

Elizabeth Hughes

From: Lynn Salinger <
Sent: Thursday, October 12, 2017 10:06 AM
To: Elizabeth Hughes
Cc: David Wood; Peggy Briggs
Subject: Concord Light Board inputs into CLRP
Attachments: Strategic Planning Progress Report 10-10-2017.docx; Concord Municipal Light Plant Strategic Plan081517.pdf

Greetings, Elizabeth,

On behalf of the Concord Light Board and in contribution to the comprehensive long-range planning being undertaken by the town, I would like to share with you two elements of the draft CMLP strategic plan currently in development. The first is a draft narrative, prepared by CMLP staff to summarize many months of work to develop a comprehensive approach, including a number of strategic initiatives, to guide CMLP toward Concord's energy future. The second is a set of slides that accompany that narrative.

I would underscore that the narrative is currently in draft form, to be modified in the next several weeks based on input being gathered from staff, the Light Board, and the Town Manager. We anticipate that, once finalized and posted (in November), the CMLP will hold a public forum to explain the strategy, provide opportunities for townspeople to learn more about the strategic initiatives that will be emphasized, and gather feedback from the public. We expect that this will take place in mid-November, though dates are yet to be scheduled.

In addition, I believe Peggy Briggs has already shared with you a CMLP memo and minutes of a recent Light Board meeting, indicating CMLP's strategy for accomplishing the objectives set out by the Energy Futures Task Force, as endorsed by 2017 Town Meeting's Article 51.

I hope this packet of information, taken together, will provide the Planning Department and the CLRP team with the information it needs from the Light Board and CMLP to address energy and greenhouse gas related topics in the plan. Please let us know if you have any questions.

Best regards,

Lynn Salinger

Concord Municipal Light Plant

Strategic Planning Report

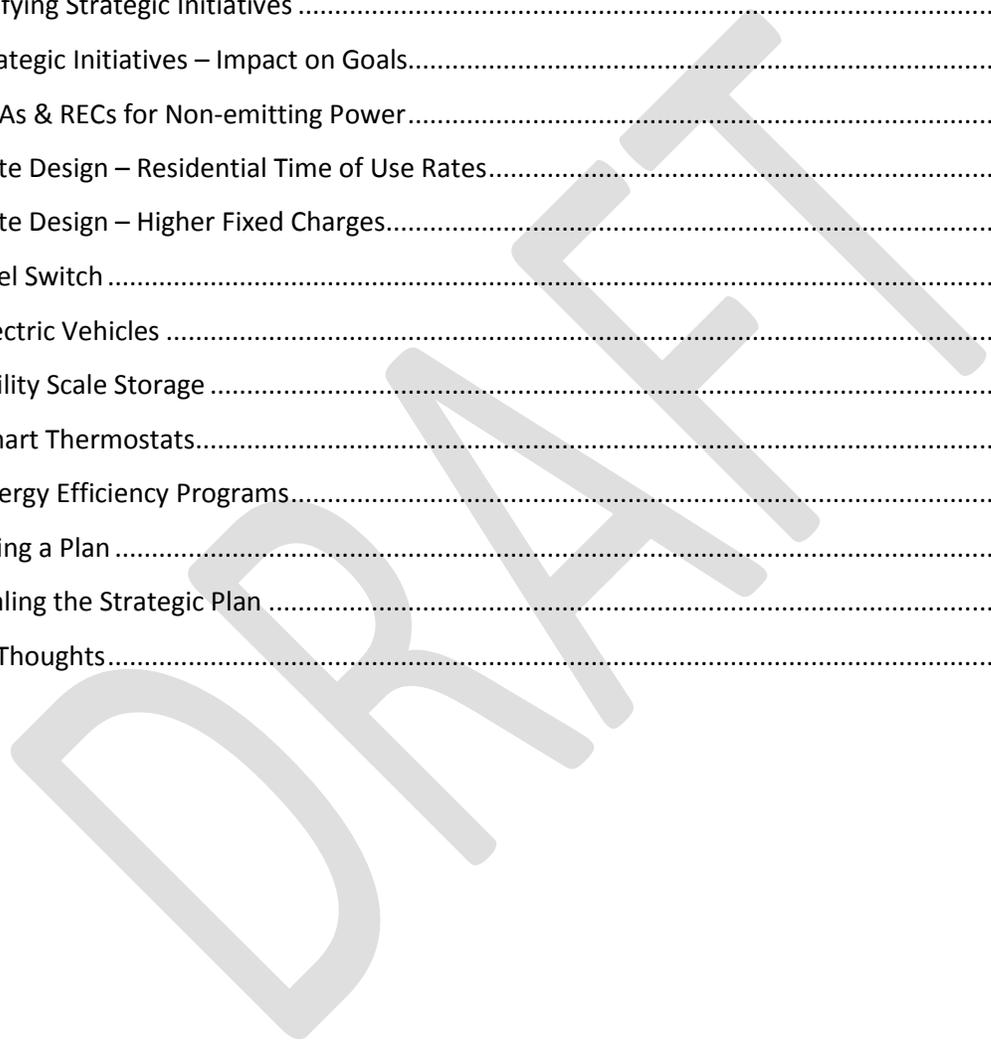
Version 1.0

DRAFT

CMLP Strategic Planning Committee
October 2017

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Overview

CMLP is happy to present Version 1 of our Strategic Plan, which lays a path forward for the next eight years, from 2018 through 2025. CMLP’s Strategic Plan is a living, working plan that will continue to evolve over time. We view this strategic planning effort as the first step in incorporating long-term planning into the way we guide our business here at CMLP.

