

# Making it Happen - The Transition to a Sustainable Society

## **Proceedings – Workshop 2**

Barriers to a Green Residential Sector

What's stopping us from making the residential sector  
totally green?"

**February 23, 2009**

## Table of Contents

Tom Brzustowski, Interim Chair: Welcome .....	3
Hugh Macleod, ADM to Premier of Ontario: Climate Change.....	3
André Potworowski, Project Director .....	4
Evaluations of three energy efficiency programs .....	5
1. Jason Spears (Telfer MBA candidate): Canadian Oil Substitution Program (COSP).....	5
2. Benedicte Losfeld (Telfer MBA candidate): Canadian Home Insulation Program (CHIP).....	5
3. Anne Murray Choudhary (Telfer MBA candidate): Evaluation of the R-2000 Program .....	6
Peter Love, Chief Energy Conservation Officer, Conservation Bureau, Ontario Power Authority .....	7
David Foster, Director of Environmental Affairs, Canadian Home Builders’ Association.....	8
Gordon Shields, Executive Director, Net-Zero Energy Home Coalition .....	9
Tom Green, Project Manager, Equilibrium Housing, CMHC.....	10
Plenary discussion on morning presentations.....	11
Reports on break-out groups (the “how might we challenges”).....	12
1. Awareness: consumer information, education, building the basis of paradigm shift.....	12
2. Affordability: new financial instruments and business models; price ranges .....	13
3. Availability: does it exist; is it reliable, proven, tested, inspected, / standards, codes, training skills.....	13
4. Adaptability: converting existing stock of housing in different shades of green, potential for upgrading .....	13
5. Acceptability: new regulatory models, standards, by-laws .....	14
David Brooks: concluding remarks.....	14
Ralph Torrie: concluding remarks.....	14

## Tom Brzustowski, Interim Chair: Welcome

There has been a lot of discussion around the way in which we can reduce the impact of human beings on the environment. Many ideas have been proposed but too little is happening and too slowly. The available technologies that could make a difference are not being put to use. The question is why? It is hoped that this conference will shed some light on these questions. The challenge of innovation is to have a good idea and then to be able to put it into practice. We have done the first, but have paid less attention to the latter: environmentalists may not have been paying enough attention to the management side. Ultimately the issue is not the technology, which is available, but rather a series of barriers to its implementation: tradition, inconvenience, financial constraints, institutional inertia and the like. We need to learn more about these barriers and how to overcome them before we can move to sustainability. That means learning from the practitioners on the front lines of change. As a starting point, this workshop today will focus on energy consumption in the residential sector, a fragmented sector in which the consumer is an essential agent of change.

## Hugh Macleod, ADM to Premier of Ontario: Climate Change

Despite progress on sustainability, much more remains to be done. Energy is being used continuously, even while we sleep, and it is being used inefficiently. According to the OECD, Canada ranks 27<sup>th</sup> out of 28 in the efficiency with which we use petroleum and 28<sup>th</sup> out of 29 in how we use water. The issue becomes why we cannot act in the face of clear evidence.

Perhaps cultural change is the biggest reason. We haven't confronted our consumer culture and how it defines value, needs, size, etc. We have larger homes on smaller lots, spread out over miles, cutting us off from social interaction, reducing connectedness and safety. This imposes costs on health and the environment because our central value remains individual home ownership.

There is also a perception that green is somehow riskier. If so, we need insurance products related to these risks and we have to reform our building codes so that everyone assumes the same levels of commitment to sustainability. Ontario's Green Energy Act will attempt to do that by setting new expectations of infrastructure in areas such as social housing and government buildings.

The Act will also take a more holistic approach to households, considering all of their water use, waste and emissions. We want to look at what households are doing now and what role they can play in mitigation. Getting better information on this is a necessary step in formulating a more effective plan of action.

