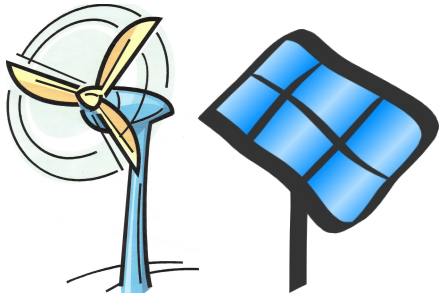

Concord Municipal Light Plant
Renewable Energy Strategy

January 2011
Version 1.1

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A. Purpose of this Document

The purpose of this document is to present the Light Board's current understanding of renewable energy opportunities and considerations and to recommend a strategy for increasing renewable energy sources within Concord's energy supply. This document is not intended to present a detailed set of action plans, but rather an overall set of strategies (see page 3) that will be prioritized and further developed with associated goals, plans and policies. The Light Board welcomes comments from the Concord community. Please send your comments to LBchair@concordma.gov.

B. Renewable Energy Strategy Overview

This section is a summary of the Concord Municipal Light Plant (CMLP) long-term strategy for sourcing renewable energy. The full-length document provides more details about each of the subjects mentioned here. Here, the focus is on power *supply;* other sustainable energy topics such as energy conservation and efficiency efforts are part of CMLP's *demand* strategy.

1. Current Power Supply

The following table displays Concord's current energy purchases by fuel source for the 12-month period ending August 31, 2010.

Fuel Type	Contract	Expires	Annual MWh	% of Supply
Natural Gas	Morgan Stanley	2013	130,000	74%
	Braintree	2029	10,000	6%
	Spot Market	Ongoing	16,000	10%
Landfill Gas	Granby LFG	2013	7,500	4%*
Hydropower	Miller (Maine)	2013	5,500	3%*
	NY Power Authority	Ongoing	6,000	3%*
Total			175,000	100%
*renewable				

CMLP's current renewable energy portfolio is about 10%, including hydropower facilities, and increases to 13% in 2011 if both the Spruce Mountain (Maine) wind contract and the Concord Wastewater Treatment Plant solar contract come to pass.

The current Massachusetts Renewable Portfolio Standard (RPS) is 5% in 2010, increasing 1% per year to 15% in 2020. Existing hydropower facilities are not included in MA's measure of renewable energy. While CMLP is not currently obligated by law to meet the MA RPS, our general objective is to obtain as much of our electricity as possible from renewable, sustainable, or environmentally-friendly sources as possible. Our particular objective is to consistently meet or exceed the Massachusetts Renewable Portfolio Standard.

2. Future Power Supply

The Light Board recommends that CMLP commit to increase the renewable energy portion of its energy supply portfolio from 10% in 2010 to 20% by 2015 and 30% by 2020. Each 10% increase in renewable energy will reduce CO2 emissions by 15 million pounds (7,500 tons) annually.

Renewable energy sources generally have several positive attributes, including the following:

- Essential environmental benefits – fewer CO2 emissions and less air pollution
- Predictable and stable cost structures – less exposure to fossil fuel price fluctuations
- Immediate cost reductions – reduced transmission costs when energy is produced locally, and reduced forward capacity charges when peak consumption is reduced by local power generation
- Low long-term costs – renewable energy sources are becoming increasingly cost-effective when viewed over the life of the energy source

3. Renewable Energy Strategies

Specific strategies to achieve the goal stated above include the following:

1. Move rapidly to implement in-town solar power generation at all levels: residential, municipal, commercial and utility-scale.
2. Research, evaluate, and take an active role in developing wind power sources in New England.
3. Work with Energy New England (ENE) to aggressively pursue other cost-effective renewable energy contracts.
4. Monitor emerging technologies and assess potential for use by CMLP.
5. Develop and implement a formal Energy Conservation strategy.
6. Develop a financial strategy that supports energy conservation and renewable energy plans. A key activity is to determine whether CMLP should purchase power or own renewable energy facilities – "buy vs. own", and how CMLP will increase its renewable energy supply and promote conservation while continuing to provide reliable and affordable power to its customers.
7. Monitor developments in plug-in electric vehicles.
8. Update the CMLP Power Supply Manual as appropriate.

It is expected that each of these strategies will be further analyzed in detail and associated tactics, plans and policy implications identified.

