Transatlantic Urban Climate Dialogue

Freie Universität Berlin

Transatlantic Urban Climate Dialogue

Briefing Books

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Integrated Community Energy Systems: Sustainable City Building, Competitiveness and Economic Development

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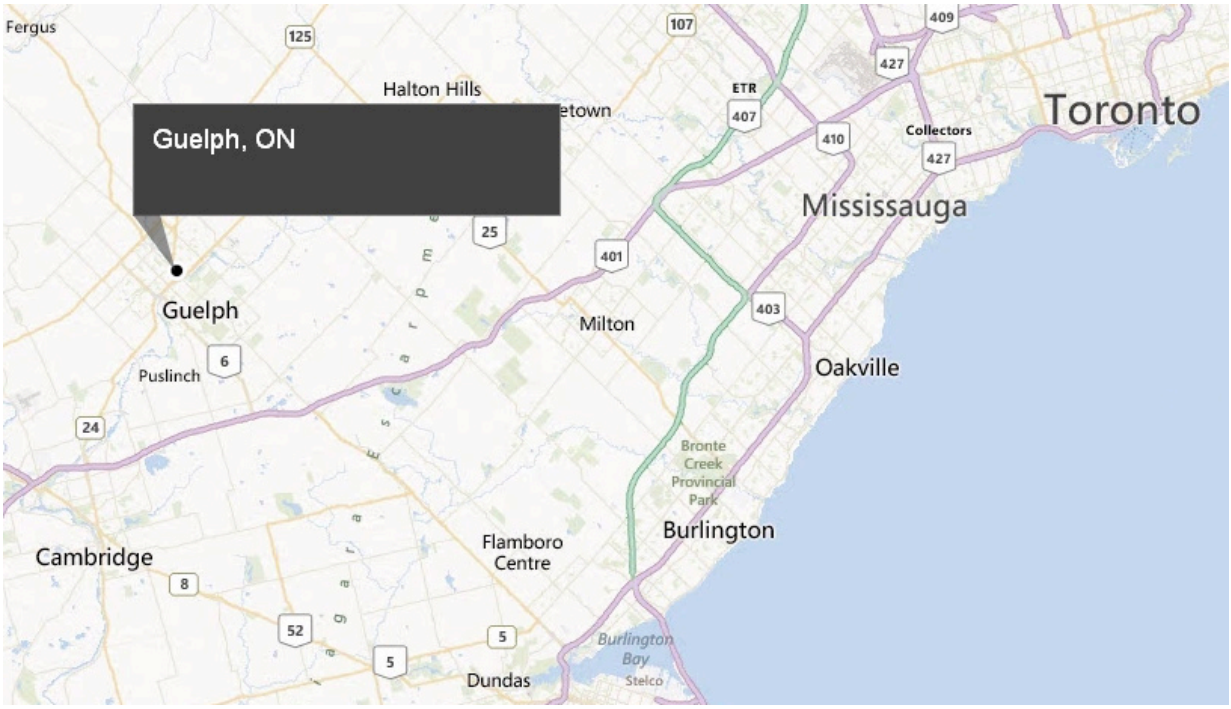

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ffu Forschungszentrum für Umweltpolitik

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1. Overview and Origins of the Transatlantic Urban Climate Dialogue

The Transatlantic Urban Climate Dialogue (TUCD) was designed to strengthen the transfer and application of sustainable energy and climate practices between metropolitan regions in Germany and North America. The reasons for the exchange of these practices are clear. Between 2010 and 2030, metropolitan areas in both countries will see significant increases in the amount of energy consumed. The OECD estimates that by 2030, cities in the U.S. will consume 87 percent of all energy. In Germany, it is projected that cities will consume nearly 75 percent of all energy by 2030. Germany has set ambitious targets to reduce greenhouse gas emissions by 2020 within the context of the Meseberg Declaration. However, questions linger about the country's ability to attain these goals – particularly within urban areas. Likewise in North America, consumption of conventional fossil fuels and emissions of greenhouse gases in the U.S. and Canada continue to rise, and current sectorial energy and climate paradigms are proving insufficient.

The U.S. and Canada continue to use substantially more energy relative to GDP than other major industrial countries of the world. It is rare to see cities in North America develop and implement actionable energy efficiency and greenhouse gas reduction programs with quantifiable benchmarks and targets. In general, the climate and energy plans of most U.S. states and Canadian provinces are voluntary and lack dedicated resources for the necessary large-scale transformation of the energy supply, building and transportation sectors.

2. Cases in Canada

2.1. Green Communities Canada

Our mission: A green and healthy future for all

GREEN COMMUNITIES CANADA (GCC) is a national association of community organizations that help people go green – in their homes and gardens, on the road, at work, and in the community. GCC has over two dozen member organizations in every region of the country, with combined annual revenues of $24 million, 600 employees, and more than 2000 volunteers.

GCC and its member organizations work together to help Canadians:

- improve the health of our communities
- conserve resources for future generations
- reduce pollution

GCC also works to strengthen its member organizations by helping them to:

- increase their capacity to deliver programs and services
- share knowledge and best practices
- benefit from economies of scale

GCC collaborates with community partners, such as governments, businesses and local organizations, to identify priorities and develop strategies that will get results.

GREEN COMMUNITIES originated in Ontario in 1993 under a provincial government funding program. In 1995, when government funding ended, the individual Green Community organizations in Ontario formed a network to work together and share information. In 2005, the name of the association was changed to Green Communities Canada to reflect our national scope.

Some accomplishments:

- delivering more than 300,000 home energy audits
- pioneered the national home energy retrofit incentive
- created the award-winning Well Aware program to protect rural water sources
- championed important sustainability policies – walk friendly communities, affordable energy retrofits for low-income households, and a national home energy efficiency strategy

GCC's member organizations appoint a 12-member national Board of Directors responsible for planning, policy and directing staff. Its members are non-profit organizations.

Core beliefs and values:

- Sustainable communities can be achieved through positive action and innovative solutions.
- Sustainability is a better way to live, with benefits for people as well as the environment, including health, comfort, safety, conviviality, reduced conflict, and rewarding work.
- Everyone has a responsibility to act. Everyone can be part of the solution.
- Sustainability begins at home, where we live, work, learn, and play. Building on this foundation, we believe in working together to achieve systemic changes in government policy and law, institutions, markets and corporate practices, and culture and social norms.
- Nations like Canada, which have achieved prosperity through conventional forms of industrialization, have a responsibility to lead the transition to a new paradigm – a green economy in which the needs of the environment are integrated into our way of life, production, and consumption.

Positive action for the environment

GCC's member organizations develop in-house programs that address the unique needs of their individual communities, but also works collectively to develop and deliver programs on a national or provincial basis.

Activities address a range of environmental opportunities including:

- Energy efficiency
- Waste reduction
- Sustainable transportation
- Water protection

2.2. Ontario Power Authority's Conservation and Demand Management

Power System Planning at Ontario Power Authority (**OPA)**

OPA develops integrated electricity plans that look forward several years, with the purpose of providing sustainable electricity solutions to Ontarians well into the future.

The plans take a long-term, province-wide perspective, examining possibilities for future electricity demand and how it can be met through conservation, generation and transmission options. The aim is to enable the electricity system to meet technical standards and public policy objectives in ways that are acceptable to the community.

These plans form the technical basis of the advice the OPA provides to government to inform policy priorities, including:

- making Ontario efficient in its use of electricity;
- phasing out the use of coal;
- increasing renewable energy sources; and,
- deploying information and technology to improve customer service.

Implementation happens through generation procurement and conservation measures, and by developing transmission.

The OPA also initiates and participates in regional planning projects, recognizing that different areas of the province face unique circumstances that require local analysis and engagement. It regularly produces reports, regulatory submissions and presentations on electricity planning. These materials outline the status and outlook of the electricity system, identify challenges to be addressed, and presents options and opportunities to address them. They are made public through regulatory forums, presentations at conferences and stakeholder engagement sessions.

In 2005, the OPA developed strategic advice on the supply mix for Ontario, and in 2007 produced a detailed Integrated Power System Plan (IPSP I) to implement the supply mix. Initiatives from the 2007 plan, together with subsequent public policy initiatives (primarily the Green Energy and Green Economy Act) are transforming how Ontario produces and uses electricity.

Electricity Conservation and Demand Management (CDM)

The Green Energy Act established a new framework for electricity conservation and demand management in Ontario.

In accordance with a directive from the Minister of Energy and Infrastructure, dated March 31, 2010, the Board was required to take certain steps to establish targets for the reduction of electricity consumption and peak provincial electricity demand to be met by certain licensed electricity distributors, as a condition of licence.

The requirement for CDM targets does not apply to distributors that are not connected to the Independent Electricity System Operator (IESO)-controlled grid, with the

exception of embedded distributors, and to distributors whose rates are not regulated by the Board.

The Directive also required the Board to issue a code that includes rules relating to the reporting requirements and performance incentives associated with the CDM Programs. These rules also relate to the planning, design, approval, implementation and the evaluation, measurement and verification of Board-approved CDM Programs and to such other matters as the Board considers appropriate.

The Board recently issued new CDM Guidelines which provide guidance on certain provisions in the CDM Code and the type of evidence a distributor should file to support an application for Board-Approved CDM programs.

2.3. Markham District Energy (MDE)

Markham District Energy, an energy utility owned by the City of Markham, operates EcoLogo certified community energy systems which produce thermal energy for the heating and cooling of buildings.

Mission:
"To continue as a leading developer of municipally owned district energy systems providing strategic foundations for Markham's Greenprint Sustainability Plan and economic development objectives."

About MDE

After the infamous ice storm hit Eastern Canada in 1998 and the deregulation of the power industry, Markham Council focused on the creation of a local energy system to become more self-reliant. MDE was created in 1999, the first of four proposed local energy plants to serve downtown Markham opened in 2000.

With two community energy plants using clean fuels and highly efficient equipment including combined heat and power technologies, MDE is ready to serve a growing clientele as Markham Centre expands.

As Markham Centre grows, the goal is to have 100 percent connection to all new buildings. When fully developed, this system will achieve a 50 percent efficiency gain in the community resulting in an equivalent 50 percent reduction of local emissions.

Serving Markham

As the City of Markham continues to grow, MDE is committed to serving the urban centres of the expanding municipality. Currently, three energy plants are operating in Markham Centre providing thermal energy for the heating and cooling of buildings totaling nearly six million square feet.

MDE now operates a second district energy system in Cornell Centre serving the Markham Stouffville Hospital, Cornell Community Centre and Library, Fire Station 99, and other surrounding buildings.

Markham District Energy lands two Combined Heat & Power Standard Offer Program (CHPSOP) projects
Source: magazine.appro.org

Perhaps the standard-bearer for small scale cogeneration in Ontario, Markham District Energy Inc. (MDE) has won two contracts under the CHPSOP program. The contracts were awarded on September 6, 2011.

