

2007 Integrated Resource Plan



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1: Executive Summary

Overview

Green Mountain Power presents the results of our 2007 Integrated Resource Planning process. Through this process we met several objectives.

The first — and most important — objective is that we thoughtfully examined the potential strategies that GMP could deploy to secure the resources necessary to meet the needs of our customers in a way that provides the most value to customers, based on current and anticipated regulatory policies, price projections, and risks. GMP evaluated the various strategic options from several perspectives: projected costs, air emissions, flexibility, financial feasibility, and flexibility to adapt to the changing environments in which our customers live and conduct their businesses.

A second objective is to form a basis for establishing dialogue with the Vermont Public Service Board, the Department of Public Service, the Vermont Legislature, the executive administration, and other government agencies. In this objective, we comply with the requirement for all utilities in Vermont to periodically file an Integrated Resource Plan.

The third objective is one that is gaining visibility and priority within the Vermont community. GMP hopes that this report and other insights and information developed within the IRP analysis provide context to the public outreach efforts being conducted by the Department of Public Service. As such, GMP has adopted a decision and information presentation process that brings more stakeholders with diverse perspectives into the strategic planning process. To do this, we incorporated a process known as a Multi-Attribute Trade-off analysis (see “Results of the Multi-Attribute Trade-off Analysis” on page 9 for details).

Planning Objectives

Based in part on the results of our analysis, GMP continues to pursue the following goals:

- Keep our revenue requirements low, both in procuring and delivering power.
- Maintain our environmental stewardship by continuing to purchase energy principally from non-emitting or low-emitting sources.
- Manage our supply and generation risk, including support of the highest level of economic energy efficiency and investing in a judicious amount of economic renewable sources. All these options help create a diverse portfolio of resources.
- Continue strengthening our financial position.

Sections of the IRP

This IRP consists of several sections.

Section 1: Executive Summary reviews the entire report and presents its conclusions.

Section 2: Background Information addresses the current situation in the electric industry — regionally, nationally, and for GMP in particular — and summarizes our investment in renewable power sources.

Section 3: Demand and Resources presents forecasts of load growth, discusses the effects of energy efficiency initiatives on growth, describes GMP's current sources of generation, and describes various methods of planning and associated studies conducted.

Section 4: Energy Resource Planning presents the analytical framework for identifying a least-cost mix of resources; and describes four alternative scenarios GMP might face over the next twenty years, evaluating potential supply portfolios and comparing those portfolios across the various potential future outcomes based on appropriate ranking criteria. We determined the portfolio best suited to meet GMP's incremental needs and evaluated whether GMP's existing portfolio should be adjusted or replaced. This section also describes previously performed studies concerning the capacity, reliability, and efficiency of GMP's sub-transmission and distribution system.

The final **Section 5: Action Plan** describes the proposed plan for implementing the conclusions presented in this IRP.

We at GMP are confident that other stakeholders will find the insights gained from this report and our process valuable and more importantly useful. Our Integrated Resource Plan is, and should be, a living plan intended to provide current direction for our resource management activities while being adaptive to the evolving global energy world and changing customer preferences. In addition, this effort provides GMP with an analytical framework to use for further refining the plan as we implement it.

As all stakeholders on Vermont's energy future recognize, the value of all planning exercises depends on a myriad of assumptions for evaluating how decisions could, would, and should turn out. GMP recognizes this uncertainty by testing key assumptions as well as by creating a living plan that can be evaluated and tested as we gain more information. This information could come in the form of clarity in environmental regulations, a change in the direction of the price and availability of fossil fuels, and revisions to the cost estimates for new efficient electric generating facilities, as well as from the evolving priorities of stakeholders as they affect GMP's provision of reliable electric power to the customers in our service territory.

This plan complies with the orders of the Vermont Public Service Board (PSB) in Docket No. 6290, to with the requirements of 30 V.S.A. §218c. That section defines an IRP as:

A plan for meeting the public's need for energy services, after safety concerns are addressed, at the lowest present value life cycle cost, including environmental and economic costs, through a strategy combining investments and expenditures on energy supply, transmission and distribution capacity, transmission and distribution efficiency, and comprehensive energy efficiency programs.

This IRP, along with steps that GMP has taken since 2003, also addresses a number of specific items contained in stipulations associated with GMP's 2003 IRP. Appendix I summarizes these items, and where they are addressed.

The Details of the Plan

Four Scenarios

We based much of the portfolio analysis and energy efficiency savings forecasts in this Integrated Resource Plan on four scenarios, called:

- Fortress America
- Green Focus
- Back to Business
- Green Growth

Please note: Much of the information in this report is based on projected figures and statistics. While much effort and considerable forethought has been exerted, no one can accurately predict the future. As such, the actual numbers and future outcomes are likely to be different. Please consider this fact when reading this report.

