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Chair

Mr. Lee Richardson

Standing Committee on Natural Resources

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● (1530)

[*English*]

The Vice-Chair (Mr. Alan Tonks (York South—Weston, Lib.)): Good afternoon. *Bonjour, mes amis, bonjour.* I am pleased to be here. The chairman cannot be. I will endeavour to do my best to move the meeting along.

This is the Standing Committee on Natural Resources, in case you thought you were in the wrong room. This is meeting number 44. Our order of the day, pursuant to Standing Order 108(2), is a study of the greening of electricity consumption in Canada—the role and future potential of hydro-electricity.

I would like to welcome our witnesses on behalf of the committee. From the National Research Council of Canada, we have Mr. Sherif Barakat, vice-president of engineering, and Andrew Norgaard, director of public affairs. I also have Jane Dyment, officer of physical sciences. Is Ms. Dyment here?

Mr. Andrew Norgaard (Director, Public Affairs, National Research Council Canada): She's not attending.

The Vice-Chair (Mr. Alan Tonks): Okay. Thank you.

Just as an explanation, members may recall that we had invited representatives from Hydro-Québec. Unfortunately, they are unable to attend. The clerk has informed me that he was informed Friday that they were not able to attend, and we were not able to schedule any other deputants in.

We will go with our witnesses, and also we have some other business. The clerk has distributed the travel itinerary for next week's visit to the upper Churchill hydro facility. So I'd ask members to look at that, and at the end of the meeting we'll discuss that.

Also, we have a motion with respect to making the necessary arrangements for dinner in response to the request that was made by a Mexican delegation. Were we also having this motion distributed? No? We didn't have the motion distributed. It's very simple:

> That the Clerk of the Committee make the necessary arrangements for a dinner at 6:00 p.m. on Tuesday, June 5, 2007 in the Parliamentary Restaurant with the delegation from the Mexican Congress Energy Committee.

Do I have unanimous consent to put that now?

Mr. Christian Ouellet (Brome—Missisquoi, BQ): Yes, you do.

The Vice-Chair (Mr. Alan Tonks): Thank you very much.

(Motion agreed to)

The Vice-Chair (Mr. Alan Tonks): Thank you.

So things move along well in this committee, wouldn't you agree? If only it were always thus.

Thank you very much.

Mr. Barakat, are you going to lead off?

Mr. Sherif Barakat (Vice-President, Engineering, National Research Council Canada): Yes. I'm actually the only speaker.

Thank you, Mr. Chairman.

Thank you for inviting the National Research Council to present to your committee.

Although we don't have much to do with hydro-electricity per se, I think the committee is interested in knowing what NRC does in electricity work and particularly what we do in energy and environmental work.

The deck is distributed in front of you, and I'll talk to it in my presentation. I'll give you a brief overview of NRC and how we are contributing to Canada's energy and environment agenda.

Allow me to first talk about the National Research Council.

We are a national institution, a federal government agency. We are actually the largest primarily mandated R and D organization in Canada federally. We provide essential elements for science and technology infrastructure with labs across Canada. There are 25 research institutes and labs distributed from St. John's all the way to Victoria.

We have a budget of $835 million. Out of that, we actually get about $165 million or $166 million from outside sources and income from industry and other organizations. We have a staff of 4,300 from coast to coast in 25 institutes and centres.

Along with NRC institutes, we also have the industrial research assistant program, and I'll talk about that later on. We have the Canada Institute for Scientific and Technical Information, which is the primary provider for technical medical information in Canada. In many of our institutes, we hold a number of industrial purpose facilities. These are facilities where we incubate small and medium enterprise spinoffs to benefit from our facilities and expertise.

Under the NRC Act, NRC's primary mandate is to undertake, assist, or promote scientific and industrial research in different fields of importance to Canada. I stress the words "industrial research" because it's what we're involved in, and we're working very closely with industry all around.

As well, NRC's success is based on its capacity to anticipate S and T opportunities and to adapt its R and D programs and services to turn these opportunities into advantages for Canada. For example, in 1987, when life sciences was in its infancy, we established a biotechnology institute in Montreal. Today the institute has one of the largest groups addressing environmental biotechnology.

A second more recent example relates to identifying technology clusters and identifies nanotechnology as one that will have a future impact on the science and technology field. Along with the province and University of Alberta, it led to the establishment of the National Institute for Nanotechnology, which you may have heard about a number of times.

NRC has been the catalyst behind many waves of innovation. However, our concern is to always do the job even better and to always be aligned with Canada's needs.

The main goals of our strategy were published last year, in 2006, and it's called *Science at Work for Canada*. As part of this strategic planning process, we consulted almost 300 stakeholders. The message we received across the country was that they are looking for S and T leadership and focus. NRC's new strategy in *Science at Work for Canada* provides that focus.

The strategy's three goals underline NRC's commitment to create sustainable economic and quality-of-life benefits for all Canadians in three areas: to work with Canadian industry in key sectors and work with communities and technology clusters; to strengthen Canada's innovation system; and to contribute to Canada's national priorities. Underpinning all these goals, naturally, are partnerships, commercialization, and research excellence.

I'll now talk a little about NRC's contribution to Canada's energy and environmental agenda.

NRC as a whole contributes around $30 million per year in energy-rated R and D. In addition, we have between $5 million and $10 million from other government programs, such as PERD, the program of energy research and development, climate change, and the climate change action plan.

● (1535)

NRC collaborates with key partners like NRCan, Environment Canada, Agriculture Canada, and many others, along with universities and industry in all the work we do.

We believe that our activities fill a unique niche, complementing the efforts of other departments in bringing our expertise and leading-edge science as well as underpinning competencies and facilities to make a significant contribution to this priority area.

In the rest of my presentation I will provide you with a short list of examples of NRC contributions. I will present them as we align them to our strategy for key sectors, some for the innovation system, and some for the national priorities.

In the next slide we see the key sectors. We have done quite an extensive study to look at what sectors NRC should focus on. As you've heard, the idea was to focus. So we looked at sectors that have a large importance to the Canadian economy, where research is essential for their success, and where NRC can actually make a significant contribution.

We came up with the nine sectors listed as you see them around the circle there: aerospace, agriculture, automotive, manufacturing, bio-pharma, chemicals, construction, ICT, and electronic instrumentation. In many cases these are not new areas for NRC, but we will be revisiting our sector strategies and ensuring that they are aligned with the needs of industry now and in the future.

Certainly, over the years NRC has invested in energy-efficiency and conservation projects aimed at the needs of companies in these sectors. As we roll out our new strategy, energy research needs and barriers are being considered in the development of sector plans.

My presentation will point to three sectors and the energy-related work done by NRC for these areas. Let me first talk about construction.

In Canada, construction facilities account for 35% to 40% of national energy consumption. One of the largest generates about 25% of solid waste and consumes about 50% of primary natural resources. So it has a major impact on the Canadian economy and Canada's natural resources.

This is a sector dominated by SMEs that do not spend much on R and D. The R and D spending of companies is less than half a percent. It is about 0.1% to 0.2%, actually. Since 1947, when NRC was asked to produce a national building code, NRC has significantly contributed to the sector. Today NRC is responsible for 20% of the R and D done in this sector in Canada.

A primary way to influence the sector is still through codes and standards. Over the last five years NRC led the process that resulted in a new national building code, completely rewritten as an objective-based code to promote innovation in the construction industry.

In 1997 NRC published the first Canadian model energy codes for buildings and for houses. Currently, we are working with NRCan on a plan to update the national energy code for buildings. These codes are developed with extensive consultation with the construction sector, as well as with the provinces.

Recently there has been considerable debate about replacing incandescent bulbs with compact fluorescents, which use 75% less electricity. At the developmental stage a few years back, NRC research on this technology and its impact on the vision of workers has contributed to the viability and acceptance of these new sources of light.

In addition, as a greener approach, research showed that integration of daylight in buildings can displace 50% of lighting in buildings. Probably you have heard that lighting is 40% of that list of consumption in large buildings.

Under the International Energy Agency, the NRC led an international project to overcome technical barriers to the adoption of such practices. Design software and demonstrations showed improvements in energy savings of 70% through relatively simple measures and controls. This has played a major role engaging the industry to increase the amount of daylight in new building design. The industry has called them daylighting measures.

