PROMOTING THE CONSERVATION CONVERSATION

Untapped Savings Promise Flow-through Economic Benefits

By Peter Love

THE MOST RECENT progress report on meeting greenhouse gas (GHG) emission reduction targets concluded that fully 81% of Canada's man-made greenhouse gases come from the production and use of energy. Low-carbon supply and reduced demand should be complementary elements of any emission-reduction strategy, but the great majority of public discussion has always been on the supply side.

Energy efficiency advocates stress its vast potential — typically, two-thirds of energy consumption is wasted — and associated advantages for employment, the economy and the environment. It is particularly noteworthy that many of the direct jobs linked to energy efficiency are at the local level — to design, build/manufacture, retail and install conservation products and/or provide skilled and professional services. Logistically, energy-efficiency projects rely on local contractors to actually do the required constructions or installations.

A report commissioned by Natural Resources Canada (NRCan) modelled the micro-economic impact of a relatively aggressive energy-efficiency scenario and concluded that over 15 years:

- gross domestic product (GDP) would increase by $582 billion
- 305,000 jobs would be added to the workforce
- provincial tax revenue would increase by $2.7 billion
- GHG emissions would be cut by 92 megatonnes/year.

Although perhaps less pressing in Canada, given its energy resources, security of supply bolsters the case for energy efficiency in many parts of the world. This is a major issue

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in European countries that rely heavily on Russian natural gas imports and in much of Southeast Asia. At a conference of energy policy experts in Europe in 2009, the potential for various energy-efficiency programs began to be measured in terms of "Russian gas pipeline equivalents."

Energy efficiency can also be framed in terms of productivity. This links energy consumption to economic output — calculated by dividing economic output (e.g., GDP) by energy consumed — providing a measure of flow-through economic benefits of reducing the input cost. For example, the U.S.-based Alliance to Save Energy uses the slogan, "Using Less; Doing More", and calls for a doubling of energy productivity.

On the flipside, there are challenges because energy efficiency often seems more conceptual than concrete. Firstly, it's hard to see. Most environmental issues like air pollution, garbage, water pollution, etc., are an assault on the senses. They stink, they're ugly, can be felt and even tasted.

In contrast, energy efficiency, as well as most forms of energy and even climate change itself, is largely invisible. Most energy-efficiency products are obscured within walls, in the furnace/mechanical room or in the controls. It's also hard to measure, requiring protocols to compare the amount of energy that was actually used with the amount that would have been used without the intervention.

Plus, it's a commitment that never comes to an end. Broad and active participation from all sectors of society — government (at all levels), private companies, public institutions, homeowners and tenants — is needed.

Generally, these efforts fall into four main categories, although two other supply-related initiatives are sometimes added to the definition of energy efficiency. They are:

- Conservation Behaviour: using existing technology in ways that reduce energy consumption;
- System Operations: ensuring that entire systems are maintained and operated in the most efficient manner;
- New Technology: replacing older, less energy-efficient technologies with newer, more energy-efficient ones;
- Demand Response: reducing energy demand at certain times of the day when the system is nearing its limits;
- On-Site Generation: technically a generation approach, but many jurisdictions consider small (less than 10 kilowatts or kW) on-site electricity generation to be a demand-side measure; and
- Fuel Substitution: when one fuel is substituted for another.

FUNDING MECHANISMS

Purchasing more energy-efficient alternatives or undertaking major energy-efficiency retrofits of buildings requires upfront funding. Even if this gets repaid by future savings, this money must come from somewhere. Some of the most common forms of financing entire projects include:

Internal Funds

Individuals or organizations use their own funds to cover both small purchases and larger ones that have been approved in an annual budget.

Bank Loans

When individuals or organizations do not have sufficient internal funds for the purchase, they can negotiate a loan from their bank for the purchase.

Product/Service Financing

In this case, the product/service provider accepts payment over a specified period of time under agreed-upon financing terms.

On-Bill Financing

This is similar to the product/service financing, but is provided by the energy utility, often with the support and encouragement of government and/or the energy regulator.

Guaranteed Energy Service Performance Contracts

These types of contracts have been used for larger ($1 million to $50 million) building retrofits for more than 30 years. Under a guaranteed Energy Service Performance Contract (ESPC), an energy service company (ESCo) undertakes the upgrade and guarantees that the resulting energy savings will cover the costs for the upgrade. This transfers the technical and financial risk associated with such projects to the ESCo.

