Review of the New England Clean Energy Connect October 2018 Supplemental Application Materials

James F. Palmer

Scenic Quality Consultants
Burlington, Vermont

Prepared for
Department of Environmental Protection
and
Land Use Planning Commission
Augusta, Maine

November 23, 2018

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1. Introduction

Central Main Power has submitted a substantial amount of materials to supplement their application for the New England Clean Energy Connect (NECEC) since the review of the visual impact assessment (VIA) was submitted in August 2018. Of particular importance, these documents have included a survey of people on a Kennebec River rafting trip, an application amendment to use horizontal directional drilling (HDD) at the Kennebec River crossing, and a detailed response to the September 4, 2018 request from DEP and LUPC for additional information. These materials are reviewed in this report.

2. Rafting Experience Survey

Market Decisions Research was contracted to conduct a survey of people rafting on the Kennebec River in order to assess how an overhead crossing of the Kennebec River by the NECEC would affect the river rafting experience (Robertson and Xiaolei 2018). Market Decisions Research has conducted several surveys of people recreating at locations where proposed Wind energy developments would be visible. They drew on this experience to design the rating experience survey.

The survey was conducted over the last two weekends in September and the first weekend in October. Responses were received from 54 respondents who were guides or participants on river rafting trips. These trips were energized by recreational water releases from Wyman Dam. The survey was administered at the take-out location. Half of a rafting group was assigned to evaluate a photosimulation of NECEC conductors crossing the river (i.e., the "experimental" group) and the other half evaluated a photograph of the existing conditions without any conductors (i.e., the "control" group). This is a standard research design that avoids problems with respondents being influenced by seeing a second version of the river crossing. However, its effectiveness is somewhat dependent on the two groups having an otherwise similar rafting experience.

The two groups are compared using two types of analyses. The first approach uses a *t*-test to determine the probability or p-value that the two groups represent different experiences or perceptions. By convention, if a p-value is less than 0.05 the difference between the two ratings is considered significant. Statistical significance is largely a function of the sample size, and should not be misinterpreted as the importance of the difference between the two groups. The second approach uses the effect size (Hedges *g*) to evaluate the size or importance of the difference. Thresholds used to evaluate the size or importance of visual impacts from wind power projects have been proposed by Palmer (2015, p. 59):

> a negative effect size between 0.0 and −0.2 could possibly go unnoticed and between −0.2 and −0.5 is noticeable but not adverse, between −0.5 and −1.1 the impact is adverse, and when it is beyond −1.1 the impact is unreasonably adverse.

These thresholds may provide useful guidance for the size of difference found in the river rafting survey.

The survey was also administered to 8 people rafting on the Dead River. However, the raw data did not indicate their assignment to either the control or experimental group. Therefore, they are not included in the analysis reported here.

2.1 Meeting Trip Expectations

Respondents were asked to rate "How well did the area meet your expectations?" on a 7-point scale "where 7 is the area completely met my expectations and 1 is the area did not meet my expectations at all." Table 1 compares the mean ratings for the control and experimental groups. By and large there is no statistically significance between the two groups and the effect size is modest. The only exception being that the control group's expectations for "the enjoyment of being on the water" were modestly more completely met ($t = 2.06$, $p = 0.044$, and $g = -0.56$).

Respondents were also asked to "rate your expectations for the number of people on the river" as uncrowded to crowded, and there were no statistically significant differences between the control and experimental groups. However, when asked about "expectations for signs of development" on the trip, the control group's expectations were for more undeveloped conditions compared to the experimental group ($t = 4.98$, $p = 0.030$, and $g = 0.61$).

The river rafting experiences of the control and experimental groups we similar for how most of their expectations were met, which helps support the reasonableness of other comparisons.

2.2 Impact of Signs of Human Activity

Respondents were told that "Those that use Maine's rivers may see signs of human activity. Below is a list of things people may see from rivers in Maine." And were asked to "rate the impact each sign of activity may have on the quality of your experience today" where 1 is very negative and 7 is very positive. The results comparing the control and experimental groups are given in Table 2 and indicate no statistically significant difference between the two groups.

The responses for the two groups are combined, and Table 3 reports how the rating for views of power lines on hillsides compares to the visual impact of other human activities. The river rafters found the visual impacts from industrial facilities to be somewhat worse than power lines. However, the visual impact of power lines is thought to be greater than large clear cuts, wind power projects, other rafts or kayaks on the river, hydroelectric dams, and bridges and roads. In particular, the visual impact of power lines is much more important than other rafters or kayakers ($t = 11.05$, $p = 0.000$, and $g = 2.88$). There was no statistical difference between the ratings for power lines and motorized boats on the river, residential development along the shore and parking lots. The conclusion is that views of power lines on hillsides create visual impacts that are among the highest of any human activity or development.

2.3 Scenic Quality Ratings

The respondents were shown six photographs representing views from their river rafting trip.

