



Building Sustainable Communities: The Danish Experience

Presentation given by John Loucks, EDA Chair

The growing urgency of climate change has led many of us in the energy industry to think increasingly about green energy. As electricity distribution companies in Ontario we have a significant role to play in building a green future. To find out what our role in a green future could look like we took a trip to the land of modern windmills, home to more than 5,000 wind turbines and a thriving green economy, the country of Denmark.

Denmark started investing in renewable energy in the 1970s in order to develop a secure source of national energy. Since then Denmark has gained worldwide recognition as a leader in green energy. It is renowned for its innovations in green technologies, its progressive energy policies and its success in promoting a conservation culture. Today the country produces 130% of its own energy needs.

Denmark is now focusing on reducing its reliance on fossil fuels. Wind turbines already supply 26% of the electricity in the country. But in order to meet its goals on greenhouse gas reduction, Denmark aims to increase its wind production to provide 40% of its electricity by 2020.

As representatives of local electricity distribution companies in Ontario, and Board members of the Electricity Distributors Association, we went to Denmark to strengthen our vision of a green future and to see what role we can play in building the sustainable communities of tomorrow.

We wanted to know how the Danish energy industry overcame some of the obstacles we face today in Ontario. Obstacles like the intermittency of wind and solar energy and how to address NIMBYism, the not-in-my-backyard attitude that can paralyze and impede progress.

Not only did we find some answers to these questions, we also discovered other exciting possibilities in working with renewable sources. We brought back much food for thought to inspire locally relevant ways in which the electricity distribution companies of Ontario can participate in the emerging green economy, and contribute to building a green future for our province.



Here, the operator of Morsø Bioenergy, is explaining to me that the Germans have supplied the plant as completed high technology in a number of containers that simply had to be put together, as we do with Lego bricks

The waving arms of wind turbines dot the Danish horizon. They are everywhere. While a few industrial type wind farms do exist, most turbines in Denmark are scattered throughout the country in groups of three or four. From our perspective, they complement the landscape and are not intrusive.

Less visible are the exhaust stacks of the Combined Heat and Power Plants. While not as conspicuous as wind turbines, these district heating plants are equally important to the production of renewable energy. In addition to being a stand alone source of heat and power, these CHP or district heating plants help balance the intermittent energy output of the wind turbines.

When there is too much wind in the system the CHP plants keep the grid balanced through down regulation. Rather than turning off the wind turbines in such situations, some of the CHP plants are able to use electric boilers to store excess electricity as thermal energy. This thermal energy can then be used as needed by the district heating system to provide heat for homes in the community. When the wind doesn't blow and additional electricity is required, some CHP plants are started up by the Danish system operator as up-regulating generators. One plant we visited specializes in up-regulation and runs for only 50 hours each year! This plant was operated on fossil fuels. But running for only 50 of the 8,766 hours in a year its emissions were more than offset by the renewable energy generation it supported.

Unlike this plant, however, most CHP plants we visited supplemented their use of fossil fuels with renewable sources and generated heat and power throughout the year on an ongoing basis. One CHP plant supplemented its natural gas generator with solar energy. When it was constructed the solar thermal array was the second largest in the world. We arrived late in the afternoon and even though the sun was getting low, it was still generating 2400 kW of a peak 6000 kW capacity. That's enough energy to heat 3,800 Danish homes!



The Canadian delegation, together with the program organizers, Preben Maegaard from the Nordic People's Centre.

The 8000 square meters of solar panels were mounted in rows in a field adjacent to the CHP facility. The grounds in and around the solar panels were very well maintained. Upon closer investigation we observed the ground maintenance staff was a herd of sheep! Their grazing ensured the grass never got long enough to cast shade over the solar panels. By using solar power in combination with natural gas, the plant was able to reduce its CO₂ emissions by 1,570 tons per year and reduce its reliance on expensive natural gas. Due to the success of this technique the owners plan to double the size of their solar installation in the next few years.

The value of CHP plants to green energy became quickly evident to us. They stabilize the intermittence of wind energy, and supplement fossil fuel use with renewable sources. Their value to a green future was even further emphasized when we saw the possibilities they created in partnership with other businesses.

