.4	3,357.9	72.2	845.3	114.3	110.8	13.5	232,505.8	2.0	10.6	49.8	3,153.2	235,708.8

Year 3 Construction Emissions													
Activity Group	Fuel Consumption (gal)	Emissions (tons)											
		NOx	VOC	CO	PM10	PM2.5	SO2	CO2	CH4	N2O	CH4 as CO2e	N2O as CO2e	CO2e
Foundation Installation (FOU)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offshore Substation Installation (OSS)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scour Protection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Inter Array Cable Installation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WTG Installation	1,837,446.3	317.5	5.9	79.3	10.2	9.9	0.6	21,545.2	0.2	1.0	4.8	288.3	21,838.3
Export Cable Installation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel Bunkering	149,444.3	20.5	0.7	6.6	0.7	0.7	0.1	1,680.6	0.0	0.1	0.7	18.3	1,699.6
Stationary Generators	169,560.0	1.8	0.5	9.2	0.1	0.1	0.0	1,935.3	0.1	0.0	2.0	4.7	1,942.0
Miscellaneous	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	2,156,450.6	339.7	7.3	95.1	11.0	10.7	0.7	25,161.1	0.3	1.0	7.4	311.3	25,479.9