

Transatlantic Urban Climate Dialogue

Briefing Books

Workshop # 2

Renewable Energies and Implementation Actions in Community Energy Planning

May 2 – 4, 2012, Arlington/Alexandria, Northern Virginia

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The Project is supported by the Transatlantic Program of the Federal Republic of Germany as Part of the European Recovery Program (ERP) of the Federal Ministry of Economics and Technology

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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 The Cases

A City of Guelph Case Study



A1 Energy and the Built Environment: Implementation Actions in Community Energy

A1.1 District Energy, Downtown Revitalization and Economic Development

A1.1.1 An overview of the role of District Energy in Guelph's Community Energy Initiative

Guelph is a city of 118,000 people, located in Ontario, Canada, west of Toronto. It has committed itself to use less energy in 25 years than it does today, to consuming less energy and water per capita than comparable Canadian cities and to producing less greenhouse gas per capita than the current global average.

In order to achieve these goals, Guelph has established a *Community Energy Initiative* that has earned international attention. It is among only a handful of North American cities to undertake an energy management project of this scope. The Community Energy Initiative (formerly Community Energy Plan - CEP) is Guelph's commitment to use and manage energy differently, better, than it has in the past.

Guelph's leaders recognized the growing importance of effective management of energy and water to the economy and environment, and in 2004 formed a Consortium to proactively develop a community energy plan. The Consortium represents all facets of the community including the administration, academia, business, the gas and electric utilities, and other community groups. In 2006, the Consortium decided to formalize a long-term Community Energy Plan (CEP) which would guide the city's energy future for years to come.

The CEP calls for making the city the place to invest in its commitment to making a sustainable energy future. This includes ensuring that it have a variety of reliable, competitive energy, water, and transport services available to all and to assure that publically funded investments visibly contribute to meeting these goals. Each of the goals has recommended long-term measurements detailed in the plan.

In 2007, the Guelph City Council unanimously endorsed the vision, goals and general directions of a 25-year Community Energy Initiative that will put Guelph on the cutting edge for North America. Under the initiative's targets, Guelph could use less energy in 25 years than it does today – even with expected residential growth of 65,000 people – and cut its annual greenhouse emissions by nine tons per person. This will put Guelph among the top energy performers in the world, and make it one of the most competitive and attractive communities in which to invest.

The CEP was developed using the following priorities:

- maximize the energy and water efficiency for buildings, vehicles and industry;
- maximize use of heat generated in electricity generation and existing industrial processes;
- incorporate as many renewable energy sources as feasible; and

- team with the existing electricity and gas networks to avoid wasteful duplication of assets.

One of the ways to achieving these ends is through the incremental creation of an energy distribution architecture in Guelph that will allow the majority of the city to be served with fuel choices that optimize cost, availability, and environmental impact long into the future. The CEP emphasizes that a successful community energy plan must take into account that over the decades that form the horizon of the plan, options for fuel, energy conversion, distribution and management technologies will change, and there must be sufficient flexibility built in to adapt as costs and technologies change.

As such, the CEP recommends a stepwise development of district heating networks covering the higher density areas of the city to supply space heating and domestic hot water. These networks also provide an efficient and economical way to distribute heat from a variety of existing and new energy sources.

The CEP recommends the approaches used by cities such as Mannheim or Copenhagen. These very efficient and reliable energy and water systems share a common feature – that the existence of all energy services is being supplied by a single company. This approach allows distribution of not only gas and electricity, but also heat, and sometimes cooling, as public utilities. Once a reasonably widespread district energy network is in place, various heat and electricity sources can be easily combined, and can change over time. This avoids the inefficient use of primary fuel, and allows a rational integration of alternative energy sources.

This is done by developing a network using pressurized hot water, running at about 120°C. This approach is more efficient than individual boilers and furnaces. Heat distribution is done via insulated pipes laid in the streets. These typically have a fully functional lifespan of 75 to 100 years. Connection at the buildings or homes is via a simple heat exchanger that transfers heating to the building's heating and domestic hot water system, obviating the need for a boiler and a furnace. If justified by the economics, there are analogous district cooling networks. In Guelph's climate these will probably be limited to high-density commercial developments, and significant industrial cooling loads.

The basic recommendations of the CEP are:

- develop a long-term approach to creating a district heating system that covers the high density areas of Guelph;
- initially focus on developing local networks within the context of the Scale Projects with the medium term aim to interlink the local networks into a city wide structure where justified by demand and economics; and
- create a municipal energy services company that has a franchise to deliver a wide portfolio of energy services including electricity, gas, heating and cooling. Other services, such as compressed air, could be included selectively.

Over time, a district energy system becomes more and more efficient and economically attractive as multiple heat sources are integrated along with a growing portfolio of clients. The experience of Mannheim and Copenhagen is that the sale of heat utility is ultimately more attractive than the sale of electricity.

Interesting Link:

Community Energy Initiative:

http://guelph.ca/uploads/ET_Group/admin/CEP_report_web.pdf

A1.1.2 A New Vision for Guelph's Downtown: The Downtown Secondary Plan

The Downtown Secondary Plan – Envision Guelph Downtown will set a long term vision to guide future development within the study area over the next 20 years. It will focus on how change should occur downtown with an emphasis on land use and urban design and therefore guide municipal and private sector actions and reinvestment decisions. It will become part of the City's Official Plan, which is the document that manages land use policy and change. The goal is to ensure Downtown Guelph grows and evolves in a meaningful and relevant way as a vibrant focus for civic, business and cultural life for all of Guelph's citizens and as a complete community unto itself.

Besides creating a diverse, vibrant, and livable urban center, which in addition to the preservation of historic buildings, an enlivened riverfront, and attracting innovative businesses, one of the visions is to become an inherently sustainable place – a green showcase of sorts – because of its density, mix of uses, and walkability. Adding more people, jobs, parkland and pedestrian-oriented places will make it, and the larger city, more sustainable.

This plan is the outcome of a study initiated in 2008. The process leading to this study began a year earlier in September, in response to new provincial policies applicable to Downtown, in which extensive consultations with downtown business owners, community leaders, residents and various other stakeholders were held to identify new broad directions for redeveloping areas of Downtown and improving its public realm. The Official Plan for Downtown had not been thoroughly reviewed and updated since the 1970s. The proposal for the Secondary Plan was completed in March 2011.

The proposed Secondary Plan possesses some overarching objectives and general underpinning principles. It describes, for example, the intended structural framework for Downtown Guelph, in terms of public transit, streets, open spaces and land use. It also contains policies regarding all aspects of development. Finally, it concludes with a description of the actions and tools required to implement the plan.

The plan establishes eight core principles from which a multitude of objectives and targets arise. With the vision that by 2031, Downtown Guelph be developed beyond its historical pattern into a distinct urban center that is a model for high-density, sustainable living, the plan emphasizes the conservation of historic structures and building beautifully, adding to the number of residence living downtown, attracting a diversity of businesses and thus jobs (7,500 by the target date), increasing the number of public institutions (and institutional jobs) as well as the number of cultural events, integrating the Speed River back into a community-wide asset, and facilitating mobility through multiple modes of public transportation and street design, with a focus on walking.

The plan also states its objectives to sustainable environmental (re)development, which includes the promotion of energy-efficient buildings and low impact development, district energy systems; green roofs and other like landscaping practices; water conservation, the re-use of stormwater and the reduction of stormwater run-off; remediation and redevelopment of contaminated lands; increased green space and number of trees Downtown; and efficient use of municipal infrastructure.

The plan aims to put Guelph in the overall positioning as a place for investment. Downtown will also be the preferred location for jobs that depend on proximity to urban services and sectors which tend to attract employees who prefer living in a downtown urban setting. Examples include major office developments, the information and communication technology sector, post-secondary educational institutions, and residential development in Downtown.

The implementation of the Secondary Plan will require a variety of tools and many actions on the part of the City, private landowners, institutions, downtown businesses and others. The City may establish a design review committee, composed of experts to review the proposals. It will also consider community improvement incentives and grants, which are listed in the plan. Further, it identifies a series of more detailed studies and strategic documents that will need to be developed to implement specific initiatives and generally support the policies of the plan including the District Energy Feasibility Study discussed in the next section.

The Plan also identifies the numerous opportunities for partnerships between the City and other private and societal entities to implement key elements of the plan. Financing of the implementation of the plan will be subject to the capital budget as well as the availability of funding from other levels of government. A Downtown Implementation Strategy shall be prepared, reviewed and updated a minimum of every five years.

Interesting Link:

The Downtown Secondary Plan:

<http://guelph.ca/living.cfm?itemid=78561&smocid=1878>

http://guelph.ca/uploads/PBS_Dept/planning/PDF/downtown%20guelph%20secondary%20plan%20study_mar23_for%20website.pdf

A1.1.3 District Energy Feasibility Study

In August 2010, Guelph Hydro Inc., along with Union Gas, the City of Guelph and the Federation of Canadian Municipalities, commissioned and produced an in-depth study about the potential clean energy projects for Guelph, i.e. the feasibility of Developing a Downtown District Energy System for the City of Guelph Using a Combined Heat and Power Facility.

The District Energy Feasibility Study provides a roadmap for city planners considering combined heat and power plants as part of their sustainable energy planning for communities. A District Energy System provides heating, cooling or both mediums

distributed as thermal energy from a central plant to residential, commercial, institutional and/or industrial consumers for domestic water heating, space heating/cooling, and/or industrial processes.

The heating energy is distributed by steam or hot water and cooling energy by chilled water piping networks. It consists of three main components: the central heating/cooling plant, the distribution network, and the customers' connection. This system provides economic and environmental benefits depending on the particular application. Since Canadian communities tend to be more spread out than those found in European townships, and DESs are more suited to urban communities of moderate population densities, the success and economic viability of them in Canada requires advanced commitment and planning.

The driver of this report is the City of Guelph's Community Energy Plan (CEP), as discussed above on pg. x. The objectives of the study were to:

- provide general, background information about District Energy Systems also known as District Heating and Cooling Systems;
- provide a roadmap to assist City planners in evaluating the potential of combined heat and power plants (CHP) or cogeneration facilities as a clean energy solution for municipalities;
- determine the applicability of DESs in the City of Guelph by retrofitting existing buildings and energy systems in three identified zones;
- provide insight regarding the cost to construct, maintain and operate a DES in Guelph over a lifecycle of 30 years;
- identify legislative and regulatory hurdles to establishing DESs in communities;
- develop the District Energy design criteria and technical performance measures;
- address greener and cleaner alternate fuel sources such as biomass, biogas, municipal solid waste, solar energy and geothermal energy;
- address the environmental issues of greenhouse gas emissions from a DES;
- Provide key conclusions with reference to current trends and barriers to DESs; and
- Make recommendations to the City of Guelph to move forward.

Having a DES in Guelph provides a number of benefits to the community. These include environmental benefits such as a reduction of greenhouse gas and NO_x emissions by 36,939 tons/yr and 436,134 Kg/yr, respectively, in addition to improved environmental conditions for the health and welfare of local inhabitants due to use of single higher chimney as opposed to low-height multiple ones throughout the city. Another advantage is the decrease in energy use, by 743,673 MM BTU/yr, energy waste, and a decreased dependency on fossil fuels. A DES also creates jobs during construction and then after (i.e., administration, operating, monitoring, and maintaining equipment). It improves the economy due to continuous operation of central plant equipment having the flexibility to match the diversity of varying city wide loads and the embracing of emerging renewable

technologies. These benefits also fit within the Ontario Green Energy & Green Economy Act.