As well, technology development in the sectors will be linked to demonstrations. NRC and its partners have also demonstrated and evaluated many technologies, including applications of co-generation and fuel cell technologies in the Canadian Centre for Housing Technology here in Ottawa.

● (1540)

The Canadian Centre for Housing Technologies, CCHT, as we call it, was built in collaboration with NRCan and CMHC with contributions from 37 companies in the housing sector. The goal of the centre is to accelerate the commercialization of new housing technologies mostly related to energy and indoor environment.

There is an example mentioned, again at the bottom, which you would have seen if you had looked at the *National Post* today, on leak detection in water pipes. This technology from NRC has actually now been taken up by a company, a start-up company, and they are making inroads in saving water and energy in large cities.

In the automotive area, NRC is making a contribution toward the development of lightweight materials and the processes to make them, including metals like aluminum and magnesium as well as composite materials and polymer nanocomposites.

We also undertake research on emission testing using laser-induced incandescence technology, or LII for short. This is a technology developed at NRC that makes it possible to measure the emissions of soot from the exhaust of travelling vehicles at parts per quadrillion, very minute parts, helping to enforce some of the world's toughest vehicle emissions standards. Some of these devices have already been built and are being used in California.

However, NRC's single largest investment in energy R and D has been in fuel cells and hydrogen, about $14 million a year. This includes the Institute for Fuel Cell Innovation in Vancouver, at the heart of the Vancouver fuel-cell cluster, and a cross-NRC program on fuel cells and hydrogen that brings expertise from eight other institutes to work on overcoming the barriers to manufacturability, performance, and reliability of fuel cells.

Again, this work is not performed in isolation: NRC is an active participant in all federal and national committees.

In another area, heavy-truck aerodynamics, developed at the NRC wind tunnel, has led to significant fuel savings. According to the number in our notes, it is 4.8 litres for each 100 kilometres a truck travels, or if you look at one year, a truck that travels 200,000 kilometres, for example, saves close to 10,000 litres of fuel.

In the aerospace area, NRC's Institute for Aerospace Research has built up a national infrastructure and competencies that support Canada's aerospace sector and are recognized internationally. Most of you will be familiar with the NRC wind tunnels at the Ottawa airport when you come. There are big wind tunnels with “NRC” on them.

We also call upon our aerodynamic expertise and facilities in these wind tunnels for other sectors. I mentioned trucks, for example, transportation, the location and orientation of wind energy farms, and the support of scientific studies and data collection for Environment Canada.

Our new Gas Turbine Environmental Research Centre here in Ottawa supports research on increasing the efficiency and reducing emissions of gas turbines. Researchers are now proposing to expand these unique facilities to allow the testing of alternative fuels, such as biofuels, biodiesel, and syngas in gas turbines. This would help find applications in stationary gas turbines used in generating electricity, the use of which is expected to increase two and a half times by 2030, generating 50% more CO_2. This proposal has already attracted interest from industry partners.

Also, a Canadian breakthrough in manufacturing aerospace structures resulted from a project between NRC and Bell Helicopter Textron Canada, not to confuse it with Bell Canada. This collaboration resulted in a new process for the production of a lighter-weight, all-composite wingbox—this is part of the wing structure—designed for that next-generation aircraft. The very light structure actually reduces the weight and reduces energy consumption. The technology was transferred to a Quebec-based firm, establishing it as a supplier of aerospace-grade parts.

● (1545)

NRC is also working with Bell, Bombardier, and SMEs to advance the development, production, and use of lightweight composites in aircraft fuselage, which will result in further energy reduction.

From the IRAP side on innovative systems and how we help small and medium enterprises, the NRC Industrial Research Assistance Program, or NRC-IRAP, works with industry SMEs in the development of alternative energy projects. More than 20 industrial technology advisors have specialized expertise in alternative energy. They provide clients across the country with business and technical assistance, competitive technical intelligence, and funding for high-quality personnel as well as appropriate R and D projects.

The next slide shows you a number of projects I chose particularly to show the variety of work IRAP has supported. Over the past five years, they did around 40 projects worth more than $5.5 million. Examples here cover areas of biodiesel from different feed stock; solar modules that are grid-generated and grid-connected that go on building roofs; electricity from water currents, which is a small electricity system that uses streams and rivers to generate electricity; small hydro; and lightweight, small wind turbines.

In the area of national priorities, it has also become clear from our consultations and studies that in an era of science convergence, no single organization can accomplish much by working on its own. As I mentioned a moment ago, one of NRC's goals is to make a significant contribution to national priorities for the 21st century, specifically in health and wellness, sustainable energy, and the environment.

To meet this objective, we have committed to implementing a number of national programs addressing national priorities where NRC can use its research excellence, partnerships, and multi-disciplinary approach to generate real, tangible results. The first of these national programs will be initiated with a focus on bioproducts, including bioenergy and biofuels.

NRC has a wealth of experience and facilities in this field. We will be collaborating with partners from Agriculture and Agri-Food Canada, NRCan, universities, and industry to develop a plan for that program—a Canadian plan. NRC's Industrial Research Assistance Program and CISTI will be an integral part of that as well.

This initiative has been met with great enthusiasm from all those approached. Last week I heard from Rolls Royce Canada when they knew of our choice to use biofuels or different gases in gas turbines. We are also working to expand our fuel cell program to become a future national program.

We do this, but we still look to the future for industry. NRC plays a unique role in helping prepare Canada's energy future. It is widely expected that the convergence among nanotechnology, biotechnology, and ICT will lead to future breakthroughs in several areas, including energy. NRC is well positioned to harness this convergence for the benefit of Canada.

For example, in the use of quantum dots in the development of solar PV materials, NRC has opened its incubation and prototyping facilities to Cyrium Technologies, a start-up company developing photovoltaic solar cell technology using quantum dots, a semiconductor nanotechnology originally developed at NRC. The company hopes to achieve conversion efficiency up to 38% at a lower cost.

A different example is NRC's unique contribution in metrology. Most scenarios for a green electricity future, as you well know, involve a variety of renewable and alternative technologies produced not only by energy companies and big hydro, but also by small producers and individual consumers. This in turn means new regulations backed up by novel methods of measurement and instrumentation. We're basing that on NRC's mandate for physical measurement and metrology.

To close, I would like to reiterate that NRC's work spans the innovation spectrum from discoveries at the frontiers of science to the commercialization of new technologies. For more than 90 years, NRC has been making valuable contributions to Canadian industry, to the growth of our economy, and to the well-being of Canadians. Working in partnership with industry, other government departments, and academia will strengthen the Canadian innovation system and contribution to energy R and D.

Thank you very much.

● (1550)

The Vice-Chair (Mr. Alan Tonks): Thank you, Mr. Barakat.

We'll now go to questions and lead off with Mr. Holland.

Mr. Mark Holland (Ajax—Pickering, Lib.): Thank you, Mr. Chair.

Thank you, Mr. Barakat, for your presentation.

We're talking about energy efficiency. Perhaps we could talk about the priority that Parliament should place on energy efficiency versus trying to develop technology and find ways of producing energy in more environmentally friendly ways.

I ask that in this particular context: One of the things we've seen is that every time we seem to make gains on energy efficiency, the number of appliances and devices that people are using grows at such a pace that we lose any of those gains in energy efficiency just because so many more devices are being used. I'm wondering what your thoughts are on the efficacy of pursuing energy efficiency versus spending more time on the ways in which we produce energy.

Mr. Sherif Barakat: This is probably my personal opinion, but I think you can't do one or the other. You can't trade up between them.

Energy efficiency is very important for things like existing houses or existing buildings, or for increasing the efficiency of appliances, as you mentioned, or making cars more efficient. At the same time, if we keep going the way we're going, the International Energy Agency predicts that our energy consumption around the world will increase by 60% by 2010 or 2012. So we can't afford to sit and not find more alternative sustainable ways to produce energy, because we're going to need it.

It is not one choice or the other. We have to really tackle both of them.

● (1555)

Mr. Mark Holland: I don't disagree with you, but the question is on focus, and some have held out the view that it's not possible to curb the growth in energy consumption. Some have said that it's so rampant, with all of these other devices coming in, that restraining consumers would be too difficult. So the question is where we can find meaningful efficiencies. Where do you see the areas of real opportunity that we should focus on?