These scenarios were initially identified in the February 2003 Vermont Integrated Resource Planning Scenario Development Report submitted on behalf of GMP, Central Vermont Public Service Company (CVPS), and Citizens Communications Company doing business as CES, the Citizens Energy Services.

Figure 1 depicts these four scenarios with respect to geopolitical and economic factors (horizontal axis) and environmental regulation factors (vertical axis).

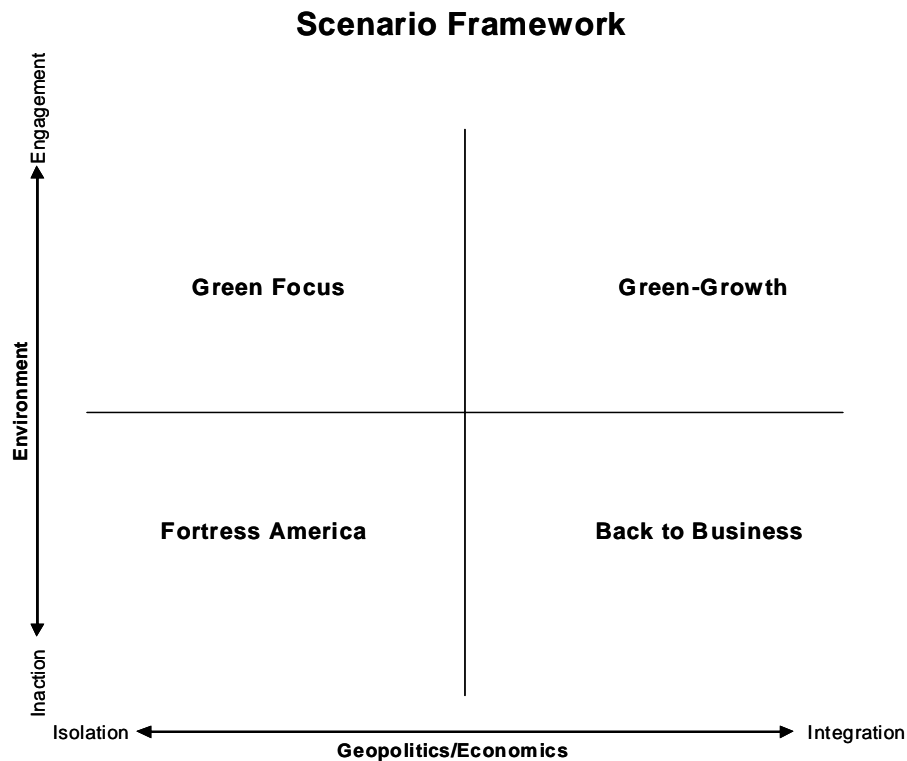


Figure 1: Framework for Future Condition Scenarios

GMP analyzed three variations of each strategy against six portfolio choices, providing for an overall analysis of 18 resource portfolio strategies. The heart of GMP's analysis is referred to as Scenario Planning whereby each of these strategies is modeled and evaluated under four different scenarios for the energy future of the state, regional, and global marketplaces.

The four scenarios can be summarized as follows:

Fortress America

- Highest fuel prices, then moderation
- Low load growth
- Security and reliability spending stagnates economy
- Little progress made toward tighter environmental regulations
- Local supply commands a premium
- Second strongest demand-side management (DSM) investment scenario

Green Focus

- High fuel price trends
- Low load growth
- High DSM, strong renewables growth
- Stronger environmental regulation

Back to Business

- Robust load and economic growth
- A share of fuel price downturn followed by moderation in price growth, hence the lowest fuel price scenario in fuel prices
- Modest levels for DSM funding levels and renewable portfolio standards (RPS)
- Limited evolution in environmental regulation

Green Growth

- Moderate load growth, strong economy
- A small fuel price decline followed then by inflationary growth
- Moderate enhancements to environmental regulations
- Slow growth in DSM
- Federal RPS, but slow implementation

Planning Resources

GMP faces a resource planning imperative over the next ten years. We forecast three alternatives with respect to growth in electricity demand (which inherently assumes some degree of energy efficiency programs in determining its growth rate) over the next 20 years:

- Base peak, based on a 1% annual growth.
- Low peak, based on a 0.6% annual growth.
- High peak, based on a 1.6% annual growth.

We considered the effects of economic trends, statistical analyses, and energy efficiency programs on all three growth rates. Figure 2 depicts these growth rates.