CMLP’s Vision

Early in our planning process, we re-visited our Vision Statement and realized it was time to update the statement to better reflect where CMLP is today and where we want to be.

We used the re-worked Vision Statement to inform our goals, found a way to narrow a list of forty initiatives to seven, and built a strategic plan around them.

We recognize the public interest imperative to protect our current and future customers from the profound consequences of climate change. CMLP applauds the ambitious goals developed by the Energy Future Task Force and embraced by the community in its support of Article 51 at Town Meeting. We believe that this plan will be a critical component of the community’s efforts to reach its vision of a clean energy future.

We also know it is important to address how CMLP will remain financially viable amidst changes in the way the world generates and uses energy differently than it has in the past. Short and long-term planning efforts are essential to completing the complex projects that will be necessary to get the results we need, and to make the course corrections that will be required in a fast-changing world. Our strategic planning initiative gave us a way to decide among the many initiatives we could undertake to reach CMLP and community goals.

As such, we look forward to receiving feedback from the Light Board and the community on our Strategic Plan Version 1. We believe this plan can serve as the heart of the Town’s efforts to reduce its greenhouse gas emissions, while maintaining CMLP as a financially-healthy business that can continue to provide the reliable, high quality, and the customer-friendly services for which it is known.

CMLP’s Vision Statement
We will partner with our customers, civic institutions, and employees to foster a vital community, in the near and in the long term, in which to live, raise a family, work, and operate a business.

Setting CMLP Goals

In November of 2016, CMLP hired the consulting firms Optimal Energy and Industrial Economics to support our strategic planning work. They worked closely with us on each step of the planning process. Our first step in the process was to ask, “What goals are important for CMLP during the next eight years?”

We identified six important goals, five of them related directly to maintaining a healthy business. Three of these are related to how our customers see us. Our remaining business goals, increasing revenue and net operating income, are related to sales and finance. The 6th goal is related to Concord’s vision of a clean energy future.

Table 1

	CMLP Goals	Target Value
1.	Maintain System Reliability	No change in customer rating (95.2%)
2.	Maintain or Increase Customer Satisfaction/Perception of Value	≥ 85.8%*
3.	Provide Energy Related Services to As Many Customers as Possible	25% Res. Participation 50% Comm. Participation
4.	Increase Revenue	0% to 5%
5.	Increase Net Operating Income	0% to 5%
6.	Reduce GHG Emissions	100% of 35% goal for 2025

In our 2015 customer survey, 95% of our customers rated our service reliability as good or very good, and we want to keep it that way. Many other businesses would envy the level of customer satisfaction that we enjoy, and our goal is to maintain or increase the level of satisfaction.

We know that customers value other aspects of our service, too. We calculated a composite score of 85.8% based on the following eight other scores from the 2015 customer survey:

- Responsiveness to Customers
- Helpfulness and Knowledgeability of our Staff

- Community Service
- Communication with Customers
- Our helpfulness to customers in conserving Electricity
- Rates
- The degree to which customers feel that CMLP is doing all it can to keep prices fair
- % Describing Themselves as Advocates or Loyal Customers of CMLP

Finally, we serve everyone. We want to provide energy-related services to as many customers as possible. We set participation targets for different customer classes, defining participation as any engagement with CMLP beyond paying a bill on a standard rate. This could include a customer participating in a time of use rate, purchasing a heat pump or electric vehicle, or participating in an energy efficiency program, for example.

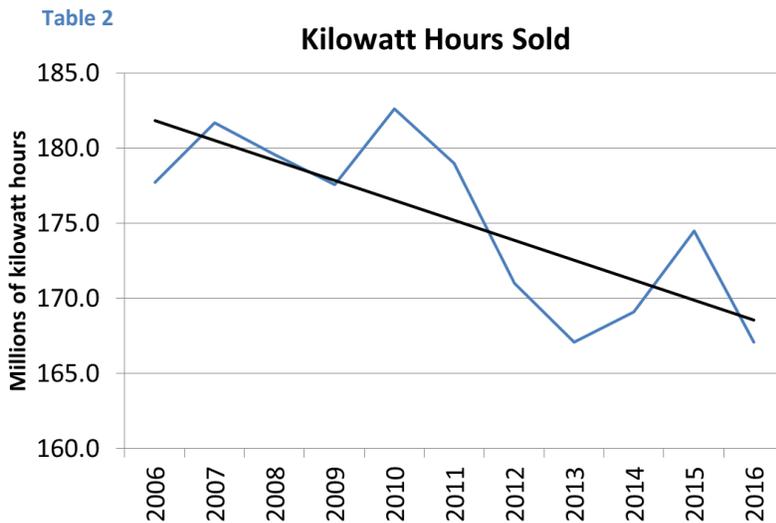
Our remaining business goals, increasing revenue and net operating income, are related to sales and finance.