You mentioned retrofitting homes as an example, and of course we had the EnerGuide program, which has now been replaced by the ecoENERGY program. Where would you see that best being achieved?

Mr. Sherif Barakat: It's retrofitting buildings, using daylighting, using more of the new lighting—whether it's compact fluorescents or the new technology of LCD lighting, for example, coming up: these are the things we could affect. More efficient appliances, more efficient use of appliances, less consumption by automobiles, and reduced consumption by trucks, which we have already worked on—these are things we have to look at.

In some cases it's quite different, particularly when we go into houses. That's why I guess provinces would like to look at buildings first, because they actually can apply things better at an institutional level than they can if they are depending on the homeowner to do it.

We can actually raise the bar by applying a very good energy code, and then by incenting builders to go above that or owners to go above the energy code.

These are things we could do in efficiency. There's still a long way to go. There are still some things that haven't been applied. I heard recently that Ontario is thinking of stopping the use of incandescent lights. How many of us use compact fluorescents around Ontario? There must be a great amount of saving there. Naturally, there's some incentive, actually. Compact fluorescents have gone down quite a bit in price, and if we increase the use, the prices would go even further down.

Mr. Mark Holland: You can probably help us here in Parliament to reduce our energy use by not having the heat on when it's 20 degrees outside.

Mr. Sherif Barakat: I don't think you have the heat on, but I think the building doesn't have cooling. But anyway, maybe we're saving energy.

Mr. Mark Holland: Maybe we're saving. I hope we're saving energy, and the heat's not on.

You had mentioned this growth of 60% in the amount of energy that's being consumed. I understand this is a hypothetical question, but I'm asking you, on the basis of your experience and personal opinion, if the government were to take decisive action and to really promote energy reductions and energy efficiency, where would you see that number being in that same time horizon? What do you think a reasonable expectation would be, in terms of what that growth could be?

Mr. Sherif Barakat: That's very hard to actually predict.

Mr. Mark Holland: But do you think the government should set a target, or do you think it should just be—

Mr. Sherif Barakat: Well, you can set a target for each application. For appliances you can—

Mr. Mark Holland: But you don't have a sense of what that global amount would be if you were to apply something individually?

Mr. Sherif Barakat: Not at all. I can't venture a number, no.

Mr. Mark Holland: But would you promote the idea of promoting targets within each area, and then trying to achieve those targets—

Mr. Sherif Barakat: Yes, that could be done, although you have to look at the barriers to that when you do it. We had old programs in houses, under which people put more insulation in their attics. People have put more insulation when they could, and replaced appliances with new appliances. However, the next step is quite expensive—when you try to tackle retrofitting housing, particularly with bad walls, with windows. It's a difficult issue.

There is quite a potential. It's achievable, but you have to look at the barriers.

Mr. Mark Holland: I may be running short of time, but in your opinion, how effective were the EnerGuide programs that were put in place to help people retrofit homes? They were cancelled for a while and have come back as a similar program, renamed. In terms of achieving energy efficiencies, should those programs be held out as a model? Do you think they were something that—

Mr. Sherif Barakat: I think Canada has had a number of good programs. I'm not sure what the impact of the last program actually was, but the earlier program, when we actually covered the easy areas, whether it was air leakage or insulation or leaky windows, and so on, was quite effective.

The program, for example, to change heating systems to high-efficiency heating has a major impact. If you have heating systems that are currently at a mid-efficiency of 82%, and that's not even in new buildings, and you encourage people to go to an efficiency level of 95%, that has a major impact.

The Vice-Chair (Mr. Alan Tonks): Thank you, Mr. Holland.

We'll go to Madame DeBellefeuille.

● (1600)

[*Translation*]

Mrs. Claude DeBellefeuille (Beauharnois—Salaberry, BQ): Thank you very much for your presentation.

According to your transparencies, you have a budget of $835 million. I suppose industrial partnerships account for $166 million. We see here on page 3 of your presentation that $30 million a year are spent on energy R&D and $10 million on outside programs, that is on energy R&D programs.

What percentage of your budget is earmarked for energy R&D? Are these the only figures you have? Are they accurate? I don't think you spend a very large portion of your budget on energy R&D. The energy in question here includes traditional oil and tar sands.

We can subtract from these $40 million money allocated to fossil energy research. What's really left for renewable energy R&D?

[*English*]

Mr. Sherif Barakat: Regarding the $40 million, we actually contribute to a survey every year for the International Energy Agency. These numbers show what energy work we're doing.

A number of areas—I mentioned many of them—are related to industry and priorities. We don't have a concentrated program in renewable energy, particularly. We haven't had that since the early eighties, when we had the solar program and the other program in energy. But priorities have changed, and NRC doesn't—

We look at how we can actually help industry meet the demands on them to meet energy requirements or reduce their energy use. As you probably heard from industry at committee, in manufacturing, one of their major concerns is increasing energy costs, and these are the things we work on. One is to use renewable energy and new fuels and so on to try to reduce their costs.

So we may put that in the industry pocket. That's how we can help industry, but it's not really renewable energy. We don't give—We don't characterize our work as alternative energy; we characterize it as industry needs.

[*Translation*]

Mrs. Claude DeBellefeuille: Of these $40 million, how much is earmarked for the renewable energy sector? Could you get that information to us?

[*English*]

Mr. Sherif Barakat: Yes, certainly, I can do that.

[*Translation*]

Mrs. Claude DeBellefeuille: I see.

Last week, the committee heard from the Canadian GeoExchange Coalition. While we were discussing energy efficiency problems, someone made a comment that made sense to me, namely that all of the efforts devoted to R&D into energy efficiency would be for naught without mandatory energy efficiency standards for new house construction.

You stated that builders should be required to comply with an energy code. Are you referring to the federal or provincial level? Who is responsible for the building code?

[*English*]

Mr. Sherif Barakat: Certainly the building code and general construction is a provincial jurisdiction. What NRC does is work with the provinces—it's a very close collaboration—to produce a model code. The model code then has to be adopted into force by provincial legislation. It can't be effective until the province says it will use that code as its energy code and actually puts it into effect.

This did not happen for the past code. The difficulty is that the cycles change, with energy. By the time we produced the code, energy and environment were not at the top of their priorities, and no province has adopted it. There is, in Quebec and Ontario, some energy.... Quebec has adopted energy measures that were produced back in 1983. Ontario has energy requirements in its building codes. But there isn't an energy code per se.

I think the intention now is really to take the leadership with NRCan in the discussion with the provinces that we update that energy code. The hope—actually, maybe the promise—is that they're going to put it in effect for buildings this time.

● (1605)

[*Translation*]

Mrs. Claude DeBellefeuille: Where do matters stand, as far as drafting this energy code is concerned? We've been discussing this for a long time, since 1995 in fact. Is the current government actively promoting the drafting of a code? Is this a priority for the government?

[*English*]

Mr. Sherif Barakat: We have a code from 1997. It needs to be updated, because energy costs and the cost of construction have gone up and changed, and so has the financial position. So we have that, and provinces such as British Columbia have used it as guidelines for a long time. Now they would like to update it to the new realities. They agree with NRCan to start on updating very soon, so it's actually an agreement almost in effect now to start updating the code.

The Vice-Chair (Mr. Alan Tonks): Madame DeBellefeuille, I have to interrupt that line of questioning. Thank you.

We'll go to Ms. Bell.

Ms. Catherine Bell (Vancouver Island North, NDP): Thank you.

Thank you, Mr. Barakat, for your presentation.

We've talked a bit about national codes for building for energy efficiency, but I want to take it just another step further, I guess, and talk about what our houses are built out of.

When talking about sustainability in the manufacturing of homes, you can look at a lot of the homes in Ontario, Quebec, and across the country that are made out of stone, and they've been around for hundreds of years. In British Columbia, where we have mostly wood, some of them were built 150 years ago and are still standing.

But look at what's happening today in a lot of developments where houses are only built to last maybe 25, 30, or 40 years. The products they're being built with are plastic siding, fibreboard that rots in a few years—just so many things that are used to build our houses that aren't sustainable. They may be affordable for people, but they're not built sustainably any more.