The study points out that the financial burden to implement these undertakings is beyond the means of most private investors and therefore is normally carried by local governments supported by provincial and federal governments. The total cost for a DES system is higher than an Individual Energy System (conventional method) over a life span of 30 years mainly due to the high construction cost of distribution piping in a DES system. The study provides a list of various levels of funding and incentive programs that are available.

But despite the clear understanding of the intricacies of entering into the field of district energy with its high costs of construction, operating and maintenance, the feasibility study also points out that the long term benefits for the community as a whole can be gratifying. The study lists five pros and four cons for a Guelph DES. The positives ranged from more energy efficiency due to simultaneous production of heat and electricity in combined heat and power generation plants to future flexibility, in which a DES provides a plug and play opportunity (that stand-alone building systems cannot) to incorporate fuels and technologies of the future. The negatives spanned from requiring a long-term commitment that fits poorly with a focus on short-term returns on investment to needing to encourage buildings of the past perform energy systems retrofits to use DES-generated energy.

Three zones within Guelph were considered for initiating a DES: (1) Zone 1 – Guelph General Hospital; (2) Zone 2 – the downtown core; and (3) University of Guelph.

With regard to Zone 1, Guelph General Hospital, the study concludes that distribution to such a small number of customers is not practical in the near future due to the high cost of distribution pipe work. Therefore it is recommended to proceed with a cogeneration unit for hospital only. An important message from the Zone 1 study is that to distribute hot and chilled water to a small number of facilities will incur great expense requiring considerable funding from government sources. Therefore, a signed contract or formal agreement between the supplier and customer needs to be in place prior to the DES installing new buried pipe services.

Zone 2 includes the above discussed Secondary Plan, which provides the greatest potential for a DES to be successful. Therefore, as each phase of this plan unfolds, the energy center equipment capacity will need to be increased together with extensive buried distribution piping, all of which will need to be paid for through additional government funding or municipal bonds.

It was considered that Zone 2 and Zone 3, the University of Guelph, be linked together. The study found that the only value of such is security which can be achieved at a much less cost by adding another boiler to the Zone 2 energy center. The study recommends that the link not be implemented.

Based on the study results, the following four main recommendations are considered applicable to the Guelph DES:

1. Proceed with the cogeneration systems of Zone 1 and Zone 3 which are seen to be viable projects with no government funding and providing an excellent Internal rate of return.

2. Maintain a communication link between Guelph Hydro Inc. and City of Guelph Planning Department with a view to incorporate a DES into the Guelph Secondary Development Plan.
3. Program a DES for downtown City of Guelph beginning with a cogeneration unit and small energy center when the redevelopment of the downtown core begins.
4. Expand the energy centers of Zone 1 and Zone 2 as the customer interest and commitment develops.

Interesting Link:

District Energy Feasibility Study:

<http://www.envida.ca/en/informationevents/reportspublications.asp>

http://www.envida.ca/en/informationEvents/resources/Feasibility%20Study%20_%20Final%20Report%20May%2027,%202010.pdf

<http://www.envida.ca/en/informationEvents/resources/District%20Energy%20Feasibility%20Study%20-%20Aug%2017,%202010.pdf>

A1.1.4 Guelph’s Economic Development Strategy: Prosperity 2020

In November 2008, the Mayor of Guelph and the Guelph City Council committed to the development of a new ten-year Economic Development and Tourism Strategy for Guelph – Prosperity 2020. This strategy supports the City of Guelph’s Corporate Strategic Plan of being “the city that makes a difference,” and the strategic goal of having “a diverse and prosperous local economy.” Specifically, Prosperity 2020 is about sustaining and enhancing the City of Guelph’s position as a competitive and prosperous location for private and public sector investment.

The plan is broken up into two phases. Phase 1, Economic Base Analysis Report, is intended to describe and assess the context and foundations shaping economic growth prospects for the City. It identifies the business sectors driving economic growth to 2006, those expected to continue to do so into the future, and the City’s competitive advantages and disadvantages. Phase 2: Strategic Directions for Economic and Tourism will provide direction, priorities and performance measures for the transformation of Guelph’s economy over the next decade and beyond.

The Economic Base Analysis identified sources of competitive advantage and disadvantage for the City. The former includes many assets with which to support further development of Guelph’s economy such as: commitment to leadership, innovation, and sustainability; location and accessibility; available employment land; a well-educated, skilled and lower cost labor force; presence of the University of Guelph and Conestoga College; emergence of more diverse industrial sectors; and civic and tourism assets. The City’s economic potential is also constrained by several competitive

disadvantages including: an employment structure and labor force with very heavy concentrations in the struggling manufacturing sector and in education; employment growth lags population growth; higher tax and impeding (2014) Development Charges costs; lagging ethnic diversity; limited reach of tourism assets; and onerous city requirements on top of the growing set of other regulatory hurdles.

These issues led to a set of recommended strategic directions for economic development and tourism with the over-arching goal to diversify Guelph's economy and the following seven areas of supporting focus:

- Focus Investment and Growth: target sustainable competitive advantage in selected business sectors.

In this sense, the plan states that Guelph's strengths in manufacturing and education should be balanced by growth in the selected business sectors. Some of these businesses include agri-innovation; environmental/renewable technologies; advanced manufacturing; professional, scientific and technical services; information, cultural, communications and technology industries; tourism and film. The strategy also includes defining a "green" niche that Guelph can grow into a position of dominance as quickly as possible.

- Re-position Guelph: as a premier business investment location.

The city should improve upon its current perception and reputation as being a difficult location to establish and operate a business. There are two keystones. First it should make itself more "business friendly" by identifying and implementing appropriate initiatives and programs. It should also set up a formal Business Retention and Expansion program, to engage with the local business community, understand its aspirations and needs, any issues with the way the City is doing things, and gain related intelligence and insights.

- Invest in People and Ideas: make Guelph a community of choice for talent of the future;

As the Phase 1 report indicated that Guelph has a lower proportion of visible minorities than the provincial average, which is necessary for the country's ability to maintain its wealth, the city should invest in attracting a steady stream of talented workers from other countries and integrating them into the workforce. One program to help with the migrants is the Guelph Work Development Council, which consists of business, education, and government partners from the community to identify and develop workforce development strategies for the future. That said, it is also important that the city nourish its home grown talent, which should account for 80 percent of new business growth.

- Invest in Hard and Green Infrastructure: support and maximize economic benefit.

"Green" infrastructure encompasses both hard assets (e.g., district energy plants and heat recovery from server installations) and such softer examples as water and energy conservation/efficiency programs, trail systems, tree canopy enhancement programs, a "pollinator," bio-fuel substitutions programs, etc. This will help create investment

streams that can help support new product and expertise development and business growth; create assets that improve quality of life, sustainability and community attractiveness to new talent or green industry; and substantiate Guelph's branding as the city that makes a difference.

- Invest in Tourism: develop new tourism products and experiences and establish a destination marketing presence.

The contributions of tourism to Guelph's economy and cultural life are not fully understood. The industry makes a substantial contribution to the City economy, across such sectors as accommodations and food services, recreation and entertainment, retail, and in attendance at cultural and sports events. Recent expansion of the accommodations base has brought more capacity than demand to fill it at current levels of visitation. More overnight visits to Guelph must be generated, which will require new product development, packaging and infrastructure (e.g. signs, kiosks). Consultation stakeholders do not perceive Guelph as having a distinct tourism brand, which makes it difficult to sell as a compelling destination. Attracting visitors will support job growth.

- Invest in the Downtown: target icon status for a vibrant, transit connected, mixed use center.

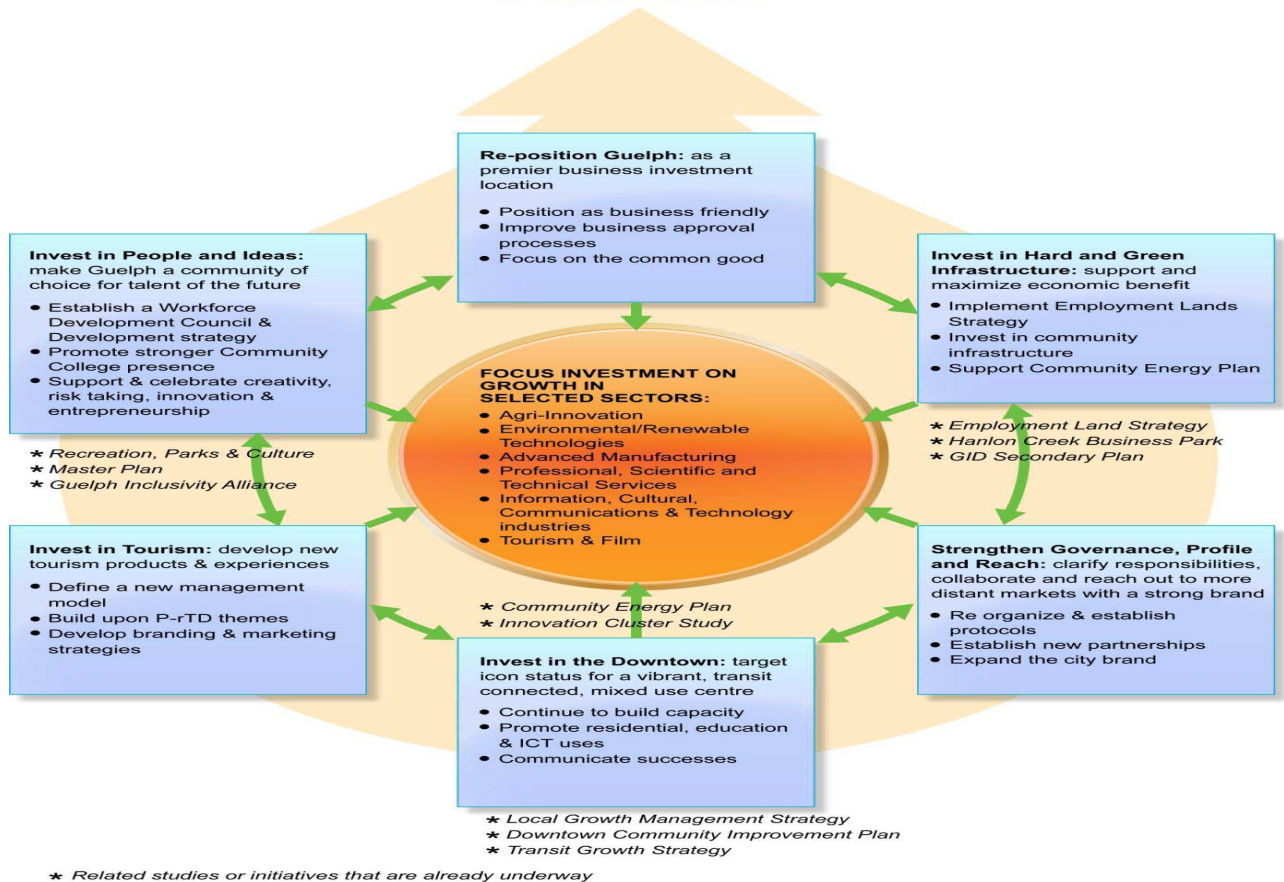
The consultation sessions revealed a perception that the Downtown is not viewed as a particularly attractive or safe destination, and that more needs to be done to fix its problems. The vitality of the Downtown and its importance to economic development and tourism objectives stems from its role as a symbol of what the whole of Guelph is (i.e., vibrant and attractive, or not so), for its strength as a higher density employment location, and as a place which generates both civic pride, and attraction to new residents and talent at executive and lower levels.