Load Trends

CMLP’s load has been declining in recent years. If we project the trend from the recent past, CMLP’s future as a business does not look particularly good. We saw the risks and needed to understand what was coming.

Our consultants confirmed the risks as we saw them and projected a 5% to 10% kWh sales decline by 2025 for CMLP. The consultants attributed the decline to limited customer growth in Concord, natural efficiency, especially the market transformation occurring in the lighting sector, and increases in customer-sited generation – predominately solar PV systems. Our consultants projected more than \$2 million in lost revenue to these factors.

On the other side of the equation, electric vehicle adoption is expected to grow rapidly over the next several decades. We want to position ourselves for that and other changes that are coming.



CMLP’s Business Goals

We believe that increasing CMLP’s revenue is desirable. Revenue is a measure of the size of a business, and we envision CMLP growing in size, not shrinking, in particular due to increased sales of electricity, as

our customers transition from burning fossil fuels to using carbon-free electricity to meet their energy needs for transportation and space heating. The consultants we worked with felt that a target value of a 0 to 5 percent revenue increase was realistic, given the factors expected to affect electricity consumption absent any action on CMLP's part.

Our net operating income is the difference between our revenues and our expenses. Not only are changes coming to CMLP on the revenue side, but power supply expenses are expected to fluctuate as well. There have been questions, both inside and outside of CMLP about whether we have the proper business model to maintain our net operating income.

Because net operating income is such an important measure of CMLP's financial stability, we are aiming to maintain or increase it slightly.

CMLP's GHG Reduction Goals

Our goal for reducing GHG emissions by 2025 will singlehandedly keep the Town on track to meet its 80% emissions reduction goal by 2050.

To develop a GHG reduction goal, we began by looking at the goals that the EFTF issued for the Town and CMLP. The EFTF sets a GHG reduction goal (in relation to 2008 levels) of 25% by 2020 and 80% by 2050 for the entire Town. In order to make steady progress towards this goal, therefore, we assumed that by 2025, the end of our 8 year planning horizon, the Town will have needed to reduce its GHG emissions by 35%.

GHG Reduction Target

Table 3

Source	2008 GHG emissions (tons)	2025 Town Reduction Goal (tons) (35%)	2025 CMLP Contribution (%)	2025 CMLP Contribution (tons)
electric	83,850	29,348	100%	83,850
gas	51,643	18,075	← 7.5%	1,356
fuel oil	47,056	16,470	← 7.5%	1,235
gasoline	68,302	23,906	← 5.0%	1,195
total	250,851	87,798		87,636

3,786

CMLP Contribution as % of 2025 Town Reduction Goal	99.82%
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Initially, we also assumed that to make steady progress towards meeting the EFTF's other goal of a non-emitting power supply by 2030, CMLP's power supply would have needed to be 62% emissions-free by 2025. However, now that the Light Board has approved the REC procurement strategy for reaching a 100% emissions-free supply by 2020, we have incorporated that decision into our goal setting.

The Town's GHG emissions were about 250,000 tons in 2008 as shown in the second column of Table 3 and is the baseline to which the EFTF's emissions reduction goal applies. The third column shows what a 35% reduction in emissions for each fuel type would look like.

As displayed in the fourth column in Table 3, just about 88,000 tons of CO₂ would need to be avoided by 2025 to reach that 35% reduction that will keep us on track for 2050. CMLP can contribute almost 84,000 tons towards the reduction by transitioning to an emissions-free power supply by 2020. The Light Board's decision to transition to an emissions-free power supply by 2020 means that we will have reduced GHG emissions due to electricity consumption to zero before 2025.

CMLP's percentage contributions for natural gas, fuel oil and gasoline emissions reductions are percentages, not of the 2008 baseline amount, but of the 35% 2025 reduction goal for that fuel type in the second column. During our initial goal setting process, the consultants proposed these percentages as a projection of what they thought we could achieve through strategic electrification. For example, they projected that we could reduce emissions from gasoline by 1,195 tons, or 5% of the 23,906 ton target for 2025.

By helping customers switch from natural gas, heating oil and gasoline to electrified space heating and transportation, we think CMLP can contribute about another 3,800 tons of GHG reduction. This means that with just these two CMLP programs, the Town can meet 100% of the 2025 GHG reduction goal.

Identifying Strategic Initiatives

Once we completed this initial goal setting exercise, we began the process with the consultants of identifying the initiatives that could best help us achieve those goals. We started with a list of 40 possible initiatives.

The consultants qualitatively evaluated each one of the initiatives based on whether they advanced each of our goals and on their feasibility, as measured by a positive, neutral, or negative rating of the level of effort needed for the initiative by in-house staff and/or contractors. They also evaluated the initiative's capital intensity; the feasibility of implementing the initiative within the eight-year time horizon; the risk entailed in implementing the initiative; and whether opportunities exist to leverage neighboring utility programs in order to implement the initiative.