1: Executive Summary

The Details of the Plan

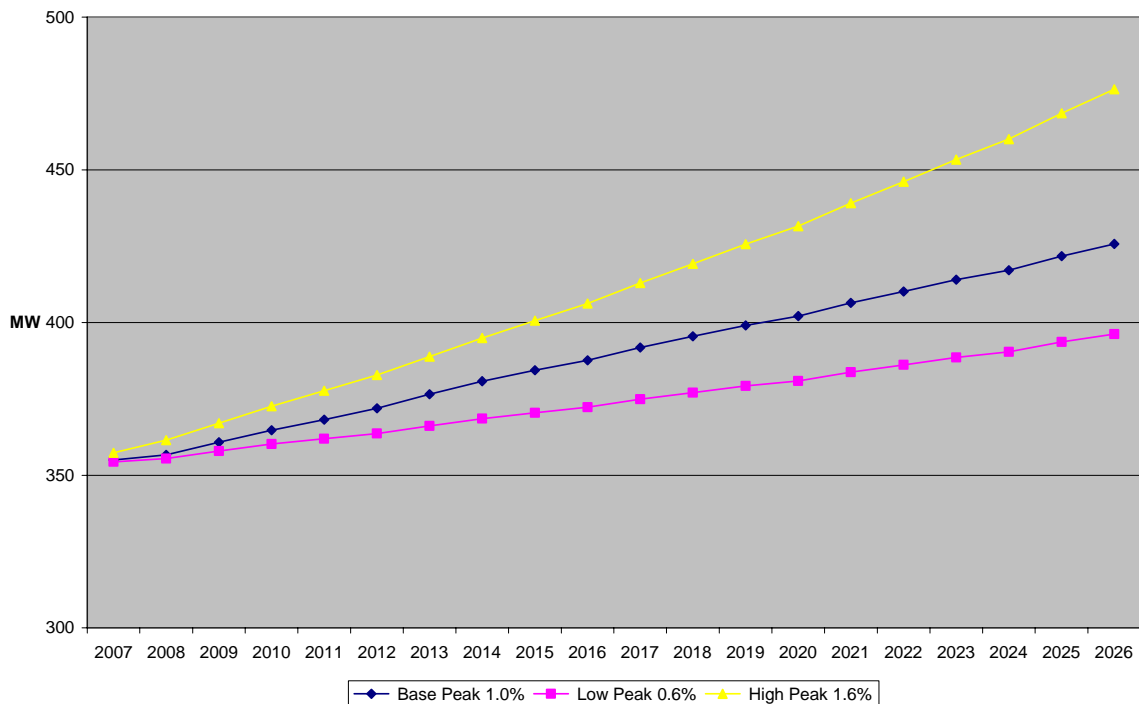


Figure 2: GMP's Annual Peak Demand Before DSM Program Influence

Funding Energy Efficiency Programs

The responsibility of planning for and implementing energy efficiency programs across Vermont lies with the organization Efficiency Vermont (EV1). This 'utility' provides consistent and focused efforts in designing programs and implementing energy efficiency improvements in existing structures, replacement appliances and equipment, and new construction. Efficiency Vermont thus provides energy efficiency services to GMP customers as part of a statewide effort supervised by the VPSB, which is funded through surcharges to utility bills.

We examined different levels of potential future energy efficiency program funding across the four scenarios (presented in Figure 1). This analysis combines savings from the reduction of peak demand and energy use. It is based on consumer financial impacts, technical and economic analysis, and the collaboration and input of many Vermont electric utility stakeholders. Based in part on information from Efficiency Vermont's annual reports, we created hypothetical future statewide efficiency budgets for each scenario. We then forecasted the energy efficiencies that might occur with these hypothetical spending levels over the next two decades. For each level of funding, we estimated the summer peak savings, winter peak savings, and annual energy savings associated with energy efficiency.

Figure 3 depicts the four basic levels of funding that we explored.