Clearly we need different ways of looking at mass transportation but home heating alone is responsible for half of all emissions. We will need to pay particular attention to residential retrofit as the foundation of significant progress. In doing so, we need to shift the focus from remediation to prevention. And we need to move out of our traditional comfort zones and affirm a commitment to leaving the planet in a better state than we found it.

*The most important challenges (How Might We...):*

HMW engage the public in a new conversation about the importance of home retrofit?

HMW begin to act as a government in a holistic way to support the public in moving toward a green residential sector?

HMW celebrate and report back on the work that the public and government are doing?

*Discussion issues:*

- How to look at housing as part of an energy mix that includes renewable for sustainability? The pieces of the puzzle must be integrated so that we are not just looking at conservation but also at renewable energy in a holistic manner.
- How can we train the workforce needed for the retrofit? There is no immediate answer and work is still required in this area.
- We need to motivate the bureaucracy because there are still significant barriers inside government. MPP David Ramsey, the Premier's Parliamentary Assistant, has been working on the design of an Ontario Public Service Go Green Strategy. The goal is create a mindset shift to take climate change more seriously. If we ask the outside world to change its behaviour, we must demonstrate that we also are taking a leadership position. Our hope is to become a disruptive catalyst, getting the public service to think differently, remove artificial barriers and bring innovation to the table. We are attempting to put our own house in order and then to engage the public in discussion about climate change.

## **André Potworowski, Project Director**

This workshop is looking at what is stopping us from making the residential sector green. Our challenge is to move toward a society with a minimal environmental footprint but with same quality of life. The theme was raised decades ago in the Conserver Society Project. We can look at pictures of key infrastructure 50 years ago and today, and ask ourselves what would we like this to look like in another 50 years. We then have to ask what it will take to get there. We also know that in times of crisis, society has shown that it can adapt. For example, during WWII when Parisians had no gasoline, they adapted their cars to run on wood. A horizon of 50-100 years allows us to think in terms of adapting infrastructure and rewriting laws. And we are constantly reminded of how quickly and radically technology can change society.

*The most important challenges:*

HMW evolve to a sustainable society?

HMW replace our entire social infrastructure over 50 years, accelerate innovation and transformation in the residential and transport sectors, redesign our systems holistically, and change paradigms to reduce energy and resource use?

HMW identify and address barriers?

*Discussion issues:*

- The residential sector could reduce GHGs by 60% by 2030. Insulation, heating, lighting, appliances, etc. are technologies that are already on the market and available. The issue is how to deploy them into 10-15 million residential units.
- We have to think in terms of the entire system, including the transportation network.
- The time frame of 50 years may be too long: we may not have that much time left.
- On the other hand, one of the reasons we look to the long term is to create a reference point to ensure that what we are doing in the short term will get us to a desirable end state. If you do not understand the ultimate objective, you will certainly make missteps along the way.

## Evaluations of three energy efficiency programs

### **1. Jason Spears (Telfer MBA candidate): Canadian Oil Substitution Program (COSP)**

COSP was announced in 1980 as part of the National Energy Program. Its purpose was to reduce reliance on foreign oil by providing grants to convert from oil heating to other sources and it was in effect up to 1985. Ultimately, it involved \$715 million in subsidies to 997,555 conversion projects worth almost \$2 billion. Altogether 90,000,000 GJ/year of oil energy were substituted and 80,000,000 GJ/year of energy were provided from other sources.

Conversion could be either full or partial but there had to be a reduction of at least 50% in the oil being used. The most popular alternative sources of energy were wood, natural gas or electricity. Participation was motivated by a desire to save money, the condition of existing furnaces, or by perceptions that the alternatives were more reliable, cleaner, convenient or safe. However, 64% performing full conversion would have done so even without COSP, as would 45% of those doing a partial conversion.

Several barriers existed that prevented more innovation. The program focused only on oil, there were no limits to substitution choices, energy prices quickly stabilized thereby removing incentives for more radical conversion, there were gaps in consumer awareness, and regional differences limited the choices available (e.g. there was little natural gas in Atlantic Canada so that was not an option for conversion.) There were no incentives in the program to use higher efficiency solutions. Moreover, the option to partially convert meant that the old oil heating systems continued to exist and many reverted back to using them after the program ended.