With additional input from CMLP regarding initiatives of particular interest to us and to the community, they narrowed the list to nine, and each one of these initiatives has a positive impact on one or more of our goals:

1. PPAs & RECs for Non-emitting Power

2. Rate Design (For our discussions going forward, Rate Design will be split into two initiatives: Time of Use Rates and Higher Fixed Charges)
3. Fuel Switch
4. Electric Vehicles
5. Smart Thermostats
6. Utility Scale Storage
7. Energy Efficiency Programs
- ~~8. Distributed Solar~~
- ~~9. Home Energy Reports~~

Both Distributed Solar and Home Energy Reports raise rates and decrease revenue and net income while not reducing GHG emissions very much. Therefore, neither is included in our final plan. At the lower levels of rooftop solar that we might expect beginning next year once the SREC program is no longer available to Concord residents, an ongoing solar rebate only results in a 0.2% decrease in GHG emissions at its peak, which is very small in relation to its cost and rate impacts.

Even if an SREC program were available to Concord residents, selling the SRECs on the market would prohibit us from counting that solar electricity in the carbon-free portion of the power supply.

Home Energy reports tell residents how much energy they used in comparison to similar homes in their region and include tips on how to reduce energy consumption. The objective is to motivate customers to make behavioral changes and investments in efficiency upgrades. The analysis showed that Home Energy Reports do not offer anything the other initiatives don't already accomplish at a larger scale.

We also concluded that the level of difficulty involved in assessing the quantitative impact of these initiatives on customer satisfaction and system reliability was beyond the scope of our planning process at this time. However, the available information indicates that these initiatives are likely to have a positive or neutral effect on customer satisfaction and system reliability.

Strategic Initiatives – Impact on Goals

We will go through each initiative and show you the impact on revenue, net operating income, and GHG reductions. In the charts below, gray means no change; green represents a positive impact; yellow means it is not clear whether there will be a change; and red indicates a negative impact.

PPAs & RECs for Non-emitting Power

Description	PPAs & RECs for Non-emitting Power
Purpose	Provide customers with a non-emitting power supply

Input Assumptions	By 2021, increase REC purchases to offset all GHG-emitting power sold By 2025, increase non-emitting power purchased through PPAs (RECs retired) to 25% of portfolio						
Impacts on Goals	<table border="1"> <thead> <tr> <th>REV</th> <th>NET INC</th> <th>GHG</th> </tr> </thead> <tbody> <tr> <td style="background-color: green;"></td> <td style="background-color: gray;"></td> <td style="background-color: green;"></td> </tr> </tbody> </table>	REV	NET INC	GHG			
REV	NET INC	GHG					
Outstanding Issues	Uncertainty in future REC and power prices						

This first initiative, transitioning to a non-emitting power supply, is based upon the CMLP GHG reduction policy recently approved by the Board.

Based on the figures REC procurement strategy, we will purchase increasing amounts of Class I Renewable Energy Credits so that the percentage of non-emitting power in our portfolio reaches 100% by 2021. Prices for RECs are assumed to escalate on the same trajectory that is projected over the next several years.

This initiative does assume that 25% of our non-emitting power comes through PPAs by 2025, for which the RECs are retired.

Rates must increase to cover the purchase of RECs, therefore, revenue increases as a result of this initiative. Future REC and non-emitting power prices will determine the rate increase needed. Net operating income will not be affected if rates increases just offset the additional clean power costs. GHG emissions decline dramatically as a result of this initiative.

Rate Design – Residential Time of Use Rates

Description	Two –Period Time of Use Rate with Opt-Out Option						
Purpose	Send a price signal to customers to shift their consumption to off-peak periods						
Input Assumptions	On-Peak to Off-Peak Rate Ratio is 2.5:1 On-Peak is 2pm to 7pm on Weekdays						
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Outstanding Issues	More in-depth rate design will need to be done
Case Study	Reading Municipal Light Plant

This initiative involves modifying our rate structure so that a two-period time of use rate is the default for our residential customers, with an opt-out option. The purpose of time of use rates is to send a price signal to customers to shift their consumption of off-peak periods. The key parameters are the ratio of the peak to off-peak rate and the duration of the peak period.

The model assumed a 2.5 to 1 ratio and a 5-hour peak based on the consultant’s initial recommendation. Research has shown that time of use rates with a substantial difference between the on and off peak rates do provide an incentive for customers to shift their consumption to off peak periods. This works best when the on-peak period is five hours or less. However, a more in-depth rate design will need to be done if we adopt TOU rates, so these parameters are subject to change.

A time of use rate would be designed to be revenue neutral. It reduces our capacity and transmission expenses, which increases net operating income. But, it reduces our capacity and transmission expenses, thereby increasing our net operating income. The impact of time of use rates on GHG emissions is uncertain. There may be effects on emissions resulting from changes in load patterns, but we were not able to assess that in this version of our strategic plan.

Our initial information is that commercial customers don’t have much ability or incentive to shift their consumption patterns permanently, their electric bill is usually a small portion of their costs and the savings are not worth the disruption. Therefore, we are not proposing time of use rates for commercial customers at this time.