C. Definition and Benefits of Renewable Energy

Renewable energy is energy which comes from natural resources such as sunlight, wind, water flow, waves, tides and geothermal heat, which are renewable (naturally replenished). Biomass (plant material) is also a renewable energy source because the energy it contains comes from the sun through the process of photosynthesis and plant material can be replenished every growing season.

Fossil fuel-based energy sources such as coal and oil and natural gas (methane), while also natural resources, are considered to be finite in supply and therefore not renewable. Also, the burning of fossil fuel-based energy sources adds carbon dioxide and other emissions to the Earth's atmosphere, contributing to climate change and its impacts, whereas the use of renewable energy sources does not.

Landfill gas is considered to be a renewable resource, because its use prevents the emission of methane, a potent greenhouse gas, into the atmosphere.

Renewable energy sources have several positive attributes, including the following:

- Essential environmental benefits – particularly, fewer CO2 emissions and less air pollution
- Predictable and stable cost structures – less exposure to fossil fuel price fluctuations
- Immediate cost reductions – reduced transmission costs when energy is produced locally, and reduced forward capacity charges when peak consumption is reduced by local solar power generation
- Low long-term costs – renewable energy sources are becoming increasingly cost-effective when viewed over the life of the energy source

D. Current Power Supply Mix

CMLP is required to contract for both energy and capacity. *Energy* is what we think of to light our lights, heat or cool our buildings, and make our appliances and machinery go. *Capacity* is the amount of energy that can be delivered during any particular instant — especially the amount that can be delivered during the hottest hour of the hottest day of the year. Under the current market rules for electricity supplies in New England, CMLP is required to purchase capacity amounting to 1.5 times the peak demand for the year.

In 2010, CMLP is paying about 8¢ per kilowatt-hour (kWh) for energy. We also pay an average of about $6.07 per month per kilowatt of capacity through 6/1/11, for a total of about 63,500 kW. The capacity charges work out to about 2.2¢ per kWh when averaged over the entire year.

The following chart displays Concord's current Energy purchases by fuel source for the 12-month period ending August 31, 2010.

Fuel Type	Contract	Expires	$/kWh	Annual kWhs (000s)	% of Supply
Natural Gas	Morgan Stanley	2013	$0.08	130,000	74%
	Braintree	2029	$0.06	10,000	6%
	Spot Market	Ongoing	$0.05	16,000	10%
Landfill Gas	Granby LFG	2013	$0.065	7,500	4%*
Hydropower	Miller (Maine)	2013	$0.0635	5,500	3%*
	NY Power Authority	Ongoing	$0.03	6,000	3%*
Total				175,000	
*renewable					

Currently renewable energy sources provide 10% of Concord's energy supply. An additional renewable source currently in progress is:

- A contract with Spruce Mountain Power of Maine has just been signed that would add 5,000,000 kWhs of wind power to CMLP's portfolio for 15 years for energy and capacity. The facility is expected to become operational in the fall of 2011.

The following chart displays Concord's current Capacity purchases by fuel source for the month of July 2010. This chart is for informational purposes only. Calculation of the portfolio's renewable energy percentage is based on Energy purchases (above).

Fuel Type	Contract	Expires	Monthly kWs	% of Requirement
Natural Gas	Braintree	2029	9,200	16%
	Dominion	2015	8,100	14%
	Spot Market	Ongoing	36,195	64%
Landfill Gas	Granby LFG	2013	1,000	2%
Hydropower	HydroQuebec	Ongoing	1,025	2%
	NY Power Authority	Ongoing	1,300	2%
Total			56,820	

The total annual carbon dioxide emission from this portfolio is roughly 150 million pounds (75,000 tons) based on an emissions rate of .952 lbs CO2/kWh (the on-peak marginal emission rate for the Northeast electric grid) multiplied by the annual non-renewable kilowatt hours of CMLP's current power supply (156,000,000).

Most of the fossil fuel power supplies in New England burn natural gas (methane), although some burn oil during the winter months when natural gas supplies are restricted.

Natural gas is a fossil fuel producing carbon emissions, albeit less than coal or oil, and it is a non-renewable energy source. New deposits of natural gas are being found, but some predictions are that natural gas supplies will peak in 2040 and decline thereafter. Moreover, new natural gas fields (such as the Marcellus Shale of Pennsylvania and New York) have severe environmental and pollution impacts of their own. Natural gas has been described as a "transition fuel" with near-term use until an infrastructure of renewable energy sources can be established.