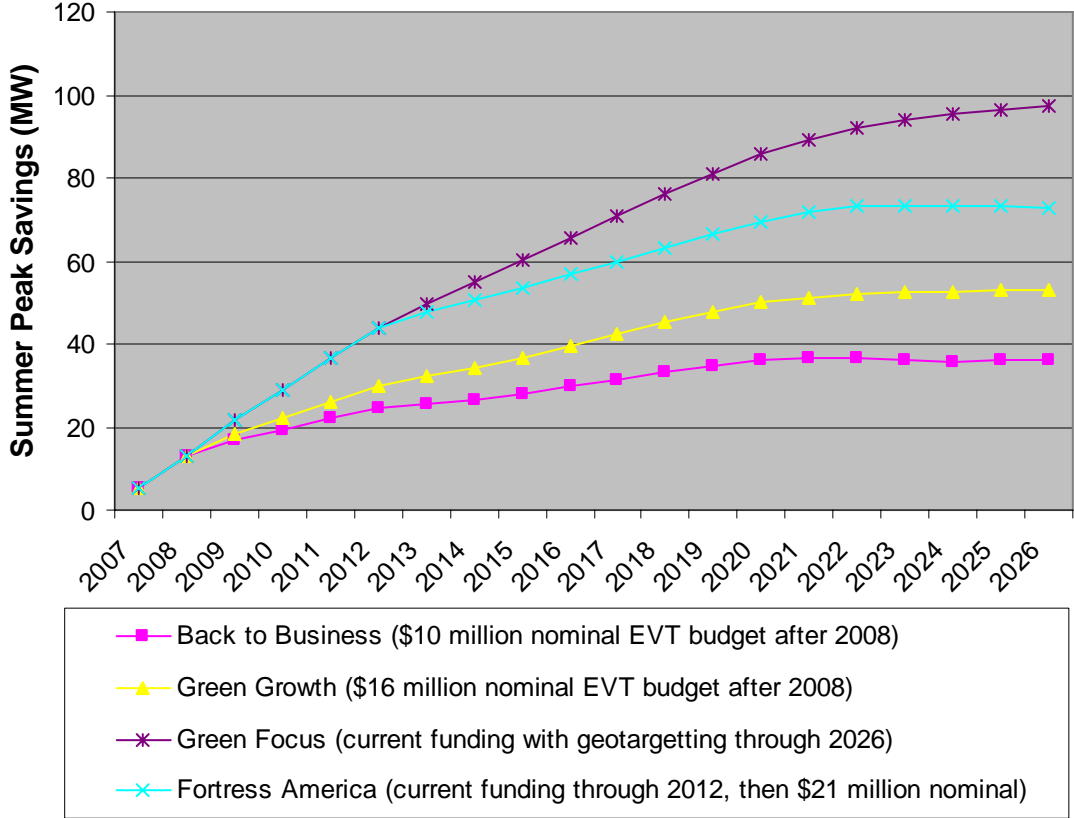


Figure 3: Efficiency Vermont Summer Peak Demand Reduction Forecasts

Future Demand and Capacity

Figure 4 compares GMP’s projected future capacity resources to the range of summer peak requirements (that is, projected summer peak demand less energy efficiency savings) described above. The expirations of agreements with Entergy to supply power from Vermont Yankee in 2012 and the long-term Hydro-Québec Vermont Joint Owners contract schedules in 2015 result in a majority of GMP’s resource portfolio needing to be replaced during the next decade.

