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Subject: Responses to Synapse Questions
Date: Monday, January 13, 2014 12:08:52 PM
Attachments: [Compiled Questions for Synapse responses 1 13 2014.pdf](#)
[Compiled Questions for Synapse redline.docx](#)
[Levelized carrying charge transmission lines.xlsx](#)
[Compiled Questions for Synapse responses 1 13 2014.docx](#)

Folks: please find attached responses to your questions for Synapse in advance of our call tomorrow.
Talk soon.

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Compiled Questions for Synapse

New Hampshire

1. Please provide the underlying economic rationale for assuming that a supplier under the Merchant Development approach would only sell energy in peak price periods.
 - a. **The rationale for assuming that a supplier under the Merchant Development approach would only sell energy in peak price periods was to provide a “what if” estimate of project impacts at the low end of the range of possible impacts. As noted on page 16, “There are a range of detailed and complicated approaches through which clean energy projects can be developed. This memo provides a “bounding” analysis for that range, by analyzing simple approaches at either end of the range. “.The assumption also highlights the fact that , in the absence of any form of contractual obligation, the quantity of clean energy that a supplier would bid into the energy market under a price-taker approach would be entirely up to the supplier. As discussed on Page 17 of the memo, one or more long-term contracts, that specified a single all-inclusive energy and delivery price, could ensure a higher capacity factor for the Merchant Development approach. The assumed low capacity factor was employed to determine a conservative cost/benefit assessment under the Merchant Development approach.**
2. Do you dispute that it is more likely that energy would be delivered in every hour that the supplier’s margin is greater than zero, i.e., whenever market revenues exceed variable cost? If so, please explain why.
 - a. **No. However, the decision by a supplier to make a major capital investment in a new transmission line, and to then subsequently use that line to deliver hydroelectricity that it would bid into the New England wholesale market in any hour is not driven solely by the supplier’s estimate that New England energy market revenues would exceed the supplier’s variable cost. To make the capital investment decision the supplier would have to forecast New England wholesale energy prices, identify the bidding strategy that would maximize its margin and determine if that margin would enable it to recover the investment at its required rate of return. Once the capital investment was made and the project was in-service, the supplier’s decision to bid into the New England market in any period would be based not only on the supplier’s variable costs but also on the supplier’s “opportunity cost”, i.e. which market would provide the highest revenues as between possible sales into New England versus other market opportunities such as exports to New York or Ontario, or supplying the domestic Quebec market during winter peaks.. It is reasonable to expect the developer will sell power into the markets which will maximize its revenues.**
3. Did you investigate the utilization rates of existing or proposed merchant transmission projects supplying hydroelectric energy and, if so, what conclusions did you arrive at?
 - a. **Synapse did review the currently effective capacity and utilization rate of HQ Phase II to understand the extent to which the effective capacity of that line could be increased. The conclusion was that even if the capacity of that line was increased the region would still benefit from incremental imports of clean energy , as noted on page 11.**

4. Is the 90% capacity factor assumption under the Merchant Energy Development plus Regional Transmission Funding approach based on the assumption that energy will be delivered in every hour that it is available, regardless of whether such delivery is economic for the supplier? If not, please explain the basis of the capacity factor assumption.
- a. **No. As discussed on Page 18 of the memo, the Regional Funding approach assumes the region would require the hydro generation developer to operate the line on a baseload basis and bid the hydroelectricity into the wholesale market accordingly (e.g. through a long-term contract or some similar mechanism).**
5. Regarding the Merchant Energy Development plus Regional Transmission Funding approach, did you select the 90% capacity factor, instead of 100% capacity factor, in order to be consistent with the decision to model a non-firm energy supply? That is, is the 90% capacity factor based on the assumption that the energy supply will be interrupted on winter days? If not, please provide the rationale for using a 90% capacity factor.
- a. **Yes.**
6. You claim there are diversity benefits, under both development approaches, that are related to the reduction in natural gas dependency. Please discuss the character of the alleged diversity benefits. That is, do the benefits reflect improvements in system reliability, reductions in greenhouse gas emissions, energy price reductions, other unspecified benefits, or a combination of some or all of these benefits?
- a. **As discussed in Chapter 3 of the memo, all of the cases under each of the two approaches offer benefits in terms of supply diversity/system reliability, greenhouse gas reductions, and wholesale energy prices. For example, the following table discusses the key benefits of 2,400MW and 3,600MW cases when compared to the reference case:**

	Merchant Development Approach		Regional Funding Approach	
	2400MW Hydro	3600MW Hydro	2400MW Hydro	3600MW Hydro
Supply Diversity*	11% reduction	18% reduction	19% reduction	31% reduction
GHG Reduction	12% reduction	17% reduction	18% reduction	27% reduction
Wholesale Energy Prices	2% reduction	3% reduction	3% reduction	5% reduction
Retail Bills Impact	minimal	minimal	minimal	minimal

* Supply diversity indicates reduction in New England's dependence on natural gas for electric generation.

