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Chair

Mr. Leon Benoit

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● (0905)

[*English*]

The Chair (Mr. Leon Benoit (Vegreville—Wainwright, CPC)): Good morning, everyone. It's good to see you here this morning.

We are here pursuant to Standing Order 108(2) to continue our study on the contribution of integrated approaches for providing energy services in Canadian communities.

We have today, by teleconference, two groups of witnesses. The first is from Berlin, Germany; we have as an individual Dr. Christine Wörlen from Arepo Consult. We have by videoconference, as individuals from Malmö, Sweden, Mr. Öhrström from Ortelius Management and Mr. Arne Sandin from Triple-E.

We'll have each group make its ten-minute presentation, in the order in which you appear on the agenda. We'll start with Dr. Christine Wörlen for a presentation of up to ten minutes before we hear from the other group; then we'll go to questions and comments.

Again, welcome, and thank you very much for being with us today. We really appreciate it, as we know it's not easy with the time difference.

Dr. Christine Wörlen (Arepo Consult, As an Individual): Thank you, Mr. Chair.

It's actually 3 p.m., so it's quite pleasant. Thanks for having us. I'm quite flattered.

I'm an independent consultant with an extensive background in renewable energies, both at the national and international levels. I used to be a researcher for a study commission of the German Parliament from 2000 to 2002, studying low greenhouse gas futures for Germany, so I can very much relate to the situation you are in. I also worked and did my PhD in the United States, so I have a connection to North America in general. I've been to Canada many times.

My last job was as head of the renewable energy division at the German energy agency. We delivered policy advice to the German government as well as to other governments. We were working with German companies, particularly in the area of renewable energies, and we generally promoted in public discussion the issues of energy efficiency and renewable energies; for example, in terms of grid integration, smart grids, and telecommunication links, as well as biogas feed-in. These are just a couple of examples.

I was asked to speak to the German experience in renewable energies. I was told that you have been given a couple of slides that I provided. Is that correct?

The Chair: Yes, that is correct. Thank you. We have the slides.

Dr. Christine Wörlen: Thank you very much.

I'll ask you to move to the first slide I provided. It's on page 4, and it is not the upper but the lower one, with a number of bars. These bars indicate five different ways to see how the German renewable energy sector has developed over the last 10 years.

When I started working in this area, around the late 1990s, we were told that this is as good as it gets in terms of renewables. As you know, Germany is not a very resource-rich country, either in terms of fossil resources or in terms of renewable energy resources. But because of a decided and very consistent, coherent, and stable policy framework, we were in fact able to develop that resource base quite a bit.

You can see the developments on these slides. In terms of overall final energy consumption, we were able to almost triple our use of reusable renewable energies. In the case of electricity, we were able to multiply it by a factor of 3.5, and in terms of heat, we were able to more than double the use of renewables in this sector.

Nevertheless, the European Union asked us to reach further for more ambitious targets, and you can see those in the slides in the red bars with the little dots. In fact, by 2020 we are asked to achieve 18% of our final energy consumption from renewable energies, and the German government intends to do that by covering 30% of our electricity use from renewables and 14% of our heat use.

Last but not least, we also have to cover a significant share of our transportation needs from biomass, but this is not something we will cover today.

On the next slide, on page 33, which has bars that go across rather than vertically, you can see what this meant for Germany in terms of CO_2 emission avoidance. In total, Germany was able to avoid about 117 million tonnes of CO_2 in the year 2007 alone. This compares with total emissions in Germany of 820 million tonnes. So we avoid about a seventh of the CO_2 emissions from the energy sector just by using renewable energies in the heat and electricity sectors.

If you turn to the slide numbered page 15, you can see where most of this growth comes from; it is the electricity sector. The German system relies, for the most part, on the functioning of a feed-in tariff system, meaning that as long ago as the early nineties, renewable energy electricity producers were guaranteed a specific rate for electricity for each kilowatt hour they produced. But this is only one aspect of why this law was so successful.

● (0910)

A very important aspect also is that the transmission system operator actually is required to buy every kilowatt hour that is produced from renewable energies. Also, the law specifies very clearly who bears the cost of grid connection and what timeframes are allowable for providing that grid connection. These kinds of clear rules save a lot of transaction costs on both sides—on the side of the transmission system operator as well as on the side of the plant operators.

The law is reviewed on a regular basis. It has a built-in digression, meaning that the tariffs go down by a pre-specified rate every year. So if I connect my plant to the grid this year, I will get more than if I wait a year and only connect it next year. This incentivizes early action, and it also adds to the cost-effectiveness of this regulation as well as to the long-term stability of the overall system.

In this review process, the government also uses the opportunity to adjust small technicalities in the law. For example, they provide additional guidance on grid codes and very technical details. This regular review process adds to the overall stability of the whole program.

This is as much as I want to say on the electricity sector, and I'm happy to take questions afterwards.

Let's now turn to heat. Heat generally was not quite as successful as electricity. You can see this on the slide on page 26. The upward trend is not quite as pronounced as it is in electricity. The government is also more cautious in terms of putting out targets on heat, for three reasons, really. The policy instruments that have been used so far have relied on investment subsidies and therefore have been very dependent on the government's budget. Secondly, this also implied that the detailed regulations for this type of support had to be adjusted every half-year, which is a very short timeframe, and basically all the small investors in solar thermal installations, for example, or in small biomass heat installations had to constantly keep track of the investment conditions that were supportive at this point in time and then wait or delay their investment proposals or just drop them. This constant revision of the rules was not very helpful to provide stable growth. So we had those two aspects of the lack of an effective policy framework.

But also, to be honest, the sector is much more difficult, and for renewable electricity generation, normal investment frameworks work. It's easy to build something on a green field. In the heat sector the retrofitting aspect is much more important, so this adds to the difficulties of achieving high growth rates here.

Lastly, I would like to draw your attention to slides 37 and 36, which demonstrate the overall impact these policies had on the German economy. In fact, renewable energies are a major growth factor for the German economy. We have, I believe, about 250,000 jobs in the renewable energy field. Some are consultants, like me, but we are really the very smallest part. We have more than 245,000 jobs in producing the facilities, running the facilities, setting them up, installing them, maintaining them, and financing them.

