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Walkin' the Walk

FIVE STEPS TOWARD
EFFICIENT CITIES

CANADA WEST FOUNDATION

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EXECUTIVE SUMMARY

Not all environmental projects are worth doing. The ones that are worth doing reduce energy use, greenhouse gas (GHG) emissions and costs to taxpayers over time. This report demonstrates that western Canadian cities are, in fact, reducing energy use and GHG emissions – and, many of the projects undertaken by our cities are worth doing. What is surprising, however, is that there is not more cross-pollination between our cities. This report highlights five steps that municipalities can take to put our cities on a solid energy management path.

In a previous report, *Buildings, Bicycles and 'Burbs*, the Canada West Foundation outlined the state of play of energy management activities in seven western Canadian cities.¹ That report examined what western cities are doing to better manage energy within their boundaries. It was the result of many hours of analyzing public documents, interviewing experts and searching for common themes.

The report found that, while our cities have taken positive steps to address energy management, most western cities tend to place a low priority on energy – largely because there is no immediate financial reason to demand better performance. Energy is abundant and relatively inexpensive in the West and effective energy management (specifically alternative energy projects) tends to have high upfront capital costs.

This report, which is intended as a companion to *Buildings, Bicycles and 'Burbs*, argues that there are meaningful efficiency gains to be made which would ease the long-term tax burden on citizens. If we take the right steps, it will be far easier to demonstrate that the West genuinely cares about environmental performance.

Our cities are all at different places on the path to demonstrating environmental performance. This report sets out five steps that politicians and municipal governments can take to put all our cities on a solid energy management path:

1 FIND CHAMPIONS TO PRIORITIZE ENERGY MANAGEMENT

Political leadership is necessary to advance energy management. Effective politicians set the vision (like Vancouver's Greenest City initiative) and rally citizen support behind that vision. A compelling vision provides the basis upon which operating and planning staff can develop strategy, programs and initiatives to make the vision a reality.

2 FOCUS A COMMUNITY ENERGY MANAGER ON CONCRETE RETURNS

The right energy manager can provide focus and co-ordination within and across city departments, delivering energy savings potentially much larger than the cost of the manager. This individual can focus attention on measurement (and measuring the right things), can take the lead in celebrating success, can lead the outreach to citizens and businesses and can promote stronger co-ordination within and between departments. The cities examined are aware of the benefits of a full-time energy advocate, but most have not yet fully committed to action. Regina hired staff to focus on cost savings by reducing energy consumption, albeit for the purpose of reducing the city's carbon footprint. Many departments have their own energy manager, but results are improved with a cross-functional person or team. Community energy managers in Vancouver and Victoria provide the best example.

¹ The seven cities include Vancouver, Victoria, Calgary, Edmonton, Regina, Saskatoon and Winnipeg.

3 MOVE PUBLIC OPINION BY ENGAGING CITIZENS AND BUSINESSES PROACTIVELY

If citizens and businesses – who consume the vast majority of energy within municipal boundaries – are not onside, then potential leaders are less likely to step up. As a consequence, it is essential to secure public support. Winnipeg and Edmonton have demonstrated the benefits of reaching out to citizens and businesses to involve them actively in long-term planning strategies. In addition to public support for key initiatives, outreach leads to a fuller understanding of transportation infrastructure and land-use options and often results in better energy-related decisions.

4 EXPAND THE REACH OF SELF-FUNDING INITIATIVES

Most cities in western Canada have initiatives that improve energy efficiency by investing in upgraded technologies. Some cities (Edmonton and Winnipeg) are partnering with energy service providers to enable private funding for energy infrastructure like street lighting, with the private investor (normally the service provider) being repaid from the savings in operating costs. Other cities (Saskatoon and Calgary) are exploring and implementing such projects on their own. The cities can do a better job of tracking and communicating the benefits, then expanding implementation.

5 IMPROVE MEASUREMENT AND REPORTING

Cities are investing in infrastructure and programs that improve the way energy is generated and consumed. Tracking the results of those investments plays a key role in building the business case for further investment. Also, given the diversity of sources for energy data, there are inherent challenges for identifying future opportunities. Better data from initiatives such as energy mapping (implemented in Victoria, North Vancouver and Calgary) can help crystallize opportunities for district energy projects (such as Calgary's), integrated solutions (such as Saskatoon's), or incremental investments that should be prioritized.





The challenge & the opportunity

Improving urban energy management in Canadian cities is not simple. A previous report² by the Canada West Foundation's Centre for Natural Resources Policy surveyed the state of play in energy management in western Canada's seven largest cities. It identified some of the challenges energy managers face:

- Energy is cheap and abundant in western Canada
- New technologies are difficult to implement in small markets
- Cities need the participation of multiple stakeholders to improve energy management
- Cities have limited ability to raise funds or legislate requirements³
- Failure to achieve climate targets has undermined credibility
- Energy management is a long-term priority that is often pre-empted by more immediate issues

There is a case to be made for better performance. Urban energy use links directly to infrastructure – roads and buildings in particular. And it begins with planning. City planning teams influence how, when and where roads and buildings are added to the urban landscape. These decisions have long-term energy implications.

Infrastructure lasts for decades and influences both short-term and long-term energy options. The cost of retrofitting or repurposing infrastructure to improve energy performance typically is significant. For example, there is a clear trade-off between the initial cost of a roadway and the long-term cost of expansion or the high cost of employee productivity due to traffic congestion. Most often, the initial cost is held to a minimum to meet near-term budget pressures, but this can

result in higher long-term expansion costs to support increasing traffic levels. Similarly, energy management investments for commercial buildings are designed to balance a higher initial capital cost against lower long-term operating costs.

The main components of the energy value chain are energy production, transformation, delivery and consumption.