MDE has been developing a district energy system (heating & cooling thermal grids) serving Markham Centre, the Town of Markham's emerging downtown core for more than ten years. Combined heat and power has been an important contributor to the system's environmental story and MDE notes that I will continue to invest in CHP as the thermal load expands.

Ultimately home to over 30 million square feet of mixed-use development, MDE provides thermal energy to nearly 6 million ft² today, representing 100% new construction since 2000.

MDE's first CHP plant, rated 3.5 MW, was built in 2001. It added a second 5 MW plant in 2008 with its first contract with the OPA. The recent CHPSOP award for a 2.6 MW plant will bring its CHP capacity in Markham Centre to over 11 MW.

In 2010 MDE commenced construction on its second district energy system in the east end of Markham. Phase one of the system includes the expanding Markham Stouffville Hospital and the Town's newest Community Centre & Library. The East Markham District Energy system will ultimately provide heating and cooling to over 10 million square feet of building space.

MDE will also be constructing a 3.25 MW CHP facility to be located in the Bur Oak Energy Centre. It is expected to be operational in 2013.

2.4. Guelph Hydro Inc. / Envida Community Energy

Owned by the City of Guelph, Guelph Hydro Inc. is helping to create a reliable, diversified and sustainable energy supply to ensure the long-term competitiveness and prosperity of the communities it serves - Guelph and Rockwood, Ontario.

Envida Community Energy Inc. is actively developing sustainable energy projects (solar, district energy, combined heat and power and bioenergy) as a key implementer of the City of Guelph's internationally renowned Community Energy Initiative.

Areas of focus include:

- Solar power
- District energy
- Combined heat and power / cogeneration

- Bioenergy
- Electric vehicles

Envida Community Energy Inc. is 100 per cent owned by Guelph Hydro Inc. and is an affiliate of Guelph Hydro Electric Systems Inc., the local electricity distribution company serving 50,000 customers in Guelph and Rockwood, Ontario.

Vision for a Sustainable Energy Future

One of the defining challenges of the 21st century will be to find ways to generate the energy we need while emitting less carbon dioxide in order to mitigate the effects of climate change. The vision of Guelph Hydro Inc. and its affiliate companies is to lead Ontario in powering community well-being and environmental stewardship with sustainable energy solutions. Through our actions, we are helping to move the communities we serve towards a sustainable energy future.

Environmental stewardship

Generating and distributing energy in an environmentally responsible and sustainable manner

Social responsibility

Enhancing community well-being through the provision of a safe and reliable supply of energy and sustainable energy solutions

Economic success

Growing our business and providing our shareholder, the City of Guelph, with a solid return on investment

Achievements in Sustainability

2010 - City of Guelph named Guelph Hydro as the key implementer of sustainable energy projects under the City of Guelph's Community Energy Initiative.

2011 - Published an inaugural **Sustainability Report**. This report was won a number of **awards** including a prestigious international award for corporate responsibility reporting.

2011 - Named **Large Company of the Year** by the **Ontario Energy Association**

2012 - Recognized by the Guelph Chamber of Commerce with an **Environmental Stewardship Award.**

Sustainability Commitment

Economic
Creating Value and Fostering Economic Growth

Social
Ensuring Safety, Valuing Employees and Customers, and Giving Back to the Community

Environmental
Developing Sustainable Energy Solutions, Championing Energy Conservation, and Protecting the Environment

2.5. Owens Corning

Delivering Solutions, Transforming Markets & Enhancing Lives

Owens Corning is a leading global producer of residential and commercial building materials, glass-fiber reinforcements, and engineered materials for composite systems. A Fortune® 500 company for 57 consecutive years, the company is committed to driving sustainability by delivering solutions, transforming markets, and enhancing lives.

Founded in 1938, Owens Corning has earned its reputation as a market-leading innovator of glass-fiber technology by consistently providing new solutions that deliver a strong combination of quality and value to its customers across the world. Owens Corning reported sales of $5.3 billion in 2011 and employs approximately 15,000people in 28 countries on five continents.

Today, the company operates within two segments: Composite Solutions and Building Materials. The Composites business manufactures products from glass-fiber reinforcements to meet diverse needs in a variety of high-performance composites markets. Building Materials products, primarily roofing and insulation, are focused on making new and existing homes and buildings more energy efficient, comfortable, and attractive.

Owens Corning is committed to balancing economic growth with social progress and environmental stewardship as it delivers sustainable solutions to its building materials and composites customers around the world. The company's ability to deliver on this commitment has earned Owens Corning a number of related honors, including a ranking on the Dow Jones Sustainability World Index, membership in the United Nations Global Compact, and selection among the 2011 "100 Best Corporate Citizens," as ranked by *Corporate Responsibility Magazine*.

Owens Corning is specifically committed to:

- Using the Product Stewardship process (including Life Cycle Management) to measure and amplify the benefits of our products and services to society.
- Working with stakeholders globally to develop technologies and solutions to achieve energy-efficient buildings with the goal of achieving no net carbon releases.
- Improving GHG footprint by reducing the GHG emissions intensity of the manufacturing facilities while reducing absolute emissions.

- Being an active and constructive participant on this issue on the world stage, including the advocacy of effective pricing signals to accelerate energy efficiency improvements, renewable energy deployment and cross-economy GHG emission reductions.

Since 2006, Owens Corning has published an annual sustainability report, with detailed information on efforts to reduce the company's environmental footprint, support local communities and ensure safe work environments.
The Owens Corning 2011 Sustainability Report is based on Global Reporting Initiative (GRI) guidelines known as GRI-G3.1. GRI's Sustainability Reporting Guidelines set a globally applicable framework for reporting the economic, environmental and social dimensions of an organization's activities, products and services.

2020 Sustainability Goals Progress

Owens Corning established its first set of 10-year footprint reduction goals in 2002. Having significantly reduced the environmental footprint by the end of 2010 a new set of footprint reduction goals was established last year.
The new footprint goals stretch forward to 2020 and use 2010 as the baseline. Achieving zero waste-to-landfill is a new long-term goal. As before, energy use, greenhouse gas emissions and water consumption remain priorities.

3. Cases in Germany

3.1. Energy in North Rhine-Westphalia

Facts & figures

North Rhine-Westphalia (NRW) is Germany's leading energy location and the most important energy region in Europe. Around 30 percent of Germany's electricity is produced here – more than in any other federal state, and 90 percent of German coal and 53 percent of German lignite is produced here. Nearly 35 percent of the total energy needed in Germany is consumed in NRW.

Around one third of all the employees subject to social security contributions in the German energy and water supply industries and approx. one fifth of those in the German manufacturing and supply industries for the energy sector come from NRW. Of the more than 43,000 employees in the coal mining, oil and natural gas sectors, around 30,000 work here, i.e. more than two thirds (2010).
On a national scale, around 20 percent of the entire electricity consumption and nearly 12 percent of the total end energy consumption came from renewable energies in 2011. In first place for electricity generation is wind power, which generated 8 percent of German electricity consumption. This was followed by biomass with 6 percent, and hydro-electric power and photovoltaics, each with 3 percent. This makes renewable energies the second most important energy producer overall after lignite with 25 percent. This is followed by anthracite with 19 percent and nuclear energy with 18 percent, and natural gas with 14 percent.

The state has attained a leading international position in the development, testing, and market launch of technologies that harness new, inexhaustible sources of energy, such

as the sun and wind. From 1988 to the end of 2007, around 700 million euros from the State and the European Union (ERDF program) were spent on more than 60,000 assisted projects in the state's funding program progres.nrw for the development, demonstration and introduction on the market of innovative energy technologies and energy consulting. The funds provided attracted further investments of about 3.8 billion euros. From 2008 to 2011, a further approx. 14,700 projects were provided with funding of around 70 million euros. In 2010, approx. 3,600 projects were funded to the tune of around 13.3 million euros in the market launch program area. In 2010, around **26,500 employees** are working on the development and utilization of renewable energy technologies in **3,500 companies**, generating total **sales** of more than **8.3 billion euros**.

From a long tradition of utilizing natural resources, a broad expertise in energy technology has grown in NRW. The state is home to a dense network of research institutes as well as to numerous companies offering innovative energy products and services for increasing energy efficiency and utilizing renewable energies. For many future-oriented companies, NRW is the ideal location – from the extraction of raw materials for energy to conversion, e.g. in fuel cells. In order to build on its leading position and to achieve its energy policy goals (climate protection, conservation of resources, economic efficiency and security of supply), the state has in the EnergyAgency.NRW an instrument possessing a wide range of competences.
As a result of the German Bundestag decree passed on 30 June 2011 to phase out nuclear power by the year 2022 (energy turnaround) the energy industry in NRW is undergoing radical change. To promote renewable energies and to achieve Germany's climate protection goals the state of North Rhine-Westphalia has introduced its own **Climate Protection Law**. This provides for a reduction of greenhouse gas emissions by the year 2020 of at least 25 percent and by the year 2050 of at least 80 percent compared to 1990.

Renewable energies

- **Biomass:** Biomass is a naturally growing material from living and dead organisms. The carbon stored within it is a fuel with particularly high potential and compared to fossil fuels biomass provides considerable ecological benefits. In NRW, about 82 percent of regenerative heat was generated from biomass producing 8.6 billion kWh (kilowatt hours), and about 46 percent of regenerative electricity at 4.8 billion kWh (2010). Furthermore, around 380,000 tons of regenerative fuel were produced. In the field of agricultural biogas plants alone, approx. 430 plants were operating with capacity of 170 MW (megawatts) at the end of 2010. By the end of 2011 a further 70 biogas plants were installed with additional total capacity of approx. 25 MW.

  More than 1,300 players from the industry have pooled their resources to work together on new projects in the Biomass Competence Network of the EnergyAgency.NRW. The cluster of excellence "Tailor-Made Fuels from Biomass" at RWTH Aachen University takes an interdisciplinary approach to research into new, biomass-based fuels. With the clusters of excellence, internationally visible and competitive research and training institutes will be established at German university locations, thereby facilitating scientifically necessary networking and cooperation. The Oberhausen-based Fraunhofer Institute UMSICHT received approx. 1.4 million euros for its "Biorefinery" concept to research into the energy utilization of renewable resources.

- **Geothermal energy:** The subject of geothermics is steadily growing in importance among the energy technologies. As the chosen location of numerous market-

leading companies, NRW occupies a key position. Within the Ruhr Metropolitan Region alone – those are the 53 municipalities of the Ruhr region – there are approx. 230 companies operating in the geothermic market. The geothermic industry provides about 4,000 to 5,000 jobs in NRW.

The earth's heat, which is being utilized increasingly in Germany, provides an inexhaustible reservoir of energy. Heat pumps cut heating costs and help protect the environment by using ambient heat to a large extent. In the meantime, approx. 30 percent of new buildings in NRW, as well as many existing buildings, are heated using heat pumps. Of the 450,000 heat pumps now installed all over Germany, more than 91,000 (20 percent) provide environment-friendly heat generation in NRW. This figure is to increase to over 200,000 by the year 2020.

