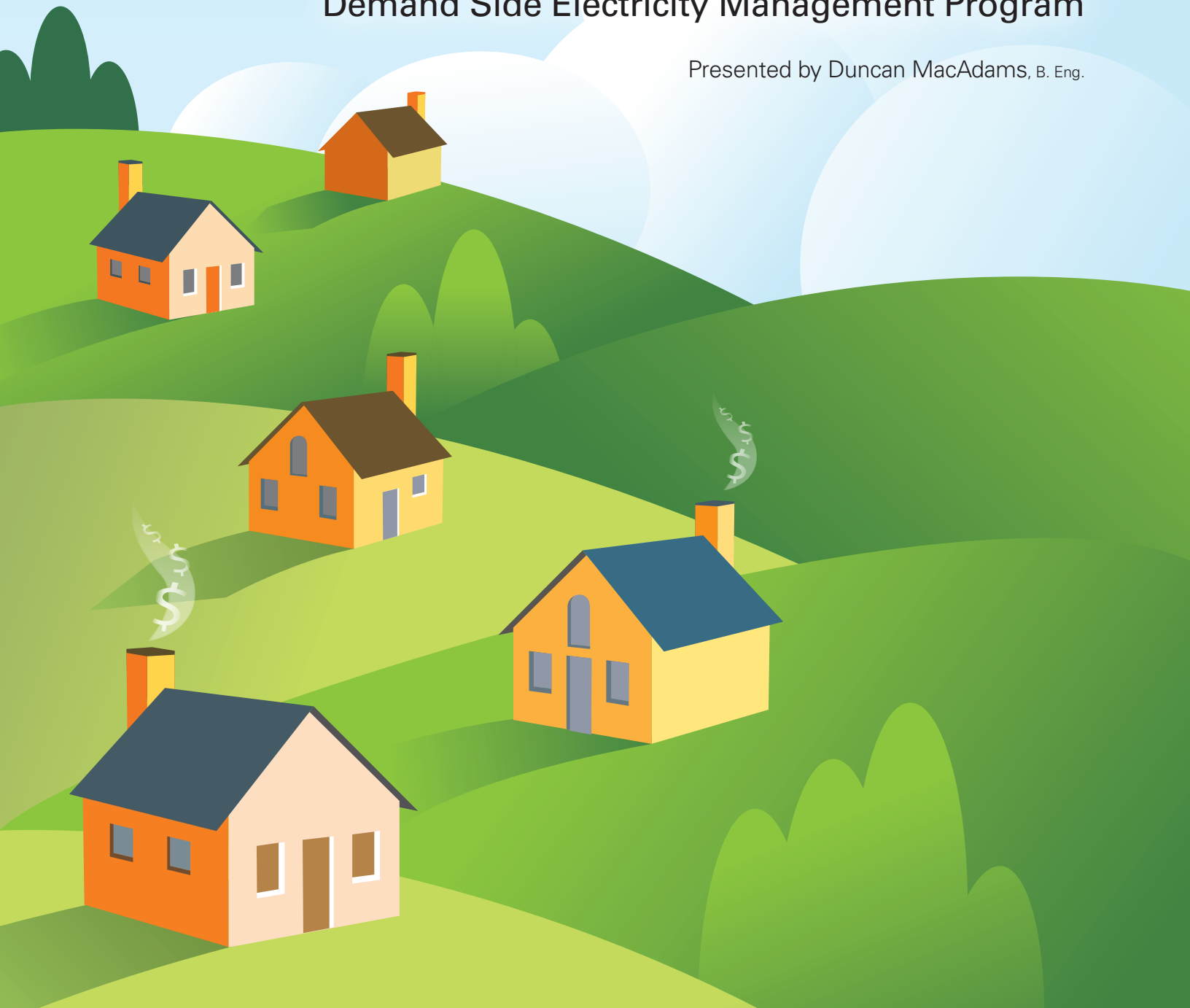


Fuel Replacement Strategy for Nova Scotia

Fuel Replacement and its Importance to
Nova Scotia's Energy Security through a
Demand Side Electricity Management Program

Presented by Duncan MacAdams, B. Eng.