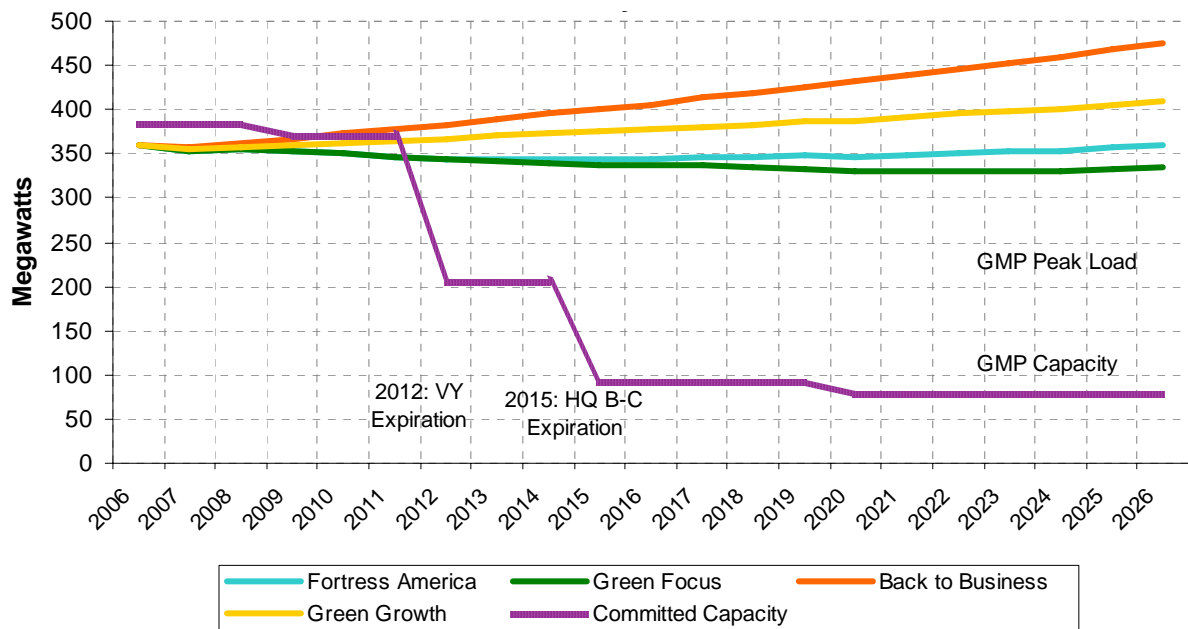


Figure 4: Comparing GMP’s Future Demand and Capacity

Potential Portfolios

GMP developed and analyzed six distinct portfolios to replace its expiring resources and meet the growing needs of its customers.

- Portfolio 1 maintains the type of price stability and environmental impact mix of supply as current portfolio choices.
- Portfolio 2 features substantial new renewable energy from regional RPS-qualifying facilities, in amounts that reach 20% of GMP’s energy supply in 2020. The emphasis on clean power results in a new Hydro-Québec contract or negotiation of a similar contract with one or more low-emission suppliers.
- Portfolio 3 purchases output from new or existing natural gas-fired combined cycles for a 15-year contract as its primary component.
- A major component of Portfolio 4 is building or buying into new or existing peaking capacity for a 15-year contract with emphasis on a location within Vermont.
- Much of Portfolio 5 is buying output from new base load facilities for a 15-year contract using Regional Clean Coal (IGCC) as a proxy.

- Portfolio 6 consists of market contracts with 1-, 3-, and 5-years duration for capacity and energy, the regional Forward Capacity Market (FCM) for capacity, and short-term or spot market purchases for peaking energy.

Table 1 summarizes the resource additions that are featured in the six portfolios. Note that in all the portfolios, committed resources (for example, owned hydroelectric units for base load, owned peaking and intermediate capacity) will provide some of GMP’s long-term needs.

#	Portfolio	Resource Additions Providing Operating Duty		
		Base Load	Intermediate Load	Peaking Load
1	Current Portfolio Energy Path	Long-term contract extensions with Vermont Yankee and Hydro-Québec or replacements with alternative counterparties	Short-term Market Energy	FCM Capacity, Short-term Market Energy
2	Renewable Emphasis	Renewables, New Hydro-Québec	Bilateral Contract	FCM Capacity, Short-term Market Energy
3	Combined Cycle Unit Contract	Combined Cycle	Combined Cycle	FCM Capacity, Short-term Market Energy
4	Peaking Capacity Unit Contract	Peaking Capacity, Bilateral Energy Contract	Peaking Capacity, Bilateral Energy Contract	Peaking Capacity, Short-term Market Energy
5	Base Load Capacity Unit Contract	New Base Load (IGCC)	FCM Capacity, Bilateral Energy Contract	FCM Capacity, Short-term Market Energy
6	Market Contracting	Bilateral Contracts — Capacity and Energy	Bilateral Contracts — Capacity and Energy	FCM Capacity, Short-term Market Energy

Table 1: Portfolios Studied in the 2007 IRP

Results of the Multi-Attribute Trade-off Analysis

In this analysis, we analyzed six attributes for each of the six portfolio strategies using three variations for each of the four scenarios to determine any trade-offs in their results that could be made. These six attributes — called impact attributes — that GMP felt were important enough to influence a recommended strategy to most benefit our customers are:

- Net present value revenue requirement: 20 years (negative values reduce revenue requirements and are thus beneficial to GMP customers)
- Societal net present value (revenue requirements plus externalities costs): 20 years
- Short-term market and fuel price exposure: the percent of energy exposed to natural gas prices
- Long-term hedged percentage: the percent of energy with fixed costs or prices fixed for terms greater than five years

1: Executive Summary

The Details of the Plan

- Imputed debt: the amount of debt that is implied to be addressed in a utility's financial statements due to its power contracting activities
- Emissions: tons of CO₂ (carbon dioxide), NO_x (nitrogen oxide), and SO₂ (sulfur dioxide)

The results suggest that the most robust resource portfolio will contain a combination of large long-term contracts with regional base load facilities, one or more replacement long-term imported power contract, a significant amount of renewable generation (to the extent it can be purchased or developed in cost effective projects), a significant amount of energy efficiency through Efficiency Vermont, and, if appropriate, capitalize on the evolving ISO New England Forward Capacity Market with strategic development of and contracting for combined cycle and peaking capacity. We will give priority to options that can be cost effective and developed within Vermont over those in other areas of New England.