To ensure that the geothermal energy can be used by all the citizens in the state, NRW commissioned the Geological Survey NRW with the "Study of Geothermal Energy Potential in NRW" to determine the state's near-surface geothermal energy potential. The result is a state-wide geothermal map on which all relevant sub-surface data and geothermal productivity for geothermal energy drilling up to a depth of 100 m can be retrieved for every location in the state.

With 130 houses, one of Europe's largest geothermal probe housing projects is located in Werne in Westphalia. Compared to housing estates which heat with conventional fuels, the residents in Werne save 125 tons of CO_2 per year. In March 2007, building work began in Cologne on Germany's largest housing construction project. The estate completed in 2009 with over 400 single-family houses as well as rented and owner-occupied apartments for approx. 1,000 people is supplied almost exclusively with geothermal energy.

- **Hydro energy:** The use of hydropower to generate energy is capable of helping to reduce climate problems worldwide. The technically usable potential of hydropower in NRW today is defined as 800 GWh/a (gigawatt hours) of electricity, of which 200 GWh/a could not, however, be used to date. The state government has so far subsidized 181 plants with total output of more than 18 MW. Subsidies totaling around 13 million euros triggered further investments of more than 49 million euros.

- **Mine gas:** The use of mine gas as a source of energy is gaining more and more importance in NRW. The large number of mine shafts in closed-down mines offers easy access to this natural resource, with which electricity is generated in block-type thermal power plants. The process is environmentally friendly, and guarantees greater safety, as gas which surfaces uncontrolled through crevices in the ground represents a latent source of danger. In 2011 there were approx. 99 mining permits to utilize mine gas in NRW. 125 block-type thermal power plants operate in the state with electrical output totaling 184 MW at the end of 2011. In 2011 alone, they produced 711 million KWh of electricity – enough to supply approx. 160,000 households with power. The total mine gas potential used resulted in a CO_2 reduction of approx. 3.3 million tons in 2011. The development of methane-rich gas deposits by means of targeted drilling also has good prospects as methane gas possesses a very high fuel value. The Herne Utility Board, for example, generates over 40 million kWh of electricity in its five mine gas-fired, block-type thermal power plants, which represents an annual CO_2 reduction of approx. 200,000 tons.

- **Solar energy:** NRW is an important location for solar energy. With more than 7,600 employees and 4.2 billion euros in sales (2010) solar energy is the largest sector in the regenerative energy industry. In recent years, the photovoltaic sector in particular has experienced a burst of growth. In 2010, installed solar electricity capacity totaled 1,941 megawatt-peak. Under the title "50 solar settlements in

NRW" the state is promoting new residential projects in which the sun is used as the main source of energy. In the meantime, 37 settlements containing over 3,500 residential units have been completed for approx. 9,000 tenants or owners, with a further 14 currently under construction. At the end of 2009, the project entitled "100 climate protection settlements in NRW" was presented as part of the North Rhine-Westphalian energy and climate protection strategy. The purpose of the new model settlements is to show how the levels of the current German Energy Saving Ordinance can be undercut by more than half with a combination of solar energy, high insulation standards, modern heating technology and heat recovery in ventilation, as well as how CO_2 emissions can be further reduced. Nine settlements are already under construction, and a further 26 are planned. With these projects, NRW is the European front-runner when it comes to solar settlements.

No grants were required for the first open-space photovoltaic plant in NRW in the town of Nottuln in Münsterland (population 20,000), which went into operation with 16,000 modules in October 2008 and can now supply electricity for 300 households with annual output of 1.2 MW while saving 1,000 tons of CO_2. With a saving of 2,400 metric tonnes of CO_2 and an output of 3.8 MW, North Rhine-Westphalia's largest solar park was commissioned in Inden (Düren district) in 2011. This means that 1,000 households can be supplied with climate-compatible electricity.

- **Wind energy:** In NRW there are nearly 2,900 wind turbine generators turning with an installed capacity of approx. 3,070 MW. This means that the state remains in 5th place on a nationwide scale. More than 7,000 people in the Rhine and Ruhr region earn their living with the construction of wind power technology, especially in the supplier areas gears/gearboxes, converters, steel towers, and anti-friction bearings and they generate sales of around 2 billion euros (2010). Five of the world's leading gearbox suppliers for wind turbine generators alone are based in NRW, including Bosch Rexroth from Witten, Renk from Rheine, and Winergy from Voerde. According to trade association figures, the export rate of the German wind power industry, which employs 96,100 people, is around 70 percent.

  Germany’s first wind turbine generator was built on the eighty-meter-high coal dump plateau in Herten in 1997. At what used to be Europe's largest wind farm near Paderborn, about 65 million kilowatt-hours of electricity are produced with 68 generators and a rated output of 39 MW. Mathematically, this corresponds to the energy requirements of approx. 50,000 households. Windtest Grevenbroich GmbH has been operating the world's largest testing field for inland wind energy systems on the Neurather Höhe near Grevenbroich since 1998.

Alternative technologies

- **Combined heat and power generation:** There is a major unexhausted potential in combined heat and power (CHP) generation. Industrial CHP in particular has attained relatively high fuel utilization ratings and use hours. The main problem in implementing the technology is the frequent lack or inadequate availability of a heat sink. The state government of North Rhine-Westphalia intends to increase the proportion of power generation accounted for by CHP as a central bridging technology to 25 percent. For this purpose a comprehensive funding programming to the tune of 250 million euros covering several years has been launched. The aim is, among other things, to eliminate investment obstacles to the expansion of CHP and to expand and condense the near-industry district heating infrastructure. Initially the state of NRW has given instructions for a potential study to highlight the economically feasible potentials of CHP in NRW. A further important measure is

the expansion of the Ruhr district heating network. To create the appropriate basis for this a feasibility study is currently being drawn up in which the prospects for district heating supply in the Ruhr Region for 2050 are being examined.

- **Electric mobility:** The future of mobility is becoming increasingly electric. This is demonstrated by various hybrid concepts from car manufacturers as well as purely electric vehicles which will become a common sight on the roads in the future. Driving with electricity reduces dependence on oil on the one hand while at the same having the effect that fuel savings mean a reduction in greenhouse gases. It is the declared goal of the federal government to make Germany the leading market for electric mobility. By the year 2020, the target is to have at least 1 million electric vehicles driving on Germany's roads, including at least 250,000 in NRW.

  NRW is very well placed as an energy and technology region, and also as a center of the automotive supplier industry. Numerous research institutes already concern themselves with the electrification of vehicle powertrains, hybrid technologies, fuel cells, high-energy batteries and smart electricity networks. In order to implement the recommendations of the Electromobility.NRW Master Plan, the centers of excellence Battery (focus in Münster), Automotive Engineering (focus in Aachen) and Infrastructure & Networks (focus in Dortmund) have been set up. In the course of the first phase of the Model Region Rhine-Ruhr, projects subsidized with federal funds include the construction of over 500 charging points and the road-testing of over 200 electric vehicles. In the second phase, a further approx. 200 further electric vehicles and nearly 200 charging points are planned. In addition, the state of North Rhine-Westphalia is actively involved with an electromobility promotional competition, providing approx. 60 million euros of state and EU funds for 36 research and development projects.

- **Fuel cells:** According to expert opinion, the fuel cell will play an important role in energy supply in the 21st century. NRW offers outstanding conditions for the development, production, application, and marketing of this technology. To date, the state government has supported 100 fuel cell and hydrogen projects via the "Fuel Cell and Hydrogen Network NRW", which was established in 2000. The objective of these projects is to establish hydrogen and fuel cell technology as an integral part of future energy supply while at the same time exploiting the economic opportunities that the technology presents for NRW as a business location. In view of the challenges of the energy turnaround, climate protection and the improvement of energy efficiency, as well as the further development of renewable energies, hydrogen and fuel cell technology is seen as being a key technology in all areas of the energy system. To this end, more than 110 million euros have been provided so far from state funding and from the EU, with the total investment amounting to around 185 million euros. The network, the largest of its kind in Europe, is an association comprising approx. 400 mostly small and medium-sized enterprises and research institutes. As a consequence of the further development of renewable energy generation in the context of the energy turnaround, hydrogen will play an increasingly important role as a storage medium in future energy supply. Surplus wind energy can be converted by means of water electrolysis into hydrogen both centrally and above all decentrally. Hydrogen can subsequently be stored without difficulty in various technical ways, e.g. converted back to electricity highly efficiently by means of fuel cells if required, or used as a "domestic fuel", for example in fuel cell vehicles for zero-emission mobility. Projects to test this approach currently form a focal point of the network's activities. With the Center for Fuel Cell Technology (ZBT) in Duisburg and Forschungszentrum (research center) Jülich the state of North Rhine-Westphalia also has research and development institutes which are known and recognized all over the world.

- **Fuels and drive systems:** NRW is not only a significant energy region, but also a major fuels region. Domestic refineries produce about 25 percent of the crude oil consumed in Germany. The amount consumed by road traffic in NRW is approx. 9 million tonnes of oil annually. This is the equivalent of 20 percent of national sales in Germany. One possibility for lowering CO_2 emissions and protecting the climate is the use of alternative fuels and drives with renewable energy. About 410,000 tonnes of renewable fuels were already produced from biomass in 2009. The biodiesel producers in, among others, Lünen, Lülsdorf, Neuss and Südlohn are among the 15 largest producers in Germany. The "Fuels and Drives of the Future" network is mobilizing all its forces along the entire value chain. These are forging ahead with the sustainable use of future-proof fuels and drives and their use forms in NRW and establishing them in the region.

- **Power plant technologies:** With a power plant capacity of approx. 38,000 MW NRW is the most important power plant location in Germany, if not in Europe. Here 30 percent of the German energy requirement is generated and 33 percent consumed. With BoA 2/3 RWE is erecting in Grevenbroich-Neurath the world's most modern brown-coal-fired units. In this project alone, with an investment volume of approx. 2.3 billion euros, about 50 percent of the local value added is remaining in the region. Following the concept of the "Reference Power Plant NRW", coal-fired power plants are being constructed worldwide with efficiency ratings of up to 46 percent. This means that it is possible to save 138 g CO_2 per kWh as compared with the present average efficiency of 38 percent. If all the power plants in the world were to produce according to this standard, the CO_2 emissions would be cut by approx. 30 percent. Major synergy effects are being obtained for the industry with the transfer of expertise to solar thermal power plants (tower power plants). There roughly 70 percent conventional boiler technology is used in the power unit.

- **Wood pellets:** There are many arguments in favor of using wood pellets as fuel. Besides benefiting the environment, their use also has economic advantages. Wood pellets are a high-quality and renewable fuel. They have a calorific value of approx. 5 kWh/kg. The energy content of a kilogram of pellets is roughly equivalent to that of half a liter of heating oil. Thanks to targeted public relations and support in the form of state and federal grants, the number of wood pellet heating systems installed in NRW has risen considerably in recent years. In 2003 just 600 of these systems were installed; at the end of 2011 there were more than 20,000 households using this climate-friendly heat source. Around 155,000 systems are installed throughout Germany.

