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CASE STUDY

Case Study

Clean Energy

Three lessons for cities in Denmark's clean-energy revolution

To find the world's most aggressive clean energy targets, look no further than Denmark. The city of Copenhagen is working hard toward meeting a pledge to become carbon-neutral by 2025. A much smaller municipality near the German border, Sønderborg, wants to do the same by 2029.

Denmark's clean-energy revolution

¨Many of Denmark's windmills are partially owned by individual investors in the community, which helps to fund projects while tempering opposition.

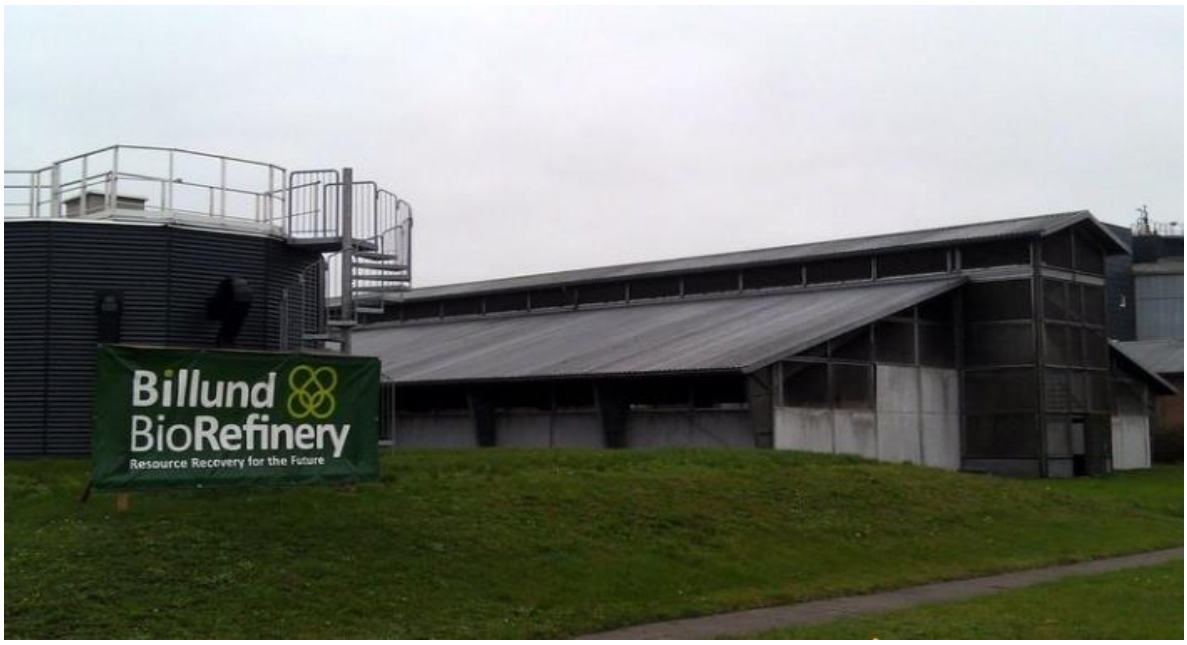
The targets are not onerous national mandates imposed on unwilling local governments. Instead, in a mutually reinforcing cycle, robust action by municipalities to cut carbon and add clean energy to the grid begets ever-more ambitious policy at the national level. By 2020, at least half of Denmark's electricity will be supplied by wind turbines. By 2050, the country intends to be free of fossil fuels… There is much city leaders across the globe can learn from Denmark, both in terms of novel clean-energy solutions as well as the creative thinking behind them. Here, distilled from the book, are three lessons Denmark has for cities around the world.

1. Unleash the creativity of public-sector entrepreneurs

Some of the most creative capitalists I've ever met work for Danish municipalities. Take Billund Vand, for example. Billund Vand is a local water services company owned by the municipality of Billund. For the past 16 years, the company has steadily improved its ability to make use of a renewable resource — wastewater — viewed nearly everywhere else as a problem to be managed. In particular, Billund Vand uses something called a bio-digester to turn wastewater and other organic material into fertilizer, heat and electricity.