#### *Discussion issues:*

Was it a good program? It was only designed after it was announced as part of the NEP. The design was rushed, a lot of money had to be spent quickly, it was deeply unpopular in Alberta, and the designers did not anticipate the market response, which was that the price of furnaces went up by \$800, exactly the amount of the federal conversion subsidy. It had little to do with energy conservation and was primarily about reducing dependence on offshore oil imports. It had a political purpose and little else.

### **2. Benedicte Losfeld (Telfer MBA candidate): Canadian Home Insulation Program (CHIP)**

CHIP was initiated in 1977 and ended in 1987. Its purpose was to protect Canada from future oil shocks by saving on the energy used in home heating, stimulating the use of better insulation materials, improving quality control over those materials and monitoring savings on energy used for home heating. Altogether, there were 1.9 million CHIP applications resulting in aggregate energy savings of 17% on home heating, which was lower than what had been targeted. About three quarters of the money spent on improvements to insulation would not have been spent without the program.

The biggest flaws in the program were a general lack of awareness about it, the lack of cooperation between NRC, CMHC and the housing industry, and the emergence of unintended consequences such as the fact that the insulation industry began to market the program only as attic insulation because this was easier for the industry to do, and this limited its impact.

Landlords and tenants had different motivations: owners mistrusted their tenants undertaking renovations and tenants on short-term leases were not willing to be disrupted. There was also prejudice

toward government, a distrust of the bureaucracy and a fear of not getting the money promised. In addition, there was little assurance that the result would be a significant improvement in the quality of insulation and because inspectors were not trained, no way of determining the ultimate outcome.

*Discussion issues:*

There was a lot of take-up. People could insulate an entire farmhouse for \$500. But there was no follow-up inspection. An enthusiastic group of people who believed in what they were doing made the program work. On the other hand, objectives were limited. The program was only about improving security of energy supply. It was not about renewable energy, transforming how we use energy or sustainability. The old tools have only a limited relevance to the vast changes we need today. What we can learn is that there is a need for standards, measurements of performance, proper inspection systems, and training.

Old programs like this illustrate the silo approach that only addresses parts of an issue. We need holistic approaches involving fundamental changes to how we design and build our homes. Government programs will have to consider how to effect changes in the marketplace and influence home builders to do things differently. Because Canada has huge resources relative to its small population, it tends to be more profligate with the way it uses those resources than people like the Europeans, whose resources are far more limited on a per capita basis.

### **3. Anne Murray Choudhary (Telfer MBA candidate): Evaluation of the R-2000 Program**

The R-2000 program started in 1980-81, was evaluated in 1995 and continues to operate. Its purpose is to encourage the construction of energy-efficient houses by enhancing technical standards, training builders, using inspections to ensure standards have been met and giving builders recognition for providing superior homes. NRCan involved numerous stakeholders including the Homebuilder's Association, energy utilities, builders and homeowners.

The program has had an indirect impact on building codes, technologies and energy efficient practices. Trainees were even building clones in imitation of the standards. In terms of direct effects, however, only 6500 new houses were built to this standard. Energy efficiencies were achieved and the houses were of a higher quality, but overall savings were estimated to be worth only about \$580 per year per house.

The biggest barrier to success was the costs of the upgrade, estimated to be an average of about \$8400 per house. Compounding this was low public awareness, energy prices that were too low to make the investment immediately appealing and a low number of housing starts during the period. Compounding the problem for home builders was a large amount of paperwork, increased supervision time on-site, and issues around air quality.

Despite these drawbacks, a large number of spin-off programs took up the R-2000 idea, both in specific regions of the country as well as nationally. As a result, the R-2000 standard served as an important benchmark improving the overall energy efficiency of new home construction.