Pilot projects

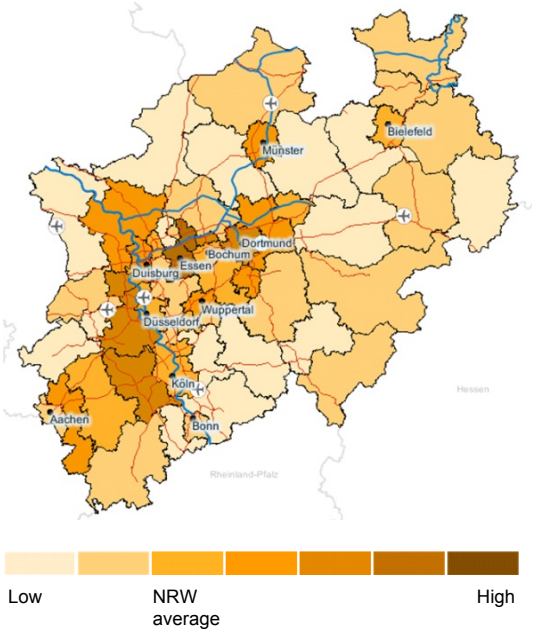
- **InnovationCity Ruhr – model city Bottrop:** A model of efficient urban redevelopment is being tested in Bottrop. Within ten years the CO_2 emissions in a part of the Ruhr region city with its 69,000 inhabitants are to be reduced by 50 percent. This target is to be achieved through the energy-related improvement of existing building stock, through increasing energy efficiency in the public sector and in industry, and through promoting electromobility and renewable energy sources.

- **Smart Grids:** In two model projects in Mülheim/Ruhr (E DeMa) and Aachen (Smart Watts) systems for the intelligent use of electricity involving over 1,000 households are being tested. Several industrial enterprises, local suppliers and university research are involved.

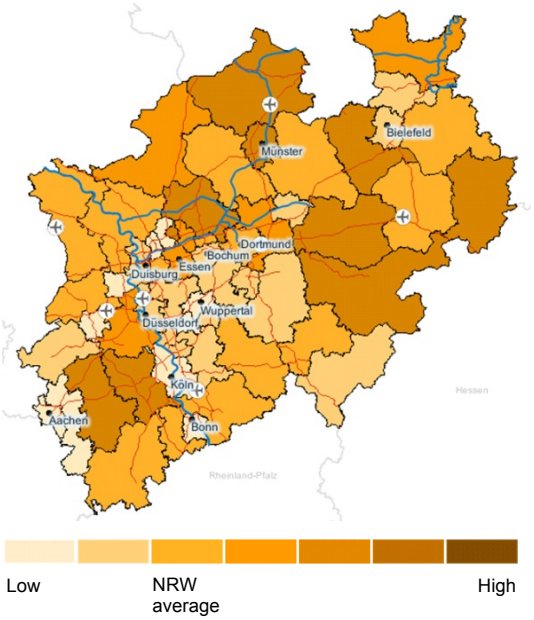
Regional concentration

The regions with a particularly high proportion of **employees subject to social security contributions** in the energy industry are the district-free cities of Essen and Gelsenkirchen. Regions with a particularly high proportion of **companies** in the energy industry are the districts of Düren, Gütersloh, Höxter, Recklinghausen, Soest and Steinfurt, district-free cities of Gladbeck and Münster, and Erftkreis and Hochsauerlandkreis districts.

Employment concentration



Company concentration



Source: IT.NRW; figures refer to NACE Code Rev. 2: 35 (energy supply); data: as of 2009

Companies

With E.ON in Düsseldorf and RWE in Essen, NRW is home to two utility companies which are among the largest in the world. This selection of examples is restricted to companies from the renewable energies sector:

- **Biogas Nord AG, Bielefeld:** In 2006, the Bielefeld-based company went public in order to enhance its position in the growth market for renewable energies. Since 1995 it has built over 250 biogas plants in 12 countries. Clients include agricultural and industrial enterprises, as well as energy suppliers, institutional investors, and municipalities. In 2010, the company generated sales of approx. 56 million euros and employed more than 120 people.

- **Bosch Rexroth AG, Witten:** Part of the Bosch Group since 1977, the company operates in the fields mobile hydraulics and wind power, manufacturing, among other things, industrial, drive and swing gears, e.g. for wheel loaders, mobile excavators and crawled hydraulic excavators. For the wind power sector Rexroth in Witten develops and manufactures all gears used in wind power generators: from efficient generator gears through high-precision azimuth gears for continuous and exact yaw mechanisms to compact pitch gears for rotor blade adjustment. Over 1,000 people are employed in this business area, and 35,000 in the group as a whole, including 18,300 in Germany alone. In 2010, sales totaled 5 billion euros.

- **E.ON AG, Düsseldorf:** As the world's largest investor-owned energy service provider with around 93 billion euros in sales and close to 85,000 employees in 2010 and significant growth rates in 2011, E.ON is also active in the field of renewable energies. In the area of wind power, off-shore and on-shore wind parks are operated in the USA and England, and off the German North Sea coast there is a wind park producing 60 MW. With more than 100 on-shore wind parks supplying several hundred thousand households worldwide the company is one of the world's largest wind power operators. It uses hydro power in 212 plants throughout around the globe for the production of 18.5 (terawatt hours) per year. And in the utilization of biomass the company numbers among the world's technology leaders. In Germany alone, 30 MW electricity is generated in this way.

- **Masterflex AG, Gelsenkirchen:** The company operates successfully in the business areas hose systems, medical technology and fuel cell technology. Its products include series production-ready, hydrogen-based 50W fuel cells for mobile energy supply. In 2011, the company employed around 450 people and generated sales of 53 million euros.

- **Natural Energy West GmbH, Neuss:** NEW (Natural Energy West) based in Neuss has been producing biodiesel at its large-scale industrial plant in Marl since 2002. Upon completion of the second expansion stage in the middle of 2005, production capacity was doubled once again. By doing so, the company responded to the growing demand for biofuels. NEW employs 19 people in Marl.

- **Petrotec AG, Borken:** The company is the largest European manufacturer of waste-based biodiesel. On the basis of residual and waste raw materials such as yellow grease and using proprietary technology Petrotec produces one of the most sustainable and climate-friendly biodiesels. Petrotec sells its biodiesel under the EcoPremium Biodiesel brand. In a fully continuous procedure Petrotec technology is capable of processing fresh vegetable oils such as rape seed, soy and palm oil as well as oils and fats that are difficult to process such as yellow grease and animal fats and oils and fish oils. In 2011, sales totaled 173 million euros.

- **RWE Innogy GmbH, Essen:** RWE Innogy is the RWE affiliate responsible for renewable energies. Established in 2008, RWE Innogy bundles the group's activities in this area. The portfolio embraces wind power plants on land and water as well as biomass plants and hydro power plants. 4,500 MW of power based on renewable energies are to be under construction or in operation by the year 2014, with 2,400 MW already available now. In 2025, 30 percent of the RWE power plant capacity will be based on renewable energies. The company employs over 1,200 people.

- **SolarWorld AG, Bonn:** With more than 3,300 employees and sales of more than 1 billion euros (2010), the listed company with its subsidies numbers among the world's largest providers in the solar electricity industry. Since 1999 the company has operated exclusively in solar electricity technology, but covers all vertical stages from the raw material silicon to turnkey solar electricity plants. In addition to its production facilities in Germany and the USA, the company opened a module factory in South Korea in December 2008 as part of a joint venture. Sales offices in Germany, Spain, the USA, South Africa and Singapore serve the international solar markets. The foreign share of sales amounts to 50 percent.

- **Vaillant Deutschland GmbH & Co. KG, Remscheid:** The Vaillant Group is an internationally operating company in the fields heating, ventilation, and air-conditioning technology. The product portfolio ranges from efficient heating equipment on the basis of conventional energy sources to system solutions for the utilization of renewable energies. For many years the company has been working successful on the development and marketing of heating equipment based on combined heat and power. Another future project is the fuel cell heating device which has already been developed jointly with partner companies for several years. In the 2010 financial year, Vaillant, which has been family-owned since 1874, generated sales of approx. 2.3 billion euros with more than 12,400 employees, including approx. 3,400 in Germany.

- **Winergy AG, Voerde:** Winergy AG is the only supplier to the international wind power industry with decades of experience in the manufacture and combination of complete drive systems for wind turbines. At its headquarters in Voerde/Friedrichsfeld, Winergy AG has an assembly plant and state-of-the-art production and testing facilities for wind turbines. In 2009, the world-wide 800 employees generated sales of one billion euros. The company belongs to the Siemens Group (402,000 employees, 74 billion euros in sales in 2011).

University and research landscape

NRW is also in an excellent position when it comes to energy research: at more than 30 locations in universities and research institutions teaching and research are conducted in all the relevant fields of energy technology. This expertise is a genuine location advantage for industry, also reflected in the settlement policy for industrial companies in our region. Here is a selection of the universities and research institutes:

Energy studies

- **RWTH Aachen University (35,700 students)**
  The Faculty of Electrical Engineering and Information Technology offers two Bachelor's and two Master's degree courses specializing in energy and the

environment in the fields electrical engineering, energy technology, and electrical power engineering. The Institute of Electrical Systems and Energy Economics is also worthy of mention.

- **University of Applied Sciences Bielefeld (8,300 students)**
  The main emphasis of the Bachelor's degree course in Regenerative Energies lies on the generation, distribution and effective utilization of electrical energy on the basis of regenerative energies, as well as on the generation, distribution and effective utilization of bioenergy from renewable raw materials and biological waste material.

- **Ruhr University Bochum (36,100 students)**
  Incorporated in the Institute of Energy Technology, the Chair for Power Systems and Energy economics belongs to the Faculty of Engineering, and according to its own definition its work focuses on resource-conserving energy economics and reactor simulation and safety.

- **University of Cologne (44,700 students)**
  The Institute of Energy Economics at the University of Cologne (EWI) is borne by the University of Cologne and the Society for the Promotion of the Institute for Energy Economics. The main emphasis of research and consultancy at the EWI lies on the liberalization of the international electricity and gas markets and the regulation of the electricity and gas markets in Germany and Europe.

- **Technical University Dortmund (26,900 students)**
  Founded in 1974, the Chair for Power Systems and Energy Economics takes an interdisciplinary approach to research and teaching with systemic considerations for sustainable power supply.
- **University of Applied Sciences Düsseldorf (7,900 students)**
  One of the outstanding features here is the accredited Bachelor's degree course in Process, Energy and Environmental Technology in the Department of Mechanical and Process Engineering.

- **University Duisburg-Essen (36,800 students)**
  In the Faculty of Engineering there are numerous chairs which concern themselves with research and teaching in the fields of energy, energy technology, the environment and electrical engineering, such as the chairs for energy economics, energy transport and storage, as well as for environmental process engineering and plant engineering.