On slide 36 you can also see the effect on our GDP. It adds to the German economy a total turnover of about 25.5 billion euros, and this actually does not even include those revenues that regenerate from exports, which are significant. You can also see that most of this, 42%, comes from the biomass sector, 30% from the solar sector, and 23% from the wind sector. Hydro power and geothermal play a smaller role here.

● (0915)

Last but not least, in these times of crisis, we also notice that the renewable energy sector is good for the economy in that it is not very affected by the current crisis. We are confident that the sector will continue its growth. Yesterday I was at the Hannover Messe, which is one of the biggest fairs for machinery suppliers. They had to correct their growth predictions downward, but from a very optimistic 26% to a less optimistic 15% growth rate that they still expect to realize this year.

So much for my presentation. I'm looking forward to answering more of your questions.

The Chair: Thank you very much, Dr. Wörlen for your presentation.

We'll go directly now to the presentation from Malmö, Sweden. Mr. Öhrström and Mr. Sandin, you can divide the presentation, or if only one of you is going to give the presentation, just go ahead, please, for up to ten minutes.

Mr. Arne Sandin (Triple-E, As an Individual): We're going to leave the voice to Mr. Peter Öhrström because I have actually caught a spring cold here in Sweden. So Peter is going to do much of the talking.

Over to you, Peter.

Mr. Peter Öhrström (Ortelius Management AB, As an Individual): Thank you.

Thank you very much for the opportunity to participate in this hearing. We are both independent consultants working in the district heating sector. We are normally helping Swedish district heating companies in their operation, and especially in their market presentations.

We are also focusing on exporting Swedish district heating competence, as we understand that Sweden is among the world leaders when it comes to district heating systems.

We have been called in a very short time to participate in this hearing, so unfortunately we have not been able to send any presentation to you or any figures; we'll just have to read it. I'm sorry about that. All the same, we are going to focus on district heating, as I suppose this is the main interest for this hearing.

To begin with, I'd like to say something about the district heating advantages as we find them in Sweden. The district heating system.... There is actually a low prime energy demand due to the high system efficiency. There is a very high efficiency in the system when it's correctly done.

● (0920)

We also have good utilization of domestic renewable energy resources. There is big utilization of industrial waste heat in the Swedish system. The carbon dioxide emissions are very low. We use incineration where heat recovery is gained for the district heating systems. Cogeneration is normally a basic system in district heating systems where we produce electricity. Heat supply is profitable in Swedish cities. The environmental performance is actually outstanding.

There are so many advantages to district heating systems, not only in terms of energy sources and fuel usage but also environmentally. As well, it's always produced in a profitable way.

The district heating history in Sweden covers about 60 years now. All major cities in the country invested in these systems in the 1950s. Initially it was local environmental reasons that started the replacement of individual oil boilers. Although there was continuous expansion in the 1950s and 1960s, mainly in the big cities, a dispersion took place after two oil price peaks in the 1970s. Then even smaller cities invested in district heating systems in order to reduce heating costs and to improve system performance efficiencies.

Most municipalities started their district heating expansion by connecting major buildings such as hospitals, schools, administration buildings, and municipally owned apartment blocks. When network pipes were passing areas of smaller houses, these were also connected to the district heating system, basically due to bulk demand.

The infrastructure within each building made it easy to convert from oil boilers to district heating, where we normally have centralized systems, but the production and distribution system needed heavy investment. For the municipalities, normally the owners, the accepted depreciation period was about 20 to 30 years, but the return on investment was much shorter than that.

In Sweden, the municipalities dominated ownership of district heating systems. Fifty years ago, 35% of the system operations were organized in municipal administrations. Today, though, almost 100% are organized in business-driven companies. They are also making good profits.

Historically there has been a regulatory system advantage for these systems, which we call heating plants. The legal heating plan, which was sort of a map of the city, had different areas planned for district heating, electricity heating, and gas heating. This system was abolished in the mid-90s; district heating companies are now operating in an unregulated market, competing with other heating systems, often heat pumps in Sweden.

Still, the expansion not only proceeded, it even increased. During the 1980s, there was a major increase in district heating systems all around the country. This was a politically driven expansion in order to reduce oil dependence and emissions of especially sulphur dioxide and nitrogen oxide.

The incentives were basically economic in order to stimulate market conversion, but this was also the starting point for fuel conversion within the district heating systems. I'll talk about a few of the systems just to show what happened between 1981 and 2007.

In 1981 we had about 97 petajoules of district heating in the Swedish system. By 2007 it was almost double that, at 175 petajoules. The fossil fuel accounted for 87% in 1981; in 2007, it's 12%. Biomass was none in 1981 and 45% in 2007. Incineration has increased from 5% to 16% in these years. Heat pumps accounted for 0% in 1981, and today, or at least two years ago, it was 9%. Industrial waste heat was 3% in 1981 and 7% in 2007.

● (0925)

So in 2007, renewable energy sources, like biomass incineration, industrial waste heat and so on, accounted for 75% to 80% of the fuel supply in all the Swedish system. Since the eighties, the expansion of district heating indicates that Sweden has achieved the Kyoto agreement more than four times over.

The reduction of CO_2 emissions from the district heating system has exceeded 80% in these years. The market share for district heating among multi-family houses to date is 88%; offices and public buildings, 75%; and small houses, 12%.

Customer opinion about district heating is that the environmental aspects are the most important for choosing district heating, but they also say that simplicity and the trust in district heating is one of the biggest reasons for choosing it. It's also said to be modern and priceworthy, although the companies are profitable.

Fifty years ago, 35% of the operation was under municipal administrations, but there has been a conversion. Today, almost every operation is a business-driven company.

This was just a short brief of the development for more than 50 years. I hope to give you more appropriate and helpful answers to your questions.

Thank you very much.

The Chair: Thank you very much, Mr. Öhrström and Mr. Sandin.

Thank you all for your presentations.

I'll explain a little about the organization here. I'm Leon Benoit, chair of the natural resources committee of the House of Commons. We have four political parties in our Canadian Parliament. All four are represented here at the committee.

I'll introduce members as they ask questions, and I will mention which party they're from so you have that background.