- Strengthen Governance, Profile and Reach: clarify responsibilities, collaborate with partners and reach out to more distant markets.

With global development trends highlighting the importance of large scale city regions (vs. nations) as economic entities, and despite notable exceptions, Guelph does not have, and will forever be challenged to achieve, a global profile by itself. The City, considered to be somewhat insular, could play a more active role in regional partnership. The plan recommends that the City's economic Development Advisory Committee also be restructured so that it is comprised of representatives of other agencies engaged in economic development in Guelph. The report lists some provincial and federal funding programs that are structured through evolving regional organizational frameworks, as well as partnerships and/or sector cluster initiatives.

The plan also provides a list of the elements supporting the recommended strategic direction according to priority.

DIVERSIFY GUELPH'S ECONOMY



To implement the strategy, the next steps, according to the plan, are to develop a detailed business/work plan that would: define detailed action plans; identify appropriate timelines; identify the respective implementation role(s) and responsibilities of both the city and other organizations; identify resources; and establish performance measures to ensure the strategy is a success.

Interesting Link:

http://guelph.ca/newsroom_display.cfm?itemID=78869

<http://www.guelph.ca/business.cfm?subCatID=2138&smocid=2711>

<http://www.guelph.ca/uploads/business/documents/Phase%201%20Prosperity2020.pdf>

<http://www.guelph.ca/uploads/business/documents/Phase%202%20Prosperity2020.pdf>

A2 Engagement of Business: Maximizing Jobs and Investment

A2.2 Aligning Energy Planning: Investment and Economic Development

A2.2.1 Prosperity 2020 focus on Clean Technologies

Prosperity 2020, outlined above, considers Guelph's role in stimulating innovation in green/ clean technologies. Successful implementation of the Community Energy Plan and Guelph Innovation District's Life Science and Innovation District Cluster in Agri-technologies and Environmental Technologies will stimulate local innovation; however, all of Guelph's sectors need to support the development and application of low-carbon technologies.

The City's vision "To be the city that makes a difference" links very strongly to becoming a center for innovation and growth in green/clean technologies. The Environmental Technologies sector includes approximately 30 firms that provide a wide range of manufactured products, research and development laboratories and consulting services. Products and services include water and wastewater treatment technologies, environmental remediation technologies and wind energy engineering services. The private sector employs over 1,000 people in Guelph.

However, the landscape in this realm is getting crowded as more and more municipalities adopt "going green" as a competitive strategy. By virtue of earlier starts, greater mass or bigger profiles, many are arguably already ahead of Guelph. Guelph has to establish a particular niche to differentiate itself in this market.

The city has plans in to invest in hard and green infrastructure and to support and maximize the economic benefit of such, as discussed above on p. x. "Green" infrastructure encompasses both hard assets (e.g., district energy plants and heat recovery from sewer installations) and such softer examples as water and energy conservation/efficiency programs, trail systems, tree canopy enhancement programs, a "pollinator," bio-fuel substitution programs, etc.

Investment in such infrastructure is considered important to economic development for several reasons: it creates investment streams that can help support new product and expertise development and business growth; it creates assets which improve quality of life, sustainability and community attractiveness to new talent or green industry; and it substantiates Guelph's branding as the city that makes a difference. Guelph needs to support job growth by putting in place the infrastructure necessary to support it, with sufficient lead time to drive demand.

In terms of goals, the city supports business competitiveness through the provision and management of local and regional infrastructure. This means that the city has to ensure that it has at all times a sufficient supply of "shovel-ready" employment lands available to accommodate forecasted demand; invest in and support improvement to local and regional infrastructure in line with their potential economic development impacts; and enhance and encourage the sustainable use of "green" infrastructure in the community and by individual businesses.

The report recommends that the city:

- implement the recommendations contained within the Guelph Employment Lands Strategy including: re-development and promotion of brownfield sites; servicing and marketing of the Hanlon Creek Business Park; and, planning, servicing and marketing of the Guelph Innovation District;
- identify, prioritize and promote investment in community infrastructure including transportation linkages, municipal and other utility services, broadband and fiber-optic connectivity and hard and soft “green” infrastructure assets;
- support the goals of Guelph’s Community Energy Plan through promoting the adoption and incorporation of its recommendations by businesses in the City;
- investigate the introduction of local programs and incentives to support the incorporation of a minimum LEED building standard on Guelph’s employment lands; and
- incorporate successes in creating and implementing new infrastructure initiatives into all economic development and tourism marketing and communications.

Interesting Link:

Prosperity 2020: <http://guelph.ca/business.cfm?smocid=2711>

A2.2.2 Province of Ontario – Green Energy and Economy Act: A Provincial Job Creation Strategy

On September 24, 2009, the province of Ontario introduced new regulations to create thousands of jobs in the new green economy. The Green Energy Act provides a stable investment environment where companies know what the rules are – giving them confidence to invest in the province, hire workers, and produce and sell renewable energy.

The major components of the act include:

- A Feed-In-Tariff (FIT) program, which allows individuals and companies to sell renewable energy – like solar, wind, water, biomass, biogas and landfill gas – into the grid at set rates.

The long-term price guarantees for renewable electricity generators, which will increase investor confidence and make it easier to finance projects. The program has several key features:

- Allows all sizes of generators, from homeowners to large developers to participate;
- Has prices that are intended to cover total project costs and provide a reasonable rate of return over a 20-year contract (40 years for waterpower);
- Is open to various renewable energy technologies: biogas, biomass, landfill gas, solar photovoltaic (PV), wind and waterpower;
- Provides incentives for Aboriginal projects;

- Provides incentives for community-based projects;
- Provides a straightforward way to obtain a contract for renewable electricity generation;
- Has different prices for different technologies and different project sizes; and
- Includes domestic content requirements.

FIT payments can range from 10.3 cents per kilowatt-hour (c/kWh) for landfill gas projects larger than 10MW to 80.2 c/kWh for residential solar rooftop projects 10 kW or smaller.

- Domestic content requirements, which would ensure at least 25 percent of wind projects and 50 percent of solar projects be produced in Ontario – requirements for solar will increase by January 1, 2011 and wind will increase by January 1, 2012.

For micro solar PV (10 kW or smaller), the requirement started at 40 percent and increased to 60 percent on January 1, 2011. For larger solar PV, the requirement started at 50 percent and increased to 60 percent on January 1, 2011.

- A streamlined approvals process and a service guarantee to bring developers greater certainty.
- Regulations for setting wind turbines certain distances from houses, roadways and property lines.
- A new Ontario Renewable Energy Facilitation Office (REFO) – a one-stop shop to help renewable energy projects get off the ground faster.

The REFO, an umbrella body with not regulatory responsibilities, functions as a source of information for renewable energy developers, communities, and municipalities, and can act as a liaison between these parties and Ontario's ministries and agencies. The REFO can assist in setting up a coordinated orientation meeting to discuss a project's requirements. This meeting can help clarify various requirements related to the renewable energy project.

More than 50,000 direct and indirect jobs were expected to be created under the Act. Investments in new renewable energy projects already in place or under construction in Ontario since 2003 exceed \$4 billion.

Ontario is Canada's leading province in wind power, producing enough electricity to power more than 300,000 homes. The province has gone from 10 turbines in 2003, to more than 670 today and will have 975 by 2012. The Act aids Ontario's commitment to eliminate coal-fired power by 2014 – the single largest climate change initiative in Canada.

The Act completes the 10th step in the province's "Ten Steps to Green Energy," which are a series of bold measures to create green jobs and open green energy investment opportunities throughout the province. The steps include measures such as closing coal-fueled power units, energy programs for the aboriginal population, municipal energy programs to help with the costs associated with new renewable energy projects, and

other programs and incentives to help with renewable energy in the province.

Interesting Link:

Provincial news release on objectives of the legislation:

<http://news.ontario.ca/opo/en/2009/09/green-energy-act-will-attract-investment-create-jobs.html>

A2.2.3 Has it Worked? A White Paper by Jann Carr, Board Member, Guelph Hydro with Some Recommendations to the Feed-in-Tariff Program

Has Ontario's Feed-in-Tariff (FIT) program worked? Jan Carr, a Board Member of Guelph Hydro, examined this question in September 2011.

Ontario's FIT program for buying wind and solar electricity at premium prices has come in for heavy criticism as consumers face the prospect of ever-rising electricity bills. While today's electricity prices are relatively unaffected by FIT, the program is building higher costs into tomorrow's electricity bills at about \$310 per year or a 22 percent increase for an average residential customer.

The current program is economically unsustainable due largely to excessive subsidies, which are borne entirely by electricity sales, and lack of incentives for electricity generators to be innovative or improve cost-effectiveness. As well, FIT's cumbersome structure requires detailed management, which results in the Ontario Power Authority (OPA), its administrator, being seen as a roadblock.

Carr argues that the current FIT program should be modified to become a Distributed Generation Tariff (DGT) better equipped to contribute to the province's electricity supply. DGT would take over where FIT has failed by facilitating economical investment in a broad range of small-scale renewable, integrated and waste energy projects. A DGT would ensure that the baby – small-scale generation projects that reduce our environmental footprint – remains, while the dirty bathwater – the subsidies and prescriptions that encumber FIT – is thrown out.

Like a FIT, a DGT would be a standardized agreement that defines the terms, conditions and prices under which a utility system would accept electricity from independent generators. The DGT "tariff" would comprise non-negotiable standard terms and pricing arrangements, similar to the way most consumers buy electricity. The main value of a standardized contract with a pre-established price is that it can facilitate the development of innovative and environmentally friendly integrated energy projects such as district heating and energy generation from waste. It can also reduce the cost and risk of developing new generating projects, which is particularly important for small-scale, distributed-generation projects associated with the emerging concept of the "smart grid."

Any standardized tariff arrangement also has the potential to unnecessarily increase costs for consumers. Without such an arrangement, electricity suppliers who are independent of the utility operating the electricity system would arrange individual pricing and contract terms, typically through a competitive process. A standardized tariff

eliminates competition in the supply of electricity and thereby both stunts innovation and exposes customers to higher prices, particularly on large-scale projects.

Ontario's current FIT program is designed for only selected types of generators, especially wind and solar, even though their intermittent nature means they cannot alone meet customers' electricity needs. As well as not providing supply reliability, this technology-specific approach disadvantages a number of other types of generators that also have reduced environmental impacts such as integrated energy systems and energy from waste projects. The new DGT would be technology-neutral, apply only to small-scale projects and not have a limited contract term.

Integrated energy systems make better use of raw energy resources – oil, gas – by combining what would otherwise be separate processes producing useful energy – heat, light, power – so that waste energy from one process cascades down to become the input to another process. The “cogeneration” plant, since it produces both electricity and heat, has a higher efficiency and results in lower environmental impact.