One full time CHP plant we visited was a biogas plant owned by a farmer's cooperative. Using the manure to produce biogas the CHP plant created multiple revenue streams from the innovative business venture. They sold heat as well as electricity. The residual solids are expected to find a market with fertilizer companies, and the treated manure is returned to the farmers to be spread on fields. By shipping manure off their farms, the owner-farmers reduced the need for environmental waste management. This plant produced up to 70% of the heat for its island community.

We also visited a large green house operation that used a natural gas CHP plant to heat many acres of greenhouses. The owner was able to reduce the CO₂ emissions from the natural gas by using scrubbing technology to extract CO₂ from the stack emissions. The extracted CO₂ was then used to grow tomatoes. The CO₂ accelerates growth time, allowing farmers to arrive faster and more often to the market ... this greenhouse was a green solution that pays real dividends!

We found that Denmark is slightly behind Ontario in implementing a smart grid system. But this has not stopped them from integrating renewable energy generation into the grid all over the country. One distributor we met was able to incorporate large quantities of renewable sources into the grid without extensive smart technology. Instead he emphasized that it was important to understand the up/down regulating processes, to implement effective system monitoring software, and have good people in the control room to react to the information on a real-time basis. For now, the Danes are capable of balancing the system with only a few strategic smart grid components on their distribution networks.

Coming from Ontario, where strict guidelines determine the distance at which power plants and wind turbines must be located, we were surprised to find a CHP plant right beside a school. In fact, they shared a driveway! The plant's engine was painfully loud when we were inside the plant examining its facilities, but nothing could be heard outside. Nothing but some birds, children playing and, of course, the occasional sound of a car going by.

Wind turbines were also placed in surprising locations. They were close to houses, near schools, in urban areas and barely off shore in water where people swam and sailed. We were assured that there have been no reports of health concerns from people living in close proximity to turbines. The northwestern municipality of Thisted provides a good example of this. Thisted has 285 wind turbines scattered throughout an area that is less than 100 km x 15 km. With a population of 50,000, most people in Thisted live close to a wind turbine. They take great pride in their renewable initiatives. They are a municipality powered 100% by renewable energy.

Of course, cases of NIMBYism are also present in Denmark. Middlegrunden project, an off shore wind facility of 20 turbines, is located just off the shore of an urban beach in Copenhagen. When the project was first proposed it received a lot of resistance. Much of this resistance melted when the decision making power was shared with the public through a cooperative system of ownership. A great deal of resistance to the turbines had to do with the unsightly view of the grid configuration in which the wind turbines were to be placed. Seriously considering such criticisms, the turbine configuration was re-designed into a gentle arc. Placed in this configuration the turbines look more like a sculpture than an industrial installation, and have become a striking landmark in the Copenhagen harbour.

Denmark has been developing modern green energy resources since the 1970s, while Ontario is taking its first steps towards a greener future. Our policies, history and resources differ from those in Denmark, but there are many ideas that we can take away from our Danish experience and adapt to an Ontario context.

The relationship between CHP plants and renewable energy is one such idea. CHP and renewables work well together to reduce reliance on fossil fuels, and to balance the intermittence of renewable sources through up and down regulation. The presence of CHP plants in our system would support and encourage wind and solar power generation, which in turn will support and encourage the further proliferation of CHP plants.

Considering the aesthetics of our renewable energy installations is another idea to bring home to our local communities, as is the potential to allay the fears of neighbours by directly engaging them in planning and implementing projects. Green energy development in Ontario may take a different path to Denmark, but these are great ideas to help us along the way.

As local electricity distribution companies in Ontario, we must strive to strengthen the collective vision of the entire industry. Everyone we spoke to in the energy industry in Denmark, whether a distributor, generator or a technician, was cognizant of and invested in green energy. They were all pulling the industry in the same direction. Their commitment to a shared vision of a greener future was clear and inspiring.

A common vision on green energy and a green economy exists across the political spectrum in Denmark, and forms the backbone of their industry. In Ontario, we should demand the same from our political parties. As local electricity distributors, we can begin to educate ourselves and others on the need to mitigate global warming, and build a green economy by building a greener energy system. We know it is possible, we saw it being realized in Denmark.

It was inspiring to see what Denmark has achieved in thirty years. The work before us is daunting, but we too are building a long-term vision. With ideas and examples from Denmark and elsewhere, we can create a green future that works for Ontario.

To realize our vision of sustainable communities tomorrow, we need to start working towards making our industry sustainable today.