Historically, only energy delivery and consumption have occurred within municipal boundaries. Linear infrastructure (pipelines, wires, chains of service stations) delivered energy to end consumers for their use. The delivery systems operated independently with only a limited focus on their interactions. More recently, however, planners have begun to take a more integrated view of energy systems. A prime example of this is district energy systems that are optimized across multiple energy sources or that capture waste heat from one process for use in another.

Energy delivery and use are both capital intensive and use infrastructure and equipment that last a very long time. Within a municipality, some of the more promising opportunities for energy management come at the early stages of planning and infrastructure investment. For example, planning frameworks for land use and transportation lead to decisions that influence long-term energy options. As western Canadian cities are learning, urban sprawl is energy-intensive and difficult to cure. The energy management benefits of encouraging proximity (living close to work and major recreational activities) and facilitating the flow of people and goods are obvious. Yet, city planners must respond to what residents want. Citizens remain the final arbiters about where they live, work and play, and how they move between those activities.

² Canada West Foundation, *Buildings, Bicycles and 'Burbs: An Overview of Urban Energy Management in Seven Western Canadian Cities*, 2014

³ However, some cities have legislated requirements in certain areas (such as development patterns) by developing standards and bylaws which require minimum energy performance.

FIGURE 1

A FRAMEWORK FOR URBAN ENERGY MANAGEMENT DECISIONS

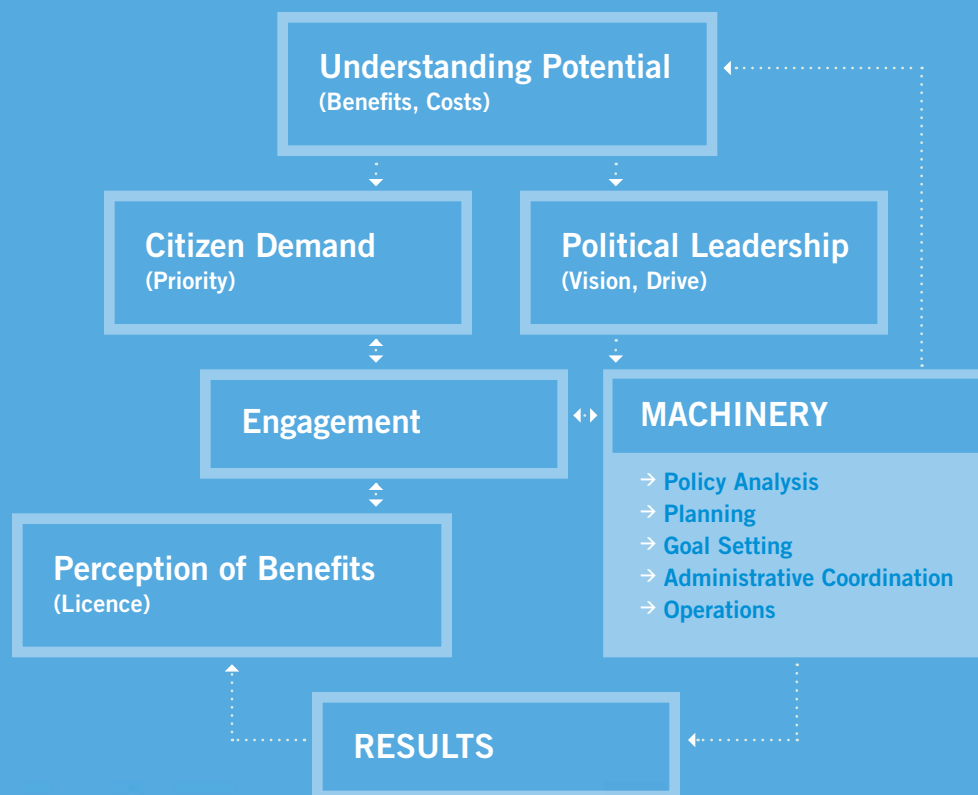


FIGURE 1 presents a simple framework for urban energy management. Direct actions taken by the municipality mostly fall within the box labeled machinery. However, they are strongly influenced by the external views of citizens and politicians. In this framework, engagement includes a clear understanding of both what citizens want and how they might react to what planners are considering.

Source: Canada West Foundation

Making urban energy management a higher priority

Urban energy management is rarely a strategic priority compared to managing growth, funding infrastructure, addressing homelessness, affordable housing or recreation facilities. Each of the seven cities examined considers energy management at some level of its planning process. However, without a champion, urban energy management initiatives often fall down the priority list at both political and operational levels. Similarly, infrastructure investments often have energy management implications that may not be fully considered as part of the decision process.

Most energy management options require long-term investments, whereas municipal decisions are often driven by short-term imperatives. In a world of short-term pressures and decision processes, near-term investments whose benefits only occur in the longer term are often a low priority, particularly when they involve capital expenditures by the municipality.

If urban energy management is to be taken seriously, municipal leaders must think beyond the next election, corporate leaders must think beyond the next quarterly report and homeowners must see past their next energy bill. How do consumers justify the incremental cost of a high-efficiency furnace when a mid-efficiency furnace is less costly? How can consumers be influenced to make more energy-conscious decisions, such as locating closer to work or closer to public or alternative transit? How do building owners justify the higher capital cost of energy equipment that can manage energy consumption in real time when tenants are not individually metered and energy costs are part of operating costs, hence paid by tenants? How do industrial or commercial enterprises justify bringing the energy requirements of others into decisions to a level that supports evaluating and even investing in district energy systems or alternative electricity generation?

POLITICAL LEADERSHIP CAN SHOW THE WAY

Strong, co-ordinated political leadership can help advance energy demand management. Federal and provincial governments lead in setting appropriate policies, building regulations and providing clear direction on energy management and related activities, such as climate change. Yet, energy conservation runs through many municipal issues, and that means municipal governments play an important role. For example, transportation, land-use planning and city operations are controlled by cities and have a significant impact on energy consumption. As a consequence, the most significant energy management activity in the West happens where there is strong municipal leadership supported at the provincial level.