We will start the questioning, for up to seven minutes, with Mr. Regan, from the official opposition Liberal Party.

Go ahead.

Hon. Geoff Regan (Halifax West, Lib.): Thank you very much, Mr. Chairman.

Thank you very much to the witnesses for joining us today, virtually, from quite a distance away.

Let me begin with Ms. Wörlen.

Can you describe the kinds of incentives provided either by the German government or by state governments to allow you to triple the energy from renewables?

Dr. Christine Wörlen: I have already mentioned the two most important parts. For electricity, it was the so-called EEG or Renewable Energy Sources Act. In North America, it is also sometimes known as the feed-in tariff or FiT scheme. This scheme works in two ways: first, it gives a guaranteed rate; second, it guarantees many other factors, like the grid connection. The guaranteed grid connection ensures that you can sell your electricity to the market, something that is not possible in Texas and other places. There are other regulations that take away certainty.

So one side is the purely financial side. The other side is the uncertainty in investment conditions. These incentives are often called subsidies, but they are not subsidies because they are not coming from the government's budget. They are coming from the transmission system operator, who has to buy this electricity and then sells it again on the free market.

Every utility in Germany, or every retailer for power, has to buy a share of this electricity to sell to customers. So every customer in Germany gets the same share—14% of electricity from renewables in their power mix. This is something similar to a renewable portfolio standard but very different in respect of what is actually regulated.

The rates compare not too badly with rates on the general market. On the power exchange, you can have power prices as low as 35 euros per megawatt hour, but we have also observed power prices as a high as 160 euros per megawatt hour.

The tariffs for wind, which are the lowest, are in the range of 60 euros per megawatt hour. So the more economical of these electricity sources are becoming marketable. We are also thinking about how to change this market setup so as to allow for a free market in this area.

Actually, I must correct myself. The most economical source is actually hydro power, even in Germany. But we have very limited natural potential for hydro power. The one that still has growth potential is wind.

So much for the electricity side. I have maybe one last word. The investment on the electricity side is made mainly by a special type of project developer, who has been developing this product for the last 15 years. The traditional utilities within Germany do not invest in wind-power farms. They are starting to invest in offshore, but not onshore. This is an indication that these rates are not high enough to give a standard mainstream utility an incentive to invest. They'd rather go into fossil fuels, where they can still make more money.

For heat, we had an incentive scheme that was building on investment support. If someone wanted to build a solar thermal collector on his roof, he would have to go to a merchant and get it installed and then hand in the bill to a public authority to get a cheque for reimbursement. The details on these regulations have changed very often. This proved to be a pretty unreliable program for consumers, which limited the take-up and effectiveness of these subsidies.

● (0930)

At the beginning of this year, the government put in place a regulation that obliges each household to cover a certain share of its heat demand from renewable energies. So if you build a new house, you have to cover about 15% of your heat demand from a solar resource. This is a regulation that has been proven on a municipal level in Germany. So far a number of municipalities have tried to put this in place in their local area and it has proven very effective. However, the federal government actually does not have any powers to put this in place and no mechanism for enforcing this. So we are now waiting for the länder, which are comparable to your provinces, to put in place directions on how to enforce this locally. And then also municipalities might, or might not, put in place even stronger regulations and even stronger demands on this. But without action on the side of the municipalities and länder, we will not see strict enforcement of this law.

Does that answer your question?

Hon. Geoff Regan: Yes, thank you very much. I have others, but I know I have less than a minute left in my time, so I think it's only reasonable to let it go on to the next intervenor.

Thank you very much.

The Chair: The next questioner is from the Bloc Québécois, Madame Brunelle, for up to seven minutes.

● (0935)

[*Translation*]

Ms. Paule Brunelle (Trois-Rivières, BQ): Good morning, it is a pleasure to meet you. I hope that you are able to make use of the interpretation from French.

My first question goes to you, Ms. Wörlen. I find it interesting that, in Germany, renewable energy was a 25-billion-euro industry in 2007 and employed 249,300 people.

Does renewable energy make a profit? Have you been able to take advantage of government grants, and are they necessary to get processes like this off the ground?

[*English*]

Dr. Christine Wörlen: Yes. As I said, there are a number of incentives for the actual end user to buy the systems from the manufacturers. The government also launched in the early 1990s a resource program into renewable energy, but unfortunately, in Germany research into energy is divided between I think three or four different ministries, and responsibility constantly switches in terms of energy research. And renewable energies got the worst of that—they switched most often—so even though the German government overall is very proud of its achievements in terms of our R and D, it could have done a much better job on that end.

In total the subsidies, the public moneys, that go into research and development are much lower for renewable energies than for all other sources of energy, and it has been like that for a very long time. If you're interested in that, I can pull up the latest figures on that.

Last but not least, a large amount of turnover that you don't see in these 25.5 billion euros is from exports. These exports, I guess, are in a range—I would have to make a wild guess—somewhere between another 15 billion euros and maybe a little more. They have also been supported with public moneys in terms of marketing support abroad, information about foreign markets in order to encourage German industry to go abroad and sell in other markets. But the leverage of these small investments the government made in these technical support measures is very high. It's about a factor of a thousand. So one euro that is put into one of these market support measures is leveraging a thousand euros in terms of exports. So there are some highly cost-effective measures the government can take in order to facilitate this type of growth.

Another example I might give is eastern Germany, which has had to build up a whole new infrastructure of industry over those 20 years. There have been effective measures of regional development from the European Union as well as the German government, so some regions in eastern Germany are now called the solar valley because so many solar firms have located there and generate decent growth and job opportunities—areas like Bitterfeld, which used to be a very run-down chemistry site.

[*Translation*]

Ms. Paule Brunelle: Good morning, Mr. Öhrström.

You say that Sweden has been interested in green energy heating systems for 60 years and that the increase in the price of oil has made it possible to develop alternative solutions. I come from the province of Quebec where more than 90% of our energy comes from hydroelectricity. We are starting to develop wind energy a little. Though we are fortunate to be able to take advantage of this energy, It is difficult to interest provincial governments and the federal government in alternative energy sources.

In Sweden's case, what was the key to becoming really interested in district heating systems and alternative energy plans?