Among the chief lessons learned were: the importance of maintaining the affordability of homes, the need for appropriate incentives, and the impact of an awareness of the building codes. Several more

recent programs have built on these lessons and numerous current programs cite the inspiration they have derived from R-2000.

Perhaps the most important aspect of R-2000 was that it shifted away from a paternalistic approach in which government developed and provided home designs, to a standards-oriented approach in which any design could be used for implementing R-2000 methods and targets. Given that R-2000 has succeeded in becoming the “new normal” in Canada, it is being reset at a higher level to drive even more innovation.

*Discussion issues:*

Though the program has been very successful in encouraging spontaneous diffusion of higher energy efficiency designs, its weakness is that there is still inadequate awareness among homeowners of the difference between best value and least cost. They are not aware of the qualities inherent in the R-2000 home and see the effort as all coming from builders and therefore as biased. The government needs to advertise the benefits to a far greater extent.

## **Peter Love, Chief Energy Conservation Officer, Conservation Bureau, Ontario Power Authority**

Ontario is in the process of closing all coal-fired generation plants by 2014. No other jurisdiction anywhere is doing this. It is the largest thing the province can do to meet its conservation and emission reduction targets. The province has also set aggressive targets for conservation: it aims for a reduction of 6300 MW in peak demand by 2025. The interim target of 1350 MW by end of 2007 has been achieved with a further 1350 MW by the end of 2010. As a result, the province got an A+ from the Canadian Energy Alliance.

There are many conservation challenges: it is hard to see the effects of conservation, it is difficult to measure because conservation involves preventing things from happening, and it requires buy-in from every citizen and organization. It is not enough to go after single point emitters - everybody in the province has to become actively involved for this to work.

One way of securing participation is to highlight successes and raise awareness of benefits. Conservation will reduce environmental impacts, create employment in local, labour-intensive green initiatives, and improve health. The efficiencies realized will mean that money will be available for other priorities. The government estimates that Ontario's Green Act will create 50,000 jobs. A study for the Conservation Bureau estimated that 57,000 person years of employment will be created in Ontario from initiatives to improve energy efficiency.

In Canada, 82% of all GHG emissions come from the production or use of energy. In Ontario, 13% of GHG emissions come from electricity generation. As coal-fired plants are closed, Ontario intends to reduce CO<sub>2</sub> emissions, eliminating 80% of what they were in 1990 by the year 2050. The Integrated Power Plan aims to reduce CO<sub>2</sub> emissions from 25 Mts in 2006 to 7 Mts in 2014. The other initiative is to price energy according to time of use, charging less for off-peak hours. Such price signals will encourage a shift away from peak hours and peak seasons such as the summer.

There are many opportunities available for conservation:

- adopt new standards for all government buildings by 2012;
- appoint conservation champions for the province;
- increase government funding for community based activities;
- develop a long-term vision for the provincial building code and appliance standards;
- work toward in-suite metering of multi-unit residential buildings;
- encourage commercial tenants and landlords to install sub-metres;
- include measurement and verification components in all conservation programs.

Initiatives such as energy conservation week on May 17-23<sup>rd</sup> can encourage people to celebrate their successes. According to Gandhi, it is up to each one of us to become the change we want to see in the world. Or as Margaret Mead said, “never doubt that a small group of thoughtful committed citizens can change the world. Indeed, it is the only thing that ever has.”

*The most important challenges:*

HMW let people know what is going on because so much of it is invisible. How can we stop being quiet about it and celebrate it instead?

HMW overcome split incentives that affect a lot of energy consumption? Some are focused on building others on operation. There are huge opportunities for savings here if we solve problem of displaced incentives: at present it is rampant and a disincentive.

HMW move to time-of-use meters?

*Discussion issues:*

The efforts of the Bureau involve both energy and water. In Toronto the single largest use for electricity is for water treatment. We are aware of silos and work for change in air and water as well as energy.

## **David Foster, Director of Environmental Affairs, Canadian Home Builders' Association**

The first step in addressing barriers to high performance housing is to ask key questions: What should we be measuring? What works and what doesn't and why? And what might happen next? What matters most is measurable performance in energy and water use as well as density. That allows us to see what works.