Another approach to cogeneration is to supplement heat supplied by a primary fuel with waste heat. As well, waste itself can be used as a fuel, heating, for example, municipal solid waste to extremely high temperatures through the use of electric arcs inside a sealed container. As a result, waste is converted into a large volume of combustible gas and a small amount of glass-like solid residue.

Integrated and waste energy systems are typically small-scale from an electric power perspective. They are also located either close to their fuel sources – municipal waste or waste heat, for example – or close to the associated heat customers such as communities with district heating or industries requiring process heat. This distributed nature of generation sources reduces the need to transport electricity over long-distance transmission lines and has both economic and environmental benefits. Many types of renewable generation projects including wind and solar systems are also small in size and therefore share these potential advantages.

But combining separate energy-producing processes entails the additional challenge of amalgamating separate businesses. Because a DGT arrangement fixes the pricing, terms, and conditions for selling the electricity, the commercial arrangements for the overall project can be organized around the non-electricity requirements.

Regardless of a project's size, some minimum level of effort is required to plan, design and gain regulatory approvals. As a result, this “transaction cost” is proportionately much higher for small projects compared to large projects. By eliminating the competitive tendering process and substituting standard contractual and pricing arrangements, a DGT reduces project transaction costs, of particular importance to the economic feasibility of smaller-scale projects.

Carr concludes that a DGT program can add to Ontario's options for building an electricity supply with a low environmental footprint while also not sacrificing economic, reliability and diversity benefits. A DGT approach would also keep pace with technological and commercial innovation while allowing simplified local management to replace complex centralized administration.

Ontario's current FIT arrangements miss delivering on these promises because, among other failings, they are available only to prescribed types of generating technologies – a limited list that will inherently always lag behind the potential of innovation. The current FIT program is also vulnerable because it will inevitably raise electricity prices.

Interesting Link:

White paper by Jann Carr:

<http://www.cdea.ca/sites/cdea/files/news/attachments/CCRE%20Commentary%20-%20September%202011.pdf>

A2.2.4 Aligning the City Government and Organization to Better Attract Investment and Job Creation: Creating a Municipal Holding Company

The city of Guelph is considering the creation of a municipal holding company that would strengthen corporate governance practices regarding the management of city-owned assets such as Guelph Hydro Inc. and Guelph Junction Railway. These considerations are the result of a process that began in November 2008, when the Guelph City Council directed the establishment of a steering committee to explore the future direction and opportunities of the Guelph Hydro business enterprise.

A draft business case study for the structure, objectives and design of a municipal holding company for the city was completed in May 2010 which also included and has been afterwards ready for public input. The model is to help meet the objectives of the City's Strategic Plan, and long term sustainability and economic prosperity goals.

The City of Guelph found it necessary to investigate alternate governance models for the management of current and future City-owned assets to ensure the greatest value to the City as the primary shareholder. In looking at the concept of improved governance alternatives for current City-owned assets, the study considered a number of both form and function options including: a corporate governance division within the City; the Status Quo; Sale/Merger of corporate assets; and Independent development corporations – deciding for the creation of the aforementioned new municipal holding company.

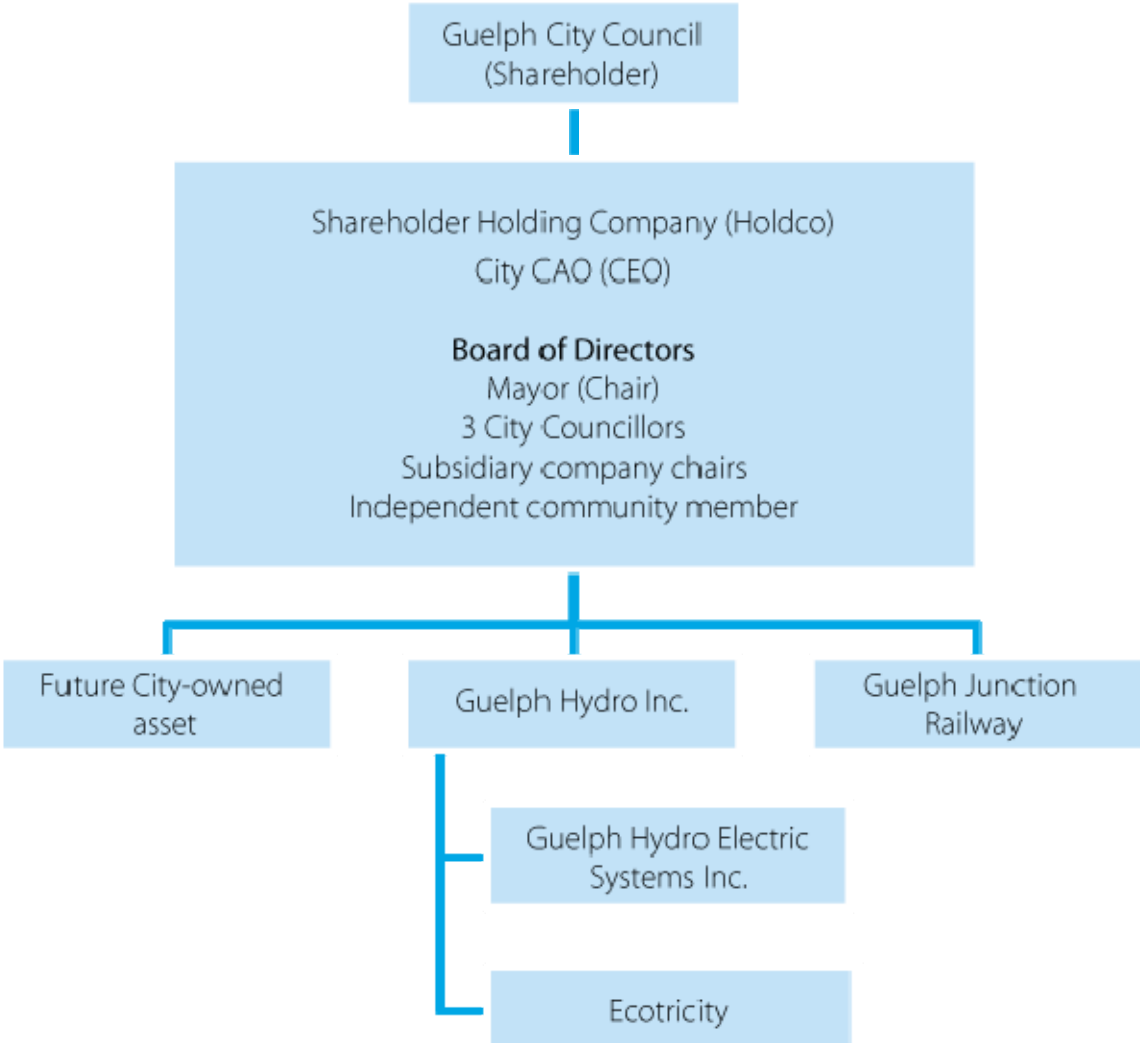
The development of such an entity is permitted under the 2001 Municipal Act Legislation (O.R.) 599/06), which gives local governments the powers to establish a range of corporations. The envisioned new holding company "Holdco" will be structured under the Ontario Business Corporations Act (OBCA). It will be governed by a board of directors including the Mayor, acting as chair, three City Councillors, the Board Chairs from subsidiary companies and one independent community member. All directors will be appointed and approved by City Council. The Chief Executive Officer (CEO) of the holding company will be the Chief Administrative Officer (CAO) of the City of Guelph.

The study recommends the new governance model for the management of current and future city-owned assets to realize the full potential of city assets and realize long-term economic benefits for the city. The new model represents a more strategic approach to asset management and would be self-financing from regular dividend payments. It aims

to achieve a more effective corporate governance, and the benefits outlined by the draft business case study include: A better system of ‘checks and balances’; strengthened communications; improved asset management practices; inter-operational synergies; increased accountability; strengthened strategy alignment; and robust reporting practices.

The new holding company will primarily work towards improved communication and information flow between the shareholder and the operating companies, capitalize on potential synergies. For this reason, subsidiaries will be directly linked through shared policy and strategic direction; the model still embraces the concept of skills-based boards and allows for the right degree of independence so that operating companies continue to be flexible and self-reliant.

The draft business case study outlines five principles that will govern the operations, services and activities of Holdco. Some of these include that there is collaboration with the public and private sectors and transparency by clearly articulating reporting and approval requirements. Another principle is that the boards of the subsidiary companies be recognized and regarded as independent and skills-based. Integration and coordination of overlapping community interests and professional capabilities are additional components. Finally, when it comes to shareholder return and benefits, in general, a long term, strategic view will be applied to such a measure.



Interesting Link:

<http://www.guelph.ca/cityhall.cfm?subCatID=2235&smocid=2808>

http://www.guelph.ca/uploads/administration/Holdco/Holdco_draft%20business%20case%20study.pdf

A2.2.5 City Staff Restructuring for Innovative Ways to Implement Long Term Investments Including the Community Energy Initiative

In early February 2012, the city of Guelph announced some key administrative changes, including the creation of a new Finance and Enterprise service area that is expected to drive innovation within the corporation. The city's Economic Development, Downtown Renewal and Community Energy divisions will join the Finance department to create the new service area.

The changes are expected to improve in the delivery of public services, prompt staff to feel more empowered to explore alternatives and act on them, and help drive a culture of innovation.

Finance and Enterprise Services will be led by a new Executive Director, who will bring expertise in innovation and enterprise to the City's Executive Team. A General Manager of Finance will lead the staff team that delivers the key municipal responsibilities of financial planning, risk management, budgeting, revenue collection and accounting.

Other changes are in community and social services. Tourism Services, formerly with Economic Development, will move to the Arts, Culture, and Entertainment division of Community and Social Services, while Parks Maintenance and Development, except for Forestry Services, will also join Community and Social Services.

In the realm of corporate and human resources, Corporate Communications will move from the CAO Office to Corporate and Human Resources. Meanwhile, in operations and transit, Emergency Services, which includes emergency planning, fire and ambulance will join Operations and Transit. Forestry Services will stay with Operations and Transit and be part of Public Works. Finally in planning, building, engineering, and environment, Planning and Building Services will be split into two departments.



February 7, 2012

Interesting Link:

“Finance and Enterprise”:

http://guelph.ca/newsroom_display.cfm?itemID=80671

A2.2.6 How Guelph Worked with Canadian Solar Inc. to Secure Location, Jobs

The world’s eighth largest solar module company, Canadian Solar, Inc., announced in August 2010 that it will establish one of the largest solar module manufacturing facilities in the continent in Guelph bringing 300 to 500 jobs to the city. Canadian Solar Inc. is a leading vertically integrated provider of ingot, wafer, solar cell, solar module and other solar applications. It designs, manufacturers and delivers solar products and solar systems for on-grid and off-grid use to customers worldwide. It is one of the world’s largest solar module producers by manufacturing capacity.

This decision demonstrates early success of the city’s economic development plan, Prosperity 2020 (see above, p. x). Even more, it represents and is attributed to the objectives of the Community Energy Initiative (see p. x) – to use less energy in 25 years than it does today, consume less energy per capita than comparable Canadian cities, produce less greenhouse gas per capita than the current global average, and to position Guelph as a place in which to invest. Such were the reasons that Canadian Solar Inc. chose Guelph as its site to locate. It is a good example of government, business, investors, and citizens working together to achieve these sustainable ends. It also demonstrates the success of Ontario’s Green Energy Act (see p. x), on which the

Community Energy Initiative was based, in generating new investments in solar energy, beginning Guelph's transformation to a new green economy.