1. Harris Dam
2. Staging parking lot
3. Flat water
4. Whitewater and rafters
5. NECEC crossing location with and without overhead conductors

6. Bridge and powerline conductors at take-out

The fifth photograph showed the location where the NECEC proposed to cross the Kennebec River; the control group was shown a photograph of the existing condition and the experimental group a photosimulation of the overhead conductors and warning balls. Both groups were asked to "Think about the full range of views in Maine, from the most scenic to the least scenic. Rate each image on a scale of scenic quality in Maine, where 7 is the highest scenic value and 1 is the lowest scenic value."

The research design comparing the control and experimental groups is based on the expectation that there will be no significant difference between the two groups' ratings of the views, except at the Kennebec River crossing. This is the result reported in Table 4, where the only statistically significant difference shows that views of the overhead conductors and warning balls will have a very large and statistically significant visual impact on the view from the Kennebec River at the proposed crossing location ($t = 3.25$, $p = 0.002$, and $g = -0.89$).

2.4 Effect on Enjoyment and Likelihood of Returning

The respondents were instructed "to think about your experience rafting based on these images. on a scale where 7 is very enjoyable and 1 is not at all enjoyable? If you saw views like these images, how would you rate your enjoyment of today's rafting trip." The results in Table 4 show that the overhead conductors and warning balls would have a more negative effect for the control group on the enjoyment of a trip composed of these views, however the effect was modest and not statistically significant.

Then the respondents were instructed "If you saw views like these images, rate how likely it would be that you would return and take this rafting trip again, where 7 means you are more likely to return and 1 means you are less likely to return?" The effect for the control group on the likelihood of returning was similar to the effect on enjoyment—modestly more negative than for the experimental group, but no statistically significant.

Another way to consider the effect on enjoyment and likelihood of returning is to compare the ratings for the rafting trip they had just experienced with the ratings of the trip represented by the six photographs. These results tell a different story, as shown in Table 5. Both the control and experimental groups rated the enjoyment of their completed trip to be statistically significantly higher than the trip represented by the six photographs representing that trip. They were also significantly more likely to return to repeat the trip that they had actual taken than the one represented by the six photographs. These results should not be surprising, since both groups found their trip largely met their expectations for the river to be largely undeveloped, and the "trip" represented by the six photographs were dominated by views of human intrusion—Harris dam, the staging parking lot and a bridge with overhead power line conductors.

Table 1. Meeting Trip Expectations by Control and Experimental Groups

	Control			Experimental			Evaluation			
	M	s_{pre}	*n*	M	s_{post}	*n*	*t*	*p*	s_{pooled}	Hedges *g*
Q5. How well did the area meet your expectations? †										
A. To get outdoors, enjoy the fresh air.	6.96	0.200	25	6.90	0.310	29	0.88	0.384	0.265	-0.240
B. The exercise or physical challenge.	6.33	1.050	24	6.39	0.916	28	0.22	0.828	0.980	0.061
C. The companionship. Camaraderie, being with my family or friends.	6.92	0.277	25	6.66	0.857	29	1.48	0.145	0.656	-0.404
D. The enjoyment of being on the water.	6.92	0.277	25	6.62	0.677	29	2.06	0.044	0.531	-0.564
E. The excitement of rafting the rapids.	6.68	0.627	25	6.76	0.636	29	0.46	0.65	0.632	0.124
F. The scenery.	6.88	0.440	25	6.79	0.620	29	0.58	0.561	0.544	-0.160
G. To have a change from your daily routine.	6.64	1.221	25	6.57	0.945	23	0.24	0.815	1.098	-0.068
Q6. How would you rate your expectations for the number of people on the river? *										
	4.32	1.435	25	4.07	1.466	27	0.61	0.544	1.451	-0.169
Q7. How would you rate your expectations for signs of development you would see along the river? §										
	2.04	1.7673	25	3.24	2.132	29	4.98	0.030	1.972	0.609

Note: † 1 = Did not meet expectations. 7 = Completely met expectations.

* 1 = Uncrowded, few or no people. 7 = Crowded, a larger number of people.

§ 1 = Undeveloped. 7 = Highly developed.

Table 2. Impact of Signs of Human Activity by Control and Experimental Groups

	Control			Experimental			Evaluation			
	M	s_{pre}	***n***	**M**	s_{post}	***n***	***t***	***p***	s_{pooled}	**Hedges *g***
Q10. Those that use Maine's rivers may see signs of human activity. Rate the impact each sign of activity may have on the quality of your experience today.										
A. Views of large clear cuts on hillsides.	3.48	2.064	25	3.31	2.593	29	0.26	0.794	2.363	-0.072
B. Views of power lines on hillsides.	2.44	2.063	25	2.17	1.983	29	0.48	0.630	2.021	-0.132
C. Views of wind power projects.	3.40	1.979	25	3.03	2.383	29	0.61	0.546	2.206	-0.166
D. Views of other rafts or kayaks on the river.	5.56	1.417	25	6.10	1.113	29	1.58	0.121	1.262	0.431
E. Views of motorized boats on the river.	2.28	1.400	25	2.62	2.227	29	0.66	0.512	1.891	0.180
F. Views of industrial facilities such as a biomass generator, paper mill or landfill.	1.56	1.530	25	1.69	1.628	29	0.30	0.765	1.583	0.082
G. Views of residential development along the shore.	2.24	1.393	25	2.28	1.791	29	0.08	0.936	1.619	0.022
H. Views of hydroelectric or other types of dams.	4.16	1.795	25	3.45	1.975	29	1.38	0.174	1.894	-0.376
I. Views of parking lots.	1.84	1.028	25	1.79	1.114	29	0.16	0.874	1.075	-0.044
J. Views of bridges and roads.	3.08	1.222	25	3.28	1.533	29	0.51	0.610	1.398	0.140