Figure 5 indicates that GMP might not incur much higher expected power supply costs in order to insulate its portfolio against potential long-term market price movements. The better portfolios (that provide the most benefit in reducing revenue requirements) also appear to provide the highest degree of long-term fuel and market price hedge combined with low emissions. The Current Portfolio Energy Path portfolio has high hedging capability and generally equal-to-or-better revenue requirements than the other portfolios. We note, however, that long-term fixed price commitments can (in retrospect) turn out to cost noticeably above or below future market prices. In evaluating actual long-term resource options, GMP will therefore need to consider the relative financial stability of its suppliers (that is, their ability to actually deliver on a below-market contract) and the performance assurance terms that suppliers will require of GMP (in the event that the contract turns out to be above-market).

Another notable indication from Figure 5 is that several of the portfolios — particularly the Current Portfolio Energy Path, Renewable Emphasis, and Combined Cycle — feature fairly similar projected costs. The relative rankings for these resources (and the appropriate amounts to include in GMP's portfolio) could therefore evolve as GMP obtains specific proposals from potential suppliers and future market conditions change. As a result, this IRP's action plan emphasizes steps to identify and evaluate potential resource options as opposed to prescribing specific volumes and timing for targeted resources.

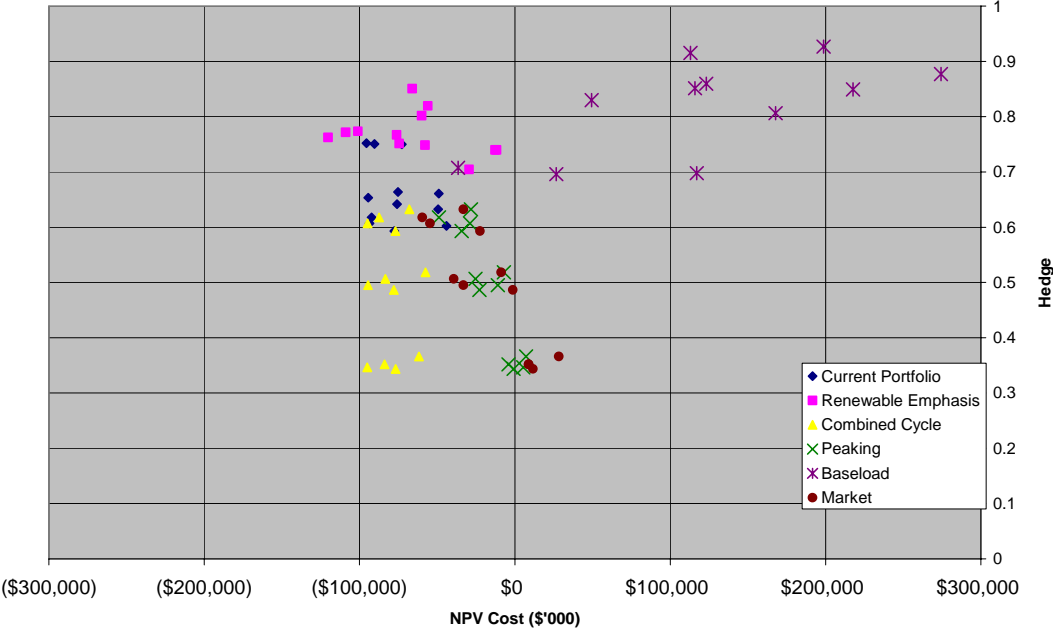


Figure 5: Twenty-Year Net Present Value Requirement Portfolio Cost versus 20-Year Term Hedge against Market and Fuel Price Changes

Figure 6 shows that the portfolio strategies based on either market- or coal-based resources have the highest CO₂ emissions and do not perform particularly well on the cost attributes.

