Review of the Environmental Impact Assessment (EIA)
Proposed Old Harbour Plant Repowering Project (190 MW)

Done by

CL Environmental Limited

Review prepared by:

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With technical assistance from the
Environmental Law Alliance Worldwide
Eugene, Oregon
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This document contains the professional opinion of the Jamaica Environment Trust (JET). In arriving at our opinion we made every reasonable attempt to ensure that our resource persons are informed and reliable and experts in the area in which their comment and analysis is sought. JET encourages readers to apply their own critical analysis to the information provided in this document and by others, particularly where JET's opinion differs from those others.

With technical assistance from the Environmental Law Alliance Worldwide (ELAW) in Eugene, Oregon, the Jamaica Environment Trust (JET) reviewed the Environmental Impact Assessment (EIA) of the proposed Old Harbour Plant Repowering Project (190 MW) done by CL Environmental Ltd. Our comments follow:

Failure to properly define the purpose and need of the project

The EIA for the proposed Old Harbour Plant Repowering Project (190 MW) too narrowly defines the purpose and need for the project. Properly defining the purpose and need (sometimes called the Rationale and Objectives) of a proposed project is the critical first step of the environmental impact assessment process. The purpose and need for the proposed project must be accurately articulated. It should not be too broadly defined so as to require the assessment of limitless range of project alternatives. Similarly, it should not be too narrowly defined as to preclude the assessment of reasonable project alternatives.

The purpose and need for a project by a public utility for the generation of energy should be defined as fulfilling the country's overall demand for electricity. Page 35 of the EIA states: "Jamaica Public Service Company (JPS) is the sole distributor of electricity in Jamaica and is a proud inheritor of a tradition that dates back to 1892, when Jamaica first received electricity." Therefore, the purpose and need for the proposed Old Harbour Plant Repowering Project (190 MW) should be defined as fulfilling Jamaica's overall demand for electricity.

Page 37 of the EIA for the proposed Old Harbour Plant Repowering Project (190 MW) contains a narrow statement of the purpose and need for the project:

> "4.2.3 Rationale and Objectives
>
> "The current 220 MW Old Harbour Power Plant utilizes heavy fuel oil for power generation and is considered inefficient. This new 190 MW Nominal combined cycle development will be undertaken from Q1 2016 to Q1 2018."

If JPS is the sole distributor of electricity in Jamaica, then its mission is to fulfill Jamaica's overall need for electricity. The manner in which the EIA states the purpose and need for the proposed Old Harbour Plant Repowering Project narrowly and mistakenly defines the mission of JPS as replacing the current 220 MW Old Harbour Power Plant with a similar energy-generating facility at the same location. As discussed below, defining the purpose and need for the proposed Old Harbour Plant Repowering Project in this manner precludes consideration of alternatives that would fulfill the mission of JPS but that do not involve the construction of a energy-generating facility at the same location. In fact, JPS could fulfill its mission of fulfill Jamaica's overall need for electricity whether or not it replaced the current 220 MW Old Harbour Power Plant at the same location.

Insufficient analysis of renewable energy alternatives to the project

In the space of less than one page, the EIA for the proposed Old Harbour Plant Repowering Project (190 MW) dismisses alternatives for fulfilling the purpose and need of the project by building additional renewable energy capacity based on wind and solar. Pages 389-390 of the EIA state:

> "10.5.3 Generating the Required Power but using Renewable Energy Resources
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> "Wind, solar and hydro energy as renewable energy sources were also considered. Although all three are clean forms of energy there are some limitations and generally, continued resource constraints limit the full value of renewable resources.
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> "10.5.3.1 Wind Energy
>
> "IMPACT
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> "□ Physical: Wind turbines would not be able to produce enough energy for this size of plant as the largest turbines to date are producing 3MW. This would require 120 wind turbines to generate the required power. There are two inherent problems with this; the land space required to establish these turbines and the unreliability (fluctuation) in wind doesn't make it suitable to be used for base power.
>
> "10.5.3.2 Solar Energy
>
> "IMPACT
>
> "□ Physical: The acreage (land area) required for solar panels to produce the required energy makes it unsuitable for this area."

There are numerous flaws in this analysis.