Just thinking about that and about how we use so much energy to create these materials—the plastics for the siding, for the windows, for the flooring.... They might be more airtight, more energy-efficient while they're in use, but they deteriorate a lot more quickly and cost us more money to redo all over again. There's a lot more renovation required.

So I'm wondering about national standards and codes. Is there any thought or any kind of research, from the beginning to the end of building your home, in which you're looking at the use of fossil fuels to make the plastics we use more and more in our homes? That's all energy-intensive use, so we might save energy somewhat. So there's that piece of it.

I wonder whether there's been any research into that.

Mr. Sherif Barakat: There's definitely an international direction looking at sustainability in general, and one of the areas is life cycle analysis of building materials and components, where you choose a material and you have to look at it from the source, all the way to decommissioning, when you throw it away, even the disposal. There is work around databases that actually show concrete versus wood versus steel, and that sort of thing, so people can make decisions.

However, it hasn't penetrated the industry. The industry still goes with traditional wood frame with whatever new materials come in. When you look at the sustainability, at the same time you have to look at a number of things—how it will perform, and as you mentioned, how it will last with time, and so on, not only the price and the sustainability.

It hasn't been taken on. The industry hasn't really picked up the life cycle analysis as a means for choosing materials. There's other work on the materials even in terms of what does it emit inside a home, emissions and indoor air quality. That work exists, but it hasn't penetrated as much in the construction sector yet, not only here but worldwide, I would say. There are some countries doing better than others.

But definitely that's the trend, to look at life cycle analysis—and at the same time, performance. You look at the performance and the longevity of these materials. Sometimes it's not the materials per se. We now use composite materials, plastic and wood together, so we can use the waste wood along with polymers, and so on. The material may be good and stay, but if you look at it from one end to the other, it may or may not be better than wood. I don't have the answer, but it's really something to look at.

The difficulty with using materials in buildings, as well, is how you integrate that material within the system. The wood chipboard, or whatever, the OSB, oriented strand board, can be a good material if you really build it right, if you include it as a system, rather than putting it as you used to put other sheathing. It's a different material. It has to be integrated within the system. You have to look at how the system will behave with that material in it. If we don't do that, it will be what you've seen, early rotting and so on.

● (1610)

Ms. Catherine Bell: Okay.

On another topic, then, fuel cells for vehicles, everybody is looking at hybrid vehicles, and that's great, but we don't see very many vehicles that run on just a fuel cell, just a battery, because you can't go very far in them. Is there any research done on the hybrid vehicles being able to be run on battery when you're in the city and then you can fill it up with gas when you want to go cross-country, which would save gas and would also save GHGs?

Mr. Sherif Barakat: Yes, there's quite a bit of work on hybrids as well. The NRC has not worked on the whole system, but we have worked, in one of our institutes, on batteries, lithium batteries and other batteries, new technology for batteries that actually work in hybrids.

As to fuel cell cars, there are still few around, I guess, until China builds up their—A thousand cars is probably the largest fleet. The industry is looking at fuel cell cars, but they will probably be on the market only in 15 years or so. Fuel cells for other applications are moving faster than for cars.

The Vice-Chair (Mr. Alan Tonks): Thank you, Ms. Bell.

Mr. Gourde.

[*Translation*]

Mr. Jacques Gourde (Lotbinière—Chutes-de-la-Chaudière, CPC): Thank you, Mr. Chairman.

I'd also like to thank the witnesses. This is a very interesting topic.

Hydroelectricity is the main source of renewable energy in Canada. What kind of research into hydroelectric power is the National Research Council of Canada currently conducting? Is it doing research into small, more accessible plants that are closer to markets, or is it focussing solely on large stations in Northern Canada where operations are more complex?

[*English*]

Mr. Sherif Barakat: Actually, the NRC is not doing any work on hydro-electricity. The only work I mentioned is some work where IRAP funded some companies to look at small systems to place in the middle of a river or stream, or even a waste stream. It's the idea of an egg beater that rotates and generates electricity from the stream. It takes about 40% or 50% of the stream energy to actually generate it. That's one.

For the rest of small hydro and the rest of the alternatives, there's quite a bit of work supported by Natural Resources Canada, so we haven't got into that. The mandate is at NRCan, and we get into areas where we can work with industry, whether with NRCan or with our expertise, and bridge the gap between them, but not much in hydro-electricity.

[*Translation*]

Mr. Jacques Gourde: Canada's has vast reserves of renewable energy. I believe these reserves are comparable to those of other countries. Are you doing any research into second generation wind and geothermal energy? Right now, we see large windmills erected, but are there any types of wind energy devices, for example, horizontal windmills, that could be used in the future to generate energy?

[*English*]

Mr. Sherif Barakat: We did work a long time ago, about 20 years ago, on horizontal wind turbines. At that time, we called them “egg beaters”. You may have seen the pictures. The work was done at NRC, and it was tested at the wind tunnels as well, but it didn't actually take off. I guess the Europeans have somehow taken hold of the wind energy file or wind energy production. Most of the wind turbines being used now come from places like Denmark and Holland, the Netherlands.

There are small wind turbines, as I mentioned. A company makes small ones that you can put on top of a house to run a heat exchanger, a small hot-water system, or something like that. This is a new development. It can be integrated with energy systems for a single unit or a small building, where you can combine wind, small hydro near a stream, or fuel cells in the future. It will become an integrated system that you won't supply through only one item. You can supply electricity and heat from difference sources and integrate that within a building.

● (1615)

[*Translation*]

Mr. Jacques Gourde: You're a step ahead of me, because I was about to ask you if any research is being done to incorporate geothermal, solar panel or wind energy into single homes to make them energy self-sufficient. You've answered part of my question. Could research culminate in the next 10 to 15 years in truly energy self-sufficient construction in remote regions?

[*English*]

Mr. Sherif Barakat: The research we're doing at the Canadian Centre for Housing Technology is part of that. When we put in a fuel cell, the first fuel cell to be put in a residential building, the idea was to integrate it with other sources within the house to supply energy. The next step, which is the thinking now and is not in place, is to try to put an integrated energy system in a house, working with NRCan and others in putting that together.

Our institute in Vancouver is as well trying to think of fuel cells in an integrated fashion. For example, there are some fuel cells used in Japan as part of the energy system for a house. The company in Vancouver is selling that in Japan.

It is starting to show up. The institute will look at how you can integrate that particular source, along with other energy systems, so that it comes with controls to connect to the grid, area controls, and instrumentation areas.

The Vice-Chair (Mr. Alan Tonks): You may have one more question, Mr. Gourde.

[*Translation*]

Mr. Jacques Gourde: My last question concerns the transmission of electrical energy. It's a known fact that a tremendous amount of energy can be lost during the transmission process because our hydroelectric dams are located in the North and our needs are greatest in the South. Is any research being done into the transmission of electrical energy?

[*English*]

Mr. Sherif Barakat: No, it's not done at NRC. The research at NRC is really on transportation.

Electricity generation and transport work is done at our Institute for National Measurement Standards. They actually work on measurements and on how to measure these losses. In the exchange of electricity for electrons going south, north, east, and west, how do you really measure it accurately to be able to get the right charges? This is work that is being done at NRC at our National Metrology Institute.

I know the work on losses and transportation, DC and AC, is done quite extensively at hydro, whether it's Manitoba, B.C., or Quebec, but it's not done at NRC.

The Vice-Chair (Mr. Alan Tonks): Okay. Thank you, Mr. Gourde.

Mr. Russell has warned the chair that his questions will take ten minutes. It's not doing much for our image, Mr. Russell. I hope you will take somewhat less time than that.

Mr. Todd Russell (Labrador, Lib.): Thank you, Mr. Chair.

Thank you for appearing before us this afternoon.

I have a broader question. How do you set your priorities? From your presentation, there is a tremendous amount of work in various fields. How do you set your priorities? What drives your research and development agenda?

Mr. Sherif Barakat: As I mentioned, NRC is really working very closely. What sets our priorities are the national priorities for the country, as I mentioned, and the needs of Canadian industry. So we're working with key sectors. We determine what sectors, and what work we do will impact those sectors and produce more wealth for Canada than other sectors. So we chose those sectors that actually need R and D and have the capacity to absorb R and D and commercialize it. These are the nine sectors we chose.