Note: 1 = Very negative. 7 = Very positive

Table 3. Impact of Views of Power Lines on Hillsides Compared to Signs of Other Human Activity

	Views of Power Lines			Views of Other Human Activity			Evaluation			
	M	s_{pre}	***n***	**M**	s_{post}	***n***	***t***	***p***	s_{pooled}	**Hedges *g***
Q10. Those that use Maine's rivers may see signs of human activity. Rate the impact each sign of activity may have on the quality of your experience today.										
A. Views of large clear cuts on hillsides.	2.42	1.938	62	3.39	2.257	62	-3.30	0.002	2.103	0.460
C. Views of wind power projects.	2.42	1.938	62	3.34	2.096	62	-4.35	0.000	2.018	0.456
D. Views of other rafts or kayaks on the river.	2.42	1.938	62	5.82	1.248	62	-11.05	0.000	1.630	2.088
E. Views of motorized boats on the river.	2.42	1.938	62	2.47	1.826	62	-0.18	0.861	1.883	0.026
F. Views of industrial facilities such as a biomass generator, paper mill or landfill.	2.42	1.938	62	1.71	1.593	62	3.34	0.001	1.774	-0.400
G. Views of residential development along the shore.	2.42	1.938	62	2.44	1.646	62	-0.07	0.948	1.798	0.009
H. Views of hydroelectric or other types of dams.	2.42	1.938	62	3.74	1.881	62	-4.20	0.000	1.910	0.693
I. Views of parking lots.	2.42	1.938	62	2.00	1.215	62	1.91	0.061	1.617	-0.259
J. Views of bridges and roads.	2.42	1.938	62	3.35	1.427	62	-3.54	0.001	1.702	0.550

Note: 1 = Very negative. 7 = Very positive

Table 4. Comparison of Image Ratings by Control and Experimental Groups

	Control			Experimental			Evaluation			
	M	s_{pre}	***n***	**M**	s_{post}	***n***	***t***	***p***	s_{pooled}	**Hedges *g***
Q11. How would you rate the scenic quality of each view? †										
A. Image 1 -- Harris Dam	2.96	1.457	25	2.62	1.425	29	0.86	0.392	1.440	-0.236
B. Image 2 -- Staging parking lot	4.16	1.650	25	3.31	1.628	29	1.90	0.063	1.638	-0.519
C. Image 3 -- Flat water	6.80	0.500	25	6.48	0.871	29	1.61	0.114	0.724	-0.438
D. Image 4 -- Whitewater & rafters	6.24	1.091	25	6.48	0.688	29	0.99	0.326	0.897	0.271
E. Image 5 -- Crossing location w/ & w/o conductors	6.20	1.500	25	4.38	2.426	29	3.25	0.002	2.051	-0.888
F. Image 6 -- Bridge & powerline conductors at take-out	5.04	1.541	25	4.25	1.602	28	1.83	0.074	1.573	-0.502
Q13. If you saw views like these images, how would you rate your enjoyment of today´s rafting? *										
	6.24	0.879	25	5.68	1.588	28	1.57	0.124	1.304	-0.431
Q15. If you saw views like these images, rate how likely it would be that you would return and take this rafting trip again? §										
	6.39	0.839	23	5.82	1.634	28	1.51	0.136	1.337	-0.426

Note: † 1 = Lowest scenic value. 7 = Highest scenic value.

* 1 = Not at all enjoyable. 7 = Very enjoyable.

§ 1 = Less likely to return. 7 = More likely to return.

Table 5. Comparison of Today's Rafting Trip to Photo-"trip" for Control and Experimental Groups

	Today's Rafting Trip			Photo-"trip"			Evaluation			
	M	s_{pre}	***n***	**M**	s_{post}	***n***	***t***	***p***	s_{pooled}	**Hedges *g***
Q8. How would you rate your enjoyment of today's rafting trip? † **Q13. If you saw views like these images, how would you rate your enjoyment of today's rafting trip? †**										
Control (No power line at crossing)	6.96	0.200	25	6.24	0.879	25	4.27	0.000	0.638	-1.129
Experimental (Power line at crossing)	6.76	0.435	29	5.68	1.588	28	3.48	0.002	1.155	-0.935
Q9. How would you rate the likelihood that you will return and take this rafting trip again? * **Q15. If you saw views like these images, rate how likely it would be that you would return and take this rafting trip again? ***										
Control (No power line at crossing)	6.84	0.374	25	6.39	0.839	23	2.71	0.013	0.640	-0.701
Experimental (Power line at crossing)	6.72	0.591	29	5.82	1.634	28	3.01	0.006	1.220	-0.740

Note: † 1 = Not at all enjoyable. 7 = Very enjoyable.