High performance housing is defined as being somewhere between ERS 80 and ERS 100. On this scale, most current homes are around ERS 75, ERS 90 is a reference target for the previous R-2000 standard, and ERS 86-88 is where the R-2000 of the future will be set, a point representing a 40—50% reduction in energy use. ERS 90 represents a limit for today's technologies – to move above that we would need to use renewable energy. Finally ERS 100 is the true Net Zero at which a house draws no power from the grid.

We need coherence around metrics and we need to include all relevant metrics such as financial issues, market dynamics, external benefits and actual validation of the performance of green homes. Most of these are currently ignored. This would allow us to monitor technological progress, study its impact on affordability, and deal with the major challenge of retrofitting existing housing stock.

Current metrics include indicators such as energy use, composition of housing stock, equipment stock and settlement patterns (densities, requirements). We tend to overlook metrics such as real-world business cases, the full extent and distribution of costs and benefits, stock transition issues, the innovation diffusion process, workforce capacity and the actual performance of green homes. In fact, a lot is changing for the better. Since 1995, housing stock increased by 33% but total energy use went up only 4% and GHG emissions from all sources including electricity generation held more or less steady over the period.

A big obstacle to innovation in the housing sector is the weighted average government imposed cost on a new home. In 2006, federal, provincial and municipal government levies added more than \$41,000 to the average cost of a new home, a number that had increased by more than 20% in just four years. Governments cannot use new development just as a cash generator, since that absolutely crowds out the possibility of any investment in higher performance housing.

Between 1990 and 2005 the rate at which older houses were removed from total stock in different provinces seems to be closely correlated with decreases in the overall energy intensity of residential homes in each of those provinces. Some things seem to be working. The R-2000 program, for example, was never about achieving numerical targets: it was about promoting innovation and accelerating the development of new technologies and it seems to have done its job in that area.

Generally it seems that a diversity of approaches works best. They must contain market-driven elements since there have to be customers willing to buy innovative solutions, though the residential sector displays less consumer price sensitivity than does the commercial sector. Consensus-based standards around equipment have worked to eliminate inefficient furnaces. Demonstration initiatives that are builder-led are effective. And we need a national process for developing building codes to avoid local ad hoc actions that tend to be inefficient and disastrous.

What doesn't work are politicized building codes, labels that mean nothing and politicians looking for simple answers. In addition, a lack of consistent energy/price signals will prevent us from moving forward as will a focus on R&D without appropriate diffusion mechanisms.

*The most important challenges:*

HMW make metrics visible in the market so we can move to full-system analysis and rational planning?

HMW provide for correct price mechanisms in order to develop suitable financing innovations?

HMW move toward consensus driven R&D driven by diffusion?

## **Gordon Shields, Executive Director, Net-Zero Energy Home Coalition**

The Net-Zero Energy Home Coalition unites many stakeholders around the objective of ensuring that by 2030, all new home construction would be Net Zero. This involves changing the mindset to see housing as part of an energy-mix solution. Homes that are micro-generators of energy would represent a major paradigm shift in our thinking.

The Coalition works through workshops to educate and build awareness as part of the process of changing the way we build our homes. As a partnership of the private and public sectors, it looks to an early transformation of the market. To do this, it uses community-scale demonstration projects. It also

promotes a new culture of conservation and consumer participation and works to change the conventional energy and environment policy paradigms and programs.

Despite much good will, there is still not enough coordinated support to get to net zero energy houses. There are individual demonstration projects but no overall plan of action or even generally accepted definition around the concept. Canada is only catching up where it should be leading. However the glass really is half full. Change is coming to the market and homes can become energy producers in the future. The Coalition has performed an analysis of barriers and requirements in previous workshops and the results were included in the handouts to this workshop. Not only did this yield insight into the marketplace, it also suggested the inherent potential of net-zero energy in the near term.