There was a hurdle, however: Danish law does not allow drinking water or wastewater treatment providers to earn a profit in the delivery of those services. So Billund Vand spun off a second company called Billund Energy. The spin-off can make a profit selling surplus electricity, and by providing consulting services to municipalities in Denmark and beyond. The model is a win-win: Clean power is delivered to the electrical grid and customers enjoy rates that are 50 percent lower than elsewhere in Denmark.

The Billund BioRefinery near Grindsted, Denmark, turns wastewater into electricity



Source: Justin Gerdes

Another example of public-sector entrepreneurship comes from the village of Dronninglund. Like most of Denmark's cities and towns, Dronninglund has a "district heating" system — buildings get their heat from hot water or steam pumped through a vast network of insulated pipes. In Dron-

ninglund, members of the local heating co-operative voted to establish what was until recently Denmark's largest solar district heating plant.

Previously, Dronninglund relied heavily on natural gas to heat the water in its district heating system. Now, 40 percent of the energy comes from the sun, avoiding Denmark's high taxes on fossil fuels. This works best during the summer months when the Nordic sun is strongest, but Dronninglund went a step further to extend the solar plant's usefulness late into the year. Water heated by the sun is pumped into a retired gravel quarry lined with plastic. The water from this storage pit can be used to heat homes and businesses well into the fall and early winter. Customers are saving hundreds of euros annually on their heating bills while simultaneously slashing the village's carbon footprint.

2. Reap the efficiencies of district energy

District heating systems like the one in Dronninglund are an indispensable element of Denmark's energy transition. Almost two-thirds of Danish households are connected to such systems; in Copenhagen, the world's largest district heating network serves 98 percent of the city's buildings. Copenhagen also has launched a district cooling system that draws cool water from the city's harbor to pre-chill water destined for buildings with large cooling loads. The city estimates district cooling reduces electricity consumption by 80 percent compared to conventional air-conditioning.

Denmark's decision many years ago to deploy these kinds of shared heating systems represents an advantage. District systems are more efficient than the more common model of having every residence or business provide its own heat. District systems like Denmark's are common in a handful of European countries, including Sweden and Finland. In the United States, district energy systems are often used to heat and cool college campuses.

Insulated pipes below Copenhagen provide heat to 98 percent of the city's buildings

Source: Justin Gerdes

Growing cities can replicate Denmark's model by planning for district-heating systems in new neighborhoods. This is something Vancouver is doing, as Citiscope reported in 2014.

Making such systems solar powered — like the one in Dronninglund — represents an exciting new frontier. Dozens more solar systems have been installed or are in the works across Denmark. Neighboring Germany, hungry for low-carbon heating solutions, is a likely market for the technology. And if solar-powered systems can thrive in cloudy Denmark, there's no reason the sun's power can't be deployed elsewhere.

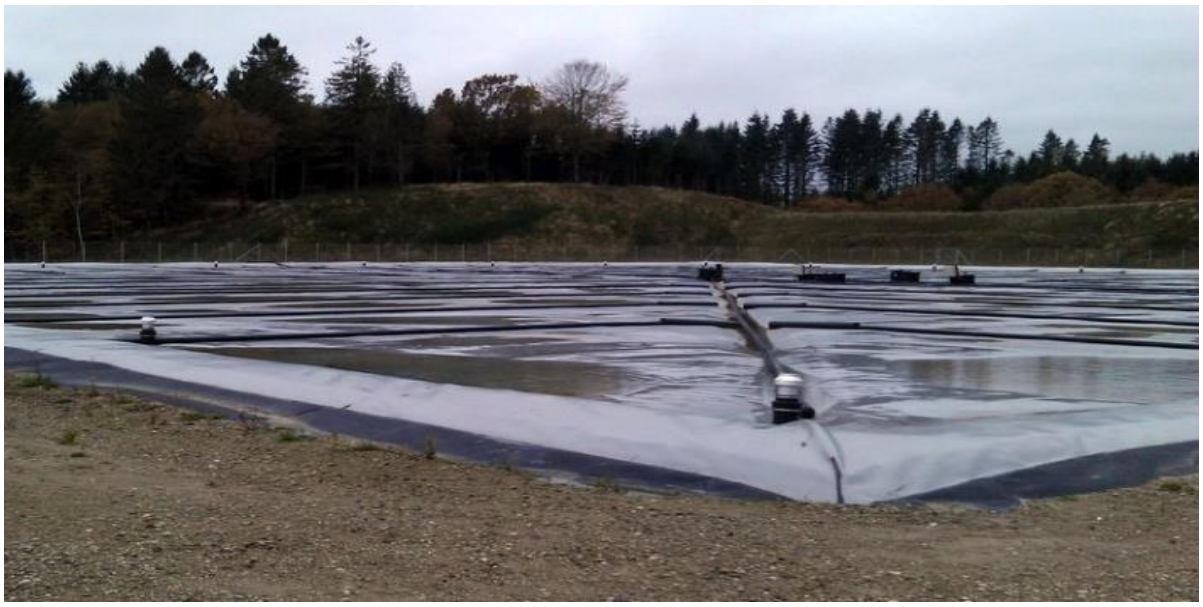
3. Give citizens a financial stake in clean energy