Natural gas prices are very low at present but have been very volatile in recent years. We believe that prices will increase over time; just how much is hard to estimate. In 2008, natural gas prices were 11¢/kWh, double today's price. Renewable energy prices have historically been higher than fossil fuel energy prices, but they are becoming competitive with fossil fuels due to market forces, federal and state incentives, and improvements in technology. When viewed in a long-term perspective, renewables tend to be more stable and predictable in cost than fossil fuels.

Currently, renewables represent a small percentage of CMLP's energy portfolio. The price of CMLP's current renewable energy contracts is very competitive with that of its current fossil fuel energy contracts.

E. Other Considerations

Energy Transmission: The electricity grid in the New England must be (and is being) modernized to handle renewable energy sources. Transmission costs to Concord have already increased significantly, and we expect them to continue to increase in the future. Energy production within Concord eliminates the transmission charges associated with energy generated outside Concord. Both transmission charges and forward capacity charges are based on peak energy consumption. Reductions in peak energy consumption will generate direct savings to CMLP and its customers.

Energy Consumption: Several factors will influence electricity consumption in the future, some increasing consumption and others decreasing consumption. Concord's population has remained stable over the past 30 years, and a significant increase in population appears unlikely. There has been a discernible trend toward decreasing energy usage due to conservation.

A planned large housing development in West Concord will increase demand in the near term. The move to electric (plug-in) cars will increase consumption, primarily during the evening hours as cars are plugged in to charge overnight. Likewise, if Electric Thermal Storage heating becomes more popular, it will also increase consumption, primarily at night. Energy conservation and local generation of solar power by residential, commercial, institutional and municipal customers will reduce demand for CMLP-supplied electricity. On the whole, we do not expect a significant reduction in electricity use in the future.

Peak Demand: The transformers at the Forest Ridge facility are sized to handle 50 MVA each at peak demand. Current peak demand is running 44 MW. With a power factor of .92, this usage translates to 47.8 MVA, which is very close to the current Forest Ridge capacity. The two transformers serve as backups for each other, so one can carry the entire load if the other is out of service. Once the peak demand goes over 50 MVA, there is no backup, and Concord would suffer a loss of capacity if one transformer goes down. The same thing is true of the transmission lines from Sudbury, which are shared by three communities, namely Concord, Acton, and Maynard. There are two lines capable of carrying 90 MVA each, but the combined demand is already over 100 MVA. Therefore, there is currently no backup if one line goes out of service during a peak period.

It is essential and urgent to address both issues. There several possible non-exclusive approaches:–

- Increase the capacity of the Forest Ridge substation to handle more than 50 MVA with appropriate backup, and later increase the capacity of the transmission lines from Sudbury to provide adequate backup. Both of these would be investments in the infrastructure but would represent pure overhead expenses.
- Reduce demand at peak times through conservation and peak management with Smart Grid.
- Provide some kind of electricity generation within Concord to provide a portion of the peak power that does not need to pass through the transformers and transmission lines.

The first of these approaches would be purely an overhead expenditure (although the transmissions lines would have to be shared with NStar, the utility for Acton and Maynard). The second should be undertaken, regardless of other efforts. However, it involves changing people's behaviors, and therefore it is likely to take a long time. The third would be a revenue-producing investment and represents the best option. Among the in-town generation options, solar energy is particularly attractive. If implemented aggressively enough, it would delay the need to upgrade the transformers, perhaps indefinitely.

Energy Conservation: Energy conservation is a very important part of an overall strategy to manage electricity consumption. There are many efforts underway to promote energy conservation, including rebates for compact fluorescent light bulbs and energy-efficient appliances, special programs for home energy audits and weatherization (e.g., National Grid and CMLP), and state and federal tax credits for energy efficiency improvements and renewable energy. In October 2009 CMLP implemented a new tiered rate structure with higher rates for higher levels of electricity use. The Smart Grid implementation within Concord will enable time-of-use billing and the installation of smart meters on home appliances such as pool pumps to reduce electricity use during peak periods. Energy conservation is the "first fuel," and will continue to be an important focus of CMLP's efforts.