Provincial leadership

Many interviewees highlighted the need for effective senior political and administrative leadership at the provincial level. Each western Canadian province has demonstrated some leadership. British Columbia's efforts may be the most obvious – in 2008, the premier and environment minister made very public statements about the need to set greenhouse gas emission targets. B.C. also has a Climate Action Charter which has been signed by 180 local governments to work toward carbon neutral operations. In Manitoba, the premier and departments of Conservation, Water and Stewardship; and Innovation, Energy and Mines (Energy Division) have led the way. Alberta's Provincial Energy Strategy (which is being revised) provides the basis for energy management practice in the province. The Saskatchewan government initiated the Go Green Fund that supports city efforts to enable residents to green their activities.

Manitoba, Saskatchewan and B.C. also implement energy demand management and optimization programs through their energy Crown corporations (BC Hydro, SaskPower and Manitoba Hydro). In Alberta, the City of Calgary and Enmax formed an Energy Management Office that is mandated to help Calgary meet its energy conservation targets.

Western provinces would do well to provide cities with more tools to address local energy issues. Again, B.C. took the lead when it enacted the Vancouver Charter – a provincial statute that provides Vancouver with powers not typically afforded to cities. Under the charter, Vancouver has the right to establish and operate an energy utility system which provides additional sources of revenue.

Alberta started down this path in 2012. A *Framework Agreement for Charters* sets the course for renegotiating the relationship between cities and the province. Negotiations are expected to address, among other things, local electricity generation, energy efficiency and conservation, and whether cities should have more input into legislation on water, waste, environmental monitoring, brownfield remediation and governance.

Municipal leadership

Many of the western Canadian cities studied have willing political leaders and qualified administrators working on energy demand management. Yet, there is much that each of our cities could learn from London, England. London's mayor, who spearheaded a major transportation initiative, provides an impressive example of what focused municipal political leadership can accomplish. A review of the London's planning documents – *Way to Go*, the *London Plan*, and the *Economic Development Strategy* – leaves a powerful impression. The voluminous work includes updates to plans, benchmarking, measurement and funding.

MAKING ENERGY MANAGEMENT A STRATEGIC PRIORITY FOR CITIES

Where strong political leadership does not exist, municipalities can take other steps to make energy management a strategic priority. Energy management is part of strategic planning processes but is a secondary component of most strategic plans. Its importance could be enhanced if cost savings were a larger part of the process.



THE MAYOR'S TRANSPORTATION STRATEGY IN LONDON, ENGLAND

The Mayor's Transportation Strategy involves investing billions of pounds in the transport system. It began in 2008 with *Way to Go*, and its main objective centered on the movement of people. Its focus on transport strategy is linked to London Plan and Economic Development Strategy. The plan is to optimize existing infrastructure, reduce congestion and CO₂ emissions, and "lead the world in new green technology – from electric vehicles to [a] new low carbon bus and bike hire scheme". (p.4, *Mayor's Transport Strategy*)

Full cost accounting

To incorporate cost savings into planning, municipalities need to utilize full cost accounting for the life of the project, shifting emphasis from a short term to long term, which is not consistent with political time frames. In this way, the interface between the ideology that drives planning and market realities can be managed.

Policy has been a clear driver of results. Calgary has linked energy management to sustainability planning. The city's 2005 *Triple Bottom Line* is a comprehensive policy framework that helps decision-makers consider the social and economic impacts of their actions. There may be value in shifting the focus more towards energy management, resilience and sustainability rather than GHG reductions, even though energy efficiencies are an outcome of the latter approach. The high overlap between these goals means that municipalities can kill two birds with one stone. That is, they can look for the multiple wins regardless of the lead objective rather than pitting these objectives against each other.

This is easier said than done because it requires integrative thinking. Even so, affordable housing, education and health care are higher political priorities than energy management, and that is not likely to change.

SOURCES OF FUNDING

Rather than obtaining new sources of capital, successful leadership in this area can identify various funding opportunities and incorporate them into energy management plans. For example, Calgary has linked funding to its *2020 Sustainability Plan*, a document that includes energy management. The plan is to integrate, innovate and take a long-term approach to sustainability. Although it is being implemented over 10 years, it is also directly linked to three-year business plans and budgets. Furthermore, budgetary allocations such as a green revolving fund could provide stability to energy management initiatives across budget cycles. For example, Saskatchewan's Go Green fund allocated a total of \$10 million to municipal initiatives over time.

Another option that could be implemented in tandem is recycling green funds. A simple example is creating a small budget for energy management actions that reduce costs, even if it is only at the margin. The cost savings can be reinvested in the program to fund its growth. This has proven effective in replacing street and traffic lights with more energy-efficient LED lights. A small initial investment creates a savings stream that is reinvested. The savings grow through time, creating a reinforcing cycle that eventually builds momentum, demonstrates success and encourages a search for similar opportunities.

Setting a price on carbon can provide seed funding for energy management initiatives. In B.C., municipalities that sign the *Climate Change Action Charter* become eligible to receive rebates under the *Climate Action Revenue Incentive Program (CARIP)*⁴, which can be used to fund emissions reduction projects in their communities.

Some municipalities, like Dawson Creek, B.C., have established their own internal carbon fund that sets aside \$100 for every tonne of GHG emissions from corporate operations. The fund is then used to finance emission reduction projects in the community. Other jurisdictions, such as the City of Toronto, also have carbon credit policies. Emission reductions resulting from various sustainable initiatives have the potential to generate revenue for the city if they are sold as carbon offset credits. Toronto City Council outlines conditions under which the city will sell its carbon offset credits and the money is recirculated into the city's budget to fund energy management programs.