[*English*]

Mr. Peter Öhrström: When it started it was basically a question of the local environment and the price of fossil fuel oil. We were caught in oil dependence. We found it was very high in heated buildings—way beyond 8%. When the prices rose, it was a problem for the economy, for single families, and so on.

The two basic reasons were oil dependence and the regional environment. At that time we were talking about sulphur dioxide and nitrogen oxides. There was a plan to make more efficient and fuel-efficient systems and convert those systems.

In Sweden, 50% of all energy comes from hydro power; it used to be nuclear power. I'm not sure of the figure, but today about 50% comes from cogeneration. The district heating system is a source of electricity production that is more efficient than just power plants, because the waste heat is used for heating buildings.

So the reasons were more efficient electricity production, oil dependence, and environmental aspects.

● (0940)

The Chair: You have time for a very short question, Madame Brunelle.

[*Translation*]

Ms. Paule Brunelle: My question goes to you all.

Because of the tar sands, the federal government wants to conduct research into carbon capture. The research has not advanced very far and we are told that carbon caption presents a lot of challenges.

Have you conducted experiments with carbon capture, and what results did you get in your countries?

[*English*]

The Chair: I think the question is on carbon capture. I'm not sure the interpretation was quite right. Go ahead, anyone who would like to answer.

Dr. Christine Wörlen: You go ahead.

Mr. Peter Öhrström: I know that the Swedish company, Vattenfall, is working quite a lot with carbon dioxide capture.

Mr. Arne Sandin: They're doing research in that area.

Mr. Peter Öhrström: They're doing research in Germany on carbon dioxide capture, but this is very early. There is no way of doing it in an economical way today, but they are researching it. Vattenfall believes a lot in carbon dioxide capture.

The Chair: Thank you.

Go ahead.

Dr. Christine Wörlen: In Germany, all the big utilities are currently putting in place carbon-capture-ready coal power plants, and they want to invest as soon as possible in this technology. It's operational on a pilot scale. The main uncertainties are the costs, the effects on the energy efficiency of the coal power plant, and whether or not it is possible to store this carbon safely under the ground.

I already referred to the study commission I worked for in 2000-2002. We tried to identify low-carbon pathways for Germany. Unfortunately, our result was that even Germany will have to use carbon capture and storage to a significant degree until renewable energies are able to develop even better than now. Everybody thinks it is necessary.

The Chair: Go ahead from Sweden.

Mr. Peter Öhrström: We are not really working with carbon capture; it's conversion from fossil fuels to biomass. That is the big task in Sweden. We are using biomass in a very high proportion today. That is the conversion we are working with today to reduce carbon dioxide emissions.

● (0945)

The Chair: Thank you.

We now go to the government side, to Mr. Anderson for up to seven minutes.

Mr. David Anderson (Cypress Hills—Grasslands, CPC): Thank you, Mr. Chair.

We don't have a lot of time today to ask questions, but I would like to ask you if you could provide us with some information.

Ms. Wörlen, you had talked about power rates a little bit earlier. I'm wondering if it's possible for you to send the chair your rates for the different energy sources you've talked about this morning. There were a number of them—hydro, wind, biomass, photovoltaic, geothermal, and solar thermal. I'm wondering if we can get that, and some information on how your rates vary from business to residential, and baseload to peak and those kinds of things. If it would be possible for both of the presenters to do that for us, we could get an idea of how we can compare those rates, and then compare them to what's happening in our country right now.

I'd like to talk a little more specifically about these feed-in tariff rates. I think the other committee members are getting sick of me talking about the monopoly utility provider in my local province, but the reality is that it has not been very cooperative in terms of giving people alternatives for energy provision. So I'd like to know at what height those feed-in tariff rates have had to be applied in order to encourage development.

Then, Ms. Wörlen, you talked about how they have been decreasing gradually. I'd like to know where they are right now and at what point you think they won't be a factor anymore. Have you reached that point in your country?

I'd also be interested in having our Swedish guests speak to that as well.

Dr. Christine Wörlen: Actually, they go down, not up.

Mr. David Anderson: What rate do we need in order to encourage development?

Dr. Christine Wörlen: There were a number of questions. Let me give you the last answer first.

It depends really on who you want to incentivize and what the framework conditions are that they must meet. I think as I mentioned and tried to emphasize earlier, it's not only the level of the tariff that is an incentive. If you give them a stable, long-term framework, this will already be a big help. So you tell them who has the obligation to connect them to the grid, what grace period the grid operator has, how long they have to wait until the grid operator takes action, whether they have to wait at all, and whether or not there are response periods that are tolerable.

Grid codes are, for example, often a point of debate. So if there is a clear grid code, if everybody knows what technical demands a plant has to fulfill, that saves a lot of time and transaction costs. So there are non-monetary factors that a regulator can put in place in order to make the process easier.

In terms of the absolute height, I would have to pull up those rates somewhere, because, as I said, they change every year. They are different according to each technology. They vary according to, for example, plant size in terms of photovoltaics, as they do under the Ontario scheme.

For wind, they depend on each single location, so the quality of the wind in a specific site is measured, referenced against the benchmark, and then also the tariff is referenced against the benchmark. So it's not a simple, straightforward answer. Wind, on average, reaches tariffs that can also be achieved on the power exchange, so the average tariff is not much higher than it is on the power exchange average. But for the others—biomass as well as solar photovoltaics—the tariffs are much higher. In fact, for solar photovoltaics, they are in the range of 40 euro cents per kilowatt hour.

The retail tariff for household consumers on average in 2007 was 20.6 euro cents per kilowatt hour. So that, too, is much higher than it is in Canada and most places. That retail tariff contains a significant share of taxes and fees that are put on top. Of this, the actual cost of transmission and the generation of electricity is 12 euro cents per kilowatt. So the end-of-the-pipe price, the delivered price of the utility, is around 12 euro cents per kilowatt hour. All the rest is charges and fees put on top by the government.

Did that answer all your questions?

● (0950)

Mr. David Anderson: Part of it. I'd like to hear from our other guests too.