In looking at priority areas in our strategic planning, we looked at all of the world's challenges. I have a page full of them. Then we looked at those that were important to Canada, and at what we could contribute to them. You can lump them into a number of areas, but they came out very closely to energy, environment, and health. By far, those are of highest importance in Canada—and not only to Canada, but to some other people in the world. In some of the strategies we looked at, some scientists and thinkers believe that energy will by far be the top challenge for the world over the next few years. If you solve the energy problem, you'll solve everything else. And some Nobel laureates have gone on to say or enumerate how we can solve everything else, or at least the next ten challenges, if we solve the energy problem.

So that's how we chose them. Then we went out and consulted with 300 Canadians in seven cities in Canada. We invited a large number of people from industry, academia, and government to present to us and validate what we've seen and validate the areas we're actually taking on.

● (1620)

Mr. Todd Russell: I think we can all anticipate there's going to be some new regulatory regime coming down, of whatever form, whether it's going to affect the automotive industry, the oil and gas sector, or things of that nature. Have you anticipated any of that in your work plan? How would you see that unfolding in the weeks and months and years to come?

Mr. Sherif Barakat: In aerospace, for example, we are always on top of that, because we are practically the institution of choice for aerospace companies to work with. We work, for example, to certify the new engines. So we have to anticipate the technology to be able to actually meet the demands of new engines for higher efficiency, lower noise, and lower emissions, when these new engines come out. So we have to anticipate what we need to do.

For the work on new fuels and gas turbines that I mentioned, now the tendency—and there's some scattered work on this around the world—is to find other fuels for stationary gas turbine engines generating electricity. If you do that, it means you need to take a very close look at standards for those: at what the turbines will need, at the blades, at the new materials and coating on these materials, and read the emissions coming out of these fuels. So this is what we anticipate, and we're now building up the project in the environmental lab to be able to meet those.

They haven't yet come to us, actually. We know of them, and when they come, we'll be ready.

Mr. Todd Russell: What percentage of all of your R and D becomes commercially marketable, or something that I, as a consumer, can basically avail myself of?

Mr. Sherif Barakat: That's hard to say; I can't give you a figure. But really, if it isn't marketable as a product, it's probably marketable as know-how. Every project has to have an outcome that somebody will benefit from. In construction there really isn't a large idea or large marketing, but it's the know-how and the transfer of know-how in the industry that makes the difference.

So for every project you have to have a guideline or standard that results in a new way of doing stuff. That's how we work. It is not in fundamentals for fundamental research's sake.

The Vice-Chair (Mr. Alan Tonks): Okay, thank you.

Mr. Sherif Barakat: We have a multitude of spin-offs, as well, from NRC, particularly in the ICT area, and now have the one I mentioned on measuring leakage out of pipes. There's a large number of them. We're talking about a few coming out in the area of fuel cells, and stuff like that. So we've licensed a lot of technologies out to companies.

There's a variety of things we do, really, but the main thing is that NRC is not in basic research. While we work on discoveries, because those actually keep us excellent in research and abreast of what's going on around the world in research, and we work with universities on those, most of our work is in the applied area, where we really have to have something tangible in the end to give somebody.

The Vice-Chair (Mr. Alan Tonks): Thank you, Mr. Russell.

Mr. Ouellet.

[*Translation*]

Mr. Christian Ouellet: Thank you, Mr. Chairman.

I have known Sherif for at least 25 years and I know that he speaks French very well. Unfortunately, he is shy and that why he's not speaking French today.

I have a brief comment to make. He is extremely modest. He's a renown researcher who has worked on glass, among other things. He's done some extraordinary things. Ms. Bell asked a question about buildings and construction that may not be as good as it once was. I have to say—because he won't admit it—that the National Research Council of Canada is considered to be one of the world's best research centres on construction—especially on residential construction. Because of men like him, Canada and Sweden are known for developing the greatest number of technologies for northern climes. The United States sees us as being on the leading edge of technology in this field. However, this research has not necessarily filtered down to builders.

The extensive research been done at the National Research Council of Canada doesn't always filter down because of jurisdictional considerations. Builders come under provincial jurisdiction and take what they can from the NRC's work. The federal government is not aggressive enough to ensure these technologies are adopted. Someone raised an excellent question concerning R&D. How many new technologies have been adopted? Sound research is being conducted, but results are not being implemented because the government is not doing what it needs to do. It's as simple as that.

I'd like to come back to something Mr. Gourde said. Mr. Barakat, this committee is meeting to look into the greening of electricity consumption across Canada. We want to focus on production aspects, distribution and interutility tielines. Should distribution be done on a more regional or local level? We believe it should. What kind of approach should be taken? Who in your organization could help us explore this field further and get a better understanding of the kind of research being carried out? Mr. Gourde asked an excellent question. How much electricity is being lost during the transmission process? Should this have an impact on the maximum distances over which electricity should be transmitted? What about the distance between the location in which high voltage electricity is produced and the place where low voltage electricity is produced? All of these questions need to be answered in order for us to become green consumers of electricity. Can anyone be of direct assistance to us?

● (1625)

[*English*]

Mr. Sherif Barakat: There is a group at NRCan that's responsible for electricity generation and transmission, but I think the best people to help you with the question are those at the electricity association. I worked with them a long time ago on utilization, but I know they have groups on generation, transmission, and so on.

There are some very strong researchers, engineers, and people working on this area in hydro. I would look to the very active hydro companies in Manitoba, B.C., and Quebec. They are really active, not only in that area, but in the area of consumption and utilization, because they had programs. B.C. still has a very good program on energy utilization. So that is probably a good idea.

I'm not an expert. I know that when we went from AC power to DC power transmission we saved quite a bit. I was close to a couple of people who worked at Ontario Hydro when I was in Manitoba, and there are some people there who really know that subject inside out.

[*Translation*]

Mr. Christian Ouellet: You spoke during your presentation about an action plan for climate change. Does this action plan, which is of special interest to our committee, affect energy transmission and the safety of the grid? Without question, climate change affects the safety of electrical grids. As part of your study, do you have people looking into the effect of climate change on electrical distribution?

● (1630)

[*English*]

Mr. Sherif Barakat: I can't answer the question; I'm sorry. I know people who work on climate change and how it affects buildings and how it affects municipal infrastructure, for example. The effect of climate change—

I am sure people who worked after the ice storm that we had a few years back are very interested in the occurrence of such events in Canada and otherwise, because that's a major catastrophic event. I would assume they are, but I can't tell you; I'm sorry.

[*Translation*]

Mr. Christian Ouellet: It was an excellent question.

Summing up, I'd like to come back to a question that was put to you earlier. Who has the final say on research priorities? Does the federal government ever ask you, through its minister, to focus on specific research areas? If so, do you ever advise the federal government that you have taken specific action to further its understanding of or to help it resolve certain problems?

[*English*]

Mr. Sherif Barakat: Actually we respond to government needs coming from other government departments to support their mandates, departments such as NRCan, Environment Canada, and Agriculture and Agri-Food Canada. NRC over the past has built strategies not on demand, but on indications set by the government for priorities. In the past it was biotechnology, aerospace, and so on; we responded to that. The idea then was to see how the S and T strategy was coming up and how we could respond to it for the country.

With the work we have done, I would probably not be surprised if we are already very aligned. Maybe we have to adjust when it comes out, but that is where we take our signals. It is really the priorities announced by the government, whether they are priorities through throne speeches or budgets, or just indications of where the country is going. That is what affects us; it is not particular demands. We respond to that and we present a program, a strategic plan, to Parliament.

The Vice-Chair (Mr. Alan Tonks): Thank you, Mr. Ouellet.

We will go to Mr. Allen now, please.

Mr. Mike Allen (Tobique—Mactaquac, CPC): Thank you, Mr. Chair.

I have a few questions I'd like to ask you. One is about the energy code for buildings. When we constructed our house back in 1996, we went to an R-2000 standard. I know things have changed over the last number of years.

I'll follow up on Madame DeBellefeuille's question. You said you started developing this business code. How long was the process for you to actually develop it? Then the next process is how you roll it out. How long would it normally take you? How long did it take you to develop your last one?

Mr. Sherif Barakat: When we started it, we took it from scratch. It was basically from scratch. It was five years. The long time was because of the consultation.