More in-depth rate design needs to be done prior to implementation. We will do a detailed study and have discussion with the Light Board before setting new rates. The consultants did some research on how time of use rates were implemented by Reading Municipal Light Plant. We are watching their progress closely and this gives us a case study to refer to as part of future rate design efforts.

Rate Design – Higher Fixed Charges

Description	Moves More of the Cost of Grid Connection into Higher Monthly Fixed Charge
Purpose	Sends clearer price signal to customers and grid services providers about value of the connection they are using
Input Assumptions	Residential and G1 Charges Rise to \$30/Mo. by 2021 G2 & G3 Charges Rise to \$100/\$600 by 2021

Impacts on Goals	REV	NET INC	GHG
Outstanding Issues	More in-depth rate design will need to be done -- impact on GHG emissions -- impact on low use/low income customers		
Case Study	Minster Electric, Minster Ohio		

The Rate Design initiative has a second component, increasing the fixed amount that we charge customers each month, and lowering the variable charge. In the past, CMLP has recovered most of our fixed charges through our energy rates and maintained a low meter charge. We are assuming we will move in the direction of more accurately allocating infrastructure and program costs into the fixed cost bucket. The assumptions involve a gradual increase in which the fixed charge goes up from \$9 per month for residential and G1 customers to \$30 per month by 2021. Complete fixed cost recovery would mean a monthly \$77 fixed charge per customer. Our assessment assumed that fixed charges for G2 would increase from \$33 to \$100 and G3 customers from \$325 to \$600.

In its purist form, called Straight Fixed/Variable Charges, the variable charge would only cover costs that vary with the amount of electricity used, and the monthly fixed charge would cover all system infrastructure costs that are not affected by usage, along with all salary, administrative and energy management program costs. Its purpose is to send clearer price signals to customers, and eventually vendors who may provide various services to customers about the value of the electricity they are using or sending to the grid.

Because we didn't assess the impact of a pure Straight Fixed/Variable Charge, in which all the non-variable costs are moved into the fixed charge, we refer to this initiative as "Higher Fixed Charges." The fixed charge amounts are the consultant's initial recommendations. However, a more in-depth rate design will need to be done if we adopt higher fixed rates, so these parameters are subject to change.

The effect of higher fixed charges on CMLP's revenue and net operating income is intended to be neutral. We are simply moving some of what we currently charge in the variable kWh portion of the rate into the monthly fixed charge portion of the rate. The impact on GHG emissions is uncertain. It depends on how customers and grid service providers react to the lower variable kWh rate that will result from higher fixed charges.

The consultants did some research for us on how higher fixed charges have been implemented by Minster Electric, a municipal utility serving the village of Minster, Ohio.

Fuel Switch

Description	Rebates, Promotion and Technical Assistance to Foster Adoption of Air Source Heat Pumps (ASHPs) and Heat Pump Water Heaters by Residential and G1 Customers		
Purpose	Beneficial Electrification		
Input Assumptions	770 new ASHPs installed by 2025 2,362 kWh used annually per ASHP \$1,500 customer acquisition cost per ASHP		
Impacts on Goals	REV	NET INC	GHG
Outstanding Issues	Program Details Timing		

This initiative involves promoting the adoption of electrically-powered heat pumps and heat pump water heaters for space heating and water heating respectively, displacing the use of fossil fuels for these purposes. Promoting these technologies involves Rebates and Technical Assistance to foster adoption. Program costs can be expressed in terms of cost per device, such as air source heat pumps.

This initiative is expected to increase CMLP's revenue. The average residential customer consumes just over 10,000 kWh per year, so heat pump adoption would increase their consumption more than 20%. The effect on our net income is negative through 2025 because of the payback period. Fuel switching does not reduce GHG emissions.

Last year, Sagewell, Inc., another consulting firm CMLP partnered with, did some heat pump analytics and program design work for us. They projected heat pump adoption rates in Concord, based on what they've seen in other programs they've administered, assuming a level of technical assistance and promotion similar to what was carried out for the Green Your Heat weatherization program in Concord several years ago.

They estimated annual kWh consumption for the average sized heat pump expected to be installed in Concord, based on smart meter data they'd collected in comparable communities. Using that same smart meter data, they also estimated the impact on summer and winter peak demand in Concord, due to heat pump adoption. We've used these projections, along with estimates for the costs associated with rebates and administration of a program designed to promote heat pump adoption, in order to assess the impact of increased air source heat pump use on GHG emissions, and on CMLP's revenue and net operating income.

Our strategic planning consultants obtained analogous estimates for heat pump water heaters from MassSave program evaluation data.