Canadian Solar Inc.'s Guelph facility is valued at about \$24 million. At full capacity the facility's total output will generate solar-based power that exceeds the entire current electrical demand of the Guelph community. The Guelph facility marks the first for Canadian Solar Inc. outside of China.

Interesting Link:

Press release:

http://guelph.ca/newsroom_display.cfm?itemID=79109

A3 Education and Outreach

A3.1 How Education/Outreach Are Integrated into Local Delivery of Provincial Conservation and Smart-Grid Programs

Between now and 2025, Ontario will replace about 80 percent of its electricity system. There are several ways to do that, including building new generating facilities, refurbishing current ones, and investing in conservation and energy management tools so that less new electricity generating capacity is required. The following talks about the local delivery of provincial conservation and smart-grid programs and how education/outreach help residents and businesses participate in such programs.

A3.1.1 A Summary of Programs Provided by Ontario Government and Delivered by Guelph Hydro Electrical Systems, Inc.

On February 25, 2011, the Ontario Power Authority and local electricity distribution companies (LDCs) launched an extensive multimedia awareness campaign that explains how consumers and businesses can conserve energy and better manage their electricity costs. The four-week campaign features TV, radio, outdoor, and online components. Moreover, full details about programs and related savings are spelled out at www.saveonenergy.ca.

The campaign supports the Ontario government's Long-Term Energy Plan by increasing conservation and empowering consumers and businesses to better manage their electricity use and costs. These efforts have saved more than 1,700 MW of electricity since 2005 in the province, equivalent to taking more than half a million homes off the grid. The following provides a synopsis of the programs provided by the Ontario government and delivered by Guelph Hydro Electrical Systems Inc. for consumers:

Fridge & Freezer Pickup is designed to remove older, inefficient fridges and freezers from the electricity system. They typically use two to three times more electricity than newer appliances. In this program, the Ontario Power Authority offers to pick up older refrigerators and freezers as well as window air conditioners and dehumidifiers from residents of Ontario and fully decommission them in an environmentally-friendly way.

The reasons given for people to participate are that it could save them up to \$125 a year on their electricity costs, help the environment, and be free of hassles for free. They have to qualify as having the appropriate appliance, however, in terms of size, age, and type of home.

The **Heating and Cooling Incentive** was created to inspire customers to purchase and install energy-efficient heating and cooling equipment through participating contractors. More than 20 percent of the energy used in Ontario is used to run homes. And as much as 60 percent of a person's electricity costs go toward heating and cooling the home.

The goal of the program is to reduce electricity consumption and demand from residential heating and cooling in Ontario by encouraging Ontario residents to: (1) replace their existing Central Air Condition (CAC) system with an ENERGY STAR qualified system (or better); (2) replace their existing furnace systems with an eligible high-efficiency furnace equipped with an Electronically Commutated Motor (ECM). An ECM is a brushless motor technology in forced air heating applications that works to reduce the electrical consumption of the furnace motor by as much as 60 percent.

There are also incentives for **Buying a New Home**. The OPA and Guelph Hydro, for example, work with home builders and renovators to build and renovate single family homes that are energy-efficient, smart, and integrated. Efficient refers to efficient electronics, appliances, home systems and building envelope. Smart refers to effective management of electricity in homes. It uses price signals, coupled with load control devices or systems that can range from simple switched sockets to sophisticated smart home grids. And integrated refers to reducing electricity use and other forms of energy through home design and examining new and innovative ways to use energy in the home. The benefits may include – financial, environmental, home comfort, and resale value.

There are a handful of energy-efficient new home programs offered including New Home Construction, EnerGuide for New Homes, ENERGY STAR for New Homes, LEED Canada for New Homes, and R2000 for New Homes.

New Home Construction promotes home energy performance and the installation of energy-efficient products to builders and renovators across the province. Builders are encouraged to build homes that achieve performance ratings like EnerGuide 83 or better. EnergyGuide is a Canadian rating system to help consumers understand energy-efficiency options. With regard to new homes, it rates the energy efficiency of a new home on a scale from 1 to 100, and compares its energy performance with other rated houses of a similar size. They are also encouraged to install energy-efficient products to help save electricity in the new home such as: all-off switches, which is a master power switch to turn everything off at once; electronic commutated motor (ECM); seasonal energy-efficiency ratio 15 central air conditioners (SEER 15 CAC); ENERGY STAR mark on light fixtures; and lighting control products.

ENERGY STAR for New Homes is an extension of label rating program of products. To qualify for a home with ENERGY STAR for New Homes status, builders select from a series of building options that will improve the home's construction in areas such as: building envelope (walls, insulation, windows, doors, roofing) and mechanical systems (high-efficiency furnaces, air conditioners coupled with heat recovery systems).

LEED Canada for New Homes is a standard designed to help builders to deliver energy and environmentally conscious new homes. It looks at new construction from a range of perspectives to reduce the overall environmental impact of the house. The LEED rating system allows builders to earn points in 8 categories: innovation and design process; indoor environmental quality; location and community; materials and resource use; indoor and outdoor water efficiency; energy efficiency; site sustainability; and awareness and education.

The R-2000 concept is the outcome of major evolution in building science since the 1970s that is still used today: the “house as a system.” The theory behind the house as a system is that the flow of air, heat and moisture in a home is affected by the interaction of all its components. Every R-2000 home is subject to a strict independent quality assurance process of testing and verification from blueprint to completion. Once an R-2000 home has complied with all tests and inspections, a certificate is awarded by the Canadian government. The R-2000 standard does not specify how a house must be built, but is a set of strict technical requirements for how a house must perform, including stringent standards for energy efficiency, indoor air quality and resource conservation. Internationally, R-2000 technology has also been embraced – with homes built in the U.S., Japan, Poland, Russia, Germany, and most recently England.

There are also several provincial programs for businesses. There are energy-efficiency programs to assist organizations from retail stores to industrial complexes. They help to fund energy audits, replace energy-wasting equipment or to pursue new construction that exceeds existing codes and standards. Businesses can also pursue incentives for controlling and reducing their electricity demand at specific times. These programs not only help businesses reduce their electricity costs, but they help the province defer the need to build new generation and reduce its environmental footprint.

The programs include Demand Response; Small Business Lighting; Retrofit Program; Audit Funding; Existing Building Commissioning; High Performance New Construction; Process and Systems; Training and Support; New Home Construction; and Social and Assisted Housing.

Demand Response programs compensate participating businesses for reducing their energy demand at specific times of power system need. During such times wholesale market prices for electricity may be high, the power system is experiencing large peaks in demand, or there is a greater risk to the reliability of the electricity grid. Demand Response can be incorporated into the businesses’ energy cost-management strategy in several different ways by reducing equipment electricity use, generating its own power, or shifting production to an off-peak period.

Businesses can participate in Demand Response Voluntary DR1, Contractual DR3, or Peaksaver for Small Businesses. DR1 and DR3, as implied, the one voluntary and the other contractual, are for those who have a minimum annual peak demand of 50kW. In both, the Demand Response is determined by comparing a businesses’ actual metered load during an activation period with a calculated baseline representing what the normal load would have otherwise been during the activation period. Demand Response can be met by shedding load by turning off lights or motors, shifting production to other periods, or drawing electricity supply from an onsite generator. Each activation generally lasts for a four-hour period. Total activation request are expected to add up to 100 hours per year for DR1 or between 100 and 200 for DR3, depending on the contract.

In DR1 the amount of compensation received is based on how much Demand Response a business provides. In DR3, the business will receive “capacity” payments for each hour of the 1600 hours they agreed to be available, plus additional “energy” payments for the actual amount of energy curtailed during an event.

Peaksaver is for businesses that have CACs and an annual electricity demand of less than 50kW. A thermostat or switch is installed so the CAC can receive a signal to cycle itself down. The temperature only changes slightly, and for just a brief period during weekdays.

Under the program, **Small Business Lighting**, for businesses with an electricity demand of less than 50kW, funding of up to \$1,000 is provided for new energy-efficient lighting and equipment otherwise known as a retrofit (including the cost of materials and labor). An appointment will be made for a licensed electrical contractor to come and assess the business, identify the options, and finally complete the retrofit. There may be opportunities for further energy efficiency retrofits above the \$1,000 allowance.

The Retrofit Program provides financial incentives to encourage the replacement of existing equipment with energy efficient equipment and new control systems that will save businesses money and improve the efficiency of the operational procedures and processes. All kinds of energy projects may be able to participate such as: replacing old lights with new energy efficient lights, putting in lighting controls, redesigning HVAC, replacing Chillers adding variable speed drives for pumps and fans and improvement of thermal performance of a building envelope through measures such as increased insulation, installation of high performance windows and frames, low emissive window glazing or low emissive roof barriers.

There are three ways to conserve energy in the program: the prescriptive track; the engineered track; and the custom track. The prescriptive track gives the ease of selecting from a defined list of end-use measures that come with a corresponding per-unit incentive, e.g. lighting, motors, unitary A/C. The engineered track consists of a series of preset calculation worksheets, ranging from commercial interior lighting engineering to compressed air engineering, that help estimate reductions in peak demand and/or electricity consumption that apply to the installation of more energy-efficient equipment or solutions. The custom track is available for more complex or innovative solutions not covered in the prescriptive or engineered track, and not on the pre-defined list. Technology, equipment and system improvements are evaluated on their demand and energy-performance. Incentives are paid after installation, and once the savings have been measured and verified. The incentives are based on the information that is provided specific to the project such as: a description of the facility baseline electricity use, disposal costs of old equipment, and the cost of the new equipment.

The **AUDIT FUNDING** program provides incentives to businesses to complete energy audits assessing the potential for energy savings to be achieved through equipment replacement, operational practices, or participation in Demand Response initiatives and other building systems and envelopes projects. The incentive is intended to cover up to 50 percent of the cost of an energy audit, based on requirements that take into account the size and complexity of the buildings.

For eligible building owners, there are up to \$25,000 in incentives available for electricity survey and analysis. This financial analysis, or life cycle analysis, provides the data for a business to fully consider the financial benefits of installing a variety of

energy-efficient measures. An additional \$10,000 in incentives is also available for a detailed analysis of capital intensive modifications, which is the next step after the electricity survey and analysis has been completed. For eligible tenants, there is also up to \$7,500 in incentives available for electricity survey and analysis. Here the incentive pays for audits of lighting, office equipment and plug loads.

As air conditioning can be costly to operate and maintain, particularly if the business has a large Chilled Water System. The **Existing Building Commissioning** program for Chilled Water Systems provides funding for: hiring an expert to analyze the Chilled Water System and make recommendations for increasing its energy efficiency; buying and installing metering equipment; and implementing the recommended upgrades. Owners or lessees of such systems located in commercial buildings, institutional buildings, and multi-family building are eligible.

There are four stages of participation, each with an incentive. In the scoping study phase, an industry expert is hired to provide a snapshot of the businesses' Chilled Water System's performance. In the investigation phase, a Data Acquisition System is installed to obtain data from the system for analysis and recommendations. In the implementation phase, the participant commits to implement all measures with a payback period of less than two years. Finally the hand-off/completion phase produces a report describing the training and documentation provided to the system operators and an analysis.