First, it is incorrect to assess the alternative of wind energy within the land space constraints of the site of the current 220 MW Old Harbour Power Plant. JPS could construct 120 wind turbines at practically any other location and still fulfill the basic purpose and need of the proposed Old Harbour Plant Repowering Project (190 MW). A recent report of the Worldwatch Institute documents ample availability of wind energy in Jamaica – at least 300 MW.

> "Peak demand in 2011 occurred in August and reached 617.7 megawatts (MW). To date, the highest peak demand in Jamaica is 627.5 MW. Although meeting the country's electricity needs with renewable energy might seem like a daunting task, Jamaica's peak demand is just a fraction of the new

renewable capacity being installed worldwide each year. In 2011 alone, the world added 30 gigawatts (GW) of solar photovoltaic (PV) capacity to reach 70 GW total, and 40 GW of wind capacity to reach 238 GW total. Global solar PV and wind capacity additions in 2011 alone were more than 1,000 times greater than Jamaica's highest electricity demand to date. …

"3.3.4 Summary of Wind Power Potential

"Jamaica overall has very strong wind potential, and several regions demonstrate resource potentials that are suitable for wind energy development. Fifteen locations in the Wigton and 3TIER assessments had average wind speeds above 6 m/s. Assuming that 10 of these sites are developed, they could supply at least half of Jamaica's current power demand. (See Table 3.5.)"[1]

Second, it is incorrect to state that wind energy cannot meet baseload energy requirements. A growing body of evidence that is based on emerging technologies to overcome the 'intermittency' of wind energy power plants shows that they could indeed meet baseload energy requirements. A study published by scientists with the Hydrogen Research Institute, the University of Delaware and Stanford University on the potential for wind energy to meet baseload energy requirements states:

"This study evaluates two wind models that are designed to replace baseload coal plants and thereby reduce CO2 emissions: (1) traditional method, in which wind power is supported by electricity supplied by natural gas combined-cycle power plants (Wind-NGCC); and (2) storage method, in which wind power is supported by electricity from compressed air energy storage (Wind-CAES). These two wind models are compared against baseload coal power plants when relevant. Descriptions of the models are presented below.

"In both Wind-NGCC and Wind-CAES models, the electricity supplied by wind combined with either NGCC or CAES must have the same level of reliability as conventional fossil fuel or nuclear baseload power plants. In addition, capacity specifications are designed to supply a pre-determined quantity of electricity (400 MW) 90% of the hours in a year and 100% of the hours during summer and winter peak load periods. As such, both designs can effectively be considered baseload systems.

"In the Wind-CAES model (Fig. 5b), the wind farms supply the maximum 400 MW of power 49% of the year, and the CAES plant is supplying its maximum

[1] Worldwatch Institute (2013) "Developing a Sustainable Energy Roadmap for Jamaica: An Integrated Approach." http://www.worldwatch.org/system/files/Jamaica-Sustainable-Energy-Roadmap-112013.pdf

output only 3% of the year. The wind farm supplies 80% of total electricity, and the CAES plant supplies 20%. The Wind-CAES model supplies 400 MW of power to the local grid 94.9% of the hours in a year. With scheduled CAES maintenance downtime in low-demand Spring and Fall months, which are periods of the year when the wind resource is generally high, the wind farms are able to supply 400 MW of power for about half of the CAES plant scheduled maintenance downtime. Therefore, the actual annual capacity factor for the Wind-CAES model exceeds the 90% requirement.

"From a short-term policy perspective with blinders in regards to future natural gas and CO2 emissions reduction policy, it is easy to discard the Wind-CAES model. On the other hand, from a long-term policy perspective taking into account future natural gas supply/demand dynamics and CO2 emissions reduction policy, it is much harder to reject the Wind-CAES model. The strength of the Wind-CAES model is the very low aggregate fuel consumption rate and the corresponding low CO2 emissions rate. The Wind-CAES model is a sure means of insulating future electricity prices from natural gas price volatility and achieving a >80% reduction in power plant CO2 emissions by 2050 to mitigate climate change."[2]

We note that JPS was "awarded the right" to go ahead with this Project (Executive Summary, Pg. 1). The EIA has presumed that this project that will go ahead and states throughout that construction will begin in first quarter 2016. Analysis of alternatives is taking place far too late in the approvals process – another issue that JET has been raising for almost ten years.