- **University of Applied Sciences Gelsenkirchen (8,200 students)**
  The university offers a four-semester, modular Master's degree course in Energy Systems Technology.

- **Hamm-Lippstadt University of Applied Sciences (1,100 students)**
  The Bachelor study course "Energy Technology and Resource Optimization" is a young and modern discipline which combines future-oriented technologies for the provision of energy with questions regarding the optimized utilization of resources in the various cases of energy use.

- **Münster University of Applied Sciences (10,800 students)**
  Bachelor's/Master's degree courses in Energy, Building and Environmental Engineering. Since the summer semester of 2010, the Energy-Building-Environment Faculty of the Münster University of Applied Sciences has offered an interdisciplinary Master's degree course entitled "Utility Industry Network Engineer", which is aimed at students with pertinent professional experience in the grid-bound

utilities sector. The Bachelor's degree course "Technical Management in Energy, Building and Environmental Engineering" offers economic modules as well as engineering content, and features lectures on the many different possibilities in energy supply (naturally including new and regenerative energies) and aspects of building technology.

Energy research

- **Public Private Partnership:** Companies with worldwide operations have decided in favor of undertaking R&D in the area of energy and associated areas in NRW: In November 2011 the **E.ON Energy Research Center** at RWTH Aachen University moved into the new, 40 million euro main building in which five institutes and 150 scientists from four faculties work together on an interdisciplinary basis. **Thyssen** funds material research in Bochum to the tune of 22.5 million euros with ICAMS. **Hitachi** is investing 30 million euros at RWTH Aachen University and at the universities in Bochum and Dortmund in the area of the very latest power plant technology. The **Institute of Energy Economics at the University of Cologne** is dedicated to the research and teaching of energy economics and to the production of science-based studies for the energy industry and political practice. It is receiving its funding totaling twelve million euros in the period from 2009 to 2013 from a consortium comprising the state of North Rhine-Westphalia and the companies E.ON and RWE. And by 2014, **RWE** intends to build a low-CO_2 power plant in the brown-coal mining area based on coal gasification with sequestration.

- **Institutional research:** RWTH Aachen University is particularly active when it comes to the subject of energy: Starting in September 2013, seven institutes in the Department of Mechanical Engineering and Electrical Engineering will operate the **"Center for Wind Power Drives (CWD)"** with a system test-bed for onshore wind energy plants with the goal of significantly increasing the reliability of wind turbines. RWTH Aachen University and the Jülich Research Center have formed the **"Jülich Aachen Research Alliance"** (JARA). One of its four subject areas is JARA Energy. As part of the excellence cluster "Tailor-Made Fuels from Biomass", which is subsidized by the Excellence Initiative, RWTH Aachen University has founded a center of excellence for fuel design. Together with the German Aerospace Center, the Aachen University of Applied Sciences and the University of Leuven in Belgium it is also involved in the joint **Virtual Institute of Solar Thermal Power Plants**. In the Ruhr region, the universities in Dortmund, Bochum and Duisburg-Essen work closely together in the field of energy. Through ef.Ruhr GmbH they conduct joint projects on topics including smart grids and CO_2 capture. The **Max Planck Institute of Coal Research** in Mülheim conducts basic research in all areas of catalysis. At the **"Münster Electrochemical Energy Technology"** (MEET), the new battery research center at the University of Münster, an international team of around 75 scientists has been working since 2010 on the research and development of innovative electrochemical energy storage devices with higher energy density, longer lifespans and maximum safety.

- With the **ZBT Center for Fuel Cell Technology** in Duisburg, the **Research Center Jülich** and the **Fraunhofer Institute for Environmental, Safety and Energy Technology UMSICHT** in Oberhausen, NRW boasts several outstanding centers for **fuel cell research**. The Fraunhofer Institute UMSICHT covers a very broad thematic spectrum of research ranging from renewable resources through process technology, biofuels and energy efficiency technologies to resource management. With its approx. 170 employees the **Wuppertal Institute for Climate, Environment and Energy** researches and develops models, strategies and instruments for transitions to a sustainable development on a regional, national and

international level. The focus is on resource, climate and energy challenges and their interactions with industry and society.

- **GeoTechnikum Bochum:** The State of NRW supports the setting up of a research-oriented facility, a "GeoTechnikum", at the Geothermics Centre on the campus of Ruhr University Bochum. In this, the largest European joint research institute for the exploitation of geothermal heat, universities and commercial companies are conducting joint technological development work. The research focuses on drilling, reservoir and heat pump technologies. The Ruhr University Bochum is responsible for operating and coordinating the Geotechnologies Competence Centre; in addition the higher education institutions of RWTH Aachen University, FH Gelsenkirchen (College of Applied Science) and University of East Westphalia-Lippe are involved. On the corporate side more than 20 companies are already committed to working in the Bochum Geothermics Centre.

- The **Institute of Solar Research** at the German Aerospace Centre (DLR) in Cologne-Porz has further subdivisions in Stuttgart, Jülich and Almeria (Spain). On January 1, 2011 it came out of the DLR Institute of Thermodynamics as an independent institution. It is currently working on the development of concentrated solar systems for the generation of electricity, heat and fuels, thereby contributing to a sustainable energy supply based on renewable energies.

Cluster & lead market

The cluster policy of the state government of North Rhine-Westphalia promotes the cooperation of companies, research facilities, and the public sector along value-added chains in a total of 16 sectoral and technological areas. These 16 clusters possess a particularly large potential for growth and are extremely important for the economic development of the state. They are oriented to eight defined lead markets.

The activities for development in NRW's leading energy market are bundled into two clusters: the EnergyResearch.NRW cluster and the EnergyIndustry.NRW cluster. The management of both clusters lies with the EnergyAgency.NRW, ensuring that their networks and partners will continue to form the basis for cluster work in the future.

The **EnergyResearch.NRW cluster** bundles North Rhine-Westphalian research, consolidates its strengths by establishing and expanding first-class research facilities, and creates transparency by visibly localizing the thematic focal points at outstanding centers. With the aim of networking the players along the entire value chain, the EnergyResearch.NRW cluster is pushing forward with coordinated collaboration between research and scientific facilities and the business community. This gives the universities, universities of applied sciences and research institutes the possibility to acquire third-party funds, to distinguish themselves as a know-how bearer, and to enhance their reputation. The three subject areas with particular emphasis are energy conversion on a fossil, nuclear and solar-thermal basis, research in the field of biological generation of energy carriers in the form of replenishable raw materials, and the field of decentral energy generation including the topics "fuel cell and hydrogen technology", "photovoltaics" and "energy storage" as well as the cross-sectional topics "energy networks and economy". The cluster is organized by EnergyAgency.NRW. *www.cef.nrw.de*

The **Cluster EnergyRegion.NRW** advances the networking of the actors in the energy sector over the entire value added chain. The aim is for NRW to remain the most important energy region in Europe in the future, as well as to strengthen the national and international positioning of NRW and the expertise and excellence of the energy

sector. The cluster concerns itself with the following eight topics: power plant technology, fuel cells and hydrogen, biomass, energy-efficient and solar construction, fuels and drive systems of the future, photovoltaics, geothermal energy and wind power. The cluster **EnergyRegion.NRW** provides the participating partners with an exchange platform for information, communication and cooperation.

The activities concentrate on promoting innovation processes in NRW, initiating cooperations and strategic alliances, and speeding up the market launches of innovative products both nationally and internationally. By further developing existing strengths and identifying and picking up new trends and developments, strengths and core competencies will be converted into market successes. The cluster is organized by EnergyAgency.NRW. *www.energieregion.nrw.de*

The **EnergyAgency.NRW** forms the strategic and competent platform in the energy domain: From energy research, technical development, demonstration and market launch to energy consultancy and continuous vocational training it covers a broad spectrum of subject areas. In various competence networks it offers companies in the state platforms for strategic alliances. Furthermore, energy consultancy services are provided in the form of initial and contracting consulting for companies and administrations, as well as information and continuous training services for specialists and private individuals.
In the subject areas "Energy Efficiency and Renewable Energies for Companies and Local Authorities" "Energy-Efficient and Solar Construction", "Innovative Power Plants and Network Technology", "Biomass", "Fuels and Drive Systems of the Future", "Fuel Cells and Hydrogen", "Wind Power" and "Solar Energy" great efforts are being made to advance technical innovations and to forge ahead with know-how transfer between science and industry, consultancy and further training services are offered and companies from NRW are given support in matters of foreign trade.
www.energieagentur.nrw.de

Regional clusters and networks

Rhein Ruhr Power – power plant of the future; *www.rhein-ruhr-power.net*
In order to cover the growing global demand for energy in a way which is environmentally compatible, economic and safe it will be necessary in the coming decades to effect the considerable further development of rene-wable energies and to increase the efficiency and flexibility of base-load and mid-load power plants. In the cluster Rhein Ruhr Power, leading companies and research institutes in the field of power plant technology in the Düssel-dorf region have pooled their resources to meet the technological challenges – high efficiency, low exhaust emissions, high flexibility – with the "power plant of the future". The flexible, efficient, fossil-based power plant and the solar-thermal tower power plant are to be developed into products capable of impacting international markets – complemented by broad measures for training, further training and the development of skilled workers. The vision of the cluster partners – which include ThyssenKrupp, Siemens and 25 universities and universities of applied sciences – is to make Rhein Ruhr Power the leading global address for future-proof power plant technologies and the associated services. In doing so, the cluster will make a major contribution to economic, safe and low-CO_2 energy supply.

Trade fairs and events

- **E-world energy & water, Essen;** *www.e-world-2012.com; next dates: February 5-7, 2013*
  NRW is not only an important location for energy companies and research facilities,

but has been also a leading industry meeting place for several years now. In all segments, the 12th E-world energy & water maintained its continuous growth in 2012. For the first time, over 20,000 visitors came to the leading sectoral meeting place in the European energy and water industries. They obtained information from 580 exhibitors from 20 countries about products and services from the electricity, gas and water industries, energy technology and energy efficiency. Against the background of the mounting challenges in the sector, the "Energy Turnaround Forum" staged for the first time at E-world proved to be a great success. At this joint stand, attention focused primarily on the generation technologies in the field of renewable energies. The exhibitors at the "smart energy" joint stand were also pleased at the high level of interest amongst the visitors. 35 companies concerned themselves with efficient application technologies and energy efficiency topics in general.

- **Batterietag NRW**; *www.battery-power.eu; next dates: March 4, 2013 in Aachen*
  This year's Battery Day took place in Münster at the beginning of March. The Battery Day NRW presents the products, services and achievements of companies and institutions in NRW which are active in the battery technology and application market and is a platform for interdisciplinary cooperation as it brings together actors from the energy and chemical industries, as well as from materials research. The current focus is particularly on the continued development of the lithium-ion battery for use in electric vehicles (electromobility), with special attention being given to the optimization of performance, lifespan and safety.