In an effort to target new construction and major renovation in the planning stages, the **High Performance New Construction** program provides design assistance and substantial financial incentives for building owners and architects who exceed the electricity efficiency standards specified in the Ontario Building Code. The program supports up to 100 percent of the cost of modeling a building (up to \$10,000) for the building owner. Approved projects are eligible for incentives in one of two program approaches – a Prescriptive component, which encourages incorporation of pre-approved technologies and a Custom component with incentive based on modeled energy performance.

The **Process and Systems** program helps a business find and hold onto major energy savings. It includes the valuable financial incentives and technical expertise that a business needs to upgrade its key systems and make improved energy management a part of how it does business. The program is designed to provide a business with major funding and technical expertise to help it: find and study its best opportunities to save; modernize its key systems not only for energy efficiency, but also for enhanced productivity product quality and reliability; get the benefits of an on-site expert; provide team with accurate, up-to-the-minute data about energy use; get advantages through energy management best practices.

The program is made up of two complementary streams. First is the energy efficiency upgrades, which is a three-step feasibility and upgrade process to help a business fine, study and act on its best opportunities: the preliminary engineering study, the detailed engineering study, and the capital incentives. Second is energy management and monitoring, which are incentives providing long-term support to maintain and grow savings. These are the embedded energy manager, monitoring and targeting, and meter lending library.

There is also funding **training opportunities**, i.e. for businesses to hire an **Energy Manager**, who can take on responsibilities such as identifying energy saving opportunities, developing energy plans, applying for program-related incentives, setting up company energy committees and building business cases to support company investments in energy-efficiency projects.

There are several criteria for which energy managers can be funded. Energy managers, for example, may be funded up to 80 percent of the energy manager's annual salary, plus reasonable expenses of up to 80 percent per year. Other criteria include that the energy manager must enroll in energy management related training programs and must develop an energy management plan and provide periodic reporting.

The **New Home Construction** initiative is designed to encourage home builders and renovators to construct energy-efficient homes in Ontario by incorporating energy-efficiency into their construction or any extensive renovation. Incentives are available to home builders and renovators for the installation of energy-efficient measures in the home, as follows: prescriptive; performance based; custom; and training. The prescriptive incentives available to home builders and renovators are for a range of defined electricity-saving measures that can be installed in the home including measures ranging from an "all off switch" to ENERGY STAR Qualified indoor light fixtures. For the performance incentives, a new home that achieves a certain score according to EnerGuide is eligible for up to \$1,000. Finally, incentives for custom measures are exclusively for innovative, cost-effective, energy-efficiency building projects that do not qualify for the others. They are provided on a savings basis.

Finally, there are financial incentives to make **social and assisted housing** building more energy-efficient. These incentives can help such housing providers undertake energy audits to identify potential energy savings opportunities, and make upgrades to equipment, such as HVAC systems, in-suite appliances and lighting fixtures, as well as to the building envelope. A wide-variety of energy-efficiency upgrades are now eligible for savings of as much as 50 percent. Additional incentives totaling \$5 million annually are available to eligible housing providers on first-come, first-served basis for equipment replacement projects. Training, tools and resources are also offered to help tenants adopt energy-saving habits.

These programs also speak to many of Guelph's Community Energy Initiative targets including the following:

- Use efficiency to create at minimum all the energy needed to support the growth of the residential sector

Ontario recently passed stringent new energy efficiency building codes that will be fully in force by 2012. The CEP is recommending that the city explore incentives and other approaches to immediately implement the full code. From 2012 onwards, the CEP is recommending a steady annual improvement in energy efficiency of about 1 percent per year.

- Use efficiency to create all the energy needed to support the growth of the commercial and institutional sectors

- Adopt an energy performance labeling scheme for buildings as a voluntary initiative for the city, teamed with Natural Resources Canada and a local mortgage bank, to act as a pilot for the whole of Canada to gain about 5 percent incremental delivered efficiency
- Add to Guelph's attractiveness for quality industrial investment by offering world class tailored energy services and achieve annual investment growth rates higher than the underlying population growth, with no overall increase of the primary energy needed to serve the first fifteen years of growth.
- Incrementally create energy distribution architecture in Guelph that will allow the majority of the city to be served with fuel choices that optimize cost, availability, and environmental impact long into the future.
- Within fifteen years, at least a quarter of Guelph's total energy requirement will be competitively sourced from locally created renewable resources
- Guelph will reduce the magnitude of the summer grid electrical peak by at least 40 percent by 2031 to avoid the need for investment in new electrical infrastructure to serve the growth of the city
- Guelph will systematically create an integrated energy metering, billing and management network across the entire city to allow cost-effective management of all energy forms.
- Guelph will implement large area high-efficiency Scale Projects that accelerate progress towards a successful implementation of the CEP by creating early success and developing a deep pool of community expertise.

Interesting Links:

<https://saveonenergy.ca/Consumer>

<https://saveonenergy.ca/business>

<http://www.powerauthority.on.ca/news/province-wide-saveonenergy-campaign-starts-monday-%E2%80%93-money-saving-benefits-energy-conservation-e>.

Community Energy Initiative:

http://guelph.ca/uploads/ET_Group/admin/CEP_report_web.pdf

A3.1.2 An Overview of Smart Meters and Time-of-Use Rates

The Ontario government has also recently introduced smart meters – along with a “time-of-use” electricity price structure – to help manage electricity costs, while helping the province to build a more efficient, more environmentally sound electricity system. All Guelph Hydro residential and small commercial customers had their smart meter installed and were switched over to Time-of-Use rates for electricity during the summer and fall of 2011.

Smart meters measure hourly electricity use so that prices can be set based on the time of day – better reflecting the way electricity prices work in the electricity market. For example, on-peak pricing for summer 2011 was 10.7 cents and off-peak was 5.9 cents. The goal with time-of-use rates for electricity is to encourage consumers to shift some of their usage to mid-peak or off-peak times to shave the peak.

Supplying electricity at peak times has, namely, a range of impacts. It adds to electricity costs, it is hard on the environment, and it means building more generating facilities and

more transmission and distribution infrastructure. As consumption is moved away from the more expensive (peak) times of the day, Ontario can reduce its peak demand, which means less need for new generating facilities and transmission and distribution infrastructure, lowering costs for all Ontarians.

Specifically, a smart meter can record and automatically report electricity consumption information. The consumption it records on an hourly basis is typically reported via a wireless technology. Conventional meters only measure total electricity consumption from one reading to the next, and they have to be read manually in order to report that information. The conventional way provides very little incentive to manage electricity use because the electricity prices remain the same no matter what the time of day simply because the meters cannot report when electricity is used, whereas the new smart meters allow for the introduction of “Time-of-Use” electricity rates – which provides a way to potentially reduce costs. The meter data can be read up to the previous day not only via phone, but also via Internet.

The cost of the smart meter initiative will be recovered through the electricity distribution rates paid by all customers in the same way that costs for existing meters and services are recovered today. And while there are costs associated with smart meter implementation, smart meters also offer efficiencies and cost savings which will be reflected in future consumer charges.

The smart meter system opens also opportunity for new kinds of conservation and demand management programs. Since smart meters provide accurate feedback about the electricity consumption and give consumers the opportunity to take advantage of lower rates, smart meters will in the future make it possible for people to use such innovations as home energy management systems and electric vehicles.

There are some key communications strategy objectives for this program. The first is to minimize resistance to it. This is done through customer education. For starters, customers will have received a letter about 60 days prior to their household’s changeover advising them of the upcoming change along with information about Time-of-Use rates and tips on how to shift some of your energy use to off-peak or mid-peak times if they wish. If customers do not change their patterns, they will pay about the same price for electricity as under the conventional model. And by taking advantage of the TOU – they will save money.

Another strategy is the minimization of calls to the call center. This is possible because the meter data can be read up to the previous day not only via phone, but also via Internet, as discussed above, which reduces calls. This allows customers access to their smart meter data. With access to information on a secure Internet site, informed choices can be made about how to take advantage of this information in order to impact consumption and costs. And putting the customer in the position to choose if, when and how s/he wants to save money and electricity, and providing the secure access to information, also positions Guelph Hydro as a valued, trusted source of information, which is the third objective.

Interesting Link:

<http://www.guelphhydro.com/SmartMeterAndTOURates.php>

http://www.guelphhydro.com/pdfs/TOU_FAQs%20-%20May%202011.pdf

B Northern Virginia Case Study

B1 Energy and the Built Environment: Implementation Actions in Community Energy

B1.1 Arlington County Crystal City IEMP

B1.1.1 Overview of Arlington Community Energy Plan and District Energy Planning

Arlington is an urban county of approximately 26 square miles located directly across the Potomac River from Washington D.C. The county's proximity to the nation's capital, its public transportation network, and its highly skilled labor force have attracted an increasingly varied residential and commercial mix. The county's current estimated population is 212,300, and forecasted to grow to 247,600 by 2040. Arlington's economy revolves around the U.S. Government and the related industries that provide consulting services to the federal government.

In January 2010, then Arlington County Board Chairman Jay Fisette announced that the County would expand its efforts to reduce greenhouse gas (GHG) emissions by developing an Arlington Community Energy Plan (CEP). Arlington County has successfully reduced GHG emissions from government operations through the AIRE (Arlington Initiative to Reduce Emissions) program. AIRE set a specific goal of lowering County government GHG emissions 10 percent from 2000 to 2012. The county now seeks to broaden that effort with meaningful community dialogue on cutting-edge GHG emissions reductions programs and energy generation, distribution, storage, and use in the greater Arlington community.

A Community Energy and Sustainability (CES) Task Force was appointed by the Board on January 1, 2010 to draft the CEP. The 30-person Task Force comprised community leaders that represented many sectors. Together with input from the community and the Technical Working Group, the Task Force provided the County Board with a Task Force Report for the CEP in March 2011, which was accepted by the board in May 2011. The report, or CEP, puts forth numerous recommendations and strategies to manage energy use, distribution, generation, and storage between 2011 and 2050 (see details below, p. x).

Benchmarked against global best practices, the plan has three overarching goals:

- Enhance Arlington's economic competitiveness and provide high-quality jobs
- Ensure reliable and affordable energy supplies
- Demonstrate the county's long-term commitment to reducing its greenhouse gas emissions as outlined through signing the "Cool Counties" Initiative.

The recommended "headline target" is for Arlington to reduce its annual GHG per capita emissions to at least 3.0 tons (mt) from the current 13.4 tons over the next four decades. To this end, the CEP recommends specific energy policies in the areas of buildings, district energy (DE), renewable energy, and transportation. This section will specifically address the DE component, which speaks to the CES Task Force Scale Projects that address entire neighborhoods in the County. The Scale Projects are large enough to

address both energy demand and supply within a single project but small in the number of decision-makers. Over time, a “connecting of the dots” of the projects is expected.

District energy systems (DES) allow for more efficient use of heat from local CHP (combined heat and power) generation, which decreases the fuel waste in the generation of electricity. This approach is one of the largest and most significant changes to Arlington’s energy future. The county uses half of all its energy in such high-density areas. By 2030, 146 MW of CHP are expected to be distributed to such areas, consisting initially of a combination of natural gas engines and small turbines and possibly fuel cells. By 2050, at least 10 percent of the needed energy could come from biofuels and recovered waste heat.

