City of Richmond

Report to Committee

TO PWT - JUNE 19 2013

To:	Public Works and Transportation Committee	**Date:**	June 11, 2013
From:	John Irving, P.Eng, MPA Director, Engineering	**File:**	
Re:	**Energy Resource Management Plan for Corporate Buildings**		

Staff Recommendation

1. That the High Performance Building Policy No. 2306 be updated to include specific emphasis on corporate energy and GHG emissions targets and conservation priorities that reduce long term energy consumption and operational costs.
2. That staff report back to Council with the updated High Performance Building Policy No. 2306.

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REPORT CONCURRENCE	
CONCURRENCE OF GENERAL MANAGER	
REVIEWED BY DIRECTORS	INITIALS: DW
REVIEWED BY CAO	INITIALS:

Staff Report

Origin

As part of the Corporate Energy Management Program (EMP) and in support of the following Council Term Goal, a Resource Management Plan – Buildings Energy Use was commissioned to estimate the projected energy demand from corporate buildings over the next twenty years:

> Council Term Goal #8.1: "*Continued implementation and significant progress towards achieving the City's Sustainability Framework, and associated targets.*

The EMP is a key contributor to achieving the Sustainability Framework Goals of a Sustainable Resource Use-Energy Smart City and Climate Prepared City. In addition, the program supports the significant progress made in the realizing of the Energy Sustainability Strategic Program Implementation Plan endorsed by Council on July 26, 2010. The Resource Management Plan examined the potential impacts to corporate energy use for buildings over the next twenty years from facility growth or expanded operational hours that may result from expected population growth. In addition, costs and benefits from implementing energy reduction, efficiency, and displacement strategies were quantified.

Background

Through continuing Council support, the City's Energy Management Program has been very successful at reducing energy use and GHG emissions from corporate buildings. For its efforts, the City has been consistently recognized by BC Hydro as a Power Smart Leader. Since 2007 approximately 5.6 GWh (5,600,000 kWh) of energy has been saved through various corporate projects, which amounts to over $1,000,000 in total operational cost avoidance. The energy savings has helped to reduce corporate energy costs and GHG emissions by approximately 1,200 tonnes of CO_2e (equal to taking approximately 400 cars off of Richmond roads). During this period, the City received approximately $1,000,000 in external funding to help support its EMP.

As outlined in the Sustainability Framework, one of the targets from the Energy Sustainability Strategic Program is to develop a Corporate Energy and Emissions Plan. For most energy and emissions plans the establishment of reduction targets is one of its main components. As energy use in corporate buildings accounts for a majority of the overall corporate energy use and emissions, it was decided that this Resource Management Plan would focus solely on corporate buildings as a first step to support the development of an overall corporate energy and emissions plan.

For civic buildings, the City adheres to the Corporate High Performance Building Policy (No. 2306), which established the Leadership in Energy and Environmental Design (LEED) rating system as the measurement tool for new buildings and major renovations. This policy requires that new buildings over 2,000 m^2 target a LEED Gold level and new buildings under 2,000 m^2 target a LEED Silver level. Since the adoption of the High Performance Building Policy, tangible results have been evident with exceptionally well designed new and renovated civic buildings, and high levels of incorporation of energy efficient technologies.

Findings of Fact

The Resource Management Plan was completed for two main purposes:

1. Determine an anticipated energy use reference baseline ("business as usual case") for corporate buildings, based on maintaining the current per capita service level at civic facilities over the next 20 years, and;
2. Analyse and quantify the cost and benefits of different energy reduction, efficiency, and displacement strategies for our existing and new capital infrastructure.

Key Findings

Establishing a Forecast Baseline: Projected Growth in Energy Demand (without Mitigation)

A key driver for future energy demand relates to facility requirements that result from anticipated population growth over the next 20 years. Assuming that current service levels are maintained over that period, additional facilities may be needed and/or operating hours at existing facilities will need to be expanded. Based on projected requirements identified in the analysis, energy use is projected to increase by 28% by 2020 and 46% by 2031 (energy use baseline forecast), as compared to the City's 2007 to 2009 energy use average (baseline service level value). The baseline forecast assumes there are no mitigation measures in place beyond what is already projected through standard equipment efficiency gains and increasing building energy performance requirements through known changes to codes and standards.