The Coalition is pursuing a coordinated strategy that consists of community scale demonstrations in all provinces, education and training that involves both customers and builders, consumer engagement through better product knowledge and quantification of benefits and savings, exploration of incentives and initiatives around financial and market stimulation, as well as the development of a new standard along the national energy efficiency continuum. The Coalition believes it is helping transform the market. Part of this success is attributed to its working relationships with the federal , provincial and municipal governments as well as homebuilders whose work is collectively helping to secure market access. This is a key step in moving first to affordability and then to acceptance

*The most important challenges:*

HMW resolve cost issues?

HMW promote education and awareness?

HMW solve problem of getting access of product to the marketplace?

HMW develop a skilled labour force for this work?

## **Tom Green, Project Manager, Equilibrium Housing, CMHC**

Equilibrium (EQ) Housing is an initiative of the CMHC designed to make invisible environmental benefits more visible to the public. EQ strikes a balance between the built and natural environment. The goal is to develop highly energy-efficient and healthy housing that will produce as much as it consumes with minimal external impacts.

The initiative started with a design contest that attracted 80 proposals of which 15 were selected. All were builder-led and involved designing showcase homes that could appeal to the marketplace and that would eventually be sold to buyers. Six projects have been completed so far. The showcase houses are the focal points for tours, lessons learned, demonstrations and performance monitoring.

We have brought all the key stakeholders together to build a common vision that would attract acceptance from the market, build capacity, provide the public with access to quality housing and develop the next generation of value added exports. Our core principles were to balance health, energy use, resource requirements, impact on the environment and affordability.

The houses typically use 80% less energy than an average house. They include on-site energy production and a connection to the grid so that over the course of a year, their net energy consumption from the grid is zero. To do this, they have a number of advanced design features that support this objective including climate responsive efficient appliances, passive solar heating, natural daylighting, on-site

renewable energy systems, water conservation and re-use, land and natural habitat conservation, sustainable community design and green infrastructure. The benefits include lower operating costs, energy security, and a healthier environment.

In undertaking these projects, we want to understand the economic dimensions of the equation and see how we can adjust our approaches, especially to financing, to make this type of house more economically feasible. Yet it is also true that in terms of GHG emissions per capita, only half are attributable to the operations of a house (heating space and water, running appliances and lighting). The other half is attributable to transportation. So we are only addressing half the problem. To look at the balance, we need to shift our focus to the community level to consider where houses are being located.

A variety of technologies are used in the EQ demonstration houses. What is common to all of them, however, is the significant shift away from simple energy consumption toward renewable sources of energy coupled with extremely efficient use of that energy. The result is a truly net-zero dwelling that does not draw power from the grid.

*The most important challenges:*

HMW make it an integrated process by bringing all key players together to a common solution?

HMW engage the consumer?

HMW share the success, get the news out, and demonstrate that it works?

## Plenary discussion on morning presentations

**Repeatability** in construction: costs of customized solutions are steep: we need strategies that work across the board and designs that are transferrable while recognizing that a cookie cutter approach doesn't work. We need a variety of designs of "different shades of green" for different market preferences.

**Incrementality:** Many are looking at incremental costs compared to what the market is willing to pay. Can we develop incremental solutions such as houses that are ready for Net Zero though not yet fully Net Zero. Instead of trying to do everything right away, can we move incrementally in the right direction? The challenge is that the consumers and developers are being asked to pay but the benefits go to the municipality. There is a need to align the business case so that everyone in the community shares in both costs and benefits.

**Building Codes:** The most important accelerators are changes to building codes, though the construction industry may resist. We need to work in the market to make it capable of sustaining that change. That may involve a combination of incentives, availability of products and tools, skills development, or attracting the right people. Codes are now referencing higher levels of energy efficiency and making prescriptions to achieve it. It should be remembered that codes are not a maximum: their purpose is to outline a reasonable minimum. Essentially, codes are for laggards but they can be used to keep raising the floor and forcing the laggards to keep up. And codes are not the only answer: Saskatchewan's code has no requirement for insulation in walls, but they produce the most energy efficient homes in Canada because the market demands them. While codes represent the minimum standards, the latest version of R2000 is being developed as a stretch standard. In fact, voluntary standards can be seen as the stretch and code is the minimum.