I'm just wondering, you're talking about all the things that need to be done. In terms of employment, can you give me the numbers on what number of employees are bureaucrats who are trying to run the system and what percentage of employees are involved in the industry, in developing it, because it seems as if quite a structure has been set up here to try to support the industries?

Dr. Christine Wörlen: No, I don't think so. If you look on the slide—you have it in the lowest bar—I think the number is something like 4,500. And this is not only bureaucrats, this is also NGOs, a whole infrastructure of outreach people. They're not all government-funded, these 4,500, people like me.

The Chair: From Sweden, do one or both of you have an answer to that question?

Mr. Peter Öhrström: I find it very difficult to answer because the terms vary all the time, especially in electricity. In Sweden, we have a trade market for electricity, so all the electricity goes to this trade market and the price is set based on the top price of the most recently produced kilowatt hour of electricity. This means that it differs all the time, depending on what the production system looks like at the moment.

But in general you can say that one-third of the price is the electricity, one-third is taxes, and one-third is the distribution costs, the transportation, according to the grid.

And the price is for renewable energy. You can buy renewable energy or renewable electricity, but the payment normally is a little bit higher priced, but that's more like an incentive for this production.

There is no real level that you can say because it varies all the time.

Mr. Arne Sandin: What you could say is that the markets are demanding a lot of renewable energy in Sweden or in Scandinavia. It's popular among the companies in Sweden to buy renewable energy, which means they are prepared to pay a little more than they do traditionally, and then use it in the marketing of the company. So it's a way of living by example from the company. All environmental aspects are a big issue in Scandinavia these days, so a good company uses renewable energy and uses that in its marketing. So they are prepared to pay some more for it.

Mr. Peter Öhrström: But when it comes to district heating, the prices are set every year. So it's once a year, and then the price is set for all the year. It's quite different. And these prices are set locally, so every operation sets its own price.

The Chair: Thank you.

Thank you, Mr. Anderson.

We go now to the five-minute round.

Mr. Tonks, for up to five minutes. Go ahead, please.

Mr. Alan Tonks (York South—Weston, Lib.): Thank you, Mr. Chairman.

Thank you so much to our witnesses.

The committee has been studying integrated energy systems, and I'm sure the members of the committee.... I certainly am impressed with the integration of the legislative framework and the cooperation that appears, on a strategic basis, to be between local authorities, transmission operators, and the other levels, the regional or provincial or whatever the equivalent levels of government are in both Germany and Sweden. I'm very impressed with that.

You have talked about the technology matches with residential and industrial parts of the economic sector. Are there any patterns or examples of how transportation, public transit—intra-urban, inter-urban—fits into the integrated energy format in both countries' experiences?

Mr. Chairman, as part of that, in Canada, in specific urban areas, there is a large environmental drive to electrify our old systems, diesel-driven systems and so on.

● (0955)

The Chair: Would any one of you like to answer?

Mr. Peter Öhrström: I'm not sure if I really understood the question. Are you talking about the integration between the municipalities' expansion and this different system of housebuilding, the integration between the use of energy and the supply of energy? Is that what it's all about?

Mr. Alan Tonks: Not quite. That's an easy one, because as we move to electrification there's an opportunity to drive that by new technologies, as opposed to simply building more coal-fired plants and reaching out for nuclear. For example, there's a move to look at wind power in terms of putting that into the energy grid to take the pressure, if you will, off our fossil fuel plants. That kind of strategy... is there anything similar in both Germany and Sweden?

Dr. Christine Wörlen: Maybe not with the integration with public transit, but in Germany we definitely see that wind is intermittent, and the intermittency is a big strain on the medium-level voltage grid, the 110-kilowatt grid. Often wind turbines have to be shut down because the grid is overloaded. However, there are definitely big research and pilot projects that look into whether there is an opportunity to store that surplus electricity on site, either in terms of batteries or as electricity, or chemically, or in terms of hydrogen, and then link this with the mobility sector. So all the big utilities in Germany are now doing projects together with the big car companies in Germany in order to investigate these opportunities. As well, some smaller companies and experts are trying to integrate locally.

A good option for this is car fleets of companies, such as delivery companies, but I don't know of any experiment in Germany where they try to combine this with public transit. Electrification in Germany is basically...I don't think they electrify any more of the tracks, but of course Germany is much more densely settled, so a lot of that has already been done in the past.

Mr. Alan Tonks: Is there another response from the Swedish group?

Mr. Peter Öhrström: Yes. There is quite a big public interest in Sweden as well, and it is still going on. We can see, as with the figures I told you about earlier, that we are using a lot of biomass in order to reduce the carbon dioxide emissions, and this is a huge transformation in the basic systems of electricity and heating production. We can also see biogas coming up as a fuel for cars and so on, and there is also an interest globally for electric cars. But biogas is also something that is going on quite a lot. Incineration, the use of waste in an incineration system...these incineration systems are integrated in the district and electricity production system. We produce electricity and heating in cogeneration plants from waste.

Then we have wind power, of course. There is a huge development of wind power in Sweden. The wind power system in Sweden actually works out well because we have hydro power to 50% and hydro power is very easy to regulate. So the differences in wind power can be regulated with hydro power.

● (1000)

Mr. Alan Tonks: I have one very short question to Madam Wörlen. What is the percentage of the GDP that comes from wind power as compared to, say, the auto sector, as a benchmark? How do the two compare?

Dr. Christine Wörlen: Well, you definitely do not want to compare it with the car industry, which is still many orders of magnitude larger in Germany than wind power. I don't have the exact figure; I can pull it up for you.

But definitely there is a move, for example, for the established machine-building industry, which we have a lot of in Germany, to also diversify into wind, and this also affects the car industry. The car industry has definitely woken up to the call for new technologies. They have been asleep at the wheel, literally, for the last 30 years, or they have actually tried, with lobbying efforts, to prevent any kind of change in this area. Now in the last year or so they have been frantically waking up and seeing that they need to change something in their technologies. So they are now really kind of queasy and uneasy about having maybe slept too long and not having developed enough. There will definitely be a whole new force in this area in Germany.