⁴ The *Climate Action Revenue Incentive Program (CARIP)* is a conditional grant program that provides funding to *BC Climate Action Charter (Charter)* signatories equivalent to one hundred percent of the carbon taxes they pay directly.



LOW-HANGING FRUIT: SELF-FUNDING OR EXTERNALLY FUNDED INITIATIVES

Initiatives that result in energy savings lead to cost savings that can then be used to expand the initiative. Edmonton has done this with a program to replace street lights with more energy efficient LED lights. In the financial model, the initial investment is borne by an energy services provider, with costs recovered from the energy savings. This could allow for accelerated action based on a small initial investment.

Most of the seven cities examined are considering, or have actually started, replacing their streetlights with LED technology. Manitoba Hydro recently announced plans to replace 130,000 street lights in Manitoba cities with LED lights. Calgary has also announced plans to convert to LED street lights in five neighbourhoods and eventually city-wide. Saskatoon is also exploring such an initiative. These programs provide opportunities to finance a portion of the investment through energy savings.

There is potential for similar investments in other areas of city operations. For example, the City of Vancouver bought 13 Mitsubishi i-MiEV electric vehicles for the city fleet, paying about \$30,000 per car. The provincial government contributed nearly \$60,000 towards this \$390,000 purchase. This is expected to save the city nearly \$21,000 per year in fuel and maintenance costs and reduce GHG emissions by 29,000 kilograms per year. Although the cost savings from reduced energy consumption does not cover the entire purchase, the city may have valued the reduction in carbon emissions more than the net money spent during the fleet's lifecycle. This is an initiative where energy savings, cost savings and emissions reductions were seen as complementary.

Moving public opinion

Three basic approaches have been taken to engage the public on energy management (as well as a host of other themes):

01

Offer financial support for desired actions

02

Provide educational campaigns that advertise the benefits of selected actions, or

03

Include the public in focus groups, planning committees or specific green planning initiatives

Financial Support

Demonstrating cost savings in tandem with improved environmental performance is one way to move public opinion and build public acceptance for technologies that have not been broadly accepted by the market. First, the capital cost is almost always higher. For residences, high-efficiency furnaces, on-demand water heaters, higher levels of insulation and even energy efficient lighting are more expensive – even several times more expensive – than the technologies they replace. In addition, the useful life and long-term maintenance costs may not live up to manufacturer claims. On-demand water heaters are an example of the risks associated with a promising technology that improves energy efficiency, but is considerably more expensive than conventional tank heaters. They were introduced into new homes in about 2008, but some models proved to be unreliable and required significant maintenance early in their life cycle.

In commercial and industrial situations, the same principle applies. When energy is cheap, the ongoing operating savings can be small compared with the initial investment. Financial support is often provided in the form of grants or subsidies to help overcome the barriers. As market experience grows and market acceptance expands, the energy management benefits eventually overcome the barriers and the financial support is no longer necessary.

BC Hydro and Manitoba Hydro both have relatively large energy conservation upgrade rebate programs, such as Power Smart and LiveSmart. SaskPower has used social media effectively to develop a dashboard (#sksavenow) that engages citizens and gives them site-specific information about programs and rebates. The efficacy of financial support is debatable; there are those who would renovate their homes even without the program. Other citizens, however, may be engaged when providing site-specific information for their homes, such as by using data gathered with energy mapping to demonstrate a residence's energy use relative to nearby homes and neighborhoods.

Financial support is also used to fund energy management studies. This provides energy users with site-specific data that include the options, potential energy savings and initial costs. This contributes to a better informed decision and greater degree of confidence that the energy management path taken will achieve the intended results.

Finally, municipalities provide indirect financial support in the form of their participation in pilot projects. These projects take on a portion of the demonstration risk associated with new technologies, building a useful track record that consumers can rely on.

This raises the question:

IF THE COST SAVINGS ARE REAL, THEN WHY ARE INCENTIVES REQUIRED?

The answer is found in the “first cost” problem. Consumers demonstrate a strong preference for technologies with low initial cost, even if the longer term expenditures end up being larger. Patient capital is needed to help overcome these hurdles. Fortunately, the regulated energy system is geared toward very long-term and low-risk investments. Other incentives may work as well.

Educational Campaigns

Communicating the benefits of energy management is an important aspect of shifting public opinion. There are a number of ways municipalities can accomplish this. For example, Edmonton has produced a Green Home Guide online and soon in print at home improvement centres. The city is also looking at working with realtors to have them provide the federal Natural Resources’ EnerGuide ratings as part of their sales process. Utilities also participate in educational campaigns by including energy savings options with utility bills. Community-based social marketing is also effective in moving communities towards sustainable practices.

Testimonials demonstrate the results achieved by organizations or individuals using a particular energy management option. Performance improvements can also be tracked using a dashboard approach. This adds a competitive element to the educational campaign in that energy management initiatives can be benchmarked and compared between consumers.

There is a potential role for the provinces to develop education/information programs that could be delivered by the municipalities through mechanisms like Edmonton is using. Information is also being provided to young people through the school systems. Provincial programs could reduce the need for each municipality to develop their own education programs. Moreover, strategies such as energy mapping, discussed later in this paper, can be used to customize and target educational outreach initiatives.

Catastrophic events are a great mover of public opinion, as was witnessed in the oil embargoes of the 1970s as well as the petroleum shortages that have occurred more recently in the aftermath of hurricanes. The same is true of municipalities that have experienced severe weather events. There is both a financial and psychological cost with these events.

Cities can improve resiliency in the face of such traumas; the use of distributed and district energy have the potential to reduce some of the financial costs by reducing power losses. Effective preparation ensures that key policy decisions are not distorted by immediate relief requirements.