We don't sit down and close the door and say we'll do a code. Actually we were established under the commission for building and energy codes. They have to establish standing committees from different industry partners and government and so on to actually oversee the direction and development of the code, so it takes a longer time to do that and the consultation.

It took us five years to publish a document at that time, from 1992 to 1997. My guess is it will take a much shorter time now, because the work has been done. We had to start at that time from an energy code that was developed mostly from computer modelling, along with energy prices, construction prices, construction methods, and so on. I think that if we established a base, building it up again would, I assume, need a shorter time.

Mr. Mike Allen: You would assume that it's probably not one year. Is it probably a couple of years with all the consultation?

Mr. Sherif Barakat: It's probably a couple of years. That's right.

Mr. Mike Allen: So we're talking at least 2009 or 2010 before we have a new building code?

Mr. Sherif Barakat: I would guess.

Mr. Mike Allen: I was reading an article the other day in the *National Post*. I think it was on Friday. The article said Alberta now has run into problems with their wind power. They have a penetration of about 4%, and now they have realized that because the capacity factors are low, they are now going to have to build new generation to allow them to put more wind in.

I was talking to a utility person in New Brunswick this morning, and this person said the same thing—that they're concerned about all this wind energy not being reliable enough to keep the system going.

It seems that NRC's focus is more on the smaller kinds of things and on efficiency, and maybe in the future we would gain more by having some of this renewable energy on the customer side of the meter, versus the other side. How much research is being done into the small kind of wind power, perhaps on a farm or on a housing project, to allow you to generate energy efficiently?

● (1635)

Mr. Sherif Barakat: There isn't much with IRAP support. A couple of projects are being worked on with companies that picked up that area. The technology exists, it just needs modification or downsizing at this time, not upsizing.

The challenge in that is really the integration. As you said, wind energy is not there every day, and you've got to build enough systems with the availability for energy or storage. You'd have storage, you'd have energy replacement, whether with a fuel cell or wind energy. When the wind is down I have solar, or if I don't have both, I have a battery. System integration is going to be an important part, and I think we're starting to work on that, as I mentioned, in Vancouver. That's an area we're heading to.

Mr. Mike Allen: With respect to your energy-related R and D, you look at the $30 million for the energy-related and $10 million on external programs for R and D, and that's on a budget of $835 million, less $166 million in revenue. Are there other pots of money buried in there, in the department, that also are on the energy side? Because if you look at your key sectors, I'm not seeing that energy plays a big part in it.

Mr. Sherif Barakat: Sustainable energy is a priority that looks at alternatives, particularly fuel cells. There could be other parts under different industries. This is reporting by cutting through all the sectors to see what we spend on energy. Just to elaborate, the $30 million or $40 million is on the NRC research budget; the research institute's probably $300 million only. When you add IRAP and other stuff, then it does come up to the 600, so it is 10%. It's not a great amount, but it is a little more than 10% in energy, but we don't have an energy program per se. As I mentioned, we serve industry in different areas, and one of them is energy and that's why we report on it. We haven't had an energy program and an energy division since 1984. Priorities changed, and we shifted to other priorities.

Mr. Mike Allen: When you talk about your nanotechnology and you're talking a nanoscience, the oil sands—this has potential to apply nanoscience to oil sands—where are you headed?

Mr. Sherif Barakat: The major challenge with oil sands is the energy and water used to get the oil. I think if we find technology that can reduce the energy for the steam, oil, and water used to get it, that would be a breakthrough, and maybe that breakthrough will come out of a combination of biotechnologies. If you can find some microbe or some bacteria somewhere that would chew that sand and put the oil on one side and the rest on the other side—that's imaginary thinking, but something that breaks the oil sands and their components by using less water and less energy is what you look for, because it has a major impact on how much we use water and energy in the oil sands to get the oil, aside from what we leave behind.

There are technologies now at our institute in Montreal that do environmental remedial sites, and it's biological, so we can use that to clean up some of the sites we left behind. The breakthrough may come as to how we can use less energy to get the oil from the oil sands. Look at life cycle. We still use quite a bit of energy.

The Vice-Chair (Mr. Alan Tonks): Thank you, Mr. Allen.

Any questions from my left, spatially speaking?

Okay, then Mr. Trost, from my right.

Mr. Bradley Trost (Saskatoon—Humboldt, CPC): A few questions have been asked about building codes, etc., and how many years they take to get in place, and I'm just wondering, from a purely educational perspective, it's one thing to say “thou shalt”. It's another thing to say that this is what we know works and educate the Home Builders' Association across the country.

I have a friend who's a professor of thermodynamics, Dr. Gabriel, and when he built his house in Saskatoon, he ended up cutting, I think, to a quarter, or even less than that, the heating bills of some of his neighbours. He got a 3,500 or 4,000 square foot house. It was massive, what he ended up cutting his heating and cooling bills by, just because he used some of his classroom knowledge.

I was wondering, can you just educate the home builders, without even enforcing provincial codes, etc.? Is there a component of that? Maybe that's not your department.

● (1640)

Mr. Sherif Barakat: No, actually the home builders have the same argument as you: that they don't need that code; that they can actually do what they need to do—the market will demand it.

It's not only the education of the home builders. The home builders association have a big manual for the R-2000 program and can distribute it and educate their builders on it. I think we have to educate the Canadian public, because they are not demanding energy efficiency. The first question when you go to a house is not how much energy it takes; it's whether it has any of the amenities you would like. I think the major educational need is the owners.

In construction, the owners—the ones who have the money—drive the agenda. So if you actually educate the owners, they will drive the agenda. That's what the builders will react to. So it's a major education piece saying it's $3,000 to $5,000 more on the house and it's worth it; it's going to pay back and be good for the environment.

If you give that education, then they're going to go and demand it, and therefore you actually beat the code. If you beat the code, you don't need a code. They beat it.

Mr. Bradley Trost: Yes. It just boggles my mind, because his basic after-tax rate-of-return equivalent for what he got from that house was unbelievable.

Mr. Sherif Barakat: There is a story in Saskatoon, which has been a hub of energy efficiency for a long time in housing. I heard that they saved 90% by using integrated energy systems.

Mr. Bradley Trost: Yes, that could be Dr. Gabriel's house.

Mr. Sherif Barakat: Yes, it could be.

So it can be done. Dr. Gabriel probably used his expertise to have things done cheaply, but if you go to a builder and it costs him $3,000 to $5,000 to go R-2000 and more—We have to be able to sell that house. You have to differentiate. You can differentiate on quality, but the market does not differentiate on that currently.

That's where you have to educate the people—to differentiate in energy and on quality other than having a Jacuzzi.

Mr. Bradley Trost: Well, he had a 4,000-square-foot house.

Mr. Sherif Barakat: That's a big house.

Mr. Bradley Trost: It was somewhere in that neighbourhood, so it was a big house. When he resold it, he actually more than profited because of it.

The other basic question I have is, how much exchange do you do with other countries for information? One doesn't want to reinvent the wheel. I realize, having lived abroad, that we have very different building techniques from other parts of the world, but we do have certain overlap with the EU and places like that. How much interchange is there and how much back and forth swapping of information is there?

Mr. Sherif Barakat: We interact quite a bit internationally. Actually that's one of the things industry told us, that they need us to make the link. In the energy area we are representing Canada on the International Energy Agency committee on building and energy conservation in buildings.

In the fuel cell area we are very involved with other countries. We have an agreement with Japan and Germany and perhaps the U.S. that helps with fuel cell research.

We have large programs between NRC and France, NRC and Germany, and with Japan and the major G-8 countries, for different areas of research in which we put our money in the pot and fund joint research projects that benefit both sides.

Mr. Bradley Trost: The one complaint I've often heard from industry in the close to three years now that I've been an MP is that in R and D the research is very well done, but the development portion—getting it to market—is a sort of in-between section in the whole stage of developing from technology to commercial application; that in the middle there are a few weak links.

I don't know whether it's quite your area to comment on this, but I was curious whether you feel from your perspective, from your interaction with industry—you'd be more at the research stage than the final end stage—that this is accurate. If it is accurate, do you have any ideas to bridge that in-between gap to get things moving forward?