Without mitigation, operational energy costs for buildings would be expected to increase to $4.7 million by 2020 from the current $3.6 million (2013 dollars). In addition, greenhouse gas emissions related to building energy use would be expected to increase by 22% to 7,300 tonnes of CO_2e by 2020 as compared to the baseline 2007-2009 average building emissions of 6,000 tonnes of CO_2e.

Mitigating Growth in Energy Demand: Assessing Measures to Reduce Energy Use

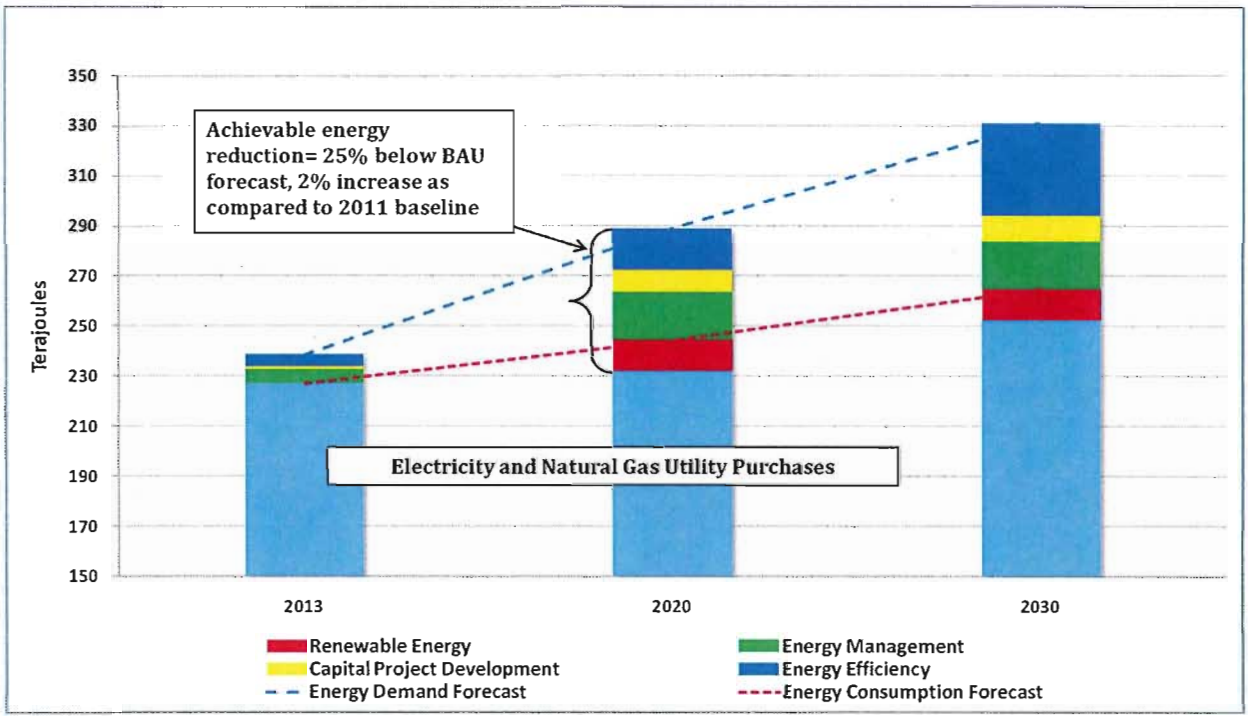
Increased energy demand can be met through increased conventional energy utility purchases (electricity and natural gas), mitigated through energy efficiency, reduction, and renewable energy initiatives, or a combination. To mitigate growth in corporate building energy consumption, the following measures were examined to determine the impacts of corporate building energy use and operational costs:

1. Energy Management - refers to the best practice management of corporate facilities to integrate opportunities for improvements to energy use in all aspects of the City's corporate and operational matters.
2. Energy Efficiency Equipment - refers to the regular replacement and maintenance of fixtures and equipment managed by the City's Facilities Department, with more efficient fixtures and equipment above business as usual efficiency gains (i.e. replacement of near or end of life equipment with the highest efficiency replacement possible beyond what would be considered a standard replacement).

3. Efficiency Improvement Capital Projects – refers to new construction and large retrofit projects where the energy performance goals will be to exceed national and provincial building codes and standards.
4. Renewable Energy – refers to the integration of renewable energy at potential capital building projects.