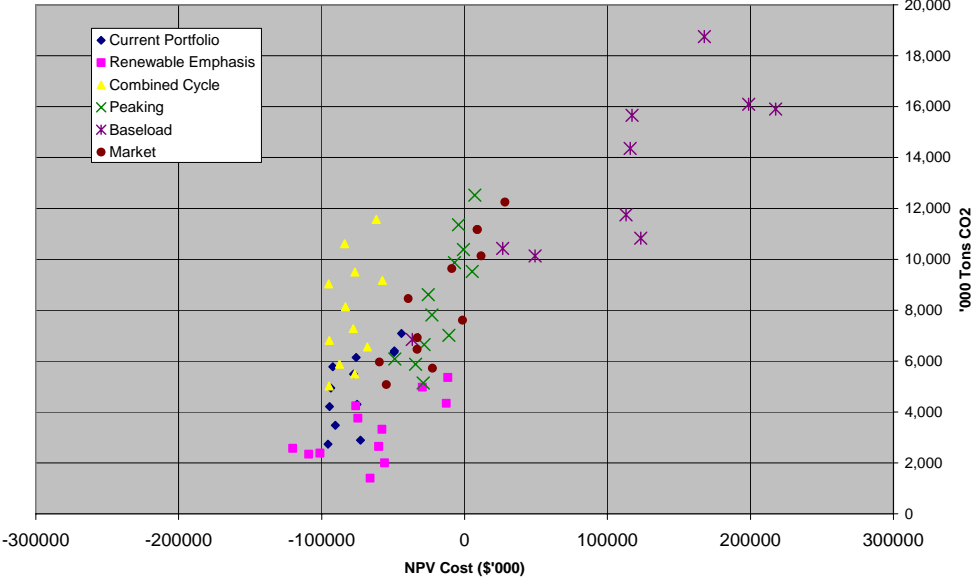


Figure 6: Twenty-Year Net Present Value Requirement Portfolio Cost versus Carbon Dioxide Emissions from New Resources

Based in part on this study’s results and consistent with least cost planning principles, GMP intends to seek to meet as much of the energy shortfall as possible with non-emitting or low-emitting resources. Obtaining long-term arrangements from non-emitting resources can

reduce supply risks, particularly in view of the potential for increasing regional and national regulation of emissions including greenhouse gases. At present, our most promising replacement portfolio includes favorable renegotiated contracts with one or both of the major expiring resources. We are fully aware, however, that there are alternative means of securing long-term contracts from other counterparties that can deliver similar low-emitting profiles to Vermont.

Other potential resources using conventional technologies that require the construction of new generating capacity exist: in-state capacity burning natural gas and/or oil, and regional capacity burning natural gas or coal.

Stress Testing

As a final step in the analysis, we stress tested the better scenarios on the basis of a 2020 snapshot. The stress tests included a:

- 10% increase in electric market energy prices.
- 25% increase and decrease in market energy and fuel prices.
- One-year temporary loss of the Vermont Yankee resource.

The stress testing for 2007 produces three additional attributes in the trade-offs discussed above. We refer to these attributes as the Resiliency Attributes since they test the beneficial nature of the portfolios in a more dynamic environment. These attributes are:

- 2020 revenue requirements portfolio value impact.
- 2020 total retail price volatility: percent and cents per kilowatt hour.
- Stressed fuel price volatility exposure: percent of energy exposed to short-term market.

Figure 7 compares the change in the portfolio value (relative to market) in 2020 to the original scenario value (that is, without the stress test change). The least net change in average retail price of electricity occurs in the most highly leveraged portfolio, which is the Renewable Emphasis portfolio. This helps us demonstrate the benefits of longer term fixed pricing in PPAs and renewable generation *contracted at the right price* can be beneficial to minimize costs, reduce environmental impact, and maximize hedge. Our general observations from the stress testing process are:

- These portfolios, with strong elements of Vermont Yankee, Hydro-Québec, and renewable energy generation, can continue to dramatically reduce fuel price exposures. They do, however, expose GMP to power costs above the regional market should future market prices turn out relatively low.
- A 25% increase in fuel prices would only result in about a 5% or less change in retail rates, with the Renewable Emphasis portfolio being close to 100% hedged.
- A loss of the largest resource, Vermont Yankee, does impact the annual portfolio economics in the future since that resource is expected to be priced close to market initially and then escalate to provide further savings.