Let me brainstorm some more about integration. There are a number of other opportunities for integration, and particularly the integration of renewably generated heat and cooling. You can actually use heat for air conditioning and reduce your cooling load with that. So that is one option where you want to integrate or think about integrating. There is also the question of heat storage. In terms of the overall system in Germany, we used to look at the electricity sector, at the transportation sector, and at the heat sector separately. With these new technologies we will have to look at it in a much more integrated way, but on a national level and not so much on a single-cost level only.

Mr. Alan Tonks: Thank you so much.

Thank you, Mr. Chairman.

The Chair: We will go now to Mr. Cullen, from the New Democratic Party.

Go ahead, Mr. Cullen.

Mr. Nathan Cullen (Skeena—Bulkley Valley, NDP): Thank you, Chair.

My apologies to committee members and witnesses. I have to run to the House in a little bit.

I have a question for you, Mr. Wörlen, about local community input. In my province of British Columbia right now there is an attempt to make a great deal more energy happen from renewables, but there is a lack of policy directive or a policy envelope that allows local input or any decision-making. I know Germany has had this large expansion. What attempts were made to involve local citizens in the placement and location of some of these projects? Or was it done entirely by the state legislature, to the exclusion of the local?

Dr. Christine Wörlen: No, this whole wind movement was a bottom-up movement. It was a garage industry and it grew.

In the 1990s we had a whole movement called the citizens' wind park, where we had problems with the acceptance of wind parks in local communities. So the project developers went out and tried to sell shares in the wind parks to the local communities. That worked very well because people were suddenly happy when windmills were turning. Where formerly they were complaining about fluctuating shadows and noise, they now literally heard how their money was being generated in these wind parks. It was their wind park and it was a share. So this was definitely one movement that came across very well.

Maybe my colleagues from Sweden also have some examples.

Mr. Peter Öhrström: I agree. There has been a big movement among the people.

We have also seen that by providing a good example. We have had authorities coming in and helping with the pilot projects and showing how things could be done. Once they see it and see that it works, that it can be profitable, then they get interested in this new technology and the new way of producing energy or reducing the usage of energy. This starts the movement, according to the environmental aspects. It is driven by the market, actually.

Mr. Arne Sandin: We have a few examples in Sweden where cities are referring to themselves as sustainable cities, where government or local politicians or administrations have performed studies of how to make a sustainable city in a local way, taking in things like heating, electricity, water, and how to use waste.

That is really a big thing here in Sweden and it makes big groups of ordinary citizens interested in how the cities and how the environments are planned in the future.

That's one way of making....

● (1005)

Mr. Nathan Cullen: I have a question for Ms. Wörlen.

With respect to the feed-in tariffs that you talked about, this is something we struggle with in Canada with many of the utilities: the guarantee of price. You talked about people being able to buy into shares of local energy production. I assume that was also connected to the feed-in laws and the tariffs that were made available for communities to go out and borrow money or finance these projects.

How critical was that component in allowing for, first, local commitment to the projects, but also to the projects themselves, those feed-in laws for local power generation?

Dr. Christine Wörlen: It's inseparable, because the feed-in laws give the certainty to small business people to know how the business will run. As I said, the uncertainty is taken out of the business plan, which helps a lot.

Of course, utilities were fighting this tooth and nail.

Mr. Nathan Cullen: We share that experience with you, then.

Thank you very much, Chair.

The Chair: Thank you, Mr. Cullen.

We now go back to the government side, to Mike Allen for up to five minutes.

Mr. Mike Allen (Tobique—Mactaquac, CPC): Thank you, Mr. Chair, and thank you to our witnesses for being here.

I'd like to start my questions with what we call our rural-urban divide, given that Canada's population is somewhat spread out over a very large area, as opposed to that of Germany and Sweden.

Also, I read in the brief from Mr. Öhrström and Mr. Sandin that the prime markets right now are the U.K. and Canada, as they believe these two countries really are interested in the experience gained in Sweden.

Can you tell me what challenges Canada might expect when developing integrated energy systems because of the size of our geography, as opposed to what you saw in Sweden and Germany?

Mr. Peter Öhrström: Yes, we actually have some similarities with you because even if Sweden is a much smaller country, still it's not densely populated. We have quite long distances between our cities and villages as well.

The systems we have are locally based. We have district heating systems based on the local sources. We use energy sources from the neighbourhood. Either it's wood that we use, the biomass, or if we have geothermal opportunities, we use heat pumps and bring energy from the ground. If there is a big incineration plant, we use that. Especially if there are big industries with waste heat, we use the waste heat.

So it's always the opportunity of using the local possibilities when developing new energy supply systems to integrate between the supply and the demand.

Mr. Mike Allen: What have you found as the optimum geographic area for implementing one of these systems—just in square kilometres or something of that nature? Do you have an optimum?

My second question is on one of your comments that in your systems you see over 75% to 95% of your municipal buildings and other public buildings on your district heating systems, and for small houses it's 12%.

I'm just trying to figure out whether you have an optimum geographic size and whether you expect to be able to get more homes onto your district heating systems.

Mr. Arne Sandin: Actually, when we started with district heating in Sweden, the bigger building was the target, and it was municipally built, so often the bigger buildings, hospitals, were the first ones to participate in the system. In the last 10 years we've actually been connecting smaller facilities to the system, and it's growing larger in every proportion.

I don't think it was the strategy, really. The strategy was to connect the bigger buildings first, and the market has asked for even the smaller buildings to be connected, because of environmental reasons but also because of price, because oil and gas in Sweden is quite heavily taxed and they saw an opportunity to get a lower price for their heating by using bio.

I would say there wasn't really a strategy for it. If you were to build it somewhere else, you should have a strategy for it and you should, as Peter told you, go by the local possibilities. You can use almost anything for this system, so in a small way you can build it for 100 buildings, or you can build it for 10,000; it's just the possibility of getting fuel for it.

● (1010)

Mr. Peter Öhrström: We are actually talking about heat density. It's the number of kilowatt hours per square meter of ground. So the dense areas are most interesting for district heating, as the distribution system is a large investment. So the distribution grids for small houses become quite costly. Also, due to the expansion of nuclear power in the seventies, we had an excess of electricity in the seventies and eighties, which was put out to heat small houses. They are not as easy to convert to district heating. More often they are direct heated, as we don't have the water system for distribution within the houses. That's the problem. It takes some time.