Planning Initiatives

There is a need for co-ordinated market acceptance and political support. Integrative thinking includes incorporation of full cost accounting into planning, and may lead decision-makers to realize that seemingly exclusive goals overlap and are complementary.

There is also need for a focus in both urban and suburban planning processes on quality of life, walkability, increasing density and making communities more self-sufficient. Communities are reshaping for reasons of cost-management, renewal and changing lifestyle choices. Energy managers may realize opportunities here because better energy performance is complementary in these changing neighborhoods.

Finally, as discussed earlier, perhaps the most effective means of elevating the priority of energy management is engaging the public in planning. Edmonton, Winnipeg and Vancouver have all demonstrated this principle. In Edmonton, the *Way We Green* environmental plan is effective and has good street-level recognition.



ENGAGING CITIZENS AND BUSINESSES

Cities create strategic plans to meet the needs of residents and businesses. Elevating energy management requires getting these stakeholders on board by ensuring they understand and support the benefits of planned actions. An effective strategy to communicate rewards, such as cost savings, is key.

Educational materials include success stories, early education and energy savings guides. These function to convince residents to make energy efficient choices, and make it as easy as possible for them to do so. As discussed earlier, energy mapping can also provide information that can be used to nudge citizens.

Changing standards is a way to pursue this goal for businesses. In the case of buildings, business stakeholders can focus on their energy use, set specific targets for increasing energy efficiency and work jointly to adopt a common standard, such as LEED Gold. A focus on specific initiatives will lead to clear goals and tangible results. Examples include zero waste, marketing green housing products and building awareness of environmental footprints.

Better co-ordination & integration

(internal and external)

FINDING ENERGY CHAMPIONS & BREAKING THE SILOS

Most energy management initiatives are secondary to other municipal planning and investment decisions. As a result, there is a constant need to ensure that the energy implications of planning and investment decisions are adequately considered. This is especially important because energy management, like resiliency and sustainability, is a theme that crosses organizational boundaries within a city.

Today's cities pursue resiliency and sustainability as primary policy targets. This typically involves creating a sustainability manager position with a responsibility to bring departments together to promote sustainability awareness and encourage specific and implementable improvements. Energy management for city operations is often subsumed in this role, at least for planning and co-ordination. Specific energy management initiatives are still the responsibility of the departments that physically manage transportation, buildings, water services and other infrastructure.

One opportunity that some cities are considering or advancing is appointing a full-time energy manager. This approach has been proven successful by firms that manage commercial buildings. The increased focus of a full-time energy manager allows for greater communication efforts, greater interaction with those who manage the assets and more focused public outreach.

In 2004, Regina created its Green Ribbon Committee to help reduce the city's carbon footprint. An emissions reduction co-ordinator was appointed to engage communities on reducing emissions and saving money. The duties of such pollution mitigation positions are similar to, and even complementary to, those of an energy manager. North Vancouver's energy manager works with city planners to

understand energy plans, maps and models energy use, implements chosen endeavors and collects data on city initiatives to update, manage and adjust policies accordingly.

The cities studied in *Buildings, Bicycles and 'Burbs*⁵ find that it is challenging to establish a single champion because of the diversity of energy management initiatives and because of the challenges of working across departments without having a line responsibility in those departments. This can perhaps be overcome by setting priorities based on the highest potential return on the effort expended. Energy mapping exercises (discussed more fully later in this report) can help in setting these priorities. Initial success can then provide momentum for broader efforts. Working across departments takes time, resources and patience, but the key probably resides in supporting the autonomy of each department, establishing win-win opportunities for collaboration and focusing on continuous improvement mandates.

Some cities are finding that each department takes initiative for energy management within the department. In that situation, the sustainability team has the opportunity to build on what departments are doing and promote the benefits of collaboration.

The primary decisions that influence energy use are made in land use planning and transportation planning. City operations (buildings, transportation, water and wastewater) also use energy. Within each department, there is a leadership opportunity to make energy management options more visible and treat them as a higher priority. This argues for a champion in each department, although that person will likely have another primary duty. Sustainability or resiliency teams also exist, and have responsibilities for co-ordinating activities across departments. This is a second option for an energy management champion.

⁵ *Buildings, Bicycles and 'Burbs* studied state of play regarding urban energy management activities in seven western Canadian cities (Vancouver, Victoria, Calgary, Edmonton, Regina, Saskatoon and Winnipeg)



FULL-TIME ENERGY MANAGER

An energy manager can co-ordinate and promote energy management activities within and outside of an organization. This person is a senior manager or executive with technical knowledge, and is a participant in planning processes and related decisions.

A dedicated, and properly resourced, energy manager helps to elevate the priority of energy in the planning process, promotes awareness within the city team, reaches out to community leaders and tracks improvements in performance.

The energy manager works closely with department leaders to ensure they are aware of near-and long-term energy saving opportunities. This means working closely with both the operations team and the planning representatives.

A municipal energy manager also serves as the key champion of and contact for pilot projects, alternative energy, integrated community energy solutions and any other project or initiative to make better use of energy within municipal boundaries. The role can also include liaison with other municipal governments or other levels of government.

BC Hydro has a Community Energy Manager Program that provides funding to municipalities to employ a full-time energy manager for two years. Some jurisdictions find this to be too much responsibility for one person and thus have an Office of Energy Management that effectively manages and promotes energy management initiatives.

COMPLEMENTARY LAND USE PRIORITIES AND TRANSPORTATION OPTIONS

Limited resources, tight budgets, finite time available and shifting priorities are all challenges in creating complementary land use priorities. Even so, much can be done to incorporate energy management into the mix.