7. Please specify the carrying charge rate(s) used to calculate the annual costs in Table 5 and provide the spreadsheet and assumptions used in its development.
- a. **The levelized carrying charge rate is 8.6%. This rate is based on a 35 year amortization period consistent with the Maritime Link financing assumptions as of January 2013, financing assumptions of 50% debt at 5.2% and 50% equity at 11.3% from *ISO-NE Offer Review Trigger Prices 2013 Study Final Results, ORTP Summary* (Brattle Group, September 2013) and a 5.1% discount rate. The spreadsheet used to calculate this charge is attached.**

Connecticut

8. Has Synapse factored in a \$100 cost per ton allowance price as part of the cost benefit analysis? What is the basis for \$100 allowance price especially in 2013 where we would look to RGGI for the relevant cost per ton number?
 - a. **No. Synapse assumed the cost of carbon as per the AESC 2013 Study, which is RGGI through 2020 and then assumed federal carbon regulation from 2020 onwards. Please see column three in attached AESC 2013 Exhibit 4.1. The Synapse assumption is similar to the assumption Black and Veatch used.**
9. What is the basis for the retirement assumptions? Some of the assumptions are different from what we are using in our 2014 IRP especially with respect to the CT plants.
 - a. **The generating unit retirement assumptions are drawn from AESC 2013. They are similar to the assumptions Black and Veatch used.**
10. The focus of the Synapse study is thermal load growth only, is there a reason not to include gas/electric generation?
 - a. **The Synapse study does not focus on gas requirements to meet thermal load growth, on the contrary it focuses solely on electric generation and on the quantity of gas required for electric generation. Synapse did not estimate growth in gas pipeline capacity. Inclusion of 0.4 BCF in the reference case was determined based on the AIM and TGP-CT expansion projects. The assumption to add 0.6BCF in the 2400MW Hydro + 1BCF case was requested by DOER to assess the inclusion of an additional 0.6BCF over the reference case with other cases.**
11. Are the costs of the transmission line rate based? If so over what period and what are the assumptions.
 - a. **See response to question 7.**

AESC 2013

Exhibit 4 1. Emission Allowance Prices per Short Ton (Constant 2013\$ and Nominal Dollars)

[illegible]

<u>Source / note</u>		
Inflation Rate	2.00%	Synapse Assumption
Debt Rate	5.2%	ISO ORTP analysis
Equity Rate	11.3%	ISO ORTP analysis
Debt Mix	50%	ISO ORTP analysis
Equity Mix	50%	ISO ORTP analysis
Nominal WACC	8.25%	
Effective Tax Rate	40%	ISO ORTP analysis
After Tax WACC	7.20%	calculation
Real Discount Rate	5.10%	calculation
Nominal Discount Rate	7.20%	calculation
<u>For Capital Costs</u>		
Book Life	35	Synapse Assumption
Tax Life	20	Synapse Assumption
Property Tax Rate	0.75%	ISO ORTP analysis
Real Levelization Rate	8.6%	calculation
Nominal Levelization Rate	10.7%	calculation
Gr. Plant Inv	1	

Notes

ISO ORTP analysis	ISO-NE Utility Review Trigger Prices 2013 Study Final Results, ORTP Summary. The Brattle Group. September 2013.
Book Life assumption	Maritime Link Application, January 2013, page 75