Failure to provide a cumulative assessment of connected actions

The proposed Old Harbour Plant Repowering Project (190 MW) is only possible if a Floating Storage and Regasification Unit (FSRU) is built for the importation of liquefied natural gas (LNG). Similarly, the FSRU would not likely be built if the proposed Old Harbour Plant Repowering Project (190 MW) would not rely of LNG. That is, the two projects are symbiotic. Page 42 of the EIA states:

"4.3.2 Fuel Supply

"Natural gas will be supplied by a third party and subject to a separate Environmental Impact Assessment (EIA). The fuel supply plan will entail the importation of Liquefied Natural Gas (LNG) from the United States which will be supplied to a Floating Storage and Regasification Unit (FSRU). The FSRU

[2] Mason, J. E., & Archer, C. L. (2012). Baseload electricity from wind via compressed air energy storage (CAES). *Renewable and Sustainable Energy Reviews*, *16*(2), 1099-1109. https://www.researchgate.net/profile/James_Mason12/publication/228451679_Baseload_electricity_from_wind_via_compressed_air_energy_storage_%28CAES%29/links/542f37110cf277d58e91ef3a.pdf

would provide a level of storage and would convert the fuel into a gaseous form which would be piped to the JPS 190 MW facility either by terrestrial or marine pipeline, the determination of which will depend on the findings of the EIA."

A news story dated 11 November 2015 indicates the FSRU will be constructed at a cost of $200 million.

> "KINGSTON, Jamaica (JIS) – American company, New Fortress Energy LLC, will invest more than $200 million to construct a Liquefied Natural Gas (LNG) terminal in Jamaica.
>
> "The facility is expected to generate more than 200,000 metric tonnes of LNG annually, which will initially be supplied to the domestic market.
>
> "There are also plans to expand output for delivery to other Caribbean countries, thereby positioning Jamaica as a regional hub for the supply of LNG.
>
> "New Fortress was selected from a list of six entities which submitted bids to supply LNG to power the national energy grid, primarily through the Jamaica Public Service (JPS) Old Harbour 190-megawatt gas fired power plant."[3]

The United States Environmental Protection Agency provides the following guidance for the preparation of EIAs for energy generation projects:

> "All related or connected actions should be addressed in the EIA. There may be different entities and project proponents responsible for different aspects of proposed projects and alternatives. Even if there are different entities involved the test is whether a proposed energy project X would still be proposed if another project Y were not also proposed. For example, an energy generation plant is proposed but the electricity will need to be distributed and connected to transmission lines and the transmission lines would not be proposed for that particular location if it were not for the proposed energy generation plant. So the two projects should be assessed at the same time either by cross referencing in separate EIA documents or within a single, integrated document. The same logic applies to related projects such as pipelines, storage, port facilities and ships delivering fuels

[3] US company to spend more than $200m to construct LNG terminal in Jamaica http://www.jamaicaobserver.com/news/US-company-to-spend-more-than--200m--to-construct-LNG-terminal-in-Jamaica

and the opening or expansion of quarries for building materials to be used in construction."[4]

Contrary to this guidance, the environmental impacts of the proposed Old Harbour Plant Repowering Project (190 MW) and the proposed Floating Storage and Regasification Unit (FSRU) are to be assessed separately, in separate EIAs, even though they are connected actions. **JET has been pointing out this flawed approach for almost ten years, but it continues.**

Both the proposed Old Harbour Plant Repowering Project (190 MW) and the proposed Floating Storage and Regasification Unit (FSRU) would impact marine resources of the Portland Bight Protected Area that are described in Chapter 5 of the EIA. For example, the proposed Old Harbour Plant Repowering Project involves construction of a Seawater Intake System (described in Section 4.3.6 of the EIA) the construction and operation of which would impact marine resources of the Portland Bight Protected Area (PBPA). A proposed Floating Storage and Regasification Unit (FSRU) would also entail the construction and operation of infrastructure (pipelines and industrial equipment) within the Portland Bight Protected Area causing impacts to its marine resources. The impacts of the power and plant and the FSRU on the impact marine resources of the Portland Bight Protected Area would be cumulative. If the environmental impacts of the proposed Old Harbour Plant Repowering Project (190 MW) and the proposed Floating Storage and Regasification Unit (FSRU) are to be assessed separately, in separate EIAs, then the overall environmental impacts of the two connected projects would be improperly underestimated. This is of major significance to how the project's overall impact is evaluated in comparison to alternatives, such as wind and solar power generation projects, that would not require a Floating Storage and Regasification Unit (FSRU).