With continued support and development in each of the energy related reduction strategies, it was estimated that a total reduction of 58 terajoules (TJ) (equal to 25% of today's corporate building energy use – 230 TJ) and 2,000 tonnes of carbon dioxide equivalent (CO_2e) (equal to taking approximately 600 vehicles off the road annually) could be realized by 2020. By 2031 a total reduction of 80 TJ (equal to 35% of today's corporate building energy) and 2,800 tonnes of CO_2e could be realized (equal to taking approximately 850 vehicles off the road annually). The following graph illustrates the reference "business as usual" corporate energy demand profile and the impact of each energy related reduction strategies.

Fig.1 – Energy Consumption Forecast and City Energy Resources to 2031



The Resource Management Plan highlighted that the projected growth in building energy consumption can be reduced from 28% by 2020 and 46% by 2031 to 2% by 2020 and 10% by 2031, if energy related reduction strategies are implemented. The corresponding GHG emissions reductions from the energy related reduction strategies are an 11% reduction by 2020 and a 13% reduction by 2031 from the 2007-2009 average baseline value.

In 2013 dollars, the expected operational cost avoidance savings from implementing fully the four energy related strategies by 2020 would be approximately $850,000 annually. The estimated capital cost for three of the four strategies (Energy Management, Energy Efficient Equipment, and Efficiency Improvement Capital Projects) to obtain this level of cost savings is approximately $3.8 million dollars. Implementation costs for renewable energy integration were

not included in the capital cost estimate as it is anticipated that these costs would be included in the construction project costs. Potential implementation costs would also be greatly influenced by the final new building design and mechanical system configuration, and by the final renewable energy system chosen.

A key role of the EMP is supporting the City in reducing its corporate energy use and GHG emissions. To date, energy consumption reductions have been achieved through implementing a range of retrofit projects where there was a relatively short payback period. Going forward, those projects will be increasingly difficult to develop. A critical step needed to further support continued corporate energy and GHG emissions reduction is the establishment of building specific energy and GHG emissions targets for new capital projects and existing buildings. This will ensure that energy reduction and related GHG emissions remain a focus throughout design, construction and/or maintenance processes to achieve optimized building energy performance and maximize cost avoidance.

Setting a Target: Building Energy Use

The Resource Management Plan indicated that reducing corporate building energy use from the baseline forecasted amount by 26% by 2020 is achievable, but will represent an overall 2% increase in building energy use as compared to the City's current facilities energy consumption of approximately 230 TJ. Energy reduction strategies to achieve the anticipated energy savings represent the most cost effective way to mitigate the significant potential increase in corporate building energy use and operational cost.

It is anticipated that building specific targets, along with targets for fleet which are currently under development and other energy using City assets (pumps and lighting), will combine to generate corporate-wide energy and GHG emission reduction targets. Staff are developing a corporate-wide target for energy reduction and GHG reductions to present to Council in a separate report to support the City's goal of working towards carbon neutrality.

Reporting: Performance Monitoring

In support of developing a plan and monitoring progress, staff are in the process of upgrading the energy database system that tracks corporate usage to allow for more timely and accurate communication of energy use information with corporate stakeholders (e.g. quarterly energy use information reports for community centres).

Financial Impact

None at this time. Capital projects related to energy management, as well as other energy related strategies discussed in this report, are reviewed and approved by Council as part of the capital budget process.

Conclusion

Projected growth in energy demand and GHG emissions from corporate buildings to accommodate the anticipated growth in population can be mitigated. Investments in improvements to the energy efficiency of new equipment, energy performance of new capital infrastructure, and energy management and renewable energy integration can have a dramatic effect on future energy use and operational cost.

As corporate energy efficiency and GHG emissions reduction have been key Council and corporate priorities over the last ten years and longer, and considerable work has been already undertaken to improve the energy efficiency of all of civic buildings, strong business case energy management projects are becoming more challenging to develop. Easily identifiable projects with shorter paybacks have been mostly completed. New project opportunities are proving to have diminishing payback as compared to projects completed to date. Future corporate energy reductions are more likely to be derived from capital infrastructure replacement projects, continued operational improvements, major equipment upgrades and renewable energy integration, which require more resources than the previous energy management retrofits required in existing buildings. Updating the High Performance Buildings Policy with more specific energy and GHG emissions reduction targets will support continued improvement by transitioning the main driver for corporate energy efficiency from strong business cases to target achievement.

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