F. Renewable Energy Technologies and Opportunities

1. Wind Power

The areas of highest potential in Massachusetts include coastline and off-shore areas, and the Berkshire mountain ridge in western Massachusetts. Wind power is currently not feasible in Concord due to low wind speeds. Transmission of energy over long distances (e.g., outside New England) is limited due to energy losses and the high cost of power transmission from or through New York State. Therefore, potential sources of wind power for Concord are New England-based wind facilities or facilities in eastern Canada. For a wind facility to be considered economically viable, it should have at least 2200-2500 wind-equivalent hours per year. That is, the wind should blow hard enough and often enough that a 1-MW turbine generates 2200-2500 megawatt-hours of energy per year.

Wind energy tends to peak in the early morning and early evening, which is not aligned with peak usage. Wind turbines can be placed on farmland, supporting dual land use and providing another source of income for farmers. Wind power efforts suffer from resistance by neighbors who complain about noise and the disruption of their view.

The State recently changed its regulations to allow the investor-owned utilities (IOUs) to meet State targets by purchasing wind power from outside Massachusetts. In general, competition for renewable energy from the IOUs can be expected to increase as they strive to meet State mandates for renewable energy.

As noted above, CMLP has signed its first wind power contract with Spruce Mountain Power of Bethel, Maine. Opportunities to add wind power to Concord's portfolio include more contracts through Energy New England, and pursuing opportunities to partner with other communities to develop modest-sized wind power facilities. For example, the town of Princeton, MA has installed two wind turbines behind Mount Wachusett which are generating 40% of that town's annual electricity needs at about 7¢/kWh. It may be possible to approach Princeton about installing a CMLP-owned turbine in Princeton.

In general, Concord should look for small or medium-scale wind facilities where we would have access to 7-12 megawatts of capacity at one site at costs of about $2.00-2.50 per watt. By contrast, most wind farms that make the news are large investor-owned installations that are measured in the hundreds of megawatts.

2. Hydropower

CMLP currently purchases power from a large-scale river-based hydropower facility in Maine and intends to purchase power from a (very) small-scale power facility in Acton, MA. Hydropower facilities, especially small ones, are affected by dry periods that drive down water levels and limit energy production. Climate change in the Northeast will

result in more rainfall in heavy downpours and then periods of little rain, exacerbating issues at small hydropower facilities. Hydropower facilities alter river and stream ecosystems, creating concerns about negative impacts on plants and animals.

It is generally regarded in the power industry that all river-based hydropower opportunities in New England have been exploited. The most promising supplier is Hydro Quebec, who has publicly expressed an interest in selling more hydropower to New England over an existing high-voltage transmission line. Concord should continue to purchase hydropower from vendors who are willing to sell at appropriate prices.

An emerging area in hydropower is marine (ocean-based) power, which is the use of waves or ocean tides to generate power. Maine has begun developing tide-based power facilities. Massachusetts is seeking to establish a "wetlab" off shore south of Cape Cod and The Islands for the testing of tidal generators, wave power generators, and offshore wind turbines. Marine power is an emerging technology and opportunities to purchase this type of power, when available, should be examined.

3. Solar Power

Solar photovoltaic (PV) technology is fairly straightforward and has remained relatively the same over the past 30 years, with modest improvements in efficiency and big reductions in cost. New developments include thin film technology which may in the future allow solar PV cells to be imbedded in roof tiles and other construction materials. While one thinks of the sunny Southwest as the best place for solar energy generation, the Northeast still has good solar potential. At Concord's latitude and in Concord's climate, a 1-kW solar array would generate about 1200-1300 kWh of energy per year. (Some solar arrays increase the number of solar-equivalent hours by mechanically controlling the tilt of the panels to track the sun.) Although solar energy is generated only during the day, it is generated at its highest levels during hot summer days when electricity usage and cost is highest and when peak capacity and transmission charges are calculated.

Solar power has historically been much more expensive than other power sources. Many factors are combining to significantly reduce the cost of solar energy, including the economic slowdown, an oversupply of panels from manufacturers in China and Germany, and state and federal incentives for solar power facilities. Current installed prices are running less than $5/watt, a decrease of 50% since 1998.

Local solar facilities, whether large-scale or located on residential or non-residential roofs, will reduce transmission costs and forward capacity market charges that are associated with peak consumption. A CMLP analysis prepared in August 2010 for a 1 megawatt array estimated that transmission cost savings would be approximately 2¢/kWh and forward capacity market savings approximately 6.5¢/kWh. With recent bids for utility-scale solar on Town-owned land at 11¢–14¢ per kWh, the transmission cost

savings makes the price of solar energy very attractive in comparison with other power purchased by CMLP.