Electric Vehicles

Description	Increases number of electric vehicles owned by residential customers, above and beyond BAU projection								
Purpose	Beneficial Electrification								
Input Assumptions	40 CMLP-driven purchases per year = 320 additional EVs by 2025 \$1,500 customer acquisition cost per EV 4,500 kWh used annually per EV								
Impacts on Goals	<table border="1"> <thead> <tr> <th>REV</th> <th>NET INC</th> <th>GHG</th> </tr> </thead> <tbody> <tr> <td style="background-color: green;"></td> <td style="background-color: red;"></td> <td style="background-color: green;"></td> </tr> </tbody> </table>	REV	NET INC	GHG					
REV	NET INC	GHG							
Outstanding Issues	Mechanisms needed to ensure that charging is done off-peak, including participation in TOU rates or controlled charging programs								
Case Study	Belmont Municipal Light Department								

This initiative aims to increase the number of electric vehicles owned by residential customers, above and beyond the BAU projection. Concord already appears to be running ahead of most communities in EV adoption. This program has the same benefits as fuel switching. The key implementation decisions are going to be around how much to spend on the program, and how to make sure that charging does not adversely affect peak demand.

This initiative is expected to increase CMLP’s revenue. Based on average annual EV usage in Concord, purchasing an electric vehicle would increase the average customer’s bill about 45%. As with heat pumps, the effect of investment in EV adoption on our net income is negative in 2025, but positive over the longer term. EVs do reduce GHG emissions.

The BAU projection is based on future growth rate equal to that required for the state to meet its 300,000 EV goal in 2025. State Initiatives to foster this objective, such as rebates for electric car purchases, are available to Concord residents. If the state goal were achieved, it would translate to a 12% increase in kWh sales by 2025, due to 4,800 new electric vehicles in Concord.

Of course, there is uncertainty associated with these projections. Recent national analyses indicate that the inflection point for EV adoption won't occur until sometime between 2025 and 2030, meaning that growth will be slower than we've estimated during our planning horizon. However, based on the state's electric car rebate data, there is one electric car per every 196 Concord residents, compared to one electric car per every 1,373 Massachusetts residents. That indicates we are way ahead of mass market adoption rates.

Our consultants did some research for us on a promotional program that Belmont Municipal Light has carried out, which has increased the number of EVs in Belmont, and has boosted the percentage of EV owners who are charging off peak. Using Belmont Light's program outcomes as a guide, we assume that we will be able to realize 40 additional EV purchases per year above and beyond the BAU growth in EVs, for a total of 320 additional EVs owned by Concord residents by 2025. Sagewell, which administers the Belmont program, indicates that the costs of EV adoption programs carried out by Belmont and other utilities range from \$1,000 to \$2,000 per EV. We've used the average cost in our modeling.

Our own data on electricity consumption by separately metered electric vehicles in Concord that are on our time of use rate, indicate that the average annual usage per EV is about 4,500 kWh per year. We assume that 95% of charge time for these new electric vehicles will be off peak. This assumes that the EV owners participate in a time of use rate, or in a controlled charging program.

Utility Scale Storage

Description	Installation of one utility-scale battery storage system		
Purpose	Shave Monthly Peak Demand Charges		
Input Assumptions	5 MW Discharges 15 MWh over 3 hours \$4.5 million cost in 2017; Costs decreasing 7% per year		
Impacts on Goals	REV	NET INC	GHG
Outstanding Issues	System Engineering, Cost		
Case Studies	Minster Electric, Sterling Municipal Light Department		

The utility scale storage initiative is based on the purchase and installation of one 5 MW utility-scale battery storage system, which can store 15 MWh, and then supply that electricity over a period of three

hours. As a preliminary estimate, this capacity would allow CMLP to shave peak demand charges on a monthly basis by discharging the battery. At current prices, this storage capacity would cost \$4.5 million. Battery storage costs are currently declining 7% per year, so the timing of our purchase will make a difference in its cost.

The effect of battery storage on revenue is neutral. It does improve net income by lowering our monthly peak demand. As with other load shifting technologies, the impact on GHG emissions is uncertain.

Engineering the system to ensure that we can hit the peak each month will be challenging. Depending on how we choose to control the battery, it is also possible that it could provide frequency regulation and other ancillary services. It is a very expensive initiative. However, because we would amortize the cost over 20 years or more, it doesn't have a negative impact on net income in 2025, as the previous initiatives did.

We do have some research on utility scale storage use at Minster Electric in Ohio and at Sterling Municipal Light Department here in Massachusetts.

Smart Thermostats

Description	Promotes residential customer adoption of smart thermostats that allow control by CMLP								
Purpose	Shave Monthly Peak Demand Charges								
Input Assumptions	\$85 up-front incentive Ongoing management costs 290 sign ups in year 1 and 90 more per year thereafter								
Impacts on Goals	<table border="1"> <thead> <tr> <th>REV</th> <th>NET INC</th> <th>GHG</th> </tr> </thead> <tbody> <tr> <td style="background-color: #cccccc;"></td> <td style="background-color: #008000;"></td> <td style="background-color: #ffff00;"></td> </tr> </tbody> </table>	REV	NET INC	GHG					
REV	NET INC	GHG							
Outstanding Issues	No widely adopted standards for communication/control technologies								
Case Studies	Austin Energy; Green Mountain Power								

Smart thermostats are currently the most popular of smart devices that people are installing in their homes. This initiative promotes residential customer adoption of “smart” thermostats that communicate over home “WiFi” networks to allow for control by CMLP, with the objective of lowering peak demand.