From the earliest days of Denmark's energy transition, policymakers understood the importance of giving citizens a stake in clean energy projects.

A grant program launched by the Danish government in the early 1980s covered 30 percent of the initial capital cost of wind turbines. It was early days for the wind industry then; even with the grant, turbines were still quite expensive. So local cooperatives formed, giving individuals and households a chance to invest in wind energy projects.

By 1996, more than 2,000 such cooperatives had formed. Within five years, the cooperatives' 100,000 investors were responsible for 86 percent of the turbines installed in Denmark. Investors in the Middelgrunden wind farm, which sits just offshore in shallow water of Copenhagen Harbor, were able to buy shares in 1,000 kilowatt-hour increments. After more than 10 years, not only do investors have their money back, they also receive a 7-percent annual return on their investment.

In Dronninglund, solar-heated water is stored in an insulated pit for later use



Source: Justin Gerdes.

A program launched by the Danish government in 2011 built upon this legacy by requiring developers of most onshore and offshore wind projects to offer nearby residents shares worth 20 percent of the total project. Developers are not permitted to earn a profit on these community shares, which must be offered at cost. These shares must first be offered to permanent residents age 18 or older living within 4.5 kilometers (about 3 miles) of the project site. As Søren Thorpstrup Laursen, an engineer with HOFOR (formerly Copenhagen Energy) [informed], the rules are intended both to promote new wind projects while also tempering local opposition to proposed projects by turning neighbors into investors. In Sønderborg, as in Copenhagen, the push to go carbon-neutral is inextricably linked to larger efforts to drive sustainable economic growth and add good-paying local

jobs. “We’ve adopted a holistic approach that’s bottom-up,” says Christian Eriksen, project director for Project Zero A/S, the private firm charged with implementing clean energy plans in Sønderborg. “It’s not just top-down, about planning and coming up with business and new technology to drive this forward. It’s also very much about participation, about learning, and empowerment of our citizens and local companies.” (Gerdes 2016)

References

Gerdes, J. 2016. Three lessons for cities in Denmark’s clean-energy revolution. *Citiscope.* June 30, 2016. http://citiscope.org/story/2016/three-lessons-cities-denmarks-clean-energy-revolution?utm_source=Citiscope&utm_campaign=f335066e4d-Mailchimp_2016_06_30&utm_medium=email&utm_term=0_ce992dbfef-f335066e4d-118049425.

See also e-book: Quitting Carbon: How Denmark Is Leading the Clean Energy Transition and Winning the Race to the Low-Carbon Future; Berger, J.J. 2017. Copenhagen, Striving To Be Carbon-Neutral *http://www.huffingtonpost.com/entry/copenhagen-striving-to-be-carbon-neutral-part-1-the_us_589ba337e4b061551b3e0737?utm_source=iNews&utm_campaign=2789758fdc-EMAIL_CAMPAIGN_2017_01_25&utm_medium=email&utm_term=0_9b68401301-2789758fdc-119145861*

Credentials

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