Location of light rail and other public transit is a key element of co-operation between municipal departments. Given the wide-ranging social and economic impacts of such decisions, there are significant benefits to collaboration between various departments. As for traffic, congestion pricing has drawn some attention in New York City and other major municipalities. It should be considered for western Canadian cities. Calgary has conducted a teleworking pilot project. Edmonton, meanwhile, is exploring a shift in transport modes. Again, municipal departments can work together to ensure that transportation options and land use priorities are complementary. Regional plans can also be used to identify priority growth areas. Edmonton has done this, looking for 25 per cent of new growth from infill development. Regina has bylaws to encourage high density housing near major arterial streets and residential development on vacant lots in certain neighborhoods.

Energy management and other policies are complementary. Not only is transforming transportation vital to municipal energy conservation, but it is also key to reducing pollution. According to the International Energy Agency (IEA), transportation accounts for 26 per cent of Canadian GHG emissions, and urban transport accounts for 40 per cent of total transport emissions.⁶ IEA's work on municipal policies focuses on three main themes for transport:

- users pay the full cost of transport (including environmental costs)
- policies are designed to support the most efficient and environmentally benign transport options, and
- urban/commercial planning includes consideration of the energy implications of transportation decisions.⁷

Key areas for transport planning include decreasing commute times, improving air quality, fostering dynamic neighborhoods, reducing noise pollution and enhancing safety.

⁶ (International Energy Agency, 2013), p1.

⁷ (International Energy Agency, 2013), p16.

The IEA also has a number of steps for policy analysis:⁸

Plan

Identify transport needs and define objectives, identify and engage stakeholders early on, address potential barriers and secure necessary resources, establish a policy framework and action plan.

Implement

Engage actors and begin implementation, raise awareness and communicate targets, manage implementation process.

Monitor

Collect, review and disseminate data.

Evaluate

Analyze data and evaluate effects of transport policy, adapt transport policy and plan next steps.

The IEA also recommends three guiding principles for transportation policy: avoid, shift and move. That is, using

city planning to avoid travel growth, shifting transport demand to alternative means that are more efficient, and implementing more efficient fuels and vehicles. These strategies have led to significant cost savings over the long term for municipalities.

DISTRICT ENERGY AND INTEGRATED SYSTEMS

District energy has been studied by the Canadian District Energy Association (CDEA) in collaboration with Natural Resources Canada.⁹ It found that district energy in Canada is being implemented slowly because there is no business case, there is lack of local capacity to design and build district energy systems, and the benefits have not been communicated well. It also points to a lack of regulatory/legislative frameworks and asserts that two-thirds of the challenges district energy faces are at the municipal level. The CDEA has also observed that district energy is the nexus between energy and land use planning efforts. Urban intensification is thought to provide the development intensity required by DE systems. The CDEA work also identifies political leadership as a key challenge. In other words, it is about policy frameworks and acceptance rather than technology.



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WORKING TOGETHER: LAND USE PLANNING AND TRANSPORTATION

Land use plans involve density targets and a focus on other energy-related issues while transportation plans optimize traffic flows based on current and anticipated land uses. With respect to energy management, these two areas have long-term effects and require early planning. The link between the two areas is complementary and therefore co-operation among departments is required.

Analyses of energy supply options and potential energy savings can inform municipal infrastructure projects that involve transportation and land use planning. For example, LRT plans can be co-ordinated with residential planning to ensure optimal outcomes with respect to energy management. Such co-ordination would be facilitated by an energy manager.

⁸ (International Energy Agency, 2013), p17.

⁹ (Canadian District Energy Association, 2011)

It is important for municipal governments to set the example and lead in co-ordination efforts. A detailed analysis of energy supply options as part of land use and transportation plans is an appropriate place to set priorities for renewable energy, alternative energy and related projects. For example, there may be a focus on co-ordinating the housing and LRT plans within the context of economic development. Cities can provide education campaigns, commercial building incentives and energy management incentives in greenfield developments. Developing and implementing training programs for building operators, which Saskatoon is planning to do, would increase capacity for district energy systems. For example, the former Saint Joseph's school in Regina was developed into an apartment building that is ready to be connected to a district energy system, and is heated by high efficiency gas appliances. Some of the best opportunities for district energy or ICES might be those that are integrated with waste heat recovery opportunities. Utilities can play a role, alongside the city and businesses to first identify the sources of waste, and then create innovative ways of capture. Saskatoon's Landfill Gas to Energy Project is a good example, creating \$1.3 million for the city in annual revenue from the sale of generated power to SaskPower.

Addressing implementation issues is necessary but not sufficient for collaboration in providing district and distributed energy systems. There is also a need for better energy measurement to make it easier to develop and implement tools for building performance measurement and management with respect to district energy. Similarly to LEED and BOMA ratings, these tools can be shared with the private sector. Natural Resources Canada has created a Canadian version of a U.S. benchmarking tool and is making it available to the public. Additionally, there are already several companies with similar tools.



DISTRICT ENERGY

District energy makes economic sense in densely populated areas, such as downtown cores and universities, where much energy is used in a geographically small area. District energy projects often have very low carbon footprints over their lifecycle, thus giving city planners additional incentive to choose district energy initiatives.

Completed in 2010, Calgary's Downtown District Energy Centre heats more than 900,000 square metres of residential, commercial and municipal buildings. An underground piping system transfers water from high efficiency natural gas boilers to conversion systems, which change the heated water's thermal energy into electricity. These energy transfer systems in buildings occupy less space than traditional heating systems.

District energy networks are best suited to new buildings since their energy infrastructure can be built initially rather than retrofitted. Lifecycle cost savings and other complementary goals may persuade decision-makers to incorporate district energy systems into city planning.

Improving measurement

Effective measurement and reporting are keys to success in any effort to improve performance. However, measurement is expensive and associated costs must be weighed against ability to deliver results. Most of the cities examined are in the early stages of determining what and how to measure so as to rank options and effectively evaluate specific projects. Their task is complicated by the fact that tools and measurements are not standardized and data are not always available for benchmarking.