**Single versus multiple-family homes:** Most of the discussion has been around single family homes but there are also opportunities in multiple-family housing to save energy and water while fostering community. Some initiatives such as NetZero chose the niche of single family houses and are not playing in the multi-family area, but they recognize it should be addressed in the future. The same techniques that work for single family dwellings will also work for low and mid-rise multiple-family units, though not for true high rises. Twenty years ago, no one was building condominiums, then they were seen as an equity starter and now they are the most expensive housing in the city. The condominium has become a destination rather than an origin. A lot of that is driven by land prices: eventually multi-family dwellings will become the only economic alternative in the inner city, where the market is driving prices up even as they fall out in the suburbs.

**Energy costs:** Serious efforts toward sustainability will not occur without higher energy prices, or at least an understanding of what the true costs of energy are. Many costs are hidden and consumers are insulated from them. Were they to be responsible for those costs, the impact would be felt immediately in housing construction. Consumers would start paying attention to issues such as the payback period of investments in energy efficiency. And some improvements add permanently to the value of a dwelling: the return on an investment in R-2000 is estimated at 6-9% annually and with Energy Star you get back more than you pay through your mortgage. If we had a common rating system for the total life-cycle costs of a house, it would be beneficial for comparability around issues such as energy costs.

**Risks of investing in energy efficiency:** People might ask for green homes, but few are available. Even if they were, people are not always sure they will see a return on investment in energy efficiency within a couple of years. There is a perception that people aren't willing to pay a premium as yet. It may be possible to share some of the risks by getting utilities to assume the costs of upgrading to higher energy performance with the utilities then amortizing the costs of those upgrades through their rates. Development charges do not currently take into account any environmental benefits for an efficient house though doing so would actually be illegal because municipalities are prohibited by provincial law from imposing differential charges on their properties. This could be changed. One possibility is to take lessons from windmill development which benefited from revolving loan funds to pay for incremental enhancements to energy efficiency.

**Pricing strategy:** Price is always a driver with any customer: people change habits when prices change. The issue is not the true cost but flat cost. There is a move to time-of-use rates that are closer to the way it works in practice. That will make people more cautious about energy use. There is a need to move to conservation-based pricing that includes the costs of environmental damage. You fix the price according to the behaviour you want to encourage. Historical research shows that rising prices are needed for transformation, but they alone are insufficient. If you look at where GHGs are coming from, there are about 15 primary sources. We need to examine each and ask whose behaviour has to change to bring emissions down and what kinds of policies that would require. For many actors, price is not an issue.

## Reports on break-out groups (the “how might we challenges”)

### *1. Awareness: consumer information, education, building the basis of paradigm shift*

*Top three*

HMW standardize, simplify a rating system for homes?

HMW demonstrate green value proposition for all stakeholders (builders, banks, real estate, etc.)?  
 HMW educate consumers, skilled trades on energy efficient labels, to become part of a common language?

*Other challenges*

HMW go about putting ratings on MLS website?  
 HMW train agents, builders, etc. to evaluate added value of energy efficient homes?  
 HMW educate everyone about shades of green associated with a house so that consumers understand not just the price tag but also the operating costs of a house; and also the costs to the community?  
 HMW bring home the operating costs of the location?  
 HMW persuade kids from high school to enter apprenticeship programs and show them that some new skilled trades are very intellectually challenging?  
 HMW ensure that there are enough programs available to train people in the right skills?

**2. Affordability: new financial instruments and business models; price ranges**

*Top three:*

HMW create financial instruments to share performance home ownership costs with others who benefit?  
 HMW facilitate new models of ownership for green/shared infrastructure to keep costs off mortgages?  
 HMW change the residential home development process so that we might focus on sustainability goals?