Residential Solar: Solar panel providers generally estimate that 25% of a community's homes could support solar panels, which in Concord would be 1,500 homes. An average installation of 4 kilowatts on 1,500 homes would translate to 6,000 kW, or 6 megawatts of solar energy potential. CMLP is currently developing a power purchase program for residential and small commercial customers to remove the financial barriers to these installations. However, given the current Federal, State and CMLP incentives, and the current CMLP net metering policies for residential solar, a homeowner who purchases a PV system outright can do well financially, recovering the initial investment within 8 - 10 years and then generating positive return.

Under the CMLP Net Metering policy effective until 12/31/10, residential solar energy offsets electricity costs at the prevailing residential rate, and any excess is sold back to CMLP at the same rate. The financial viability of this practice on CMLP's operation has been reviewed. It has been decided that as of January 1, 2011, CMLP customers with PV systems on their property will be credited for energy delivered to the CMLP system at the previous month's average cost of the Day Ahead energy as purchased by CMLP from the Integrated System Operator (ISO).

Municipal, Commercial, and Institutional Solar: Non-residential buildings are also good sites for solar, due to generally large and flat roofs. A 48 kW system on the roof of the Willard Elementary School recently went live and is expected to provide about 9% of Willard's annual electricity needs. The Department of Corrections has installed a 60 kW system at the Concord Reformatory and is installing another system (100 kW) at the Northeast Correctional Institute (on the north side of Route 2). Commercial investment in solar will reduce purchases of power from CMLP, affecting the ability to cover CMLP operating costs, but will also reduce CMLP's transmission and forward capacity costs. An estimate of the potential size of commercial solar facilities has not been made. The commercial sector may not be aware of the potential for solar facilities.

CMLP does not currently have a tariff for non-residential solar energy. An in-depth study and analysis is required to balance the benefits against the costs and to develop appropriate incentives.

Utility-Scale Solar: Utility-scale facilities offer a good way to achieve significant amounts of solar energy relatively quickly, and with the current State incentives, at a very competitive cost. The drawback of utility-scale facilities is that they require a lot of space, generally about 5 acres per megawatt and there are always existing uses of the land that must be considered. There are a number of utility-scale solar vendors who will own, install, operate and maintain solar facilities, and enter into a long-term power purchase agreement with the local electrical utility.

The Light Board has recently voted to approve a Utility-Scale Solar Strategy. In summary, this calls for about 25 megawatts of solar capacity within Concord, to be deployed in increments of about 5 megawatts each and about 5 years apart. 25 megawatts would represent about as much power as CMLP could accommodate on normal (non-peak) days and more than 50% of the Town's total peak demand. When fully deployed, it would generate about 20% of the Town's annual electrical energy requirements at reasonable and predictable costs. Incremental deployment over time would help to manage the financing and to enable us to take advantage of technological improvements as they emerge.

In-town solar helps CMLP manage its costs by reducing forward capacity and transmission costs, and long-term utility-scale solar contracts at competitive rates provide rate stability. Solar power is the energy source with the greatest potential in Concord and should be aggressively pursued at all levels – residential, municipal, commercial, institutional and utility-scale.

4. Biomass

Biomass is plant matter grown to generate electricity or produce heat generally through direct incineration. Forest residues (such as dead trees, branches and tree stumps), yard clippings, wood chips and garbage are often used for this. Industrial biomass can be grown from numerous types of plants, including miscanthus, switchgrass, hemp, corn, poplar, willow, sorghum, sugarcane, and a variety of tree species, ranging from eucalyptus to oil palm. The issues with the use of biomass have to do with competition with other uses of the land (e.g., raising crops to burn versus raising crops to eat), the true "sustainability" of the feedstock (the ability to keep feeding the incinerator), and the need to allow crop residues to remain to nourish the soil.

CMLP has been in conversation with the developers of a wood-burning facility in mid-state, but it appears that the facility will not be built. Massachusetts has recently restricted its definition of what qualifies as biomass, which will probably limit the opportunities for power generation in this area. Biomass is an emerging technology and should be monitored to see if opportunities develop.