Let's discuss the consideration of Fuel Replacement and its importance to Nova Scotia's Energy Security in a question and answer format:

1. What is the difference between "Fuel Substitution" and Fuel Replacement?

Here is the answer as provided by:

Dr. Larry Hughes, PhD
 Professor, Energy Research Group
 Department of Electrical and Computer Engineering
 Dalhousie University, Halifax, Nova Scotia, Canada B3J 2X4

"Fuel Substitution" – "substitution" implies that you can go back to the source at will sometime in the future. This is why we chose the word "replacement" [and "restriction"] to indicate that moving towards an energy secure future will require replacing insecure energy sources with ones that are secure and preferably environmentally benign.

2. Why consider replacement fuels?

Consideration of price and availability...now and in the future...and environmental issues, make replacement fuels look very attractive, when compared with electric baseboard heating in which 75% of the electricity supplied is generated in coal fired power plants, or oil heating, derived from imported fossil fuel, which like coal, pollutes the environment, drains huge quantities of money from the Nova Scotia economy, and will likely be more expensive as a heat energy source than electricity in the near future. At a crude oil price of \$150 US/barrel, No. 2 heating oil will be more costly than electric resistance heating. (PLEASE SEE EXHIBIT B)

3. Which replacement fuels are best?

As Caterpillar Tractor says in their ads: "*There are no simple solutions, only intelligent choices.*" Our view is that the intelligent choices should be left to the individual property owner who can do the required analysis on a site-specific, building-by-building basis. Different property owners will come up with different optimal solutions for selecting one or more replacement fuels as the optimal solution for a specific building, in a specific location in Nova Scotia, at a specific point in time. No one solution can easily be judged as correct or incorrect. Our view is that on the peninsula of Halifax, buildings presently heated with oil should be switched to natural gas as soon as natural gas is available to the building, and as a second step, solar thermal panels should be considered so as to reduce natural gas consumption. This is one view, and other property owners may have other views, which could also be equally viable for their situation. But, the one common fact is that oil consumption is not sustainable, and when one considers that as noted in the "Bottom Line" in Exhibit B, at some point heating with electricity will probably be cheaper than heating with oil and at that tipping point the NSPI winter peak will likely grow dramatically.

4. What are the barriers that building owners face when considering switching from baseboard electric or No. 2 heating oil to replacement fuels such as wood pellets, natural gas, electric thermal storage [ETS], ground source heat pumps [geothermal], or solar thermal?

The main challenge is not only financing the upfront capital cost required for the basic fuel to energy conversion system [a pellet boiler, a natural gas boiler, an ETS system, a ground source heat pump, or a solar thermal panel array], but also financing of the radiant heating system required to efficiently deliver to the building, the heat derived from the replacement fuel(s).

5. How can Demand Side Management [DSM] funds be used to efficiently leverage private investment in replacement fuel systems?

One method would be to put in place a program for that would guarantee long-term, low interest bank loans from Canada’s chartered banks to individual building owners, much like what has been done for many decades by Central Mortgage and Housing Corporation [CMHC]. For a fee, CMHC provides mortgage insurance, which allows the property owner to shop around to the chartered banks for the best interest rate. Using the CMHC model, we envisage it would be quite simple for Efficiency Nova Scotia to operate a loan guarantee program, which would issue a guarantee for an approved applicant. The applicant/ building owner, with the Efficiency Nova Scotia loan guarantee, could shop around to the chartered banks and negotiate a long-term, low interest loan, which would finance a complete replacement fuel system, whether it is a new installation or a retrofit in an existing building.

6. Are there any other provinces which operate loan programs for replacement fuels?

YES. Manitoba is one such province, where replacement energy loans are available directly through Manitoba Hydro...the provincially owned Crown Corporation that supplies electricity and natural gas.