* 1 = Less likely to return. 7 = More likely to return.

2.5 Conclusion of the Survey Review

My interpretation of these results is that the rafters would notice the degraded scenery, whether the proposed NECEC overhead conductors or the more extensive development implied by the 6 photographs, but that they would still enjoy the rafting trip, and would likely return for a repeat rafting experience (this may be influenced by a lack of alternative options, since there apparently are only two rivers with recreational dam releases in Maine).

The application amendment to use horizontal directional drilling (HDD) to cross the Kennebec River will address visual impact concerns at this location. However, the results of the survey may provide some information to assess the visual impacts at other locations, particularly for people engaged in water-based activities. It may not be necessary to see transmission structures or the cleared ROW for the scenic quality to be degraded. In this survey, views of the conductors and warning balls were sufficient to degrade the scenic quality at the Kennebec River crossing.

2.6 Implications for Visual Impacts at other Locations

On September 4, 2018, DEP and LUPC requested additional support for CMP's "assertion that the project will not impact the use, or enjoyment of the scenic resources that have project visibility." The Kennebec River rafting survey is in response to this request. While DEP and LUPC are not necessarily looking for additional intercept surveys, the need for data to support the assertion that the NECEC will not impact the use, or enjoyment of other scenic resources remains.

The results of the Kennebec River survey found that people believe that seeing power lines has a greater negative impact on their river recreation experience than most other human activities, including wind turbines, clear cuts, and bridges. This response is comparable to that obtained from intercept surveys to evaluate proposed wind energy development in Maine (Portland Research Group, 2011; Robertson and Mildner, 2012).

In their response to DEP and LURP's September 4 request additional data, CMP offers the Baskahegan Lake User Survey (Kleimschmidt, 2012). This survey was administered to users of Baskahegan Lake, from which the Stetson Mountain Wind Farm is prominently visible. The executive summary of the study states:

> Eighty-five percent of respondents were aware of the wind farm prior to visiting the lake and most (81%) said it has no effect or a positive effect on the scenic value of Baskahegan Lake. Almost all respondents (93%) reported that the wind farm has no effect or a positive effect on the overall quality of their recreational experience. In fact, 74% gave the lake the highest scenic rating, and 93% rate the scenic quality of Baskahegan Lake as better than the typical scenic value.

However, this study was not designed to determine how construction of the Stetson Mountain Wind Farm would affect use of the lake. Because it was a post-construction study, it is not possible to know how it affected people who no longer visit Baskahegan Lake. The post-construction users primarily engaged in fishing (70 percent); only 4 percent identified viewing scenery as their primary activity. Most had a very high-quality experience, but scenic quality was

not mentioned by anyone as part of the reason. In other words, scenery was not identified as an important factor in the experience of these respondents.

This is in contrast to the rafting survey, where 74 percent of the respondents indicated that viewing scenery was one of the activities that they planned for during their visit to the upper Kennebec River. Their response indicates that their expectations for scenery were largely met—a mean value of 6.85 out of a possible 7.00 points. Scenery appears to be an important part of the experience of rafting on the Kennebec River, in contrast to the people fishing on Baskahegan Lake.

It would be misleading to generalize from finding about the effect of seeing wind turbines on the fishing experience of people at Baskahegan Lake in order to explain the effect of seeing a large transmission line while on a Kennebec River rafting trip. There is simply no data to suggest that either study could shed light on the effect to people appreciating the view of a historic site, hiking on a trail, or driving along a road chosen in part for the enjoyment of is scenic quality.

3. Visibility Analysis

The September 4, 2018 request for data from DEP and LUPC asked why the VIA did not use the most accurate available land cover height information for conducting the visibility analysis. CMP goes to some length to support their use of the 1999/2001 Maine Land Cover Data (MELCD).

3.1 Maine Land Cover Data

The response from CMP states "In summary, the MELCD provides more Maine-specific land cover types and higher resolution data." The MELCD metadata provides the definitions of these "Maine-specific land cover types."[1] For example, the characteristic species listed for the "Scrub-Shrub-Areas" in Maine are: "chaparral species such as chamise (Adenostoma fasciculatum), chaparral honeysuckle (Lonicera interrupta), scrub oak (Quercus beberidifolia), sagebrush (artemisia tridentate), and manzanita (Arctostaphylos spp.)." None of these species grow in Maine or the Northeast; this description is from the National Land Cover Data (NLCD).