One possible application for biomass energy involves cogeneration. Cogeneration involves generating electricity through combustion of fuel (fossil or biomass), and using the "waste" heat for water and space heating applications. Cogeneration is very energy efficient, but must be located near the site(s) where the excess heat is utilized. Examples of biomass cogeneration systems include systems at Mt. Wachusett Community College and Middlebury College. The magnitude of locally available, sustainably-produced biomass feedstock has not been assessed, so it is not yet known if biomass cogeneration could contribute significantly to the Town's power supply.

5. Energy Storage

There are many emerging energy storage technologies, including ice storage, water storage, fly wheels, batteries and fuel cells. These technologies help the grid handle intermittent generation by renewable energy sources. The ISO (grid operator) generally manages the inflow of electricity to the grid to meet demand. For the time being, additional storage at the local level is not critical. A pilot of ice storage technology in a municipal building is currently being considered as a peak-shaving option. CMLP's current ETS (Electric Thermal Storage) program goals and results should be evaluated as part of CMLP's Energy Conservation/Demand Management Strategy. The field of energy storage technology and Concord's needs can be monitored to see if anything of potential use develops.

G. Financial Considerations

CMLP Mission: CMLP's mission is to provide reliable electricity at a reasonable cost to its customers. According to a residential customer survey completed in 2008, CMLP's residential customers consider reliability, cost and environmental sensitivity to be equally important. An informal survey of selected commercial customers indicates a bias toward reliability and cost but with concern for the environment. CMLP's challenge is to incorporate renewable energy sources into its portfolio at a cost that does not result in an unreasonable price to customers and at the same time provides enough revenue to fund CMLP operations.

Conservation and Renewable Energy Budget: CMLP currently collects a surcharge of 0.52% on its electricity bills for energy conservation and renewable energy incentives, amounting to about $100,000 per year. CMLP's current solar rebate is $1/watt. At this incentive level and given the current budget, only 20 5kW installations could be supported annually. Beginning 1/1/11, CMLP's solar PV rebate will be $.625 per watt AC with a maximum rebate per installation of $3,125. The revised rebate amount is calculated based upon 10 years of savings realized by CMLP due to the installation of local solar capacity, minus the revenue lost by CMLP when customers with solar PV facilities generate their own electricity. It is an open question as to whether or not the annual budget for energy conservation and solar PV rebates is adequate, given CMLP's interest in promoting conservation and renewable energy.

Federal and State Financial Incentives: The Light Board recognizes that federal and state subsidies and Renewable Energy Credit programs are intended to stimulate the renewable energy market and that as those markets mature, the subsidies will no longer be needed. The Light Board also recognizes that the "externalities" cost of the use of fossil fuels (e.g., the cost of war in the Middle East, the cost of pollution cleanup, the cost of black lung disease and other public health problems) is disregarded when these costs are compared to the cost of renewable energy. In addition, special tax breaks are awarded to the oil, gas and coal industries. Government subsidies have been used when the market

itself has been dysfunctional in promoting "the right kind of activity." The subsidies for renewable energy are helping to create a green energy economy and jobs. The Light Board believes that we have a responsibility to participate in moving the market forward.

Nevertheless, the Light Board also believes that financial decisions should only be made with subsidies actually in hand or guaranteed to be available. It should not count on future subsidies that may change or evaporate as a result of legislative action or on renewable energy credits whose price is determined by market forces. Instead, any such future subsidies or credits that are earned by CMLP renewable energy facilities should be used to retire debt and/or to build up funds to pay for future facilities.

H. Renewable Energy Portfolio Goal

The current Massachusetts Renewable Energy goal is 5% in 2010, increasing 1% per year to 15% in 2020. Existing hydropower facilities are not included in MA's measure of renewable energy. CMLP's current renewable energy portfolio is about 10%, including hydropower facilities, and increases to 13% in 2011 if both the Spruce Mountain wind contract and the Wastewater Treatment Plant solar contract come to pass.

The potential for future wind power contracts is unknown at this time. The potential for utility-scale solar power in town is based on the amount of land that can be acquired or made available. Under the Utility-Scale Solar Strategy adopted by the Light Board, ten megawatts should be deployed in the next ten years. Several potential sites have been identified, and options are being explored.

The Light Board recommends that CMLP commit to increase the renewable energy portion of its energy supply portfolio from 10% in 2010 to 20% by 2015 and 30% by 2020. Each 10% increase in renewable energy will reduce CO2 emissions by 15 million pounds (7,500 tons) annually. It appears that this goal is achievable with the addition of 10 MW of solar energy and 7MW of wind energy over a 10-year period.