7. How is the proposed Efficiency Nova Scotia loan program suggested in Question No. 5 different from the Manitoba loan program described in the answer to Question No. 6?

The Efficiency Nova Scotia loan program envisaged in the answer to Question No. 5 would be financed by the chartered banks and would have loan to value limits, rather than capping dollar amounts of direct subsidies. This would make it possible for owners of say apartment buildings to borrow relatively large amounts of money, perhaps in the hundreds of thousands of dollars, to aggressively pursue replacement fuel installations. The only utility involvement could perhaps be the collecting of the monthly loan payment as a line item on a gas or electric bill, which would be electronically transmitted to the chartered bank that granted the loan. The utility providing the collection service could be reimbursed a small administrative fee.

Additionally, the program could be virtually subsidy free, if an initial starting fund was set up and the annual investment yield of the fund was equal to, or greater than, the annual loan loss amount. I believe such a scheme is possible, if set up by investment banker professionals, rather than a government committee.

8. How could an aggressive replacement fuels loan program promote sustainable and environmentally sound economic growth?

The installation of pellet boilers, geothermal heat pumps, and solar thermal installations would launch three new industries, similar to the way natural gas has launched a new trade for the installation and maintenance of natural gas systems.

Heating with pellets, geothermal and solar thermal would lead to the replacement of large quantities of imported No. 2 heating oil, which would annually retain substantial amounts of “new” money in the Nova Scotia economy. “Import Substitution,” is one of the simplest and most powerful economic development strategies available to grow an economy.

In Sweden, where pellets are used in cogeneration plants, as well as for residential and commercial heating, the wood fiber used to manufacture the pellets is in part derived from silviculture of the nation’s forest. Swedish forests are managed much more intensely than Nova Scotia forests, and one underlying reason for this phenomenon is because in Sweden there is a market for low quality wood fiber derived from silviculture practices such as weeding, cleaning, spacing and utilization of tree parts not used for higher value wood products. The demand for low value wood fiber in Sweden is such that they cannot supply their own needs and as a result import shiploads of pellets from Nova Scotia...pellets that we could very well use here to displace imported oil.

At the risk of beating this economic development subject to death, I think it is well worth reading every word of the November 9, 2009 report of Nova Scotia’s Economic Advisory Panel [Elizabeth Beale, Tim O’Neill, Lars Osberg, and Donald J. Savoie], entitled, “Addressing Nova Scotia’s Fiscal Challenge.”

[PLEASE SEE ATTACHMENT C]

Donald Savoie, in his fascinating paper on the history of governments grappling with deficits entitled “Reviewing the Expenditure Budget: Lessons Learned,” states:

*“There are six ways to deal with stubborn deficits: raise taxes; cut spending; sell government assets; introduce or increase user fees, or download responsibilities to a different order of government, the private sector, or volunteer associations; and **stimulate economic growth to generate more revenues.**”*

[BOLD EMPHASIS IS MINE]

Obviously, the option of stimulating economic growth to generate more revenues is a whole lot more desirable compared to the other options Donald Savoie listed as ways to get Nova Scotia out of its fiscal hole.

Accordingly, I believe the NSPI ratepayers, who will fund Nova Scotia’s Electricity Demand Side Management Plan for 2011, if asked, would agree that programs developed to deliver the plan be strategically crafted to maximize the value of each DSM dollar to **stimulate economic growth and generate more revenues.**

Elizabeth Beale in her paper entitled “Shaping a Path for Growth and Prosperity in Nova Scotia” in a Section on page 90 entitled “Committing to Growth” states:

*“The overarching requirement is for government to embrace a strategic focus that coalesces its policies and programs around the dual objectives of **increasing growth and productivity.**”*

[BOLD EMPHASIS IS MINE]

On page 91, Elizabeth Beale notes that, “...*redirecting incentives towards productivity enhancement, such as investment in **new technologies or skills developments**, can be a hard sell for government, as it may consolidate support in successful firms (or regions) and offer limited benefits in terms of new job growth.*”