The Chair: Thank you.

Thank you, Mr. Allen.

We'll go back to the Bloc Québécois for up to five minutes, and Madame Bonsant.

[*Translation*]

Ms. France Bonsant (Compton—Stanstead, BQ): Good morning, Madam; good morning, gentlemen.

Ever since you began your presentations, I have been asking myself one question. Biomass generates 42% of your energy. In your countries, how do you manage to conserve biomass and protect your forests?

[*English*]

Mr. Peter Öhrström: It was not really the electricity, but district heating, that was based on biomass—but quite a lot of the electricity as well. But the major portion of electricity production is based on hydro power and nuclear power. But still, we have an increasing amount based on cogeneration and biomass. We have biomass in Sweden, as we have a lot of forests. So there is an opportunity to use the residues from the forestry industries for this energy production, and that is what we are using.

[*Translation*]

Ms. France Bonsant: Ms. Wörlen.

[*English*]

Dr. Christine Wörlen: In Germany we are definitely limited by the amount of biomass we can generate locally. We do have a significant forestry industry, but we use much of the biomass for heat. As you can see from the slides, 84% of our renewable heat comes from biomass. Most of that is wood. It's either residues or it's wood taken out of forests in a sustainable way by small-hold foresters, and it's mainly informal, too. But there is also a global trade in pellets, a processed type of fuel wood, which can be fed into these ovens automatically, making them easier to use. So there is global commodity trade in pellets and it's not all German wood that we use.

[*Translation*]

Ms. France Bonsant: I know that your countries are densely populated. But I have communities of 112 people in my constituency. So it is a little complicated to try to manage that.

Have you felt any resistance to change from people? By change, I mean substituting renewable products like biomass for oil. Were your people ready to make this change?

● (1015)

[*English*]

Dr. Christine Wörlen: I think people, particularly in rural areas, like to have their own stoves with wood. From friends of mine who also live in these areas, this is my impression. They prefer wood.

Mr. Peter Öhrström: In Sweden we do have small district heating plants for small villages. They are very common in Sweden. Small villages with small plants—not cogeneration, but just heating plants—supplying local villages with heating. That is very popular in Sweden and has been increasing a lot. People prefer to have this kind of centralized system, because it's easier than having your own stove.

[*Translation*]

Ms. France Bonsant: Have you thought of establishing a kind of community wind generation that can supply villages and communities of 600 people, say?

[*English*]

Mr. Peter Öhrström: Yes. We have such cooperatives. We have cooperatives that put up windmills. You can buy a share in the windmill and you have a very low electricity cost, but you have invested in the plant.

Dr. Christine Wörlen: In Germany you would not produce electricity for just one village, because all the villages are connected to the grid. There's basically no area that is not connected to the grid. So you produce it in the villages, and it goes into the national grid and then goes where the use is.

Mr. Peter Öhrström: In Sweden it is the same thing. We have a national grid and an international grid. But you can do that anyway because it is just a question of metering and counting. The amount that is produced within the windmill is counted, so you can use the same amount for your house. That is possible, although it is a national grid.

[*Translation*]

Ms. France Bonsant: In a totally different area, I know that Germany really loves its little Volkswagen cars. Are your automobile factories engaged in research and development with a view to making more electric cars, buses and trains?

[*English*]

Dr. Christine Wörlen: Actually one of our most important train manufacturers here is Bombardier. Volkswagen is just looking into going into electric and also hydrogen. It is the same for Daimler Benz and BMW. They are all looking into new drive trains and new ways of being mobile.

Mr. Peter Öhrström: There is no difference in Sweden. We still have Volvo and Saab in Sweden, although the Americans own them now. But they are also looking into electricity and new ways of making this happen. We already have electric trains in Sweden.

The Chair: Thank you, and *merci*, Madame Bonsant.

We go now to Mr. Trost, for up to five minutes.

Mr. Bradley Trost (Saskatoon—Humboldt, CPC): Thank you, Mr. Chair. Let me express my appreciation to our guests for visiting us via television. I have had the privilege of visiting Sweden, and I have spent a couple of months in Germany over the years. Once upon a time my German was even quite respectable. It was spoken by my grandparents quite a bit, and even by my parents. It is still their first language.

I guess I have a variety of questions. One of them starts with different countries having different sorts of energy mixes, backgrounds, and resources. It seems, gathering from other comments, that Sweden is independent on electricity, heating, and energy, and Germany a little bit more, not as endowed with as much natural resources.

My question is this. Are your countries energy-independent in the electric market? I know natural gas is imported all over western Europe. Mr. Putin has made that very clear over the years. But when it comes to electricity, is Germany self-sufficient? Is Sweden self-sufficient? Do you rely on other countries? If so, in what sense? If not, how have you made yourselves independent?

● (1020)

Dr. Christine Wörlen: Germany is a net exporter of electricity and produces somewhat more electricity than it consumes. However, in terms of the resources that go into that production of electricity, everything comes from abroad. Let me correct that. We have some power plants that run on lignite, which is a very low-grade type of dirty fuel, coal. These are the only fossil fuels in a significant amount that we can take from within the country. A share of about 10% of our natural gas demand is also covered from domestic sources. Everything else, all the rest of the natural gas, all the rest of the coal, the hard coal in particular, and all the rest of the uranium, is imported.

Mr. Peter Öhrström: Self-sufficiency is actually not easy to answer because it is a question of time. You have peaks of demand and you have the normal level of demand. In terms of the net over the year, the net import and export, I would say Sweden normally is a net exporter of electricity.

But during peak times we may import, especially since the system is integrated with Europe. Sweden is integrated with, for example, Germany. That means that if the production cost is lower in Germany, then the German production plant supplies Sweden and vice versa.

So it is an integrated system. It is not really any more a question of —

Mr. Bradley Trost: To summarize, European integration of the electrical system is very important. That would be a correct summary, then?

Mr. Peter Öhrström: Yes.

Mr. Bradley Trost: My next question is on balance of sources for electricity. It comes from a situation we have in Alberta, where they have expanded their electricity generated from wind, but they're beginning to bump up to limits as far as balancing in their system, balance on the electrical grid, because of the intermittent nature of wind. So here is a very broad question. How do Sweden and Germany try to find the optimal mix of various technologies to balance it out?