3.2. Stadtwerke Dinslaken GmbH

Innovative energy partner with responsibility for citizens, economy and environment

"We have the energy" is the motto of Stadtwerke Dinslaken and its subsidiaries. The modern service companies guarantee the people and businesses in Dinslaken and the region reliable and equitable supply of electricity, heat, cooling, gas and water, and customer-friendly energy and telecommunications services, as well as an attractive sports and leisure bath.

The companies represent value for money, energy partnership solutions, environmental responsibility and innovation.

Energy partnerships as the way to success
As a local provider at Dinslaken and a heat- and cold provider in the municipalities of the Wesel – Voerde, Hünxe, Moers, Neukirchen-Vluyn - the companies know their customers very well. With tailored products for industry, commerce, governments and households, e.g. combined heat and cooling concepts, provision of cost-effective process energy, construction, planning, financing and operation of energy systems based on contracting, energy demand analysis, lighting consulting and other services in order to fullfill business and individual needs. Proximity to customers is a high priority; fast service is guaranteed. The companies with their innovative energy concepts contribute to the success of the business situated in Dinslaken and in the Wesel municipalities.

Services under one roof
The companies provide future-oriented, economical and environmentally responsible services to the citizens in the district of Wesel.

Natural gas - energy from nature. For over one hundred years, the Stadtwerke supply customers with gas, since the beginning of the year also outside Dinslaken. Over 30 percent of the buildings in Dinslaken are connected to the gas network. Latest equipment technology ensures our customers that natural gas is disposed ecologically compatible. Like this, we protect the environment.

Power for the municipalities - Responsible use of electricity - a task carried out by the Stadtwerke since 1995. Even in times of competition in electricity markets we offer, in addition to a secure supply, competitive prices and electricity from organic production. In the sense of a rational use of energy, the company stands for the economical use of electricity in all areas of daily life.

District heating from waste heat - district heating is a success story. This comfortable, safe and environmentally friendly form of energy exists already since 1962. Today, about 60 percent of the buildings in the city Dinslaken are connected to the district heating network. And we are expanding our network of district heating successively.

Water is life - Water supply is a matter of trust. For more than a hundred years, the inhabitants of Dinslaken obtain their drinking water from Stadtwerke. The drinking water of Dinslaken is gained at the waterworks in Voerde Löhnen, processed in the nanofiltration plant and transported to Dinslaken. With the water of very good quality, almost all the inhabitants of Dinslaken are supplied.

Active climate protection is a benefit for the entire region
The subsidiary Niederrhein district heating is the largest municipal utility district in North Rhine-Westphalia with environmentally friendly waste heat from industrial processes. CHP heat of the combined heat and power are contributing to the system, including Dinslaken, Moers and Hückelhoven using wood, a renewable resource. To consumers in 220,000 homes, public buildings, industrial and commercial properties, the company provides heat in form of space heating and water heating or absorption cooling. On the Lower Rhine, the companies contribute, together with the industrial partners ThyssenKrupp Steel AG, Sachtleben Chemie GmbH, Sasol Solvents GmbH and Steag GmbH, to conserve energy reserves and to avoid additional emissions, e.g. approximately 200,000 tonnes of CO2. Thus, an active contribution to the environmental protection in the region is provided.

With district and local heating, and with the instrument of energy contracting, objects in around 50 German cities are supplied. The funding of Stadtwerke for environmentally friendly use of energy also contributes to better environmental conditions.

The future is here
Stadtwerke and the district heating plants responded with new strategies and technologies on the major changes in the energy market sector.

Through investments in and partnerships with providers, new perspectives were opened to continue to be successful in the competition for the best products and

cheap prices.

With the construction of biomass power plants on the basis of the CO2 neutral fuel wood from landscape conservation at the sites in Dinslaken, Moers and in the district heating subsidiary Wep, more independency on the electricity and heat market was gained. For the benefit of the citizens and the environment.

An increasingly important role in the Stadtwerke group takes the production of electricity from solar energy, in Dinslaken but also Germany-wide. The total power of photovoltaic panels is constructed for a 1,897 kW peak. The generated energy is sufficient throughout the year for around 500 households, which get supplied eco-friendly with solar power. A further advantage of solar power is the saving of around 1,200 tons of CO2.
Technologically outstanding is the combined heat, cooling and power plant for district heating in the Niederrhein airport Cologne / Bonn, which ensures a reliable supply of electricity, heat and cooling. The contracting project is characterized by a high availability and efficiency and a 24/7 service.

New service packages and energy supply concepts built on innovative technologies will be the way the business will be continued in the future.

Services for citizens
"DINamare - the Stadtwerkebad" provides good fun in sports and leisure for the inhabitants of Dinslaken. This company is run by the Dinslaken baths GmbH, a subsidiary of Stadtwerke Dinslaken. The trick: the roof of the new swimming pool and the southern outer wall beside the lawns and terraces opens. Thus, the indoor swimming pool in the summer offers the charm of an outdoor swimming pool.

Pleasure in making progress
In our Custom Centre, Gerhard-Malina-Str. 1 in Dinslaken, qualified employees advise interested clients on all aspects of efficient and environmentally responsible use of energy. Speeches, action and service offerings are part of the programs for environmentally friendly use of energy.

4. Site visits

4.1. Hamilton Community Energy (HCE)

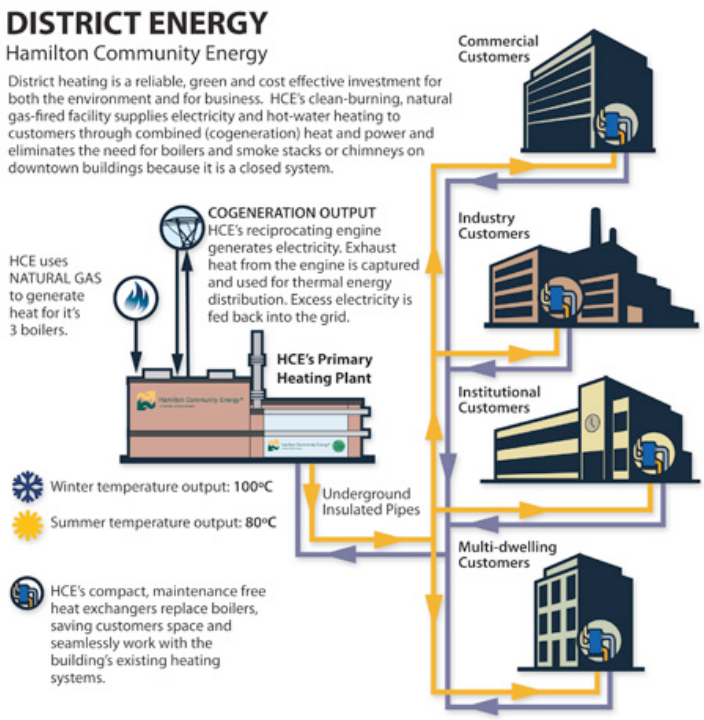
Operating a powerful, clean burning, natural gas-fired reciprocating engine connected to a generator and three 4 MW gas-fired boilers at its primary facility, HCE leverages cogeneration heat and power technology to produce and supply thermal energy through a network of insulated underground pipes for heating, domestic hot water, electricity and cooling services. Exhaust heat is captured and used to produce 3.2 MW of additional thermal capacity.

In addition, HCE has partnered with McMaster Innovation Park to provide ground breaking geo exchange and solar thermal technologies that fully integrate district and renewable energy at a new satellite district energy operation.

HCE's award winning primary facility together with its other operations offers sustainable energy solutions that align with Hamilton's Vision 2020.

HCE Benefits:

- Releases capital for core investment
- Competitive energy costs
- Protection against rising energy prices
- Lower operating and maintenance cost
- Minimizes the impact of future carbon credit taxes
- Cleaner environmental committment
- No external fuel and maintenance contracts



Source: www.hamiltonce.com

What is District Energy?

District energy systems produce hot water at a central plant. The water is then piped underground to individual buildings for heating and cooling. As a result, individual buildings served by a district energy system don't need their own boilers and chillers. The district energy system does that work for them. Once used in customer buildings, the water is returned to the central plant to be reheated and then recirculated through the closed-loop piping system. District Energy provides valuable benefits including:

- Improved energy efficiency
- Environmental protection through no on-site emissions
- No on-site operation and maintenance resource needed
- Improved reliability
- Decreased life-cycle/building capital costs
- Improved architectural design flexibility

HCE and McMaster Innovation Park
In 2010, HCE formed a strategic partnership with McMaster Innovation Park in Hamilton, completing an on-site satellite operation, becoming one of the first in Ontario to combine conventional DES with renewable technology—connecting and interfacing district heating and cooling equipment with a geo exchange system of eighty-one 500 ft. geo wells and the CANMET Materials Laboratory solar thermal technology.

This project is one of a very few employing a hybrid of renewable, green and conventional technologies in a district energy concept, and where HCE is at the forefront of innovative technology partnerships.

City of Hamilton Market Library Expansion
Construction began in the spring of 2009 to renovate the Hamilton Farmers' Market and Central Library as part of an initiative to revitalize York Boulevard between Bay and James Streets. HCE succesfully completed an installation and expansion of DES heating for these two landmarks. This was no easy feat and was accomplished through seamless coordination with all construction and renovation crews on site.

4.2. Sir Adam Beck Hydro-Electric Generating Station

SIR ADAM BECK I

PLANT GROUP: Niagara Plant Group
DRAINAGE BASIN: Lake Erie
RIVER: Niagara
NEAREST POPULATION CENTRE: Queenston
IN SERVICE DATE:
Unit 1-2, 4 - 1922
Unit 5- 1923
Unit 3, 6-7 - 1924
Unit 8-9 - 1925
Unit 10 - 1930 (1924)
BUILT BY: Hydro-Electric Power Commission of Ontario
Asset Transferred to Ontario Power Generation: April 1, 1999
NUMBER OF UNITS: 10
CONTROL: Remote from SAB II GS

HISTORICAL NOTE:
Formerly known as the Queenston-Chippawa Development.

MISCELLANEOUS:
Typical component weights are as follows:
Rotor - 286 tonnes (315 tons)
Runner - 23 tonnes (25 tons)
Total - 947 tonnes (1044 tons)
Transformer - 91 tonnes (100 tons)

ADAM BECK II

PLANT GROUP: Niagara Plant Group
DRAINAGE BASIN: Lake Erie

RIVER: Niagara
IN SERVICE DATE: 1954
Asset Transferred to Ontario Power Generation: April 1, 1999
NUMBER OF UNITS: 16
CONTROL: Attended

MISCELLANEOUS:
Models of the river and of the intakes were used extensively in the design of hydraulic features. The model at A.W. Manby Service Centre was used to investigate problems related to location and general dimensions, to river bed excavation, and to the exclusion of ice from the tubes. The detailed design of the tubes, including slots and angles of the piers, was based on investigations carried out by means of a larger model in the hydraulic laboratories of the University of Toronto. The latter model was used to measure the direction of flow and the magnitude of velocities and also to measure hydraulic losses. It is interesting to note that the intakes effectively excluded ice from water flowing to the tunnels during the particularly adverse ice conditions that developed during the first winter of operations.

