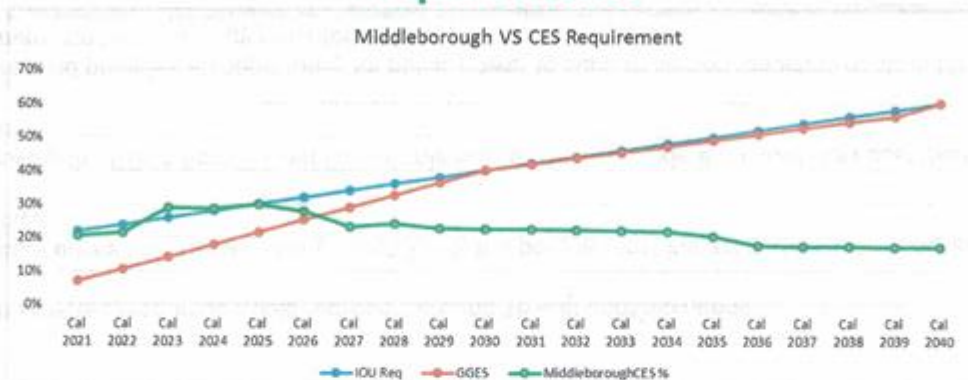


Green Opportunities and Potential Regulatory Requirements



- The chart above is ENE's estimate on how the MGED portfolio will stack up against the potential clean energy requirements, following the recommended green deal volumes.
- Understanding that MGED already has carbon free resources including nuclear, hydro, and Class 1 wind, adding resources like these will help approach IOU CES compliance through 2026.
- Meeting any clean energy standard will require different resource decisions than in the past. Commodity cost management now has a green tint to it. ENE has built clean portfolio cost models and decision support tools to help guide public power in the new "green" realm of power supply planning. These are three examples of resources that balance cost, portfolio diversity/concentration, and duty type to help public power meet these challenges.



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Palmer Renewable Energy

- 42 MW; 338 million KWH/yr biomass project
- Fuel is wood waste/tree trimmings
- 2021 target commercial operation date
- Springfield MA, 210 construction, 60 permanent jobs
- Reliable base-load power
- Power Purchase:
 - Energy -
 - 1st 5 years fixed
 - Next 10 years escalate with CPI-U or 2.5%
 - Years 16-20 – price fixed
 - Capacity - Fixed for 20 years
 - Renewable Energy Credit's (RECs)
 - CT Class 1 now; MA Class 1 likely late 2019
- Multiple studies show large GHG benefits
- Meets MA Clean Energy Standards
- MA DEP states in public meetings PRE has:
 - Highest efficiency and lowest emissions of any biomass plant in US



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Recommendation: Volumes & Portfolio Cost Impact

Recommended Volumes & Portfolio Cost Impact							
Middleborough	Nextera		Offshore Wind	Palmer Biomass w/o REC	Palmer with REC	Total Impact of New Deals	Impact of New Deals with Palmer REC
	Nextera Solar	Nextera Nuclear w/EFEC					
Annual Volume in MWh:	5,798	11,211	9,721	19,575	19,575	46,305	46,305
Volume as a % of Load:	2.0%	3.9%	3.4%	6.8%	6.8%	16.0%	16.0%
Portfolio Cost Impact \$/Mwh:	\$0.42	-\$0.05	\$1.31	-\$0.30	\$1.22	\$1.38	\$2.90
Portfolio Cost Impact %	0.73%	-0.08%	2.29%	-0.53%	2.13%	2.41%	5.07%

Project	PPA Start	PPA End	Capacity Available (MW)	Annual Output	MiddleboroughMW	Annual Mwh
Palmer Biomass	2021	2040	42	338,486	2.42	19,575
Offshore Wind	2024	2043	56	210,240	2.48	9,721
Nextera Solar	2024	2043	50	100,253	2.88	5,798
NextEra Nuclear w/EFEC	2024	2043	50	193,857	2.88	11,211

- Current Massachusetts RPS compliance costs for IOUs is \$18-20/MWH. The total impact of these transactions combined is less than \$3/MWH
- Adding all of these selected resources would represent around 16% of portfolio needs
- * • Assuming that energy prices rise 1% per year through 2043, the portfolio cost impact of the NextEra nuclear offer and Palmer Biomass are negative.
- We recommend buying the RECs from Palmer Renewable Energy. They provide a relatively low cost “hedge” against future green energy costs.
- Deepwater offshore wind provides an opportunity for public power to support carbon reduction goals in Massachusetts without being included in mandated state energy procurements.