I. Renewable Energy Strategy

The following strategic initiatives are recommended to achieve the Renewable Energy Portfolio goal stated above. It is expected that each of these strategies will be further analyzed in detail and associated goals, plans and policy implications identified.

1. **Move rapidly to implement in-town solar power generation at all levels: residential, municipal, commercial, institutional and utility-scale**.

Communications: Develop a communications plan to educate the community about solar energy potential and CMLP's strategy.

Residential Solar

- Implement a PPA (power purchase agreement) option for residents.
- Develop a financial comparison between an outright purchase and a PPA to inform residents of their options.
- Develop a system to submit solar energy generated from resident-owned systems to the State for SRECs (solar renewable energy credits) and give dollars earned back to the residents.

Municipal, Commercial, and Institutional Solar

- Develop policies, tariffs, and incentives for solar energy on non-residential buildings and properties.
- Determine the potential for solar facilities on municipal and commercial rooftops and land (e.g., parking lots).
- Inform business/building owners of the potential for solar energy, including financial savings.
- Facilitate the process between owners and PV system providers.

Utility-Scale Solar

- Proceed with the Article 64 project as under recommendations suggested by the Board of Selectmen. Consider if additions to capacity for the Wastewater Treatment Plant site are possible to achieve a meaningful-size installation.
- Identify all potential sites within Concord, including those not currently owned by the Town.
- Prepare warrant articles for Town Meeting 2011 or 2012 as needed.
- Prepare a detailed plan for making a multi-year investment in utility-scale solar based on potential sites and financial feasibility.
- Consider if it makes sense for CMLP to own and operate such facilities, given its ability to issue long-term bonds at favorable rates and the opportunity to own SRECs.

2. **Research and evaluate opportunities to develop modest scale wind power facilities in New England.** Understand the details of the Princeton facility and explore options for siting a CMLP-owned wind turbine or turbines in one or more locations in New England.

3. **Work through ENE to aggressively pursue other renewable energy contracts that make sense financially.** Inform ENE of CMLP's Renewable Energy Strategy and Goal. Discuss options, including multi-municipal opportunities to own renewable energy facilities, much like some of the current fossil fuel-based facilities.

4. **Develop and implement a formal Energy Conservation strategy**. Review the effectiveness of the current programs and adjust as required to maximize impact.

5. **Monitor emerging technologies and assess potential for use in Concord.** These include, but are not limited to, the following: local wind power, biomass, energy storage, marine-based power.

6. **Develop a financial strategy that supports energy conservation and renewable energy plans.** Consider increasing annual funding for energy conservation and renewable energy, while reviewing and adjusting incentive levels as appropriate. Understand the potential impact of energy conservation and local residential and commercial solar facilities on CMLP revenues and adjust incentives as needed. Research other sources of funding for renewable energy and conservation (e.g., RGGI – Regional Greenhouse Gas Initiative $$$). Understand CMLP's overall financial strengths and debt capacity to help determine whether CMLP should in the future purchase power or own renewable energy facilities.

7. **Monitor developments in plug-in electric vehicles.** Not only must the impact on rates be considered, but also on the electrical system and the ability to deliver renewable energy to them.

8. **Review contract policy implications and update the CMLP Power Supply Manual as appropriate.**

J. Policy Considerations

Power supply contracting efforts will need to take the renewable energy portfolio goal into account to ensure that contracts are structured to achieve the goal. For example, CMLP should not commit to fossil fuel contract timeframes that would not leave enough consumption to be met by renewable energy contracts. Also, CMLP's position on purchasing coal-fueled energy should be stated, as coal is the biggest contributor to climate change and has many other deleterious environmental and public health effects. CMLP's position on the purchase of nuclear power should also be stated, given the safety and other issues associated with nuclear power.

K. Next Steps

It is not realistic to expect that CMLP staff will be able to perform all of this work, so priorities for efforts will need to be established. It is possible that teams of people could be put together to work on each of these projects, with a Light Board member or CMLP staff member as lead for each project. The Solar initiatives could be split into 3 projects – residential, municipal/commercial/institutional, and utility-scale – with separate teams to

address. Team members can come from the Light Board, the Comprehensive Sustainable Energy Committee, CMLP staff and the community at large.