Sir Adam Beck Pump Generating Station

The 174 megawatt Sir Adam Beck Pump Generating Station and its 300-hectare reservoir were constructed concurrent with the Sir Adam Beck II Generating Station.

Water diverted to the Sir Adam Beck generating complex is typically pumped into the reservoir at night so it can be used to generate electricity during subsequent periods of high electricity demand. Six mixed-flow variable-pitch reversible pump-turbines are installed at the pump generating station. The six pumps are capable, in a period of about eight hours, of filling the reservoir.

The pumped-storage scheme enables more effective use than could otherwise be made of the water that is available for power production under the Niagara Diversion Treaty of 1950. It offers a method for translating what would be surplus energy at times of low demand into primary energy at times of high demand. The change over from turbine to pumping sequence is accomplished in a matter of minutes and occurs several times each day.

Completed Niagara Tunnel Project to Provide Renewable Power for 100 Years

New Ontario Government Committed to Building Clean, Reliable Energy System

Source: news.ontario.ca

The new Ontario government is now harnessing more clean, renewable electricity from Niagara Falls through the completed Niagara Tunnel Project.

The new tunnel, which is more than 10 kilometers in length, is channelling additional water from the Niagara River to flow to the Sir Adam Beck Generating Station at a rate of 500 cubic metres per second. This will supply Ontario with enough electricity to power the homes and businesses of a city the size of Barrie.

The largest hydroelectric project to come into service in Ontario for the past 50 years, the Niagara Tunnel Project is a significant provincial achievement, employing 580 people during the peak of construction.

Building a clean, reliable energy system is part of the new Ontario government's plan to ensure we have the electricity we need to power the province's homes, schools, hospitals and economy.

Quick Facts

- When under construction, the Niagara Tunnel Project was the largest renewable energy project of its type anywhere in the world.
- The Niagara Tunnel is as high as a four-storey building, and will propel water at a rate of 500 cubic metres per second, fast enough to fill an Olympic-sized swimming pool in a matter of seconds.
- About 500,000 cubic metres of concrete was used to line the tunnel – enough to build a sidewalk from Windsor to Quebec City.
- The tunnel liner wall is 60 centimetres thick and made of cast-in-place concrete.
- Since 2003, more than 360 megawatts of new, upgraded and refurbished waterpower projects have come online in Ontario, enough to power an estimated 240,000 households.

4.3. Table Rock Welcome Centre – Niagara Falls

Features at Table Rock:

- Journey Behind the Falls
- Welcome Centres
- Shopping
- Table Rock Food Court

History of Table Rock

Hundreds of years ago, the land on which the pedestrian walkway at the brink of the falls and Table Rock now stands, formed part of the Falls and was covered with fast flowing water.

The original Table Rock was one of the oldest structures taken over by the Commission with the Parks' lands in 1886. It was erected in 1853 by Saul Davis at a time when private owners controlled the land surrounding the Falls. It occupied a site just north of the existing Table Rock, opposite the historic land form of Table Rock, a limestone ledge which was overhanging near the brink of the Falls and that fell into the Niagara Gorge in 1850.

Table Rock was a starting point for the Scenic Tunnels, now much changed and renamed Journey Behind the Falls. In 1926, the old Table Rock House was demolished and a new Table Rock House was built south of the old one and closer to the Horseshoe Falls. Extensive alterations were made to Table Rock House in 1963 and in 1974 an expansion was added upstream of the main building consisting of the

semi-circular dining room on the upper floor providing a panoramic view of the Falls. In 2008, extensive renovations included the addition of a covered pedestrian walkway to take visitors safely over the Niagara Parkway to the Falls Parking Lot and the Incline Railway, as well as a two-level indoor viewing gallery.

Source: www.niagaraparks.com

4.4. Flat Rock Cellars

Environmental Sustainability

To ensure a sustainable environment Flat Rock Cellars have incorporated many environmentally responsible technologies:

- Geo-thermal systems for all heating and cooling within the winery
- Environmentally sensitive waste management systems
- The use of ozone technology to clean barrels and tanks resulting in the use of no chemicals and only water run off.
  Low impact viticulture strategies to manage our vineyards
- Gravity flow to reduce the energy required to transport wine through the winemaking process.
- Landscaping that complements and reflects our natural surroundings and also helps us to manage the vineyards.
- Underground barrel cellar offering natural temperature and humidity control.
- Plenty of natural lighting to reduce energy costs.

4.5. Ontario Independent Electricity System Operator (IESO)

The IESO balances the supply of and demand for electricity in Ontario and then directs its flow across the province's transmission lines.

IESO works at the heart of Ontario's power system, connecting all participants - generators that produce electricity, transmitters that send it across the province, retailers that buy and sell it, industries and businesses that use it in large quantities and local distribution companies that deliver it to people's homes.

Every five minutes, the IESO forecasts consumption throughout the province and collects the best offers from generators to provide the required amount of electricity.

This allows customers to see prices fluctuate based on supply and demand. As a result, they can shift consumption away from peaks in demand to times when the price is lower.

The IESO monitors the system and identifies what is required to maintain reliability in the future, reporting on these recommendations through regular publications. In its quarterly 18-month forecasts of the growth in demand for electricity, the IESO assesses whether there will be adequate generation and transmission facilities.

How the IESO is Governed

The IESO is a not-for-profit corporate entity established in 1998 by the Electricity Act of Ontario. It is governed by an independent Board whose Chair and Directors are appointed by the Government of Ontario. Its fees and licences to operate are set by the Ontario Energy Board and it operates independently of all other participants in the electricity market.

The IESO has full statute-based authority for establishing, monitoring and enforcing reliability standards in the province. All the companies that make up the power system in Ontario must meet the IESO's standards. An audit by the North American Electric Reliability Corporation cited the IESO as a model for system operators, while a peer review showed that its practices in enforcing reliability are exemplary.

4.6. Temporal Power

Temporal Power develops and manufactures flywheel electricity storage systems that deliver high power and energy capacity coupled with low standby losses and heavy-duty cycle capability. The company’s breakthrough technology enables utilities, generators, and industrial customers to realize the benefits of large-scale energy storage with a low cost, high performance solution. Temporal Power is headquartered in Ontario, Canada.

Temporal Power delivers energy storage technology solutions that reposition flywheels as a leader in the stationary energy storage market. Offering the highest power to energy ratio in a compact 50 kWh module, our product offers a dynamic and scalable storage technology ready to face the most demanding applications on the grid.

Customizable from 10 kW to 500 kW to serve a variety of applications and delivering power for hours or minutes. Systems can be configured in arrays and each module offers flexible power capacity, making for even greater scalability.

5. Biographies of Speakers

Urbanist, planner, and futurist, **Brad Bradford** is the Community Energy Planner at the International District Energy Association (IDEA) and is responsible for the Canadian Desk. A graduate of the University of Waterloo with a Master of Planning degree, Bradford's research and project work focuses on the intersection of land use planning, density, and efficient solutions for addressing thermal energy requirements. He is a passionate advocate for the development of community-based thermal energy systems that make sense in a world of energy scarcity and climate change. Bradford is working with Canadian communities interested in deploying district energy systems to support more resilient energy strategies, increase economic competitiveness, and drive urban intensification. Prior to joining IDEA, Bradford worked as a Planner at the Toronto-based design studio DIALOG, where he provided land use and planning policy consultation for transformative projects across Canada.
In addition to his professional planning work, Bradford continues to research, compose articles, and speak on a number of topics including district energy development, transit urbanism, and resilient city building. He is one of the co-founders of the Future-Proofing Cities Working Group, an active contributor to the Symbiotic Cities Network, and holds a seat on the QUEST Research Advisory Board.

Dr. Stefan Blüm is heading the Energy Service department of Stadtwerke Ettlingen GmbH (SWE), multi-utility of the municipality of Ettlingen. He is responsible for project development and implementation of energy efficiency projects on the heat and power sector, including CHP projects.
He is a physicist by education, and his professional expertise covers a wide spectrum of topics, ranging from research and development, energy efficiency analysis and improvement, feasibility studies, energy concept and project development, economical evaluation and ecological impact assessment, to project management and international procurement procedures.
In his energy efficiency career he worked in several engineering and consulting firms as well as a freelance consultant in a wide variety of fields, with a focus on industrial and community energy efficiency projects.
He joined SWE in 2012, coming from the consulting engineer firm Kofler Energies International GmbH where he worked as Senior Energy Efficiency Expert, responsible for international consulting projects regarding all facets of Energy Efficiency and Renewable Energies. Until September 2010, he was the Head of the Department Clean Energy at MVV decon, the international consulting arm of the German multi-utility MVV group. Prior to this, he was project director for Electricity Efficiency in Industry and Commerce with the German Energy Agency / Deutsche Energie-Agentur GmbH (dena). Before that, Dr. Blüm worked with the consulting engineer firm Energieconsulting Heidelberg GmbH (ECH) and as a freelance consultant.
Dr. Blüm studied Physics at the University of Karlsruhe, and subsequently worked as fellow researcher at the Institute for Applied Physics at the Research Center/Forschungszentrum Karlsruhe, where he received his doctorate in Natural Sciences.

Barry Chuddy has more than two decades of industry experience. Prior to joining Guelph Hydro Inc. in 2009, he served as President and Chief Executive Officer of Columbia Power Corporation, Executive Vice President of Business Development and Marketing at Enersource Hydro Mississauga and held senior positions with TransAlta and Emera Inc. He was an original stakeholder Board member of the Independent

Electricity Market Operator (now the Independent Electricity System Operator - IESO) in Ontario and chaired the IESO Audit Committee. He is a past Board member of the Independent Power Producers Society of Ontario (now APPro) and currently serves on the Board of the Canadian District Energy Association.

Jan Carr was the Chief Executive Officer of the Ontario Power Authority from the time of its founding in January 2005 until September 2008. Prior to that, he was Vice Chair of the Ontario Energy Board during its transition from a government department to a self-funding independently operated tribunal.
Dr. Carr is a professional engineer who worked on the design and planning of electricity systems. He has also advised utilities, governments and others on the financial, business, strategic and policy aspects of the electric power industry.
He is a member of the boards of the Alberta Electric System Operator (AESO) and Guelph Hydro and has previously served on the boards of TransAlta Power, Legend Power Systems, and Macquarie Canadian Infrastructure Management.

Ron Collins joined Guelph Hydro Inc. in November 2010 with more than 15 years of senior management experience in Ontario's utility and power generation industries. In addition to holding senior manager positions with Capital Power, EPCOR, Enbridge and Union Gas, he founded Global Energy Solutions, an energy services consultancy that specializes in delivering highly effective Conservation and Demand Management programs as well as project management program for power generation projects. Collins has a Bachelor of Business Administration and Bachelor of Arts in Psychology degrees.

