Hinkel, Bill

From: Clement, Jay L CIV USARMY CENAE (US) <Jay.L.Clement@usace.army.mil>
Sent: Monday, March 18, 2019 8:17 AM
To: 'Mirabile, Gerry J.'; Mark Goodwin
Cc: Matt Manahan; Beyer, Jim R; Hinkel, Bill; Kern, Mark; Pauley, Melissa
Subject: HVDC Alternative
Attachments: 2019-02-28 FINAL Prefiled Testimony of Chris Russo.pdf

Gerry/Mark:

You undoubtedly have seen this testimony and your team is presumably preparing a substantive rebuttal. In as much as this alternative would address substantial elements of the public concern for your project, would address early comments from USEPA, and would appear to be at least an "available alternative" vis a vis the Section 404(b)1) Guidelines (in that precedent has been set elsewhere), we are very interested in your analysis of its practicability. Presumably it is technologically practicable and less environmentally damaging, perhaps it is somehow not logistically or economically practicable? We encourage you to be very thorough in your analysis and to frame your response relative to the Guidelines and state regulations. If, for example, you were to argue that it is economically impracticable, how would the added cost of this installation compare to the overall cost of the project PLUS all of the millions in concessions the company is prepared to offer the state and other stakeholders?

Thank you in advance for your consideration. No doubt this will be but one element of your overall response to the various testimonies to be provided at the pending state hearings, so there is no reason to respond at this time unless you wish. Furthermore, our public notice has yet to run its course, which will no doubt generate a much more comprehensive request for additional information and comment rebuttal.

Jay Clement
Senior Project Manager
US Army Corps of Engineers
Maine Project Office

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION
AND LAND USE PLANNING COMMISSION
IN THE MATTERS OF

CENTRAL MAINE POWER COMPANY	)	
NEW ENGLAND CLEAN ENERGY CONNECT	)	
25 Municipalities, 13 Townships/Plantations	)	APPLICATION FOR NATURAL
7 Counties	)	RESOURCES PROTECTION ACT
L-27625-26- A-N	)	AND SITE LOCATION OF
L-27625-TB-B-N	)	DEVELOPMENT ACT PERMITS AND
L-27625-2C-C-N	)	SITE LAW
L-27625-VP-D-N	)	
L-27625-IW-E-N	)	
	)	
And	)	
	)	
Site Law Certification	)	
SLC 9		

PRE-FILED TESTIMONY OF CHRISTOPHER RUSSO

A. Introduction and Qualifications

My name is Christopher Russo, I am a Vice President and the head of the Energy Practice at Charles River Associates ("CRA"), a/k/a CRA International, Inc., located at 200 Clarendon Street, Boston, Massachusetts 02116. The primary focus of my consulting is in the areas of wholesale electricity market analysis, business strategy for the electricity industry, and strategic planning for energy market participants. I have advised clients on strategic issues in the energy industry, including quantitative analysis of wholesale energy markets, the impact of regulatory restructuring, planning under uncertain conditions, market power issues, and energy procurement. I have testified in regulatory proceedings and litigation. I received my BS in Mechanical Engineering from Tufts University, and my MS in Technology and Policy with a focus in Energy from the Massachusetts Institute of Technology ("MIT"). Prior to joining CRA in 2007, I worked as an independent energy market consultant, supporting clients in the analysis and modeling of electricity markets in the United States and Europe.

I am testifying on behalf of NextEra Energy Resources, LLC ("NextEra"). The purpose of my testimony is to provide information to the Maine Department of Environmental Protection ("Department") and the Land Use Planning Commission ("Commission") related to Central Maine Power Company's ("CMP") failure to consider undergrounding the New England Clean Energy Connect ("NECEC") high voltage direct current ("HVDC") transmission line. Undergrounding the HDVC transmission line would allow CMP to avoid unreasonable interference with scenic character, existing scenic, aesthetic, recreational, or navigational uses, and unreasonable impacts to protected natural resources. An undergrounded HVDC transmission line would allow the development to fit harmoniously into the natural environment. Failure to evaluate an undergrounded the HVDC transmission line means that CMP has failed to establish that "there is no alternative site which is both suitable to the proposed use and reasonably available to the applicant" as required for portions of the NECEC within the Commission's P-RR subdistrict.

B. CMP failed to consider undergrounding the HVDC transmission line

NECEC is an approximately 145 mile long HVDC transmission line that is proposed to be overhead, except for less than a mile that will be routed under the Kennebec Gorge. The overhead route for the HVDC transmission line starts at the Canadian border and extends into Maine for 53 miles of greenfield corridor that is currently forested. While the routing under the Kennebec Gorge may address concerns specific to the Gorge, it does not address impacts associated with the 53 miles of forested land through which CMP plans to route NECEC as an overhead transmission line, or the additive impacts to the 92 mile routing over an existing corridor.