The response states that the 2011 NLCD only "includes 16 land cover types (three of which are only found in Alaska). There are three classifications of forest and 4 classifications of developed areas" and that the MELCD using data from between 1999 and 2004 is superior because it "was further refined to the State of Maine specific classification system (27 land cover classifications)." First the statement is misleading, since the 2011 NLCD has 16 classes plus four that are Alaska specific.[2] The MELCD has 28 values, but the values 0, 1, 14, 17, and 18 are not used. The "Maine-specific land cover types" are:

16 Road/Runway-Developed Hight Intensity Sub-type includes some of Maine's major highways and most airports with paved runways.

19 Unconsolidated Shore-Unconsolidated material such as silt, sand, or gravel that is subject to inundation and redistribution due to the action of water. Characterized by substrates

[1] https://www.maine.gov/megis/catalog/metadata/melcd.html
[2] https://www.mrlc.gov/nlcd11_leg.php

lacking vegetation except for pioneering plants that become established during brief periods when growing conditions are favorable. Erosion and deposition by waves and currents produce a number of landforms representing this class. Characteristic land cover features: Beaches, bars, and flats.

22 Blueberry Field-This type is composed of agricultural fields dominated by the production of low-bush blueberries. Multiple structural forms include: burned field, pruned field, early season with leaves, and late season with leaves and fruit set (Yardborough, 1996). This type is most common in eastern Maine and occurs primarily on acidic gravel soils.

23 Clear-Cut-This type includes areas harvested from forest with greater than 90% canopy cover removal and expected to regenerate into forest. This class is structurally similar to Crops/Ground with minimal biomass present, but the satellite imagery or other data indicated that the areas were previously forested. Characterization conditional: Forest loss must have occurred after 1995.

24 Light Partial Cut-This type is composed of forestland where less than 50% of the overstory canopy has been removed through harvesting. Harvesting may have occurred previously. May include improvement thinning, light shelterwood and light selection harvests. Characterization conditional: Forest loss must have occurred after 1995.

25 Heavy Partial Cut-This type includes forestland where greater than 50% of the overstory canopy has been removed through harvesting. Harvesting may have occurred previously. May include heavy shelter wood and heavy selection harvests. Characterization conditional: Forest loss must have occurred after 1995.

26 Forest Regeneration-Forested areas previously harvested that have begun to regenerate to forest are included in this type. Seedling to sapling sized trees are expected, possibly with some residual trees present. Species present will vary based on the original site composition, harvesting techniques and site disturbance, and the presence of advance regeneration at the time of harvesting. These sites will return to mature forests. Characterization conditional: Forest loss and subsequent re-growth must have occurred after 1995.

From this information it is clear that the MELCD based on data from 1999 to 2004 had 23 land classes, 16 that are essentially the same as those from the NLCD and 7 that are "Maine-specific." The only new "Maine-specific" land cover classes that are assigned heights for use in the visibility analysis are for forest harvest activity. By definition, these activities must have been within 10 years of when the MELCD data were gathered (i.e., the MELCD data were from 2004 or earlier and the harvest activity must have occurred after 1995). None of the harvest activity areas would be classified as such in 2018; there would be new harvest areas which are not indicated in the old MELCD data.

3.2 Accuracy of the Landcover Viewshed Map

Whether one uses the MELCD from 2004 or 2011 NLCD data for the visibility analysis is not the fundamental concern. What really matters is whether the land cover viewshed maps used by TJD&A to evaluate the visibility of NECEC structures from scenic resources and that were submitted as part of the VIA report are accurate. It is my understanding that this viewshed was made in September 2017, and includes the following descriptive note in its legend.

This viewshed map:

- Accounts for the screening effects of topography as well as 8 types of existing vegetation. Landcover data from Maine OGIS. The heights for the forest cover types are as follows.
  - Decidious: 40'
  - Evergreen: 40'
  - Mixed: 40'
  - Scrub Shrub: 10'
  - Forested Wetland: 20'
  - Light Partial Cut: 40'
  - Heavy Partial Cut: 40'
  - Forest Regeneration: 20'
- Shows where the viewer may see any portion of a transmission structure.

Potential transmission line visibility needs to be confirmed with field investigations and other visualization techniques. See Report.

TJD&A has effectively evaluated the visibility of the proposed NECEC structures from the 39 photosimulation viewpoints. Importantly, they used a CAD-based approach to create the photosimulations and determine the visibility of NECEC structures, which is independent of the GIS-based visibility analysis. TJD&A has provided the location of the photosimulation viewpoints, and it is a simple matter to determine the intersection of these viewpoints with the land cover viewshed map. It is recognized that these viewpoints are not a random sample, rather they have been selected to represent the "worst-case" views. It would seem that if most of them are not within the viewshed, then there is the possibility that other "worst-case" views were overlooked.

Table 6 lists the photosimulations and whether proposed structures are identified as visible in the viewshed analysis and photosimulation coversheets. The cross tabulation summary in Table 7 shows that for both approaches, transmission structures would be visible in 11 and not visible in 5 of the photosimulation viewpoints—they are in agreement for approximately 40 percent of the viewpoints. However, it is significant that the GIS visibility analysis indicates there would not be visibility from approximately 50 percent of the viewpoints, when the construction of the photosimulations at these viewpoints indicates there would be visibility.