Smart devices increase net operating income by decreasing monthly peak demand charges. They do not affect revenue. Impact on GHGs is uncertain.

Controlling thermostats via our smart meters rather than via the internet may be a possibility, but communication and control technologies are far from standardized, so that is unclear at this time. We assume an \$85 one time, upfront incentive to customers who install smart thermostats, and ongoing costs to CMLP for connection to a website portal to manage each thermostat.

We assume a big push to sign up smart thermostat users in year one of the initiative and about 90 more per year thereafter.

Our consultants researched a program of this type run by Austin Energy in Texas. They also researched a more comprehensive program run by Green Mountain Power, which provides customers with a suite of smart devices that allow for peak demand control, including smart thermostats, heat pumps and hot water heaters. We hope to move towards more offerings in the future.

Energy Efficiency Programs

Description	Efficient products and upgrades in the residential, commercial, and low-income customer sectors; lighting, HVAC, refrigeration, compressed air, process heat, and motors end-uses; and new construction, retrofit, and replacement markets.		
Purpose	Help customers reduce their electricity bills		
Input Assumptions	Residential savings of 2.5% of sales by 2025 Commercial savings of 3.2% to 4.6% of sales by 2025		
Impacts on Goals	REV	NET INC	GHG
Outstanding Issues	Uncertainty regarding the nature and extent of effective energy efficiency programs over the next few years		

Energy efficiency includes programs supporting efficient products and upgrades in the residential, commercial, and low-income customer sectors.

Once our electricity supply is 100% carbon-free, efficiency programs to reduce electricity consumption will not provide further GHG reductions. We do propose to pursue energy efficiency programs that reduce electricity use and mitigate upward pressure on rates. Reducing electricity consumption during peak demand periods also extends the life of our capital assets.

Energy efficiency programs decrease CMLP's revenue. However, the available data indicates that it costs less to help a customer not use a kWh than it does to buy a kWh of non-emitting power. Assuming that is the case, efficiency programs will improve our net operating income by lowering our power supply costs. Assumptions about program outcomes and costs are based on actual Eversource program results from 2016.

Creating a Plan

With seven promising initiatives identified, the next step in our process was to begin building a plan.

At our consultants' suggestion, we pursued a scenario-based planning process, in which we evaluated the outcomes of scenarios composed of different combinations of the seven individual strategic initiatives. The four scenarios we looked at can be characterized as: #1, "do nothing we weren't planning to do anyway," #2, "reduce GHGs as much as possible," #3, "be the healthiest business possible, and #4, "take a middle of the road approach that also controls rate impacts."

Our consultants built an Excel-based Scenario Planning Tool for us allowing us to explore whether the goals we've set can, in fact, be accomplished by implementing one or more alternative scenarios. The planning tool is really a model of our entire business and includes numerous spreadsheets used to project sales and peak load through 2025 starting with our current actual figures and applying the ISO-NE forecast of a slight annual decrease in sales each year, and also the additional load due to electric vehicle adoption over time. There are additional spreadsheets that incorporate our historical load factor, our power mix, our power purchase expenses and our rates into the model.

The scenario summary page of the tool brings together on one page the bottom line changes in revenue, net operating income, GHG reduction and number of customers served as a result of each initiative or as a result of combined initiatives included in a particular scenario.

The summary spreadsheet also allows us to turn initiatives on or off, so that we can use this summary page to look at the impact of various scenarios, each containing a different combination of initiatives. For example, it allows us to set a target increase in net income, and it shows us the change in rates that will needed to be for each class, once the target net income increase and the combined changes in revenue and expenses due to the selected initiatives are taken into account.

Additionally, each of the initiatives that we shortlisted is modeled on its own spreadsheet in the Scenario Planning Tool.

Revealing the Strategic Plan

Given the work that's been done to identify goals and promising initiatives, and to build a tool to help us examine various scenarios, what plan did our consultants and CMLP staff recommend to pursue over the next eight years?

We are recommending the *balanced scenario* which includes all seven of the initiatives we've discussed in this Executive Summary. The timing with which we implement these initiatives could change, depending on how things actually play out.

The initiative to execute power purchase agreements and purchase RECs would follow CMLP's GHG reduction policy, was recently adopted by the Light Board. The retirement of RECs and plans to purchase RECs are already underway.

In addition to the seven initiatives, there are at least two enabling projects that need to be completed to enable us to interact with our customers. Some of the initiatives depend on us being able to do that.

We've prioritized implementation of the new NISC billing system because not only will it make implementation of time of use rates more efficient, it provides a host of other benefits as well. The system will streamline billing, freeing up staff time to promote customer participation in our other initiatives. NISC will enable electronic billing and virtual net metering. In conjunction with smart meters, it will allow customers to see their real-time electricity usage, enhancing responsiveness to time of use rates. NISC also includes an enterprise management system that will allow us to analyze the Town-wide smart meter data that will be available once our smart meter deployment is complete in 2019.