	BOY RateBase (%) =Prev EOY RateBase	EOY RateBase (%) = BOY RateBase - Book Deprec	Avg RateBase (%) =Average BOY & EOY RateBase	Net Plant (%) =BOY RateBase - BOY ADIT	Net Return =ROR * Net Plant	Book Deprec (%) =Lookup based on Book Life	Tax Deprec (%) =Lookup based on Tax Life	EOY DIT =TaxRate * (Tax Deprec - Book Deprec)	BOY ADIT =Sum of Prev EOY DIT	Income Tax = Based on Net Return, Tax Rate and Financial	Prop Tax = Simple fraction of initial cost	Rev Req (%) =Net Return + Book Deprec + Income Taxes +
1	1.000	0.971	0.986	1.000	0.083	0.029	0.038	0.004	0.000	0.038	0.008	0.1566
2	0.971	0.943	0.957	0.968	0.080	0.029	0.072	0.017	0.004	0.037	0.008	0.1527
3	0.943	0.914	0.929	0.922	0.076	0.029	0.067	0.015	0.021	0.035	0.008	0.1471
4	0.914	0.886	0.900	0.878	0.072	0.029	0.062	0.013	0.037	0.033	0.008	0.1418
5	0.886	0.857	0.871	0.836	0.069	0.029	0.057	0.011	0.050	0.032	0.008	0.1367
6	0.857	0.829	0.843	0.796	0.066	0.029	0.053	0.010	0.062	0.030	0.008	0.1319
7	0.829	0.800	0.814	0.757	0.062	0.029	0.049	0.008	0.071	0.029	0.008	0.1273
8	0.800	0.771	0.786	0.720	0.059	0.029	0.045	0.007	0.080	0.027	0.008	0.1229
9	0.771	0.743	0.757	0.685	0.057	0.029	0.045	0.007	0.086	0.026	0.008	0.1186
10	0.743	0.714	0.729	0.650	0.054	0.029	0.045	0.007	0.093	0.025	0.008	0.1144
11	0.714	0.686	0.700	0.615	0.051	0.029	0.045	0.007	0.099	0.023	0.008	0.1102
12	0.686	0.657	0.671	0.580	0.048	0.029	0.045	0.007	0.106	0.022	0.008	0.1059
13	0.657	0.629	0.643	0.545	0.045	0.029	0.045	0.007	0.113	0.021	0.008	0.1017
14	0.629	0.600	0.614	0.509	0.042	0.029	0.045	0.007	0.119	0.019	0.008	0.0974
15	0.600	0.571	0.586	0.474	0.039	0.029	0.045	0.007	0.126	0.018	0.008	0.0932
16	0.571	0.543	0.557	0.439	0.036	0.029	0.045	0.007	0.132	0.017	0.008	0.0890
17	0.543	0.514	0.529	0.404	0.033	0.029	0.045	0.007	0.139	0.015	0.008	0.0847
18	0.514	0.486	0.500	0.369	0.030	0.029	0.045	0.007	0.146	0.014	0.008	0.0805
19	0.486	0.457	0.471	0.333	0.028	0.029	0.045	0.007	0.152	0.013	0.008	0.0762
20	0.457	0.429	0.443	0.298	0.025	0.029	0.045	0.007	0.159	0.011	0.008	0.0720
21	0.429	0.400	0.414	0.263	0.022	0.029	0.017	-0.005	0.165	0.010	0.008	0.0678
22	0.400	0.371	0.386	0.239	0.020	0.029	0.000	-0.011	0.161	0.009	0.008	0.0649
23	0.371	0.343	0.357	0.222	0.018	0.029	0.000	-0.011	0.149	0.008	0.008	0.0628
24	0.343	0.314	0.329	0.205	0.017	0.029	0.000	-0.011	0.138	0.008	0.008	0.0608
25	0.314	0.286	0.300	0.188	0.016	0.029	0.000	-0.011	0.126	0.007	0.008	0.0587
26	0.286	0.257	0.271	0.171	0.014	0.029	0.000	-0.011	0.115	0.006	0.008	0.0567
27	0.257	0.229	0.243	0.154	0.013	0.029	0.000	-0.011	0.103	0.006	0.008	0.0546
28	0.229	0.200	0.214	0.137	0.011	0.029	0.000	-0.011	0.092	0.005	0.008	0.0525
29	0.200	0.171	0.186	0.120	0.010	0.029	0.000	-0.011	0.080	0.005	0.008	0.0505
30	0.171	0.143	0.157	0.103	0.008	0.029	0.000	-0.011	0.069	0.004	0.008	0.0484
31	0.143	0.114	0.129	0.085	0.007	0.029	0.000	-0.011	0.057	0.003	0.008	0.0464
32	0.114	0.086	0.100	0.068	0.006	0.029	0.000	-0.011	0.046	0.003	0.008	0.0443
33	0.086	0.057	0.071	0.051	0.004	0.029	0.000	-0.011	0.034	0.002	0.008	0.0422
34	0.057	0.029	0.043	0.034	0.003	0.029	0.000	-0.011	0.023	0.001	0.008	0.0402
35	0.029	0.000	0.014	0.017	0.001	0.029	0.000	-0.011	0.011	0.001	0.008	0.0381
36	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.0075
37	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.0075
38	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.0075
39	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.0075
40	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.0075
Column	Beginning of year	End of Year	Simple average of	Net Plant is Rate	Return on Net	Book depreciation.	Tax depreciation	Difference in Tax -	Accumulated DIT.			Return on Net

Tax Depreciation (Accelerated)		Based on Brealey and Myers edition 6, p. 130				
Offset/year	3	5	7	10	15	20
1	0.33	0.2	0.143	0.1	0.05	0.038
2	0.45	0.32	0.245	0.18	0.095	0.072
3	0.15	0.192	0.175	0.144	0.086	0.067
4	0.07	0.115	0.125	0.115	0.077	0.062
5		0.115	0.089	0.092	0.069	0.057
6		0.058	0.089	0.074	0.062	0.053
7			0.089	0.066	0.059	0.049
8			0.045	0.066	0.059	0.045
9				0.065	0.059	0.045
10				0.065	0.059	0.045
11				0.033	0.059	0.045
12					0.059	0.045
13					0.059	0.045
14					0.059	0.045
15					0.059	0.045
16					0.03	0.045
17						0.045
18						0.045
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20						0.045
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