Table 6. Comparison of Visibility for Sections 1-4 as Determined by the GIS Viewshed and Photosimulations

Photoimulation	Viewshed	Simulation
01-Beattie Pond	7	1
02-Wing Pond	0	2
03-Rock Pond	18	12
04-No 5 Mtn	0	yes, at 3.9 mi
05-Fish Pond	12	4
06-Attean View Rest Area	0	corridor at 7.6 mi
07-Parlin Pond	0	5

08-Coburn Mtn	0	10
09-Route 201, Johnson Mtn Twp	0	0--no structures, only wires visible
10-Kennebec Gorge, Moxie Gore, Looking SW	0	0--no structures, only wires visible
11-Kennebec Gorge, Moxie Gore, Looking NE	0	1
12-Moxie Stream	0	0--no structures, only wires visible
13-Moxie Pond Looking North	13	3
14-Moxie Pond, Looking North	13	2
15-Moxie Pond South	18	3
16-Mosquito Mountain	0	7
17-Mosquito Mountain	0	13
18-Troutdale Road	0	2
19-Route 201 Moscow	0	3
20-Wyman Lake Recreation Area	0	3
21-Route 8_Anson	2	3
22-Route 2 Farmington	7	6
23-Androscoggin Riverlands State Park	0	8
24-Merrill Road	0	4
30-Kennebec Gorge Crossing Looking NW	7	0--no structures, only wires visible
31-Kennebec Gorge Crossing Looking SE	7	0--no structures, only wires visible
32-Kennebec Gorge Picnic Area	1	0--no structures, only wires visible
33-Kennebec Gorge North of Picnic Area	0	0--no structures, only wires visible
34-Carrabassett River	7	3
35-Sandy River	0	2
38-Top of Stairs at Harrison Dam	0	1
39-Indian Pond Impoundment	0	5
40-Rafting Put-in on Kennebec River	0	0--no structures, only wires visible
41-Dead Stream Pond	0	1
A2-Appalachian Trail on Pleasant Pond Mtn	0	2
B6-Appalachian Trail on Troutdale Rd	0	6
C9-Appalachian Trail on Bald Mtn	0	5

Table 7. Cross Tabulation of Visibility for Sections 1-4 as Determined by the GIS Viewshed and Photosimulations.

Frequency:

	GIS Visibility		**Total**
Simulation Visibility	**Yes**	**No**	
Yes	11	20	31
No	3	5	8
Total	14	25	39

Percent:

	GIS Visible		Total
Simulation Visible	Yes	No	
Yes	28%	51%	79%
No	8%	13%	21%
Total	36%	64%	100%

These results are important because the visibility analysis is the initial filter to determine whether and where there would be visibility from a scenic resource. The September 4 response to DEP and LUPC's requests states (with emphasis added):

> **Inventory of Scenic Resources**. The format and methodology for the NECEC VIA is virtually identical to the format and methodology used in the approved and now constructed MPRP, with the exception that viewshed mapping was used for the NECEC inventory. …
>
> TJD&A has prepared a summary chart that lists of all scenic resources within the 3 to 5 mile area of potential effect (APE) where there may be views of the Project, as determined by viewshed mapping and field evaluation (see Attachments H and I).

It is my understanding that the field investigation of scenic resources was primarily directed to areas where the GIS-based visibility analysis indicated there would be visibility, with the intent to verify whether visibility of the transmission structures would likely occur. However, the validity of this approach assumes that the land cover viewshed overstates the project's visibility. What should be done when the land cover viewshed apparently understates the visibility? Where do you even begin to conduct fieldwork when half of the photosimulations representing "worst-case" view are not within the viewshed? One possible response would be to acquire and use better quality data for the height of land cover.

3.3 Availability of Land Cover Height Data

As described in the Review of the NECEC VIA (Palmer 2018), higher quality data to describe land cover heights is available. In many places LiDAR data are publicly available. Often it is necessary to process the raw LiDAR data to obtain the height of the land cover, which is called a digital surface model of DSM. Alternately, a DSM is commercially available from Intermap Technologies. TJD&A (2015) has experience using Intermap Technologies DSM data to evaluate the visibility of transmission structures.

3.4 Field Verification of Visibility

While the GIS-based viewshed is the first step in determining visibility of the NECEC structures, it then requires field verification. The most obvious way to verify visibility is if an existing transmission line is visible. There are also many circumstances where foreground vegetation or structures effectively screen views—this is particularly common at historic and other developed sites. However, there are still many locations within the viewshed where these conditions do not exist. It is not clear how field observation can help in these circumstances. THD&A used field sheets to document photo locations, but they do not appear to systematically record whether

there is potential visibility, and how that was determined. In addition, there is no indication that potential visibility is evaluated at all sites that meet Chapter 315.10's criteria for being a scenic resource.

The value of field verification is further complicated because it is first limited by the land cover viewshed, which did not correctly identify visibility of NECEC structures at many viewpoints.