I know and understand that wind mixes very, very well with hydro and it doesn't mix quite as well with coal or other things. One, how do you find the maximum blend of sources for electricity? Two, is there an ultimate limit you view as possible for renewables, at which point renewables will tap out and no longer become practical?

Those are my two interrelated questions.

The Chair: Who would like to answer that?

Dr. Christine Wörlen: I can go first.

In Germany I think, in the very long run, technology will solve it. We have very ambitious targets of building renewable energy plants. The government has just said it wants to build 50% of electricity in 2030, but we know that today already we have trouble integrating this electricity into the electric grid we have now. We now have 14% on an annual average.

The only way to solve it is to develop new technologies, to develop storage technologies, to develop integration with, for example, electric cars or electric mobility. In Germany I think this is seen as a positive challenge in terms of being a technology leader and developing new technologies that help overall solve the problem of both energy security and climate change.

It's policy that tells us where to go and industry that follows.

Mr. Peter Öhrström: When it comes to the wind industry and the electricity grid, so far it's not really a problem because wind production is way too small in comparison to hydro power in Sweden. So it's not a problem to balance.

There is electricity quality as well, so there is a lot of research in developing smart electricity grids. This is basically done because we want to be able to get more wind power into the system because the wind power is much more difficult to regulate due to the quality of the electricity. The smart electricity grid is one of the reasons. So it's new technology, yes.

The second question I didn't get, actually.

● (1025)

Mr. Bradley Trost: Do I still have time left, Mr. Chairman?

The Chair: Actually, no, Mr. Trost. We don't have time to go back to that. We have about five minutes left.

Mr. Tonks, if you could take about four minutes, then Mr. Anderson has time for one question.

Mr. Alan Tonks: Madam Wörlen, we're very proud of Bombardier here. They have been running some very creative ads. With your permission, I'm going to suggest they should have a little clip that is a repeat of your comment with respect to Bombardier.

Dr. Christine Wörlen: No, please don't.

Mr. Alan Tonks: Okay.

A large component of our energy production is from incineration. There was a comment made, and I'm not sure whether it's in both countries' experience, that incineration has increased with respect to the percentage of the energy components. In Canada, we're having a great deal of opposition to incineration—at least in my area, which is an urbanized area in Toronto. Could you just outline a little how incineration fits into your overall energy strategy?

Mr. Peter Öhrström: To the strategy, it's very easy because we have waste, garbage, which is a problem. It has to be dumped somewhere; you have to get rid of it. Incineration is a way to get rid of the problem and at the same time produce electricity and heat. If you can do this in an environmentally good way, then this is the best way for society.

The emissions from these modern incineration plants are far less than from a dump. You get problems from a dump, but from the incineration plants you have less emission than you have from a dump, so you reduce emissions, you produce electricity, and you produce heat. So what's the problem, actually?

Voices: Oh, oh!

Mr. Alan Tonks: I would invite you to come and listen to the problem.

Dr. Christine Wörlen: We had the public acceptance issue in the 1970s and 1980s. In the 1970s our dumps filled up, and we didn't have any more space to add any more, so there was a move to incineration in the 1980s, which stopped in the 1990s because the public opposition was too strong. The government turned to a very detailed and intricate system of recycling. Now we have very low rates of waste that actually have to be dumped. We might have a trash export problem. It's something that's not very openly discussed, so I'm not sure there is none, but there might be one. But we also have very intricate recycling systems.

Mr. Alan Tonks: Mr. Chairman, I don't think I framed the question with respect to the percentage of GDP isolated to wind power.

What percentage of the GDP does the total green technology envelope represent in each country in terms of machinery and applications and interfaces?

Dr. Christine Wörlen: Every time I look at that number I see that it is disappointingly low, but I couldn't quote it for you, unfortunately. I can pull it up for you.

Mr. Peter Öhrström: Unfortunately, we don't have the figures from Sweden right here. I'm sorry.

The Chair: If you could get it to the clerk, that would be very helpful, if it's possible. Thank you very much.

We'll have one final question from Mr. Anderson. Go ahead, please.

Mr. David Anderson: Because biomass is so important to both of you in terms of both energy and heating, I wanted to ask you what types of systems are prevalent in your countries, and of those, what percentage are a non-polluting closed loop? Also, what percentage of them would have some of the issues, such as dealing with the by-products?

The Chair: Who would like to start with that?

Dr. Christine Wörlen: I couldn't tell you the percentages of the different types. Germany has almost everything: biocombustion in power plants, biocombustion in smaller plants, heat plants combustion, single ovens of solid biomass, combustion of liquid biomass in stationary plants, combustion of liquid biomass in mobile units, and transportation. But Germany also has a specific avenue, which is biogas production in anaerobic fermentation combined with local CHP. This is something that is supported both through the CHP support system and through the renewable energy support system. These two incentive systems make it very attractive, and the largest part of the electricity we generate from biomass comes from this type of technology. Most of the plants are located on the farms, so farmers take very well to that.

But I couldn't give you the numbers, because it's always difficult to add up all these different types of biomass and forms of bioenergy.

● (1030)

Mr. David Anderson: Are you saying that 45% of your energy comes from biomass, but most of it is produced in small locations?

Dr. Christine Wörlen: The 45% was for Sweden.

Mr. Peter Öhrström: I don't have the figures or the percentages for different types of plants right here, but we could probably get it pretty easily, so we'll hand it over. We use biomass in huge cogeneration plants—producing some 300 megawatts of heat and so on and maybe 120 to 150 megawatts of electricity—down to the smallest boilers, all sizes.

Dr. Christine Wörlen: Germany covers only 5.1% of its primary energy with biomass.

The Chair: Thank you very much to all three of you for being with us by teleconference today, Dr. Wörlen from Germany, and Mr. Sandin and Mr. Öhrström from Sweden. We do appreciate it, and this information will be very useful as we write the report for this study on integrated energy systems. So thank you very much.

We will briefly suspend the meeting and come back in about two minutes.

[*Proceedings continue in camera*]

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