*Other challenges*

HMW assign and quantify the \$ benefits so that the cost of sustainable home ownership is affordable?  
 HMW bring forward truer costs of energy to increase the value of green home investment?  
 HMW align the government of Canada with the public interest in green home costs?  
 HMW create subsidies and special mortgages as incentives for green homes?

**3. Availability: Does it exist? Is it reliable, proven, tested, inspected? Are there standards, codes, and skills?**

HMW increase capacity of industry to use the building techniques that are known, proven and available, starting with the building envelope?  
 HMW increase market adoption/awareness of existing technologies to reduce risks of proven technology?  
 HMW improve the economics of new technologies through innovative financing or creative ownership structures?  
 HMW new financial instruments: (e.g. solar hot water heater) to shift risk away from, the homeowners; a different ownership mechanism so that utility can accept the risks

**4. Adaptability: converting existing stock of housing in different shades of green -the potential for upgrading**

HMW deal with the difficulty and cost of retrofitting existing stock of housing compared to new development?  
 HMW promote knowledge of technology (shared learning) to make information available to all?

HMW provide incentives along the supply chain to ensure that everyone has an interest in improvement?

HMW create program mechanisms in which groups of homes share in costs of common infrastructure?

HMW develop mechanisms for local improvement that shift up-front capital cost onto the property rather than the individual so that the cost affects taxes, not personal lines of credit?

### ***5. Acceptability: new regulatory models, standards, by-laws***

HMW develop a municipal set of performance standards through the regulatory regime?

HMW share risks involved among all stakeholders?

HMW use provincial code and role of government to raise the baseline?

HMW translate GHG reduction targets down into the building sector both provincially and municipally?

HMW attach some federal funding programs to the building sector to encourage integrated community sustainability plan that would be concrete and a financial and regulatory requirement?

## **David Brooks: concluding remarks**

It is encouraging to see so many people interested in this topic. My thoughts are meant to push the boundaries out even further, and, in so doing, I do not mean to criticize what has been accomplished in this one day. I have three points:

First, one thing that was implicit but that did not come out clearly enough is the need to insist that all actions have to be economic. The real bottom line is not just efficiency but efficiency plus ecology plus equity. As Keynes said more than half a century ago, the market is a wonderful servant but a terrible master. It makes decisions on very narrow grounds, and therefore should advise but not determine our policy choices.

Second, we should start thinking about scaling up the ideas brought out in this workshop. Most immediately, we must consider larger residential buildings along with their commercial and institutional partners. And we must then scale up to the community level, and even to the urban level. These levels mean including the transportation network as well as such questions as where our food comes from and what food can appropriately be local and what food simply cannot be grown locally. All of this cuts away the boundary conditions we have set and makes our problem harder to address.

Finally, we have to frame our objectives correctly: our goal is maintaining the quality of life, not necessarily the standard of living as defined by the per capita cost of living. In the end, as Barbara Ward suggested at the first Stockholm Conference on the Environment, people may do the right thing just because it is the right thing.

## **Ralph Torrie: concluding remarks**

We have an enormous manpower challenge in the residential sector. We need to pay more attention to the practical challenge of retrofitting older stock because 70% of the houses we will be using in the future have already been built. And retrofitting is something that may involve a million person-years of work. Where are those people and how will they be trained? The logical place might be the community colleges, but they have to get organized to do this.

The environmental sector lacks the financing infrastructure and business innovation that companies in other sectors have had a century to develop. We need ways to front end the cost of energy development projects. We also need to devote the same time and energy to renewable energy as to fossil fuels.

We cannot set the bar for immediate action so high that incrementality cannot be an option. But I feel that incrementality is the enemy in this field. We need to let our imaginations run free and see if we can achieve the same kind of innovation as is being achieved in model initiatives such as the EQ program. In that sense we cannot be hobbled by incrementality but be bold enough to ask the really big questions.