3.5 Visibility Conclusions

When the need for using the most accurate DSM data available was raised by DEP and LUPC, the CMP response was to go into the weeds defending the use of MELCD's "Maine-specific land cover types." I believe that the above review of the MELCD classification describes how the special nature of the MELCD was over stated by CMP, and that the "Maine-specific" harvest activities are out of date.

However, the real issue is whether the visibility analysis is accurate. A simple evaluation compares how the visibility in the CAD-based photosimulations compares with the GIS-based land cover viewshed for those viewpoints. It indicates that half of the photosimulations with visibility of NECEC structures are outside the GIS-based landcover viewshed. This is a problem because the GIS viewshed is the primary tool to identify scenic resources with potential visibility. It is assumed that these specific viewpoints were identified opportunistically during fieldwork. How many "worst-case" viewpoints were left unidentified because they were outside the landcover viewshed?

It is believed that more accurate alternatives exist to using MELCD for representing DSM data to conduct a visibility analysis. The question remains, why does the VIA not use the most accurate available land cover height information?

4. Scenic Resources

The September 4, 2018 request for data from DEP and LUPC stated that:

> CMP needs to provide a complete inventory of scenic resources potentially impacted by the project, including but not limited to, historic sites, streams and public roads.

CMP's response was:

> The format and methodology for the NECEC VIA is virtually identical to the format and methodology used in the approved and now constructed MPRP, with the exception that viewshed mapping was used for the NECEC inventory."

This may be the case, but it is not an adequate response. The MPRP VIA was not subject to peer review, and now that the NECEC is being peer reviewed there are questions about why the identification of scenic resources does not follow the plain language interpretation of Chapter 315.10 as described in Palmer's (2018) review of the NECEC VIA.

The Review of the NECEC VIA mentions many potential scenic resources that were not fully considered, among them:

- Public roads visited in part for the enjoyment of visual qualities.
- Properties within the study area that are eligible for inclusion in the National Register of Historic Places.
- Properties that take advantage of Maine's Open Space Tax Law offers property tax reductions in return for public access to private conservation lands; lands that would be visited in part for the enjoyment of visual qualities.

For instance, there are several locations where clusters of properties eligible for inclusion in the National Register of Historic Places appear to have a potential for visual impacts: along the west side of Moxie Pond, and the villages of Bingham, Solon, North Anson, Anson, Madison, Farmington and other locations. "Visual impacts" refers to the impacts as identified by the VIA following the direction of Chapter 315, not the indirect impacts to a historic site's integrity identified in Attachment D AH Recon Results and Finding of Effects.

Cemeteries are an example of sites that might qualify as scenic resources under Chapter 315.10.F. The October 2018 response includes Attachment I: Cemetery Visibility Review, which contains maps and photographs for eight cemeteries but lacks any descriptive text. There are 222 cemeteries within 3 miles of the NECEC centerline. Of these 47 appear to be in the landcover viewshed for segments 1-4. Were all of these cemeteries visited, and if so where is the documentation evaluating their visibility and the potential visual impact?

Chapter 315.10.F identifies as a scenic resource (1) public land, that is (2) visited in part for the enjoyment of visual qualities. Attachment K: Conservation Area Charts indicate that the BPL owned West Forks Parcel and Johnson Mountain Parcel are not scenic resources because they are managed primarily for timber and not visual resources. However, it is not necessary for the primary objectives to include visual resource management—it is whether the general public visits them in part for enjoyment of their visual qualities. Documentation must be provided showing that these BPL lands are not visited in part for enjoyment of their visual qualities. How many other public resources or public lands have been eliminated from consideration because the were "not managed for preservation of Visual Resources"?

These are examples, not an exhaustive listing. The question remains—why is there not a full accounting of potential scenic resources and a documented evaluation of all those with potential visibility? There does not even appear to be a process to attempt a full accounting.

5. Photosimulations

The September 4, 2018 request for data from DEP and LUPC asked to describe the process used to select photosimulation viewpoints, and how the digital model of the NECEC is registered to the simulation photograph.

5.1 Process for Selecting Photosimulation Viewpoints

The results of a VIA are heavily dependent on the selection of photosimulation viewpoints. The photosimulations represent to the public and permitting agency how the proposed project will

appear. For a project the size of NECEC it is unreasonable to expect that photosimulations be prepared from all the viewpoints within all the scenic resources where the project is potentially visible. There needs to be a process for determining the selection of viewpoints that are representative of more general conditions.

Attachment Q: VIA PSIM Summary describes several characteristics of the selected viewpoints, but it is not a description of the process used to assure that the selected viewpoints would represent the full range of conditions within the study area where the NECEC will potentially be visible. Was there a conscious attempt to represent all possible combinations of viewing distance zones, viewpoint types, and surrounding land use, or is Attachment Q just a description of the photosimulations that were prepared?