Most of the projects using an ESPC are in institutional buildings (municipal and other levels of government buildings, universities/colleges, schools and hospitals). Over the last 10 years, eight universities and colleges across Canada have undertaken such projects and a few more are underway.

Property Assessed Clean Energy (PACE) Loans

This is the newest form of project financing and is based on the successful Local Improvement Charge that Business

Improvement Areas can employ to fund communal assets (hanging planters, festive lights, etc.). In this case, the municipality provides the financing for an energy-efficiency upgrade and payments are added onto the property tax bill over the period of the contract.

One of the biggest benefits to this loan is that responsibility for paying for an energy-efficiency upgrade is passed on to new owners if the property is sold. This overcomes the reluctance to invest in an energy-efficiency upgrade if the payback period is longer than the owner expects to own the property.

INCENTIVES

There are four major ways that incentive funding can be made available to partially reduce the initial additional cost of an energy-efficiency product or building. It should be noted that these different methods are in no way exclusive, and it is likely that the most optimal form of funding would include the last three together as they each provide distinct benefits.

General Government Revenues

In this program, funding is provided out of general government revenues and can take the form of sales tax (e.g., PST/ HST rebates), income tax reductions or funding for any type of incentive program. History has shown that regions that relied on this form of funding were subject to wide fluctuations in funding, as programs were often terminated when governments faced funding challenges.

Ratepayer-Funded Programs

This is similar to incentives from general government revenue, but with the critical difference that funds are from ratepayers, not taxpayers. Again, history has shown that once energy regulators approve the ability to deduct funds from ratepayer bills for such programs, they are much more stable than those from general government revenue.

Ratepayer-based programs fund the majority of incentive programs in North America. They are sometimes referred to as System Benefit Funds that are used for System Benefit Programs. The programs they fund result in reduced requirements for electricity or natural gas and thus provide overall system benefits.

Carbon Pricing Programs

This is the newest form of funding for incentive programs. There are basically two types of carbon pricing programs: carbon tax or cap-and-trade

Under the first, the price of carbon is set and the market determines the resulting quantity of carbon that is reduced. Under the second, the quantity of carbon is set and the market determines the resulting price. Under both, revenues raised can be used either to reduce other taxes (thus making the programs revenue-neutral) or to provide funds for various incentive programs.

In Canada, British Columbia has had a revenue-neutral carbon tax since 2008; Quebec has a cap-and-trade system that includes California; and Alberta has recently expanded its initial carbon tax on large emitters to include all energy consumers. The programs they fund result in reduced GHG emissions.

Capacity Market

Some electricity markets in Canada have (Ontario) or are investigating (Alberta) the introduction of capacity markets to handle the system peak loads for a limited number of hours per year. Energy-efficiency resources have been permitted to bid into these markets in two U.S. jurisdictions. In New England's wholesale electricity market, energy efficiency is currently contributing about 4% of the total capacity, double what it was contributing five years ago. By 2021, it is expected to provide about 8%. Payments for this capacity represent a way to fund energy efficiency, as these types of programs result in reduced costs to meet system peaks.

JEVONS EFFECT

Although not usually taken into account when energy-efficiency programs are evaluated, it should be noted that increases in efficiency have been found to result in increases in resource use. This effect was first discovered by William Jevons in 1865.

Now known as the Jevons Effect, it supposes that improvements in the efficiency of a resource from improved technology results in increased resource use due to an increased rate of consumption. Appropriate for the times, Jevons used coal as his example.

He observed that technical improvements to the efficiency in steam engines resulted in increased use of coal as the steam engines began to be used in other applications. This effect is also referred to as the rebound effect.

Subsequent research has identified the potential for both direct rebound effects as well as indirect effects. Money saved by using less energy is spent on an energy-intensive activity that otherwise would not have been undertaken.

Recent studies estimate this effect to be in the range of 5 to 15% in developed countries. One counter argument is that, if the purchasers of the more energy-efficient technology bought it because they want to improve their environmental footprint, then they might be expected to invest the savings generated in additional energy-saving technologies and thus reduce even more energy.

Peter Love is an energy efficiency consultant, an adjunct professor in York University's Faculty of Environmental Studies and a member of the board of directors of Energy Efficiency Alberta. The preceding article is excerpted from his book, **Fundamentals of Energy Efficiency, Policy, Programs and Best Practices.** It can be found online at http://energyefficiencyfundamentals.org/textbook.