Time of use rates also require advanced metering infrastructure for implementation, and we are targeting 2018 – 2019 for smart meter deployment. Smart meters also have advantages for water and wastewater management.

Prioritizing the adoption of electric vehicles follows an existing trend in customer behavior and represents the biggest opportunity for electrification.

We also recommend large-scale promotion of heat pump and heat pump water heater adoption at this time. We responded to a Request for Proposal recently issued by DOER and MassCEC that provides an opportunity to participate in a 2018 pilot program to encourage the adoption of heat pumps. If we are selected, we would reprioritize the fuel switching initiative.

In the years leading up to 2020, we would design a time of use rate structure in preparation for implementation in that year. We also anticipate that higher fixed charges would be explored as a part of a rate design effort, although small steps towards higher fixed rates may be taken prior to 2020.

Some initiatives that require large capital outlays require some lead time for planning and approval by the Light Board and the Town Manager. In 2019, we recommend investing in CMLP-owned battery storage to begin lowering power expenses and help offset rate increases from other initiatives.

The promotion of smart thermostats in order to further control peak demand and related costs is another priority for 2020.

Finally, we would begin supporting expanded Energy Efficiency Programs in 2020. We would have the benefit of the most up-to-date information compiled by the IOUs on the effectiveness and costs of energy efficiency measures, as outlined in their next Three-Year Plan, to be completed in late 2018.

How does the balanced scenario plan meet the goals we laid out at the beginning of the planning exercise?

Table 4

CMLP Goal	Target Value	Projected Value
Maintain System Reliability	No change in customer rating (95.2%)	No change in customer rating (95.2%)
Maintain or Increase Customer Satisfaction	≥ 85.8%	≥ 85.8%
Provide Energy Related Services to Many Customers	25% Res. Participation 50% Comm. Participation	25% Res. Participation 50% Comm. Participation
Increase Revenue	0% to 5%	15%
Increase Net Operating Income	0% to 5%	2%
Reduce GHG Emissions	100% of 35% goal for 2025	98% of 35% goal for 2025

You may remember that we did not assess the impact of the initiatives on customer satisfaction or system reliability. However, the available information indicates that the impacts would be positive or neutral.

The participation goal was to involve 25% to 50% of our customers in one or more initiatives. Experience from other utilities is that about 16% of residential customers will opt out of time of use rates, meaning that we'd have 84% participation in that initiative for the residential sector. We are estimating residential and G1 participation in fuel switching at about 29% of our customer base by 2025 and 4 to 9% participation in electric vehicle and smart thermostat adoption in the residential sector. We are expecting that about 13% of residential customers will have participated in an energy efficiency program by 2025, and about 25% of businesses. Those numbers indicate we may fall short of our participation goal for the commercial sector. Additional efforts may be needed to boost participation.

In large part because rates must increase to cover the purchase of RECs, revenue increases about 15% in our balanced scenario, significantly more than our target range. Our goal was to increase net income by 2% and our balanced scenario achieves that.

Our initial goal was to achieve 100% of the 2025 35% Town-wide GHG reduction goal that will keep the Town on track to reduce GHG 80% by 2050. Now that we have assessed the GHG reduction potential of initiatives such as fuel switching and electric vehicle adoption, in addition to the purchase of non-emitting power and RECs, we find that our balanced plan still comes very close to achieving that goal.

The percentage reductions from fuel switching and electric vehicle adoption were a little lower than we originally thought. Reduction in GHG of 1,119 tons is attributable to fuel switching from both natural gas and fuel oil heating systems. In the end, CMLP is still able to contribute almost 100% of the Town's 2025 GHG reduction goal.

We will be looking for guidance from the Board on the boundaries of the rate changes we need to make to carry out the plan. REC purchases will drive rates up by about 17% over 4 years. However, RECS are not our long term strategy. We will need to transition beyond RECs to invest in actual non-emitting power generation facilities and that may add costs.

The other initiatives we've described will increase rates less than 5%, and will make us more able to address the complex environment in which we'll be operating in the future.

Final Thoughts

CMLP's Strategic Plan, Version 1 is a living, working plan that will continue to evolve over time and will create benchmarks that can be tracked. Annual adjustments will be required to our programs to stay on track and respond to market conditions. Our next step is to do detailed planning for each initiative.

While we have a credible plan that will achieve CMLP's goals, the forward capacity, transmission and REC markets, along with policy changes that affect those markets could vary greatly from our assumptions and must be watched carefully.

This plan finishes the job of reducing GHG emissions from electricity use by 2021, and begins the transition from fossil fuels to non-emitting power for space and water heating and transportation. The community's main focus needs to be on completing that transition to ensure that the Town's 2050 GHG reduction goal can be met.

A secondary focus will need to be on reducing the remaining fossil fuel use in Town. Weatherization of buildings that are still partially or fully heated with fossil fuels will be important. Working on ways to reduce vehicle miles driven will help reduce GHG emissions while the vehicle stock transitions from internal combustion engines to electric vehicles.

Involvement by the new Director of Sustainability, other Town departments, and active citizens and volunteers will be essential. CMLP looks forward to working with many partners to achieve this mission in the years ahead.

Appendix

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