● (1645)

Mr. Sherif Barakat: Definitely the research in Canada is very strong as compared with other countries, as you said. It's well funded. We have a very respected research community, in academia and other institutions.

There aren't many that would take research the next step, to development. I mean, at NRC we do that all the time, because we work closely with industry on all our projects. As well, there is the challenge that Canada has most of its industry in small and medium enterprises. The entrepreneurial capacity to absorb research is challenged. We have to work out a solution to do that. Programs like IRAP do that, and other programs that the provinces put through to help commercialization. It's quite an effort now to do that.

Again, we would like to see companies taking recent research and growing in Canada, not companies taking research and in a few years selling and being moved somewhere else. That's the challenge for us in Canada, seeing the small companies in Canada grow, and keeping them in. This is where you hear about tax credits and a variety of other things.

So that's where the challenge is, getting the capacity for industry to get these innovations. Then you can talk about the link, about how we can actually work side by side with these companies. It's not only to transfer a piece of technology, to say, “Here, now do it”, but also to actually hold their hands while they're doing it, whether it's seconding people there or hiring a post-doctoral fellow to work with them on it, to grow it and so on.

The other challenge, naturally, is the amount of VC money in the country; that's versus other countries like the U.S. and Japan.

The Vice-Chair (Mr. Alan Tonks): Okay, Mr. Trost, you're out of time.

Madame DeBellefeuille, you have a question?

[*Translation*]

Mrs. Claude DeBellefeuille: Yes, I do have a question.

Today's topic is being discussed against the backdrop of climate change. We want to generate energy as ecologically as possible in order to reduce our greenhouse gas emissions. You claim that you set your priorities based on the needs expressed by industries. I take it by that you mean well-established industries capable of stating their requirements. This isn't necessarily the case for other sectors, such as the solar energy or geothermal energy sectors. According to witnesses, they don't necessarily get the full attention they deserve in order to flourish and develop on the R&D side and to attract manufacturers and consumers alike.

In terms of your budget, how much money would you need to truly expand research efforts in the field of solar and geothermal energy and to make these sectors attractive options? How much more money would you need to speed up the process and to develop this sector from a technological standpoint, when we talk about integration with the electrical grid and about everything that's now going on right now? What needs to be done in order to take this major step forward? Fundamentally, I don't think time is on our side and I think we need to step things up a notch. Ideally, what would like to see happen?

[*English*]

Mr. Sherif Barakat: I can't tell you how much money I need. Research can take all the money you throw at it. I think if you gauge it by the work that was done in 1984, I can't remember the exact budget in the energy division, but one of our large institutes will take $25 million to $30 million to start. We have an institute where the budget dedicated to fuel cells is $9 million to $10 million. In addition to that, we spend money on a horizontal program, so we spend about $14 million.

It depends on the area. I think fuel cells involve very technology-intensive development in materials, and so on. Industries probably spend $200 million to $250 million a year in research in that area, so in that small part you can see the contribution.

In other areas—maybe similar investment. IRAP, for example, is really helping SMEs. They say they are not getting attention. I think there is attention paid to SMEs. In 90 places in Canada they can find an IRAP rep and talk to them about development around funding research. The IRAP budget for contributions is now $80 million to $100 million. I can't give you an exact number because we really have to look at what we're going to do.

In wind energy, what do we have as a niche in Canada to be able to build it in Canada—other than what's built in Denmark, for example?

In solar energy, do we put more money in nanotechnology and energy—more in NINT? NINT is working on it now. Do we need to focus on it and give it more money to work on solar particularly? Would that accelerate it?

It's a difficult thing, but by putting more people on it and having Canadians focus together on some area we can accelerate research. That's what we're trying to do with national programs. We hope to get most researchers in Canada who work in one area to work collectively toward the same objective so we can beat other countries to it. That's one thing you can do, because there is funding in academia. We fund universities better than any other G-8 or G-7 country.

So the work is going very well, but can we put it all together? Then we can say what gaps we have and what money we can put in to accelerate it.

● (1650)

The Vice-Chair (Mr. Alan Tonks): Mr. Epp.

Mr. Ken Epp (Edmonton—Sherwood Park, CPC): Thank you for your presentation.

I've been interested in energy and energy conservation for many decades. I'm probably the oldest guy around here.

One of the things that intrigues me from a physics point of view is the huge amount of energy we waste in the whole world simply starting and stopping vehicles at stop signs and red lights. We grind that energy into heat via our brakes, and then we apply fuel to the engine in order to get back up to speed again.

I'm wondering whether you've done any research in trying to develop systems that will conserve that energy in an efficient way. I think the charging of batteries is not efficient because it adds so much mass to the vehicle. So are there any other ways?

The one I thought of was having a compressor that would pressurize a tank onboard and release that pressure to provide forward propulsion when you're ready to go again.

I guess my big question is, have you done research on this, and does it have any promise?

Mr. Sherif Barakat: No, we haven't. As you probably know, regenerative brakes now exist on hybrid cars. One of the reasons for their high efficiency is they actually use the energy from brakes to recharge the battery.

Mr. Ken Epp: Yes, but you also have the weight of the batteries when you accelerate.

Mr. Sherif Barakat: Yes. We have to think about how we can use that energy and in what form can we store it. If you think of compressed air, you have to get it back into a compressor. So we have to send it back to electricity and to a compressor. I don't know. It's a very good idea that industry has used in the hybrid cars.

There's another area where we could use that. Some countries are working on how to get traffic flowing with fewer stops and starts. I've seen the work done in Finland, for example.

Mr. Ken Epp: One area I thought of this weekend was that we need some smart lights. We have computer capacity now coming out of our ears, and I don't know why they can't have computers with sensors on the road.

Several times this week I had to stop just because there was a red light. There was no opposing traffic. I stopped because the light was red.

Mr. Sherif Barakat: Probably the road you were on did not have a sensor, because they use them extensively now.

Mr. Ken Epp: Some of them do, but that should be extended. One of the roads I travel has a lot of truck traffic in one direction and mostly cars in the other, and I would think it would be advantageous for the sensors to detect half a mile away if a truck is coming and give him a green light so he doesn't have to stop.

● (1655)

Mr. Sherif Barakat: The other area about braking is what's nice about electric cars is that once you stop, the engine's not running. You can stop the engine.

Mr. Ken Epp: Yes, I'm aware of that.

There's another area I've thought a great deal about. I just about got blown out of my shoes when I walked to the building today, because of the high wind. Surely we should be able to harness that.

As I said before, I'm an old guy. In the forties on a farm in Saskatchewan we had wind power. We used wind power to pump water for the cattle. We used wind power to generate electricity for our 32-volt system. That was the only electricity we had. That was way back in the forties and fifties.

We've gone in the reverse direction on that. Of course, it becomes a matter of economics, but surely we should be able to come up with a very efficient system, especially with the new technologies in batteries and so on. Perhaps more houses could get energy self-sufficiency by having a series of generators.

Mr. Sherif Barakat: Yes. I certainly don't disagree with that. As I said, there are a number of things we can do, particularly in houses.

The difficulty in a big city when energy becomes a little problematic is if you have a wind turbine on every house. But definitely a combination of systems with the advance of batteries can help get us more energy efficient.

Mr. Ken Epp: Thank you.

The Vice-Chair (Mr. Alan Tonks): Thank you, Mr. Epp.

One question, if I may, from the chair.

Mr. Barakat, thank you for being here.

I understand the nature of research, but when it comes to political action, it seems to me that the round table on the economy and sustainable development is more of a political action arm, if you will, of our system of creating crowns or NGOs or whatever and nurturing them. Do you ever meet in concert with the round table with respect to advice or action or advocacy or priority setting?

Mr. Sherif Barakat: Yes. We've done that a couple of times, not extensively, and we follow their work and their reports quite closely, because this is one of the areas where you get direction as well, where experts think energy is going or what the requirements are. So we follow these reports closely.

The Vice-Chair (Mr. Alan Tonks): If a report came out of the round table on the economy and sustainable development with respect to aviation—and I see that one of the areas you have etched out is aviation—and there is fairly compelling evidence that aviation and the emissions that are projected are devastating with respect to climate change, greenhouse gases, and so on, if the round table came out with a report, would you take that and establish a higher priority with respect to what you are doing in the area of aviation?