In addition, the provision of a more efficient power plant in the Portland Bight Protected Area (PBPA) along with an LNG Hub may well attract a range of industrial investments which are likely to have serious impacts on the biological diversity of the PBPA. This is not discussed at all. The map provided of the St. Catherine Coastal Development order (Pg. 295), which would show zoning, planned and existing land use was not reproduced at high enough resolution to be read. The map of the Highway 2000 Corridor Development Plan (Pg. 296) also could not be read, so JET is unable to say whether current planning instruments will adequately protect the natural resources of the PBPA in the event of a new influx of developments to the area.

Failure to compare the costs of the project to alternatives based on renewable energy generation

[4] USEPA: EIA Technical Review Guidelines: Energy Generation and Transmission, CAFTA-DR, USEPA, USAID, EPA/315R11001, 2011.
http://www2.epa.gov/international-cooperation/eia-technical-review-guidelines-energy-sector

Page 397 of the EIA contains the following information about the social costs of the project's greenhouse gas emissions.

Using USEPA*greenhouse gas emission factors for LNG-Fired Stationary Gas Turbines and the heat consumption rate of 1.383 x 109 kJ/h for the LNG to be used, the following emission rates were calculated (Table 12-4):

Table 12-4 Greenhouse Gas Emission rates for LNG Facility

Facility	Pollutant	Emission Factor, lb/MMBtu	Facility Emission Rate, tonne/y
NG-Fired Combustion Turbine	CO2	110	573,000
	N2O	0.003	15.6
	CH4	0.0086	44.8

United States Environmental Protection Agency. July 1998. Emission Factor Documentation for AP-42: Stationary Gas Turbines. Office of Air Quality Planning and Standards, Office of Air and Radiation, U.S. Environmental Protection Agency, Research Triangle, North Carolina.

The difference in pollutants for CO_2, N_2O, and CH_4 are; 323,260.2, -3.9, and 34.5 tonne/y respectively. Using a social of US$40 for CO_2, US$29,000 for N_2O and US$2,000 for CH_4. See Marten, Alex L., and Stephen C. Newbold (2012) for calculations. Therefore net reduction in pollutants are valued at US$13,000,000 per year with a present value of US$84,030,000 over 25 year using a discount rate of 15%.

However, this provides decision-makers no perspective to how the social costs of the project's greenhouse gas emissions compare to alternatives based on renewable energy generation, such as wind and solar, which are carbon-free.

According to the United States Environmental Protection Agency, the Central Value (3% discount rate) of the social cost of CO_2 emissions in the year 2020 is $47 per metric ton, rising to 51 per metric ton in the year 2025.[5]

Although it might be true that the social cost of greenhouse gas emissions associated with the proposed Old Harbour Plant Repowering Project (190 MW) might be $13 million per year compared to the social cost of greenhouse gas emissions associated with the current 220 MW Old Harbour Power Plant, the EIA fails to inform decision-makers that the social cost of greenhouse gas emissions associated with the proposed Old Harbour Plant Repowering Project (190 MW), based on the social cost of CO_2 emissions in the year 2020 is $47 per metric ton , is $26.9 million/year greater than the social cost of greenhouse gas emissions associated with alternatives based on renewable energy generation, such as wind and solar, which are carbon-free.