[BOLD EMPHASIS IS MINE]

In my opinion, a DMS program that aggressively promotes replacement fuels, provides a rare opportunity for investment in new technologies and skills development, and should be an easy sell for government for the simple reason that any building owner taking advantage of a DMS guaranteed loan program to pursue an replacement fuel strategy would be saving money in the course of heating their building and domestic hot water. **Saving money is never a hard sell.**

Productivity improvements are important to every single Canadian. I would like to recommend an article on Monday, April 5, 2010 by Gwyn Morgan in the Globe and Mail’s *Report on Business* entitled, “Why Productivity Gains Should Matter to Canadians”, please see Attachment D.

Gwyn Morgan refers to Bank of Canada Governor Mark Carney’s recent statements that Canadian business has “disappointed” by failing to take advantage of this country’s relative superior economic and policy environment to improve lagging productivity. The article goes on to quote former Bank of Canada Governor David Dodge, who recently stated that productivity improvement is “a necessary condition” for governments to continue to finance social programs. Gwyn Morgan ends his article, with the best definition for productivity that he has discovered:

“Productivity is a process of continuous improvement in the production/supply of quality output/service through efficient, effective use of inputs; with the emphasis on team-work for the betterment of all.”

In my opinion the custodians of Nova Scotia’s Demand Side Management Plan should consider it a strategic Provincial asset that through skillful program design can grow to be a powerful catalyst fostering productivity improvements throughout Nova Scotia. **The NSPI customers who bankroll the DSM budget deserve maximum value for their money.**

9. How can a Demand Side Electricity Management Plan reduce upward pressure on NSPI's winter peak system demand over time as the world oil prices increase?

First, for customers using electric baseboard heating, a move to any of the replacement fuels in Exhibit A, will remove substantial peak electrical demand from the NSPI winter peak electrical grid.

Second, for homes and businesses using No. 2 heating oil, a move to one or more of the heating fuels listed in Exhibit A, will eliminate the possibility of an oil to electricity switching threat, which will likely materialize when No. 2 heating oil becomes more expensive than regularly priced electricity.

[PLEASE SEE EXHIBIT B]

**“There is never time
to do it right the first time,
but always time
to do it over.”**



EXHIBIT A

Effective Cost of Various Heating Fuels in the Halifax Peninsula Area

For Period 2009 - 2010*

HEATING FUEL	FUEL COST \$ / Million BTU at Tank, Meter, or Storage Bin	FUEL COST \$ / Million BTU Available to Heating Distribution System
PELLETS [Bulk Delivery]	\$12.94 / Million BTU	\$14.38 / Million BTU
NO. 2 HEATING OIL	\$17.09 / Million BTU	\$29.26 / Million BTU
NATURAL GAS	\$15.31 / Million BTU	\$16.11 / Million BTU
ELECTRICITY Resistance	\$39.27 / Million BTU	\$39.27 / Million BTU
ELECTRICITY Resistance [Off Peak – 50% Discount] Electric Thermal Storage [ETS]	\$19.64 / Million BTU	\$19.64 / Million BTU
ELECTRICITY Geothermal Heat Pump COP = 3		\$13.09 / Million BTU
ELECTRICITY Geothermal Heat Pump COP = 3 [Off Peak Rate @ 50% Discount]		\$6.55 / Million BTU
SOLAR THERMAL	NIL	NIL

* Based on actual purchase experience of one Property Manager, and using estimated fuel conversion efficiencies of actual equipment in service. Detail of cost data and efficiency calculations for pellets, No.2 heating oil, natural gas, and electricity can be found in Attachments A-1, A-2, A-3, & A-4 respectively.