As a starting point, it is important to understand the current level of energy consumption over a wide range of uses. The focus for energy demand management for our western cities is centred mainly on greenhouse gas (GHG) reduction targets. GHG calculations for municipalities are made up of two primary components: energy (subcategories are stationary combustion and transport) and waste (landfills, wastewater treatment and waste incineration). The other component sometimes present in specific municipalities is industrial processes.

Energy mapping appears to be an effective tool for improving measurement and using available data to find energy solutions. Victoria's energy mapping initiative found that just more than half of GHG emissions are from buildings, 44 per cent from transport, and the rest from solid waste management. The buildings emissions are large partly because of the high average age of buildings.¹⁰ The city used energy mapping to identify neighborhoods with high intensity usage, and to identify the split between transport and buildings for a range of neighborhoods. Using a vehicle-kilometres-of-travel methodology, the results were broken down further. The mapping found that 88 per cent of vehicle emissions are from private vehicles, and 12 per cent from public transit. These energy mapping results were then analyzed to identify opportunities for land use planning to improve mobile emissions. Proximity and options for working, shopping, schools and recreation versus transport requirements were important criteria for these decisions.¹¹

AN ENERGY AND EMISSIONS INVENTORY

The first of its kind in North America, British Columbia's Community Energy and Emissions Inventory (CEEI) provides each community in the province with a basic energy use and emissions inventory. CEEI collects data from GHG source sectors from utilities, public agencies and other trusted partners, in order to calculate the size of each sector's carbon footprint in each jurisdiction. Additionally, the CEEI measures supporting indicators from core sectors and other sources to help track the progress of local government efforts to reduce GHG emissions across their communities. An inventory of this kind is a valuable tool that strengthens and accelerates broader sustainability planning. It also helps municipalities implement and monitor energy management strategies.

¹⁰ (HB Lanarc, 2010)

¹¹ (HB Lanarc, 2010)



IMPROVING MEASUREMENT

North Vancouver's energy manager obtains data for energy mapping from self-reporting schools, NRCAN data, energy and emissions data from some businesses, boiler-size records and modelling. Additional sources may include census data, utility and municipal files to examine business licences, building permits, socioeconomic indicators and energy consumption. Using these records, project financing models can be based on the building type and/or its ownership model, energy mapping can provide data on whether retrofit initiatives are effective, and district energy systems can be planned when identifying waste heat sources, older infrastructure such as old boilers, and expected future heat demand. Without such information, there is a lack of data with respect to effectiveness, and uptake of energy conservation initiatives may be delayed or forgone if home and building owners are not convinced with meaningful data.



ENERGY MAPPING

In the context of municipal energy management, energy mapping is the identification of the location and quantity of energy intensity and use within a building, neighbourhood or city. Data can be gathered in a variety of ways, such as flyovers using infrared technology. However, such methodologies can't detect the source of heat loss. Public records can be much more informative. For example, filed permits can reveal a residence's energy-related renovations, the type of insulation can be inferred from a building's date of construction, and metered gas data can tell whether the furnace has been replaced. Such data provide a good starting point for learning about energy allocation in a municipality and analyzing how different energy sources could interact.

Energy mapping helps identify opportunities for municipal energy management policies. A public education campaign can include targeted outreach, such as by mailing out factsheets that inform residents of their home energy expenditures relative to others in their neighborhood, or in adjacent neighborhoods. This will affect increased efficiencies if residents are convinced to take action. Energy mapping can also inform municipalities of other opportunities, such as where to implement district energy projects.

Energy mapping has been done in Calgary and North Vancouver, and a project is being developed in Edmonton. This relatively new measurement tool has much potential.

Energy mapping also found that 59 per cent of building energy use is in commercial buildings and 41 per cent is in residences. Victoria uses a Climate Action Navigator (CAN) to measure emissions impact of various measures.¹² This tool has been combined with workshops to engage stakeholders in order to build common understanding. Community Energy Emission Plans are another common tool for quantifying emissions impacts.

The City of North Vancouver commissioned HB Lanarc for an energy mapping study to gather data for the purpose of reducing GHG emissions and energy consumption. With the municipal energy manager as the consultant's liaison, the report provided the city with an analysis of the local energy situation, potential strategies for the municipality, and modelling of future energy consumption and policy scenarios. A particularly useful focus of the report was that the areas of energy consumption showed where the city had jurisdiction and thus could take sole initiative, and where more senior levels of government would need to be engaged. Moreover, the report examined relevant administrative departments and positions in North Vancouver to give specific recommendations as to who could do what with respect to energy management.

Calgary also commissioned energy mapping work to diminish energy consumption resulting from new development.¹³ It found that 67 per cent of GHG emissions come from buildings, and just less than one-third come from transportation. Energy mapping provides information for many uses, such as a platform for identifying the actual costs of the highest priority actions. The Calgary project identified an opportunity to encourage higher building energy standards by using indicators and benchmarks. Energy mapping could also be used in decisions about alternative energy sources identified for Calgary, including geo-exchange, solar air, solar hot water, energy sharing (waste heat from industrial processes), sewer heat capture, solar photovoltaics, biomass, wind and district energy. However, energy mapping is an expensive process. While it may be useful for larger communities, a more streamlined approach is likely to yield practical results at a low cost in smaller communities.

WHAT TO MEASURE

Data at the municipal level is hard to come by; municipalities need to solve this. Energy mapping is a promising tool, but there are other methods, such as municipalities measuring the energy performance of their own operations.

The most critical measure is energy intensity. This can be measured as per unit of city GDP (somewhat difficult), by population (not so difficult) or per dollar of municipal expenditure (easy). GHG emissions are most often estimated and criteria air contaminants are likely easy to measure. Tracking their impact is relatively simple once the tools are put in place. Contributions from energy conservation, alternative energy and renewable energy can also be measured. Other policies that would contribute to measurement include having building operators generate more detail regarding building energy use, such as 24-hour profiles, and measuring progress on green power procurements. Useful data on individual developments can be easily obtained if there are public uses associated with them or public dollars spent on them. Administrators can build out from these.