The Arlington CEP has concluded that high-density areas such as Crystal City and the Ballston Rosslyn Corridor have the potential to economically transition towards neighborhood-scale DESs starting as early as 2015. Specifically, the CES Task Force calls for the development of Integrated Energy Master Plans (IEMP) for Crystal City, Columbia Pike, Rosslyn and East Falls Church. In the case of Crystal City, the first steps are being taken under the leadership of Vornado in cooperation with the County and local utilities (see below, pg. x), which can serve as a framework to create IEMP Scopes of Work for other comparable high-density areas.

A District Energy Company (DEC), whose first priority could be to develop these areas, should be granted the right to supply heating, cooling and domestic hot water services via DESs on an exclusive basis anywhere within Arlington for at least 20 years. It should be free to pursue other energy service related businesses on a competitive basis. And it should operate on a for-profit basis, with profit sharing based on ownership and mutually agreed commercial conditions, which can take several different forms.

While the Task Force does not recommend a particular ownership form, it does illustrate some successful approaches, each with different advantages and disadvantages, from around the world. The first is a DEC ownership structure, in which the DEC would be owned and operated by the county as a public corporation, with profits going to the county government. The disadvantages in this scenario include having to use public money for all investments and the possible lack of innovation performance stimulus that can occur in public ownership. The second is a public-private partnership option, in which the DEC would be owned by both the county and private investors and investments and profits would be divided according to the ownership shares. The advantages are the shared risks and possible increased motivation for innovation and growth beyond county. Disadvantages may include different public and private motivations.

The third is an investor-owned company, which would mean 100 percent owned by private investors, who would operate under a county license. The advantage is that all the financial risks are private. The possible challenge is to maintain a balance between being a long-term public service provider and a profitable private entity. The fourth is a site specific company, which is a special purpose company to provide DE to a specific site. This model is not commonly used. Whichever model is chosen, the Task Force says that the investments and benefits should be shared between property owners, energy consumers, and the DEC.

In terms of physical assets, the DEC could own and operate effects such as the network of highly insulated pipes and thermal sub-stations. It would either own energy sources or purchase the output of sources owned by others under long-term contracts. As the DE network grows, other thermal sources such as geothermal loops may be added. The owner of a property connected to DE would no longer own heating and cooling assets, they would be shared across the network.

With regard to revenue, DE heating, hot water and cooling services should be invoiced by the DEC using heating and cooling meters. Prices would be competitive with prevailing heating or cooling equivalents using natural gas or electricity. Due to the inherent efficiency and the flexibility of DE to make use of multiple fuels and waste heat, and the long-term nature of the service agreements, the costs for the end-user should be equal or less than business-as-usual.

The CEP would like to see about 70 percent of all relevant buildings to be district-energy ready and most DE connected by 2050.

Interesting Links:

Information about Arlington County CEP including report:

<http://news.arlingtonva.us/pr/ava/community-energy-plan.aspx>.

Arlington Environment Information:

<http://www.arlingtonva.us/portals/topics/TopicsEnvironment.aspx>.

B1.1.2 Investing in district energy: Cost-Benefit, an Overview

How a district energy system is owned and operated impacts the cost advantages and disadvantages. This section looks at some of the legal and economic implications from two different reports.

McGuireWoods Consulting LLP and McGuireWoods Consulting LLC completed an analysis of Virginia law and DESs in August 2011 for the Northern Virginia Regional Commission on district energy systems in Virginia – the statutory authority for creating them; local, state, and federal regulatory process; the ownership structures that are possible; operation issues; and financing considerations, among other things.

According to the findings, a DES in Virginia would operate within a complicated legal framework, which creates significant legal requirements and barriers for certain types of DES structures. That said, the paper found that Virginia’s legal framework does not present severe barriers to a DES structure so as to avoid those impediments. Some of the legal concepts are as follows:

- Directly or indirectly, Virginia localities have the authority to own and operate a DES under Virginia law.
- The Virginia State Corporate Commission (SCC) regulates, among other things, the rates, terms and conditions and quality of service of public utilities, as well as the construction and acquisition of public utility facilities. However, the SCC does not

have the power to regulate utility services provided by (or to) municipal governments except with respect to the construction of electric generation facilities.

- A DES will be subject to a variety of environmental permitting requirements typical for both publicly- and privately-owned energy (and non-energy) facilities.
- The treatment of DESs under plans and zoning ordinances varies by jurisdiction.
- A DES that produces only thermal energy will not be subject to federal energy regulation. However, a privately-owned DES will be subject to federal energy regulation (albeit one that is not overly burdensome) if it sells electricity at wholesale, or transmits electricity, in interstate commerce.
- Municipalities and public service corporations (i.e., utilities) have the power of eminent domain, but generally with the consent of the other party or the SCC.
- A DES may need or want to enter into a variety of contracts as part of its operations.

The various types of ownership arrangements for a district energy system (DES) include private ownership and operation, public ownership and operation, and mixed public and private ownership and operation (see also CEP above, p. x). A successful DES can be created in Virginia using any of these ownership structures, although each structure has its own advantages and disadvantages. In addition, the type of services provided by the DES may suggest one choice of ownership structure over another.

In the first option regarding private ownership and operation, a private company would be to be able to finance the development, ownership and operation of the DES. Typical debt levels for a project such as this would be somewhere between 60-75 percent of the DES costs.

The principal advantage of public ownership is that the SCC does not regulate public entities, which would reduce development costs and operating costs, and increase the DES's operation flexibility. These benefits obtained, however, would need to be balanced with the additional costs attendant on public ownership, including public procurement rules, hearing requirements, and other requirements of public bodies.

Under the public ownership option the paper lists six possibilities: locality ownership; electric utility authority; water and sewer authority; community development authority (CDA); service districts; and sanitary districts. Of these various forms, direct DES ownership by a locality or ownership by a Sanitary District offers the most advantages and greatest flexibility in financing, operations, and rate setting. A Sanitary District has a number of financial alternatives. It can levy a tax on all properties within the district to pay for expenses and charges incident to constructing the systems. It can fix and prescribe rates and charges for use of the systems. And it can issue bonds in an amount not to exceed 18 percent of the assessed value of all real estate in the district. These mechanisms create multiple sources of revenue to establish and operate a DES.

A Sanitary District can also play a role in a mixed public/private arrangement. A DES, for example, could be owned by a public entity such as a sanitary district or municipality, but operated by a private party under the terms of an operations and maintenance agreement. The private party might finance and construct the new generation assets and lease existing real property and/or physical assets such as pipelines and/or underground tunnels from the affected localities to implement the distribution system. In addition to this combination, the paper lists other public

ownership, private operation options as non-stock corporation; franchise agreements; joint ownership; and split ownership.

According to FVB Energy, Inc., ownership structures have a significant impact on the options available for funding and financing the development of the system. The ultimate structure should be tailored to the goals of the major stakeholders. Key considerations in the assessment of models should include:

- Access to a range of project financing sources, including state and federal grants, tax credits, subsidized financing tools and cost-effective market-based financing.
- Risk mitigation in construction and operation of the system that can address energy costs and price stability, as well as changing environmental parameters.
- Flexibility to accommodate future expansions of the district energy system while supporting development and sustainability agenda.

It is not just the ownership structure that has a financial impact; the range of district energy technologies do as well. FVB Energy, Inc. analyzed such technologies and their potential to save energy, reduce GHG emissions, cut peak power demand and save money in the region. The generalized economic analysis concluded that:

- District energy natural gas boilers, electric chillers and thermal storage (typically the initial step in developing a DES can provide cost advantages over conventional hydronic building technologies, especially if low-cost financing is available.
- CHP is not cost-competitive where electricity is inexpensive but can be cost-effective in areas with high power costs if the excess electricity not needed by the district energy plant can be sold to the grid, especially if low-cost capital is available.
- The assumption of a 25 dollars per metric ton carbon dioxide equivalent value for GHG significantly improves the cost savings with CHP.
- Biomass is not cost-effective at the scale of DES modeled.
- Ground source heat pumps are potentially cost-effective if low-cost capital is available.
- Solar district heating is unlikely to be cost-effective.
- Waste heat recovery is potentially very cost-effective but truly requires a site-specific analysis.

The impact of DES varies depending on the particular scenario, but generally provides significant reductions in total fossil fuel consumption, GHGs and regulated pollutants. These calculations include both direct consumption by the district energy plant or the building system and indirect consumption in the power grid resulting from electricity purchased from the grid. GHG reductions range from minor (about 2 percent) for DES boilers and chillers to highly significant (from about 60 percent to over 165 percent) for CHP.

District energy provides significant reductions in peak grid power demand, generally in excess of 25 percent compared with conventional approaches. With CHP, the peak power demand reduction ranges from 160 percent to 260 percent, as the CHP facility,

which is sized based on the heating load, makes a large net contribution to the grid during the summer.

Development of a DES can be a significant undertaking, requiring an interactive progress on a range of fronts, including: market assessment; stakeholder communication; technical design; economic analysis; air emissions permitting; securing the revenue stream with customer contracts; permitting; risk analysis; and financial structuring and analysis.

Interesting Links:

McGuireWoods analysis:

<http://www.novaregion.org/index.aspx?NID=1215>.

FVB reports:

http://www.mwcog.org/committee/committee/documents.asp?COMMITTEE_ID=265.

B1.1.3 Performance Metrics

Arlington's CEP puts forth eighteen recommendations and strategies to help everyone in the county effectively manage energy use, distribution, generation, and storage between 2011 and 2050. These policies cover CO2 emissions, buildings, district energy (discussed above), renewable energy, and transportation. They also include approaches such as metrics to measure institutionalization and programs such as energy labeling, to help ensure success.

Using energy-related greenhouse gas emissions per resident as a surrogate for energy productivity as a whole, a core sustainability goal of Arlington is to cut its per capita emissions to at least 3.0 tons (mt) from the current 13.4 tons over the next 40 years. The county has committed a deeper goal of 2.2 mt/capita if surrounding jurisdictions share in credible, aligned community energy planning.

The preliminary recommendations to meet the goal in ways that are economically viable and improve energy supply quality fall into four categories:

- . Governance of the CEP implementation
- . Specific targets and policies regarding built environment
- . Cross-cutting initiatives

The governance recommendations include organizational aspects at the county and local neighborhood level, and regular reporting of results including energy costs, investments and jobs created and environmental performance. In addition, the plan calls for, under crosscutting initiatives, the creation of "high quality green jobs" to implement the recommendations of the CEP.

The efficiency targets have been established for both existing and new construction and evolve over time. Widespread adoption of efficient new construction and renovation will have a deep transforming effect on the local employment in the buildings sector for a

wide range of functions from investment, through construction and operational management.

With homes and buildings consuming 75 percent of all energy, the efficiency and supply of the built environment are the major focus on the Arlington CEP. By energy type, the generation and use of electricity accounts for 64 percent of all the fuel consumed, followed by gasoline and diesel fuel at 21 percent and natural gas at 14 percent.