EXHIBIT B**Projected Cost of No. 2 Heating Oil Delivered in Halifax Peninsula Area**

Using Following Rule of Thumb Formula*:

Cost Of No. 2 Oil [\$Cdn/Litre] = Cost Of Crude Oil** Divided By 100

COST OF CRUDE OIL Cushing, OK WTI Spot Price, Price FOB [US Dollars / Barrel]	COST OF NO. 2 HEATING OIL \$CDN / Litre	COST OF NO. 2 HEATING OIL \$CDN / Million BTU
\$80	\$0.80	\$21.86
\$90	\$0.90	\$24.60
\$100	\$1.00	\$27.33
\$110	\$1.10	\$30.06
\$120	\$1.20	\$32.80
\$130	\$1.30	\$35.53
\$140	\$1.40	\$38.26
\$150	\$1.50	\$41.00
\$160	\$1.60	\$43.73
\$170	\$1.70	\$46.46
\$180	\$1.80	\$49.19
\$190	\$1.90	\$51.93
\$200	\$2.00	\$54.66
\$210	\$2.10	\$57.39
\$220	\$2.20	\$60.13
\$230	\$2.30	\$62.86
\$240	\$2.40	\$65.59
\$250	\$2.50	\$68.33
\$260	\$2.60	\$71.06
\$270	\$2.70	\$73.79
\$280	\$2.80	\$76.52
\$290	\$2.90	\$79.26
\$300	\$3.00	\$81.99
\$310	\$3.10	\$84.72
\$320	\$3.20	\$87.46
\$330	\$3.30	\$90.19
\$340	\$3.40	\$92.92
\$350	\$3.50	\$95.66

NOTE: Jeff Ruben, the Former Economist for CIBC, who was ridiculed when he first predicted Oil would go to over \$100 US/Barrel, predicted on March 31, 2010 "By the fourth quarter of this year, oil prices will be back in triple digit range, and by next year oil prices will rise to record highs, taking out the high water mark of \$147 per barrel set back before the recession began in 2008."

BOTTOM LINE: When Oil reaches \$150 US/Barrel which translates to approximately \$1.50 CDN/litre or \$41 CDN/Million BTU's, it becomes more expensive than NSPI electricity, for which the effective cost is \$39.27/ Million BTU's; this is the tipping point when No. 2 Heating Oil will become more expensive than electricity, and the NSPI winter peak will likely grow dramatically.

* This "Rule of Thumb Formula" is based on data compiled over Period 3 January 2006 to 19 January 2010. See Attachments B-1, B-2, B-3, & B-4 re: data for years 2006, 2007, 2008, & 2009-10 respectively.

** Cushing, Ok WTI Spot Price FOB (US/Barrel).

Annual Home Energy Usage Comparison

Based on residential consumption of approximately one hundred million BTU's of heat energy each year for domestic hot water and space heating.

STANDARD FUELS



Electric Baseboard
and Hot Water Tank
\$3,927



No. 2 Heating Oil
\$2,926

Using 2009 Fuel Costs in Exhibit A, the fuel costs for heating such a house with **Electric Baseboard** would be:

$$\frac{100 \text{ Million BTU's}}{\text{Year}} \times \frac{\$39.27}{\text{Million BTU's}} = \text{\$3,927 per year}$$

Similarly, heating with **No. 2 Heating Oil** would be:

$$\frac{100 \text{ Million BTU's}}{\text{Year}} \times \frac{\$29.26}{\text{Million BTU's}} = \text{\$2,926 per year}$$

REPLACEMENT FUELS



Off Peak Electricity
\$1,964



Natural Gas
\$1,611



Wood Pellets
\$1,438



Geothermal Heat Pump
\$1,309

IMPORTANT NOTE: If a Solar Thermal heating system was combined with a Replacement Fuel heating system, the reduction in total fuel cost would be equal to the percentage of replacement fuel displaced.

FOR EXAMPLE: A house with a Natural Gas system and a Solar Thermal heating system providing 25% of annual energy needs, would have an annual fuel cost of:

$$\text{\$1,611} - \$403 \text{ [25\% of \$1,611]} = \text{\$1,208}$$