At the same time, there are practical limits to what can be measured. For example, Calgary is finding that some of its sustainability goals are challenging to measure, or cannot be measured directly. This is leading to a re-examination of its targets. Regardless, such conclusions are only reached once plans for measurement are pursued, and the potential benefits of improving and standardizing measurement are too great to be overlooked.

Many programs can be used to engage stakeholders. Energy dashboards, environmental award programs, and promoting an environmental ethic are all effective forms of outreach. The first step to measuring energy performance is laying out a model that will indicate what can be measured and what cannot. Informing stakeholders of this will help ensure consistent approaches and avoid measuring the wrong variables or micro-measurement of unimportant variables.

¹² (Miller & Cavens, 2012)

¹³ (Canadian Urban Institute, 2008)

RECOMMENDATIONS

The western Canadian economy depends on our ability to provide food, energy and materials to the world and our customers increasingly demand improved environmental performance. To date, Canadians have expected the federal government, provincial governments and industry to shoulder the burden of improved environmental performance. There is a case to be made that the burden should be shouldered at the local level – by municipalities and citizens alike. This report recommends five steps that municipalities should take to put our cities on a solid energy management path.

1 FIND CHAMPIONS TO PRIORITIZE ENERGY MANAGEMENT

Effective leadership is needed at the senior level on both the administrative and political sides. Of the two, a political champion may be more difficult to acquire. Politics is a two-way street. Politicians inform and influence the public, but citizens give a mandate to those they elect. Hence, if the public is engaged on energy management and conservation issues using the vehicle of public outreach, a political champion may follow. The political champion's role is to stay informed on what constituents are willing to support while communicating the results to other politicians, and act to ensure that city departments have the incentives to co-operate. The administrative champion's role is to co-ordinate across departments and to promote innovative approaches, such as energy mapping.

The role of political champion is not full time. The imperative is to provide leadership and momentum in areas where cross-departmental co-ordination is essential (transportation and land use planning), and to be a visible spokesperson to communicate a vision for energy management to communities and the general public.

2 FOCUS A COMMUNITY ENERGY MANAGER ON CONCRETE RETURNS

A full-time community energy manager within the sustainability team, with an operating budget, would facilitate interdepartmental co-ordination. This person would highlight complementary, overlapping goals and communicate them to decision-makers and department leaders in land-use, transportation, planning and other areas. The energy manager would fulfill at a minimum, the following roles:

- Champion energy management and add focus both internally and externally
- Ensure that the life-cycle energy implications of capital allocation decisions is considered before recommendations are put forward
- Work with industry and communities to identify opportunities for district energy and integrated solutions, then build the partnerships needed for the projects
- Develop opportunities to partner with energy service providers to leverage municipal resources through programs that are funded by the service provider, with long-term cost recovery from energy savings

The manager should also reach out to community leaders, promote awareness in the city team and track performance. As a liaison and nexus for all of these actors, an energy manager would also help elevate its priority on the municipal agenda. They would communicate the benefits of energy management to decision-makers and the public. The energy manager's focus should include district energy opportunities and integrated solutions because these are areas where multiple organizations participate in projects, but leadership is required to launch such projects.

3 MOVE PUBLIC OPINION BY ENGAGING CITIZENS AND BUSINESSES

An effective communications strategy is key to getting stakeholders on board. It requires ensuring that they recognize and understand the benefits of planned actions for energy management and support them. Educational materials can include success stories, early education and energy-savings guides to nudge citizens and encourage public interest (and therefore political interest). Energy mapping can provide the foundational information for these materials. Given consumer preferences for low initial cost options, financial support can be provided for more costly desired actions. Initiatives to engage businesses can include promotion of common existing energy efficiency standards, setting targets and building awareness. Where relevant, both businesses and the public should be involved in focus groups, planning committees, or specific green planning initiatives. An energy manager could provide leadership on all of these fronts.

4 EXPAND THE REACH OF SELF-FUNDING INITIATIVES

Energy-savings initiatives lead to cost savings, which can then be used to expand these projects. LED streetlight replacement projects are a good example. Given the overlap between energy management goals and other corresponding goals, such as GHG reductions, complementary goals can also be achieved with such projects. They can be then publicized as success stories and influence other actors to pursue more easy wins for cost and energy savings. This low-hanging fruit will be plucked when elected officials and energy managers raise the priority of energy management.

5 IMPROVE MEASUREMENT AND REPORTING

Standardization of measurement and reporting allows projects to be ranked and contributes to a better understanding of which departments are best suited to implement them. Also, engaging and motivating the public and businesses is best done with data that allows municipalities to inform citizens about what they can do. For municipal governments, energy intensity is the most critical measure and can be assessed using tools, such as energy mapping. Using gathered data, an energy manager can facilitate collaborative decision-making among city departments. There are many feasible opportunities for measurement, and challenges and limits can be indicated when outlining out a model.

Improved measurement and reporting can improve energy management in several very simple but fundamental ways:

- Tracking the results of municipal energy management investments helps to build a record of successes that supports future investments. It also identifies the operating savings that are available to fund further capital investments.
- Accurately tracking both micro and macro level performance on energy conservation or GHG emissions reductions helps citizens, businesses and politicians to experience success and commit to further improvements. This is a critical element in translating an overall vision into action.
- Initiatives such as energy mapping help to identify the highest value targets for energy management, district energy and alternative energy.

NOTES

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The background of the page is a photograph of tall, thin grasses in the foreground, slightly out of focus. In the background, a modern city building with a curved facade and many windows is visible. The entire image has a green color overlay.

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