Thomas Döking is the Senior Head of District Heating at Stadtwerke Dinslaken GmbH in Dinslaken, Germany. Thomas holds a diploma in mechanical engineering with a main focus on supply engineering.
Before joining Stadtwerke Dinslaken in February 2012, he worked for a district heating subsidiary of E.ON group in the Ruhr Area since 1991. Döking has about 22 years of experience in the district heating supply field. After 10 years working in engineering district heating networks, substations, pumpstations, heat generation plants and housing installations, he was responsible for the operation and maintanance of a district heating grid containing a length of 700 km and supplying 13.000 customers in 7 towns throughout the Ruhr Area. In the E.ON group he was consulting several subsidiaries in different European countries concerning district heating inquiries and issues. He has been involved in many projects within the German district heating association.
At Stadtwerke Dinslaken, Döking is responsible for engineering, dispatching, operation and maintenance of the district heating business with a strong focus on the development of environmentally friendly and economical heat sources. He is also involved in the development of the supraregional district heating network in the Ruhr area which is strongly supported by the government of North Rhine-Westfalia (NRW).

Don Eaton (Elora Environment Centre, Executive Director)

Karen Farbridge was re-elected as Mayor of the City of Guelph in 2006 and returned to office in the 2010 municipal election. She was first elected to Council in 1994 and previously served as Mayor in 2000-2003 and 2006-2010. In the past, Farbridge has served as an Associate Professor at the University of Guelph, teaching courses in political science and environmental policy, and for ten years was the Director of the

Ontario Public Interest Research Group. In 2005, she was the recipient of the prestigious Women of Distinction Award from the YMCA-YWCA of Guelph in the business and professions category.

Peter Garforth runs a specialist consultancy based in Toledo, Ohio, and Brussels, Belgium. He advises major U.S. and Canadian companies, communities, colleges and universities, property developers, and policymakers on developing competitive approaches that reduce the economic and environmental impact of energy use. He has held senior management roles around the world at Honeywell, Landis & Gyr (now Siemens) and, most recently, was Vice President of Strategy for Owens Corning, the largest U.S. manufacturer of insulation and other materials. Garforth has long been interested in energy productivity as a profitable business opportunity and has a considerable track record establishing successful businesses and programs in the U.S., Western and Eastern Europe, Indonesia, India, Brazil, and elsewhere. He was the co chairperson of the International Advisory Committee of the Alliance to Save Energy in Washington, D.C., a founding member of the European Business Council for a Sustainable Energy Future, a member of the Steering Committee on Energy Efficiency Financing of the Russian Federation, and Chairman of the International Institute for Energy Conservation. He is also past President of the Board of Trustees of Toledo Opera and Vice Chairman of Downtown Toledo Inc, a non-profit organization dedicated to the revitalization of Toledo's city center.
His main activities are urban and regional planning, planning methods and theories. His experiences of national and international research projects are used in planning education as well as presentations at international congresses.

As the vice president of the Smart Grid Division, Mr. **Tim Gibson** is responsible for the daily management, direction and leadership of Siemens' Smart Grid activities in Canada, including its business units; Smart Grid Services, Energy Automation, and Rail Electrification. Gibson joined Siemens Canada in 1999 in the role of Service Delivery Manager for IT service delivery to Siemens Canada. In 2002 he moved into an operational role where he established the IT Service Desk outsourcing business for Siemens Canada, quickly growing this business to over 500 employees. With the formation of Siemens IT Solutions and Services in 2006, he was appointed to the position of Director, Sales and Delivery for Canada. In 2009 Gibson took on the role of Business Unit Head for Transmission & Distribution Services in Canada. The Siemens T&D Services team in Canada provides local solutions in the areas of complete substation equipment installation and repair, planning software (PTI), training, consulting and MDMR installation and integration for Canadian utilities and industrial clients. In October 2011, Mr. Gibson assumed the role of vice president of the Smart Grid Division where he brings together his IT outsourcing experience, knowledge of T&D Service, and background in the utility industry.

In his role as Executive Director for Quality Urban Energy Systems of Tomorrow (QUEST), **Brent Gilmour** is responsible for advancing the implementation of the QUEST vision and providing the overall leadership for the successful deployment of research and education to support Integrated Community Energy Solutions in Canada. Gilmour was involved with the initial launch of QUEST in 2007 when he was with the Canadian Urban Institute's (CUI) in the capacity of Vice President, Urban Solutions. Prior to joining the CUI, Gilmour was the Strategic Coordinator responsible for the establishment of the University of Toronto's Sustainability Office (USO) and was an independent research consultant specializing in community energy innovation. Gilmour is a registered professional planner specializing in integrated community

energy, transportation and land-use planning; downtown revitalization; and, public infrastructure investment. Gilmour has a passion for sustainable development and is active in many issues that are advancing Canada's productivity and urban advantage. Gilmour holds a Masters of Science in Planning from the University of Toronto, a Bachelor of Arts (Honours) from the University of Toronto and is an alumnus of Massey College.

Rob Kerr is the Community Energy Plan Manager for the City of Guelph. Kerr holds a bachelor's degree in physics and environmental studies and has over 25 years of experience working in field of energy management, with a unique mix of private sector experience and a strong background in public service. Kerr's career has evolved in parallel to a rapidly changing energy landscape- from straightforward energy conservation activities to leading edge approaches to energy, climate change and community sustainability. In addition to working for recognizable energy management providers such as Honeywell Ltd, he worked for energy-service subsidiaries of Toronto Hydro and Hydro Quebec. He has worked in energy related program delivery for both the provincial and federal governments. The majority of Kerr's career has focused on local governments and community sustainability initiatives- whether it's as a service to clients from his private sector positions, as the Energy Management Coordinator for the City of Mississauga, or the Director of the Canadian office for the International Council for Local Environmental Initiatives. Kerr has provided policy and program support to the Ontario and federal governments and has officially represented local government interests to international bodies such as the United Nations Framework Convention on Climate Change and its annual climate conferences starting in Kyoto in 1997. In April 2010, he joined the City of Guelph as the Community Energy Plan (CEP) Program Manager. He will represent the City of Guelph as a cornerstone partner in a community-wide effort to implement Guelph's CEP. Kerr will play a key role in educating the public and keeping stakeholders informed of the goals, progress and successes of the plan.

LLoyd Longfield is currently President and CAO of the Guelph Chamber of Commerce, since January 2008. A 28 year career in hydraulic and pneumatic machine automation involved working with distributors across Canada and working on projects across Canada and around the world in various industrial sectors. Currently serving as Chair of the Chamber Executives of Ontario as well as on the Board of Directors for the Ontario Chamber of Commerce, Innovation Guelph, the Guelph Wellington Business Enterprise Centre, and many committees within the City of Guelph. He holds a BA in Mathematics and English from the University of Manitoba, and Mechanical Engineering Technologist Diploma from Red River College.

Clifford Maynes (Green Communities Canada, Executive Director)

Julia McNally is the Director, Market Transformation, Conservation division of the Ontario Power Authority. McNally is responsible for 12 staff who make up the Market Transformation team. This Team will identify the next generation conservation programs, policies and technologies, and will be known for its innovation, pilot projects, and relevant research. She originally joined the OPA in January of 2006 as Manager – Planning, Coordinating and Reporting, Conservation Bureau. McNally is an Adjunct Professor of Osgoode Hall Law School of York University, and teaches a course on Demand Side Management: Policy and Regulation.

McNally has an LLB from The University of Toronto and an LLM from Cambridge University in the UK. McNally practiced law for 10 years in the legal aid system and in a private labour firm. Prior to joining the Ontario Power Authority, McNally was the Director of the Tenant Duty Counsel on housing and other issues. She was also a lead member of the Low Income Energy Network, and their counsel at the Ontario Energy Board.

Karen Nasmith is a LEED®-accredited professional, registered professional planner, and social entrepreneur with experience in climate change and sustainability. Nasmith has a Bachelor of Industrial Engineering (Dalhousie University) and a Master in Urban Planning (McGill University). She has worked extensively with municipalities on sustainable integrated planning and implementation, and recently co-founded Project Neutral. Over the past 15 years, she has analyzed systems in the northern Alberta oil sands; worked with farmers to examine the role of public participation in Pueblo, Mexico; managed social impact assessments in the Caribbean; and developed an expertise in the planning implications of urban mining and climate change adaptation and mitigation planning. She has worked with a range of clients, communities and stakeholders to develop community plans, and collaborated with integrated design teams to develop realistic implementation strategies. As Director of Project Neutral, Nasmith is leading the development of a model for transformational neighbourhood-based climate change action.

Martin Nohe represents the citizens of the Coles Magisterial District on the Prince William Board of County Supervisors. He was elected to this position in November 2003 and was chosen by his colleagues on the Board to serve as the Vice Chairman for calendar year 2007, and again in 2012. Prior to his election as Supervisor, Mr. Nohe served as an elected member of the Prince William Soil and Water Conservation District from 2002-2003. Supervisor Nohe serves on a number of boards and committees that work at the local, regional and state level including: Transportation, Natural Resource Conservation, Child Welfare and Advocacy and Public Safety and Administration of Government.
Supervisor Nohe is the president of Appliance Connection, a Woodbridge-based, family-owned retail appliance store. He has a bachelor's degree in economics from George Mason University and is a graduate of the University of Virginia's Sorensen Institute for Political Leadership.

Bernd Tischler is lord mayor of the city of Bottrop, elected in the municipal elections in 2009. He finished his studies of spatial planning at the University of Dortmund with a diploma in 1984. After the clerkship at the District Government of Cologne and the Great State examination for higher technical management services in 1987 in Frankfurt am Main, Tischler worked from 1987 to 1989 as deputy chief officer in the Office of Urban Affairs and Business Development of Dormagen. In 1989 he came to the city of Bottrop, where he worked as a department manager for environmental planning until 1993. He was then Head of land-use planning and deputy chief officer. In 1995, Tischler was promoted to the director of the city planning office. In 1996 he was appointed Executive Director of Construction.

Annette Voigt is as Area Manager Foreign Economic Relations in the Ministry for Economic Affairs, Energy and Industry of the State of North Rhine-Westphalia responsible for activities related to France and North America. She graduated in 1992 at University of Public Administration Ludwigsburg with a diploma in Public Administration. From 1992 to 1997 she worked for the Regional Government in

Düsseldorf. She is working with the Ministry in several different departments since 1997. In particular her main target is to support the development and growth of the economic relations with the U.S., Canada and France. That includes to maintain and develop commercial contacts and to initiate and accompany new projects for example in areas as energy, renewable energies, environmental technologies, innovative materials, mechanical engineering, information and communication technologies. She is contact partner to embassies, organizes and executes delegations of the minister/state secretary and supports delegations at home and abroad. She also coordinates and plans events, on trade fairs as well.