Mr. Sherif Barakat: Absolutely. I mentioned this area because this area is already establishing some projects with Environment Canada because of the expected increase in aviation in high altitudes. We're establishing a project to have measurements of major emissions, particularly close to the layer we worry about—have planes follow the big 380 or 747 to look at emissions.

Because of the increased aviation across continents, it will have two things. One, it will reduce the distance between airplanes so they can examine the effect of the exhaust or the turbulence of one on the other. The other thing is, what are we putting in the atmosphere up there and how can we mitigate it? That's a major item.

The other thing is to work with companies like GE and others that produce engines to try to minimize emissions.

The Vice-Chair (Mr. Alan Tonks): At what point do you report that out, in terms of your work plan?

Mr. Sherif Barakat: Now that we're working with the industry, in aerospace, we can get you quite a bit of material on what we do, from engine certification to cold weather testing, ice testing, emission for gas turbines and so on.

● (1700)

The Vice-Chair (Mr. Alan Tonks): As a case study for this committee's information, there is an example where we have fairly compelling evidence that technology change is required in that particular sector in industry. Your role is to do research and add value to the Canadian economy, but climate change is a world issue. How do you effect that behaviour change in that technology area?

Mr. Sherif Barakat: We can certainly get you quite a bit of information on that.

The Vice-Chair (Mr. Alan Tonks): Would the committee be interested in getting a thumbnail sketch on that?

Mr. Sherif Barakat: I don't know if you have noticed it when you're coming from the airport, but we have the big wind tunnel at NRC. There's also a hangar there, and we have four or five airplanes —all experimental. Some of them sometimes fly to study hurricanes, but others fly to study and measure emissions for Environment Canada and stuff like that. So that's actually—

The Vice-Chair (Mr. Alan Tonks): Yes. Well, we won't take any of those experimental aircraft to Churchill Falls.

Mr. Sherif Barakat: I wouldn't either.

The Vice-Chair (Mr. Alan Tonks): But I think we would be interested in an update on that, Mr. Barakat.

Mr. Sherif Barakat: Certainly. We'll get you that.

The Vice-Chair (Mr. Alan Tonks): Thank you so much.

On behalf of the committee, we thank you and Mr. Norgaard for being here. It has helped considerably in our understanding of what —

Mr. Sherif Barakat: If I may, if you're in Ottawa and we can have a few minutes of your valuable time, please come aboard. I will show you that work, right at NRC.

The Vice-Chair (Mr. Alan Tonks): Good. Thank you so much. Maybe we'll have a visit there too.

Mr. Sherif Barakat: Yes, absolutely.

The Vice-Chair (Mr. Alan Tonks): Do you serve lunch?

Mr. Sherif Barakat: We can do that too. I don't know if it's as good as the cafeteria here.

The Vice-Chair (Mr. Alan Tonks): Thank you. Enjoy the rest of the day and the evening.

Mr. Sherif Barakat: Thank you.

The Vice-Chair (Mr. Alan Tonks): Members of the committee, you have seen a copy of the itinerary with respect to our working trip to Churchill Falls. Is there any question?

I think the last discussion we had came out of an issue raised by Mr. Russell with respect to attempting to meet with some of the community. I don't see that here. But I think the suggestion.... Oh good, there's an informal meeting at McParland House. I guess, then, that is with members of the committee.

Mr. Russell, you're satisfied that's what we're working towards there?

Mr. Todd Russell: Yes, and I want to thank Chad. He and I got together. They have a faster plane and it gets you there earlier. We made some accommodation that I think is fine, so two and a half hours is on the agenda if we have to use that.

The Vice-Chair (Mr. Alan Tonks): Excellent.

Madame DeBellefeuille.

[*Translation*]

Mrs. Claude DeBellefeuille: My question has nothing to do with the itinerary. It has to do with something else. May I continue?

[*English*]

The Vice-Chair (Mr. Alan Tonks): Let's finish with this, then we'll go on to something new.

Okay, so we're satisfied. Thank you to Chad and those who put this itinerary together.

Madame DeBellefeuille.

[*Translation*]

Mrs. Claude DeBellefeuille: Last Friday, I sent a letter to the chair asking that he consider holding an additional meeting to hear from witnesses involved in more expert research. I'm thinking here about engineers and others who are doing cutting edge research. They could help broaden our understanding of this matter. I was wondering if the clerk had read my letter and if we could possibly discuss it today. However, I now realize that you haven't received this letter.

The Clerk of the Committee (Mr. Chad Mariage): I just this minute received it.

Mrs. Claude DeBellefeuille: We sent it to the Chair, assuming that he would pass it on to you. Perhaps we could discuss it Wednesday and consider possible expert witnesses who could testify. It would be interesting for committee members to hear from experts in the field of energy research. We could talk about this on Wednesday.

[*English*]

The Vice-Chair (Mr. Alan Tonks): Okay.

We may have a little more time with respect to our meeting on May 2. We can discuss it on Wednesday. But to the end that Madame DeBellefeuille has suggested, if any members have suggestions, we may be able to also have additional—

We are going to have, on May 2, as you will recall, out of the deputations we had—Through the Federation of Canadian Municipalities green program there are two or three excellent examples of integrated energy programs that are coming under cities or municipalities.

The last I heard, we were thinking of Okotoks, which comes out of Alberta, and Vulcan, which is also out west. But there is also Ottawa. Bob Mills suggested that there is quite a program, and it wouldn't be very difficult to get somebody from Ottawa. And there is Sudbury. They are both confirmed.

In any case, there may be a bit of time to also add to it from your perspective. If you have specific examples, don't wait until Wednesday. Let's bring them forward.

● (1705)

[*Translation*]

Mr. Christian Ouellet: You already have our list. We've already submitted it.

Mrs. Claude DeBellefeuille: The Chairman has our list of prospective witnesses. Is the Minister still scheduled to appear on May 2?

[*English*]

The Vice-Chair (Mr. Alan Tonks): I have no idea. I will turn it over to Chad.

[*Translation*]

The Clerk: Mr. Chairman, I've just been informed today that the Minister will not be available on May 2. Other possible dates have been suggested and I've been in touch with the Chair's office. As you can see, the Chair is not here today. I will run the suggested dates by him and he'll get back to you. One of the possible dates was next Monday, but we won't be here. The Chair will have to get back to you on this.

[*English*]

The Vice-Chair (Mr. Alan Tonks): There are two issues. We'll reschedule the minister, but if the May 2 date has excess time in it, we may be able to bring in some of those leading-edge energy experts, program directors, or whatever. So I just want to make sure that if that is the direction we want to go in—

We don't need to wait until Wednesday to discuss it. We'll discuss it on Wednesday, but put in some ideas as to who we might be able to bring in.

Go ahead, Mr. Ouellet.

[*Translation*]

Mr. Christian Ouellet: Mr. Chairman, I think we need to come to a decision today and not wait until next Wednesday to discuss this matter. Then we could substitute other witnesses for the minister. It's interesting to hear from generalists. This witness is a specialist, but not in our current field of study. We need to hear from specialists in areas that relate to our mandate.

[*English*]

The Vice-Chair (Mr. Alan Tonks): Okay, but I think we're going in that direction. We see an opportunity to fill the time in addition to the municipal examples. I will tell you that on the basis of knowledge I have, for example, if we invited people from the deep water cooling and heating program in Toronto, they really are leading-edge thinkers. It is not only the financing; it's the actual integration into the downtown energy use grid and the co-generation from it into the overall electric grid. We will get that kind of testimony, I think, from these people, but we can expand that with the suggestions that are put forward.

Mr. Mike Allen: I have a really quick question. What were the folks from Hydro Québec who were supposed to be here going to talk about?

The Clerk: I'm sure Jean-Luc could probably answer that a little bit better in terms of his conversations with them. In the invitation, they were given essentially what you saw on the agenda for today. They were given the pretty general theme of this study and the more specific theme of hydro-electricity and its future role and future potential.

Mr. Mike Allen: Were you able to get hold of folks on the transmission side?

The Clerk: Yes, the NPCC is confirmed for Wednesday.

Mr. Mike Allen: That's great.

Thank you.

The Vice-Chair (Mr. Alan Tonks): Okay.

The committee is adjourned.

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