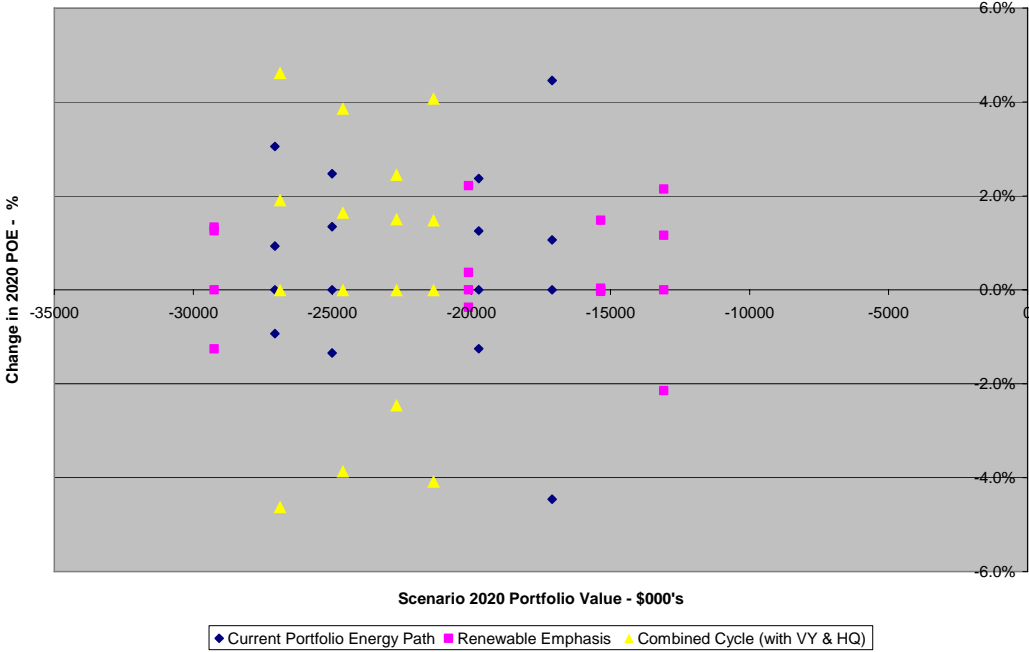


Figure 7: 2020 Portfolio Value versus Percent Change in the Retail Price of Electricity

This analysis suggests that the portfolio GMP choose include significant elements of Vermont Yankee, Hydro-Québec, and renewable energy generation. It is important to note that the actual amounts of these and other resource within the portfolio depend on price negotiations as well as other contract terms, and on renewable project costs.

Leverage Advantages and Opportunities

There are several areas where GMP has leverage in the marketplace to potentially provide resources at below market cost when actually purchased. The need for Vermont approval of a Vermont Yankee license extension, and possible value sharing with its owner could provide GMP with an early opportunity for beneficial power supply. In addition of the long-term capital recovery perspective of a cost-of-service regulated utility on behalf of its customers may compare favorably to a market based on merchant financing costs and risk perspectives. As an integrated utility, GMP should have the ability to capture all the economic advantages of generation that location, reliability, and T&D savings might create. GMP's ability and willingness to enter into long-term supply contracts with existing or new generation facilities could potentially provide leverage in negotiating with project developers.

This can lead to several opportunities for GMP. One is developing utility-owned local peaking generation with 'wires' benefits, in coordination with VELCO analysis and planning. GMP also has the ability, albeit difficult, to join or form a consortium of vertically integrated utilities within New England to jointly develop resources and purchase from large resources in order to capture economies of scale or buying power advantages.

The results of this analysis establish several resources as having priority in the GMP planning over the next few years. These resources are:

- Vermont Yankee and other nuclear owners
- Hydro-Québec and/or other import opportunities
- Renewable generation
- Natural gas combined cycle participation
- In-state peaking or combined cycle capacity

Implementation Timeline for Actions

The 2007 IRP Action Plan focuses on early development and negotiations activities with the objective to either acquire resource commitments or firm up the estimated cost and availability of future generation facilities.

Date	Activity
2007	Prepare IRP. Monitor and participate in the Vermont DPS public outreach process.
2007 to 2008	Explore opportunities for renewable energy resource PPAs, to assess their potential role in the resource portfolio. Begin soliciting or negotiating for renewables.
2007 to 2008	Conduct discussions for replacing our nuclear contract after its expiration in 2012. Also discuss potential future contract opportunities with Hydro-Québec. Review the long-term market alternatives to both of these resources.

2007 to 2008	Test the potential for cost-effective long-term contracts with existing and new natural gas combined cycle capacity. Inventory the potential for contracting with these resources for discrete entitlements (less than 50 megawatts).
2007	Guide and participate in the joint utility Vermont generation siting study.
2007 to 2009	Review FCM auction results to determine if GMP has a financial advantage or can leverage its vertical integration when facilitating the development of in-state capacity.
2009 to 2011	Gorge gas turbine is retired and replaced with a newer 25 megawatt unit.
2010 to 2012	Vergennes diesel retirement is reviewed: evaluate life extension and replacement with a newer unit.
2011 to 2015	Berlin is retired. Its replacement may be evaluated in the context of participation in a statewide process.
2012	Vermont Yankee contract expires.
2013 to 2015	Potentially take positions in short- and medium-term base/intermediate load contracts up to the expected net short in 2015/2016. Hydro-Québec VJO Schedule B contract expires.
Post 2015	Replace and add contracts as needed, consistent with GMP's Risk Management Policy.

Table 2: Implementation Timeline

1: Executive Summary
The Details of the Plan