5.2 Registering the Digital Model to the Photograph

In the NECEC VIA Review, one of the bullet points was that "There is an over reliance on using only ridgelines to register the 3D Studio Max model to the photograph. It is very desirable to use some additional markers, such as building corners or existing transmission structures." In the October 2018 Response, CMP states:

> The photosimulations were prepared in 3D Studio Max using visible vertical and horizontal control points to register the photographs. These included existing transmission structures, ridgelines, edges of waterbodies, buildings, rock outcrops, and other similar objects. A minimum of two control points are used for horizontal alignment on far right and far left of each normal image. Vertical control points are primarily established using DTM elevation data for both ridgelines and the edges of waterbodies. When visible in the image, significant trees, roads, and buildings are also used as vertical control points. Google Earth was also used as a second means of comparison when available.

Constructing photosimulations using 3D CAD software is an improvement over using Google Earth, which is not intended for such precise technical work. However, it is more difficult to review, since AutoCAD does not make available a reader for 3ds Max files.

The photosimulations in Exhibit 6-1 of NECEC Kennebec River HDD Site Law Application Amendment_10.19.18 are a good example of this issue. The various information necessary to evaluate the registration of the digital model and photography are documented as PDFs. Represented are three types of information:

1. There is a shaded model of the terrain and ridgeline, which is not visible in the photograph because of forest cover.
2. There is an area representing the water level of the Kennebec River, but we know that the water level changes significantly depending on how much water is being released through the Harris Dam.
3. There are 75-foot cylinders representing trees, but there is no documentation that the forest cover creates an opaque screen that is 75 feet high.

The accuracy of these simulations is critical, since CMP is assuring DEP and LUPC that the transition stations will not be visible from the river. It appears very likely that the transition stations will not be visible, but it is difficult to verify from the uncertain information provided.

6. Evaluation of Visual Impacts

TJD&A provided a table of all the ratings made by two reviewers of 37 photosimulations and a memo describing the length of view, viewer expectation, and additional mitigation at the sites thought to have the most important visual impacts (Segal 2018). In the final reckoning, none of the visual impacts were thought to be unreasonable.

The evaluation of the photosimulations used DEP's Basic Visual Impact Assessment Form (DEPLW0541-A2002). This form was originally prepared by Smardon and Hunter (1983) based on research evaluating the contrast rating approach to VIA (Feimer et al. 1979). This research found that the reliability of five observers was only moderate in strength, and they recommended using larger panels of evaluators. The use of only two raters clearly does not approach the standard recommended by the research that established the contrast rating approach to VIA.

The mean contrast rating at the overhead crossing of the Kennebec River (Photosimulation 32) was 16.5 which is "moderate" (a rating of at least 18 is required for a visual impact to be "strong" and 27 to be "severe."). This is the photosimulation used in the Kennebec River rafting intercept survey reviewed above. The results suggest that there is a statistically significant difference between the rafters' ratings of the existing and proposed conditions. The effect size suggests that this difference is probably large enough to be considered "strong," but does not reach the level of "severe." There are insufficient alternative data to evaluate the contrast ratings at the other viewpoints.

Finally, only 37 viewpoints are evaluated, some of these represent the same scenic resource. There is no documentation of any visual impact evaluation at other scenic resources. Attachment H_Summary of Scenic Resources characterizes over 50 scenic resources with potential visibility of the project, but does not state whether the visual impact is adverse or unreasonable. No procedure is described to evaluate the visual impact at viewpoints with potential visibility but for which photosimulations have not been prepared.

7. Mitigation

The use of HDD to cross the Kennebec River is a significant mitigation compared to the initially proposed overhead crossing.

The Attachment G: Road Buffer Evaluation is another step toward a systematic consideration of using vegetative screening to mitigate the visual impacts of the NECEC at road crossings. However, there is no support for the point system index that is used to determine whether a road crossing would benefit from vegetative screening. An alternative interpretation of these ratings might be to require vegetative buffering at any public road where either of the following occurs:

- The degree of visible change is moderate or higher (i.e., a rating of 3 or higher)

- More than minor existing screening vegetation is to be removed (i.e., a rating of 2 or higher).

Visual impacts of a project the size of NECEC are unavoidable, vegetative screening cannot eliminate all visual impacts. It is somewhat surprising that there is no discussion of compensatory mitigation for these visual impacts. In particular, this might include visual resource improvement within effected communities.

8. Conclusions

It is recognized that the area potentially impacted by the NECEC is very large. However, that does not seem to be a reasonable cause to do less of an assessment than for a smaller project; rather is seems to justify a more thorough assessment.

The expectation is that:

1. All scenic resources, as described in Chapter 315.10, be identified.
2. An accurate approach be used to determining potential visibility at all scenic resources and that the determination of potential visibility be fully documented.
3. A clear process be used to select representative viewpoints for photosimulations and that the procedure used to evaluate visual impacts at these viewpoints be fully documented.
4. The visual impact to all scenic resources with potential visibility be evaluated, whether they are represented by a photosimulation or not, and that a clear evaluation procedure be used and the findings documented.
5. All measures proposed to mitigate potential visual impacts be clearly described. It may be useful to also describe mitigation measures considered but not used, and why they were rejected.

9. References

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