Tellingly, CMP, in the Maine Public Utilities Commission proceeding on its Certificate of Public Convenience and Necessity, admitted that it never evaluated the alternative of

undergrounding the HVDC transmission line for the 53 miles of greenfield forested corridor.[1] CMP failed to evaluate the underground alternative despite the following facts:

- CMP's own internal personnel acknowledging that the HVDC voltage-sourced conversion ("VSC") technology it proposes to use is "extremely vulnerable" to faults, and its external consultant, Power Engineering, stated that HVDC VSC lines are "[t]ypically only installed with underground HVDC lines;"[2]

- HVDC transmission lines of the same length or shorter than NECEC are routed underground or underwater, **with only 1 exception in the world**,[3] which uses the HVDC line commutate converter technology,[4] rather than the HVDC VSC technology selected by CMP;

- CMP's HVDC vendor, Siemens, indicated that, between those projects that are already in-service or planned, only **1 out of 14 HVDC VSC transmission lines of any length are aboveground in the world**,[5] and that one project involves DC and AC lines sharing overhead transmission towers;[6]

- Significant stakeholder opposition to NECEC clear-cutting the 53-mile greenfield forested corridor due to the clearing's negative impact on natural resources including scenic and recreation values;[7] and

- Other proposed New England HVDC transmission projects incorporating significant portions of underground or underwater routing into their design when compared to NECEC.

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[1] Exhibit CR-1 (Nov. 28, 2018 Maine Public Utilities Commission ("PUC") Tech. Conf. Tr. at 37; PUC Jan. 9, 2018 Hearing Tr. at 5:4-25; 90:3-7).

[2] Exhibit CR-2. (CMP emails)

[3] Exhibit CR-3 (CMP Document on HVDC Projects).

[4] Exhibit CR-4 (CMP Consultant Document on HVDC Projects).

[5] *Id*.

[6] *Id*. and Exhibit CR-5 at 25.

[7] Exhibit CR-6 (Excerpts from PUC Public Hearing Transcript University of Maine - Farmington 9/14/18 at 12-13, 24, 31-32, 41-43, 45-48, 67-70; and 75-76; Public Hearing Transcript The Forks 9/14/18 at 30-31, 45-46, 62; 73, 78, 89, and 121 and Public Hearing Transcript 10/17/18 at 43, 57, 64, 67-68, 81-82, 114, 130, 141).

The following table shows the significant difference between NECEC and other proposed regional HVDC transmission projects with respect to routing proposed HVDC transmission lines underground or underwater.

Routing HVDC Underground or Underwater					
Project Name/ State	**Length in US (miles)**	**Underwater Cable (miles)**	**Buried Cable (miles)**	**Overhead (miles)**	**Totals (columns 3+4)**
NECEC (Maine)	145	0	~1	144	**~1**
TDI (Vermont)	154	97	57	0	**154**[8]
Green Line (New York and Vermont)	60	40	20	0	**60**[9]
Northern Pass (New Hampshire)	192	0	60	132	**60**[10]

[8] Exhibit CR-7 at 241 (TDI Mass. 83 D RFP bid). "The 154 mile transmission line will utilize high voltage direct current (HVDC) technology, capable of transmitting 1,000 megawatts (MW) of electricity. The underwater portions of the transmission line, approximately 97 miles in length, will be buried in the bed of Lake Champlain, except at water depths of greater than 150 feet where the cables will be placed on the bottom. The overland (terrestrial) portions of the transmission line, approximately 57 miles in length, will be buried underground within existing public road and railroad rights-of-way ('ROWs'), or on private land under TDI-NE ownership or control." Also see Exhibit CR-8 at 1 (CMP Slide Deck).

[9] Exhibit CR-9 at 14 (Vt. Clean Line bid into Conn. Zero Emissions RFP). "Approximately 40 miles of HVDC underwater cable bundled with a fiber optic cable ("Underwater Cable") to be buried along the lakebed of Lake Champlain with landfall at Pointe Au Roche Park, New York and Kingsland Bay State Park in Vermont. Approximately 4.8 miles are located within waters regulated by New York and 35.4 miles are located within waters of Vermont. Two segments of HVDC underground cable with associated fiber optic cable ("HVDC Land Cable") linking the Underwater Cable to the Converter Stations, one segment in New York and one in Vermont. The New York HVDC Land Cable segment length is approximately 6.7 miles and the Vermont HVDC Land Cable segment is approximately 13.3 miles"

[10] Exhibit CR-10 at 6-3, 6-5, and 7-20 (Northern Pass Mass. 83 D RFP bid). "8 miles of undergrounding in the towns of Pittsburg, Clarksville and Stewartstown" and "52 miles of underground line within the White Mountain National Forest." "NPT now proposes to build nearly one-third of the project underground, in public highways, to avoid or minimize potential visual impacts to the most sensitive scenic resources in the state, including areas in and around the White Mountain National Forest, Appalachian Trail, and Franconia Notch area"

A CMP affiliate also proposed a HVDC transmission line project in New York that was 144 miles long and routed completely underground.[11]

The facts set forth in this testimony highlight the viability of an underground route for NECEC for the first 53 miles from the Forks to the Canadian border, particularly in the context of other proposed New England HVDC transmission lines. Furthermore, CMP, by its own admission, failed to even evaluate the underground option. Therefore, CMP has not conducted the requisite studies and analysis to show that NECEC avoids unreasonable interference with scenic character, existing scenic, aesthetic, recreational or navigational uses, and unreasonable impacts to protected natural resources.

Dated February 15, 2019 By:

Christopher Russo

COMMONWEALTH OF MASSACHUSETTS

February 15, 2019

Personally appeared the above-named Christopher Russo and made oath as to the truth of the foregoing pre-filed testimony.

Before me,

Caroline M. MacKenzie, Notary Public
My Commission expires: May 14, 2021

Caroline M. MacKenzie
MY COMM. EXPIRES MAY 14, 2021
NOTARY PUBLIC COMMONWEALTH OF MASSACHUSETTS

[11] Exhibit CR-11.