Failure to assess entrainment impacts

[5] http://www3.epa.gov/climatechange/EPAactivities/economics/scc.html

One of the major impacts of thermal power plants located in a coastal environment is the loss of marine life because of the entrainment of marine organisms. According to the United States Environmental Protection Agency:

> "Thousands of industrial facilities use large volumes of cooling water from lakes, rivers, estuaries or oceans to cool their plants. Cooling water intake structures cause adverse environmental impact by pulling large numbers of fish and shellfish or their eggs into a power plant's or factory's cooling system. There, the organisms may be killed or injured by heat, physical stress, or by chemicals used to clean the cooling system. Larger organisms may be killed or injured when they are trapped against screens at the front of an intake structure."[6]

According to the California Energy Commission:

> "Concerns regarding the environmental effects of entrainment result from the large volume of cooling water potentially used by coastal power plants. In California, the 21 coastal power plants potentially withdraw up to 17 billion gallons of seawater per day. This process results in the loss of billions of aquatic organisms, including fishes, fish larvae and eggs, crustaceans, shellfish, and many other forms of aquatic life from California's coastal ecosystem each year. There has been increased focus on the effects of power plant cooling water intake systems because the biological resources of the world's oceans are in serious decline. Long-term declines, which started in the early 1970s, have occurred in 60 percent of the fishes for which landings are reported."[7]

Page 245 of the EIA contains the following basic information about fisheries that would be present in the vicinity of the project's cooling water intake structure:

> "Fifteen (15) different taxa of fish were identified from the five survey areas. Five (5) taxa were identified from Site 1, one (1) from Site 2, three (3) from Site 3, five (5) from Site 4 and ten (10) from Site 5. Fish abundance was generally low, ranging from a maximum (24 individuals) at Site 5 to a minimum (2 individuals) at Site 2 (Table 5-63). As expected, the majority of fish observed were in the smaller size classes (≤6-10cm) with damselfish, foureye butterflyfish or surgeonfish present at most sites."

Guidance is available for how to assess the adverse environmental impact of a cooling water intake of a thermal power plant.[8]

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[6] U.S. EPA Cooling Water Intakes http://water.epa.gov/lawsregs/lawsguidance/cwa/316b

[7] California Energy Commission "Assessing Power Plant Cooling Water Intake System Entrainment Impacts" (2007) http://www.energy.ca.gov/2007publications/CEC-700-2007-010/CEC-700-2007-010.PDF

[8] Assessing Power Plant Cooling Water Intake System Entrainment Impacts" (2007) http://www.energy.ca.gov/2007publications/CEC-700-2007-010/CEC-700-2007-010.PDF.

The United States Environmental Protection Agency provides the following guidance for the preparation of EIAs for energy generation projects with cooling water intake structures:

> "6.8 Aquatic and Terrestrial Wildlife/Fauna and Associated Ecosystems
> Describe and quantify alterations in aquatic and terrestrial wildlife populations due to:
>
> "6.8.1 Fish and Aquatic Resources
> "6.8.1.1 Loss in habitat (e.g., spawning, rearing, juvenile, or adult habitats) from changes in water quality (temperature, dissolved oxygen and other parameters) and instream flow
> "6.8.1.2 Disturbance of aquatic resources during construction, operations, or maintenance activities, including equipment noise, erosion and sedimentation, vehicular movements, or blasting
> "6.8.1.3 Entrainment and mortality effects on fish populations from water intakes for cooling water."[9]

The EIA for the proposed Old Harbour Plant Repowering Project (190 MW) does not provide this critical information: a quantitative description of alterations to fisheries that would be caused by entrainment and mortality effects of the proposed cooling water intake. As such, decision-makers reviewing the project will have no information to determine whether the project would have a detrimental impact on the fisheries described on page 245 of the EIA.

Public Consultation Process

JET was represented at the public meeting on the EIA on November 24th, 2015 and considered that far too much of the meeting was taken up with public relations instead of a sober and independent assessment of the environmental impacts. JET has written to the Minister of Land Water Environment and Climate Change separately on this. We do not think the public meeting as conducted conforms to the spirit or letter of NEPA's Guidelines for Public Consultation and should be reconvened. Additionally, although the EIA stated that the public has one month for submitting comments after the public meeting, to the best of the writer's recollection, a three-week comment period was announced at the public meeting. JET requests that NEPA review the verbatim notes to confirm this point.

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December 7th, 2015

[9] USEPA: EIA Technical Review Guidelines: Energy Generation and Transmission, CAFTA-DR, USEPA, USAID, EPA/315R11001, 2011.
http://www2.epa.gov/international-cooperation/eia-technical-review-guidelines-energy-sector