The Task Force recommends that from 2015, renovated residential buildings should operate at least 30 percent more efficiently on average compared to the 2007 baseline average. Non-residential buildings being renovated should operate at least 50 percent more efficiently than the 2007 baseline average. Moreover, from 2015, all new residential and non-residential buildings should operate at least 30 percent more efficiently than current code expectations. From 2025, ongoing new residential and non-residential building construction should operate 1 percent more efficiently every year through 2050. A further recommendation in the building sector is to emphasize that home and building operations must be effectively managed day-to-day to control energy costs.

The major impact of the use of electricity, mainly through losses in generation, transmission and distribution, strongly influences the Arlington CEP recommendations. Arlington has already recognized the challenge of transportation energy use, and through a decades-long multi-pronged approach including transit-oriented development, has achieved a lower portion of its total emissions than the US average.

The Arlington CEP has assessed that district energy could be a viable option in much of the county (see above, p. x). In this realm it also calls for about 150 MW of distributed cogeneration to both reduce the peak loads on the wider grid, to generate heat for the district energy system and to greatly reduce the GHG footprint. In lower-density neighborhoods, at least 50 percent of all domestic hot water needs and 20 percent of the space heating needs not supplied by district energy should be from clean and renewable sources by 2050.

To both reduce the summer peak, and to further reduce GHG emissions, the plan recommends installing a total of 160 MW of Solar PV capacities by about 2035. Like the widespread increases in efficiency, these strategies have the potential to promote transformational job growth in the district energy, and clean and renewable energy sectors.

One of the seven strategies discussed in the plan is that of taking steps to institutionalize long-term energy planning and processes. To these ends, seven metrics are outlined to measure the progress toward meeting the goals. Under the umbrella goal of ensuring economic competitiveness, progress can be measured through energy cost, employment, and investment. For the environment, it can be seen through GHG emission reductions. And for security, it can be measured through supply security, supply quality, and flexibility.

Other recommended strategies included: establishing an Energy Performance Labeling program; improving the public's energy literacy; working with the education sector to make sure training programs are available for ensuing high-quality jobs; compiling and

providing a list of all incentives at all levels of government and non-government that promote energy efficiency; establishing independently verifiable GHG emissions levels; and working with neighboring jurisdictions to create a regional energy and climate plan.

Interesting Link:

CEP:

http://www.arlingtonva.us/departments/DES-CEP/CommunityEnergyPlan/documents/Community%20Energy%20Plan%20Report_FINALv5b.pdf

B1.1.4 Overview of the Crystal City IEMP

Arlington County, in conjunction with Vornado/Charles E. Smith L.P., and Washington Gas/WGL Holdings, Inc. issued a Request for Proposal (RFP) for Consulting Services for a Decision Grade Integrated Energy Master Plan for Crystal City (IEMP).

This request comes in conjunction with major renovations and new developments that are planned for the site over the next 40 years (2010 Crystal City Sector Plan). Such plans anticipate an additional 15 million square feet of commercial office, retail, hospitality, and multifamily residential buildings. It also comes in reference to the Community Energy Plan (CEP) (see above, p. x), which aims to reduce energy-related GHG emissions per resident to 3.0 mt CO₂e/capita/year by 2050.

As the CEPs goals to reduce GHGs includes energy use in residential and non-residential buildings and for public and private transportation, this makes Crystal City an important focal area, as it is one of the largest and densest energy consuming areas of Arlington County, using 19 percent of all energy and creating 20 percent of GHGs of the entire County.

The Scope of Work of the RFP focuses on the integrated energy master planning, which includes an analysis of potential district energy implementation in Crystal City. The areas that should be integrated and assessed include energy-related investment returns, but also on the competitiveness of Crystal City as a whole; increased energy supply reliability and affordability, and reduction of GHG emissions; and the enablement of possible additional new areas in the future, technologies, and wider County energy services.

One of the goals of the IEMP is that total energy usage should be substantially less than a comparable development elsewhere in Virginia. The indicative target is that the energy use will be 60 percent less than current practice by 2050, with GHG levels being at least 70 percent less.

In assessing the feasibility of developing a district energy (DE) system in Crystal City, the consortia asked that the proposals address design alternatives; business case and financial models; and air quality. With regard to the Design Alternatives, the IEMP is

expected to include as assessment of DE implementation 1) a phased-in system approach and 2) a central plant DE system, that include hot and chilled water, electricity, and thermal storage systems. Design alternatives will describe the size and scale of power generation infrastructure. The Business Case and Financial Model is expected to analyze the DE from two perspectives: building owners and the District Energy Company, which for the scope of the proposal is the entity that oversees the design, financing, construction, operation and ownership of the district energy system. And with regard to air quality, the proposal will provide a preliminary assessment of district energy issues related to air quality regulations from the U.S. EPA and Virginia Department of Environmental Quality.

The IEMP is expected to address the following topics: (1) buildings energy demand estimates; (2) buildings energy supply estimates; (3) site additional energy demand estimates; (4) site control and interconnection; (5) climate change legislation; (6) energy pricing estimates; (7) energy and climate performance validation; (8) investments; (9) legislative and regulatory (excluding financial incentives); (10) financial incentives; (11) ownership and operating structure; and (12) market pricing. Each of these points will contain clearly structured base and scenario cases.

All analyses, for example, will be done relative to the base case. The scenarios analyses are expected to be done from the perspective of the property developers/owners, Washington Gas, the County, and the District Energy Company. Minimum analysis sets will be: internal rate of return; net present value; energy use reductions; avoided greenhouse gas emissions; and recommendations including timeline with milestones.

The final draft report from the consultants working on the project is due in July 2012 with the final report due shortly thereafter. The consultants are slated to present to the County Board at its July 2012 meeting.

For more information, contact:

For copy of RFP, contact:
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B2 Engagement of Business: Maximizing Jobs and Investment

B2.1 Loudoun County

B2.1.1 Overview of Loudoun County Energy Strategy

Loudoun County has a population of 312,311 and stretches across an area of 520 square miles. By 2040, local employment in Loudon County is expected to grow to 305,000 jobs from 140,000 in 2007. The population is expected to grow to 458,000 over the same time. This will require adding 75,000 homes to the current 100,000 and adding 73 million square feet of nonresidential buildings to the existing 69 million. All electricity for the County is generated outside of the County resulting in about 70 percent conversion and transmission inefficiencies. Loudoun County is home to a number of

Data Centers, which continue to be major consumers of electricity, and are constantly seeking new ways to be both more energy efficient and to create lower emissions. Data Centers and the other technology businesses are expected to be a continuing strategic source of investment and employment in the County.

Transportation will remain a challenge for the County, with about 2.3 billion vehicle miles of travel causing congestion of the existing roads at peak traffic times. The 2007 local energy use in Loudoun County was distributed as 34 percent in homes, 38 percent in commercial and public buildings of all types, and about 28 percent in transportation. In total, the County uses 70,753,000 Million Btu of energy of all types.

Recognizing the potential challenges, opportunities of developments in the energy markets, Loudoun County took the lead in developing a comprehensive County Energy Strategy (CES) reaching to 2040 to achieve measurable reductions, using 2007 as the baseline year. In December 2009, the Loudoun County Board of Supervisors adopted the County Energy Strategy. It represents Loudoun County's goals for the next 30 years and its recommendations are possible approaches for the county to achieve these goals.

Success will be measured in many ways summarized in the five key Goals of the CES:

- Loudoun County will be recognized as a location of choice for investment in part because of its innovative energy strategy.
- Loudoun County will strive to have consistently lower energy costs relative to surrounding areas.
- Loudoun County will have greenhouse gas emissions among the lowest in the country.
- Loudoun County will be recognized as a regional, state, and national role model of effective energy and climate management.
- All major investments will visibly contribute to meeting the CES goals.

The CES addresses three main areas of energy opportunity – homes and buildings, transportation and clean and renewable energy supplies.

The energy needs of the growth in both employment and housing for the County can be provided through efficiency of both new construction and existing homes and buildings. This will be achieved by:

- Encouraging all new construction to meet Energy Star levels from 2011, or about 30 percent more efficient than current code.
- Encouraging all major retrofits to be at least 25 percent more efficient than the current County average.
- Incrementally increasing these targets every four years by about 4 percent.

To both educate the market and to raise the market transparency of the actual energy performance of homes and buildings, voluntary Energy Performance Labeling (EPL) is recommended. These recommendations result in 7 percent less total energy use in homes and buildings while serving a 70 percent increase in population and more than a 100 percent increase in jobs.

The CES recommends the following efficiency measures for the transportation sector:

- Reduction in outbound commuting through the successful growth of local employment.
- Development of mixed-use neighborhoods to encourage shorter commutes, walking and cycling.
- Development of transit-oriented mixed-use neighborhoods encouraging the use of mass-transit and local walking and cycling or short drives to the two new Metrorail stations.
- Encouragement of smaller vehicle use through urban design and parking strategies.
- While including some impacts from urban redesign and mass transit, the CES recognized that individual vehicles would remain the dominant form of transportation for the entire period to 2040.

These combinations of wider trends and local recommendations result in 18 percent less energy use in transportation, again serving the needs of a 70 percent higher population.

By generating a significant percentage of its electricity and heat locally, the County can greatly reduce the peak demands on the electric grid and the fuel waste inherent in distant electricity generation. The CES is recommending two major clean and renewable energy supply approaches. The first is to implement about 100 Megawatts of natural gas-fired Combined Heat and Power (CHP) by 2040. The use of medium-sized CHP would be encouraged in the following kinds of developments:

- In higher density developments, such as anticipated around the transit hubs, district energy could be used to distribute heating and cooling, avoiding the need for individual chillers and boilers in every home and building. This recommended approach was modeled on two typical projects and showed good economics for homeowners, building occupants, developers, the district energy service provider and potentially the County.
- In single large developments of about 100,000 square feet or larger. These would include commercial or retail complexes, sport centers, large healthcare facilities, etc.

The second recommendation is to install about 25 Megawatts of solar electricity by 2016, rising to 100 Megawatts by 2040, aimed primarily at reducing the summer cooling peaks, and reducing the need for increased transmission capacity.

In much of the County, property densities are very low and will remain so. A wide and growing market of clean and renewable energy supply options is available, ranging from micro-CHP units to geothermal heating and cooling units. Loudoun County has a strong rural nature, with a substantial supply of agricultural and forestry waste. These have significant potential to be converted to various gas, liquid, or solid biofuels. Depending on the relative costs of energy and the need to further reduce greenhouse gases, about 10 percent of new construction could use biofuels for heating, and up to 20 percent of all natural gas could be substituted with biogas.

The CES lays out a framework of recommendations that touches on many different aspects of the County over the coming decades. Over time, the basic recommendations

need to be incorporated in multiple County outreach meetings, planning, and reporting activities.

Loudoun County has already successfully implemented various projects to pursue its climate and energy goals. In March 2011 it completed a project that was financed through the Energy Efficiency & Conservation Block grant (EECBG). Forty-two LED lights were installed along the Main Road in Purcellville. This not only reduced greenhouse gases, it also reduced energy consumption by 2525 kW/h in the first two months. Another project that was financed through the EECBG was energy improvement retrofits of five county homes. This project created jobs, reduced greenhouse gases and energy consumption. In July 2011, a project was completed that installed 23 kW/h solar panels on the roof of a youth shelter.

In addition to these construction projects, several outreach projects were started in 2011 to increase energy awareness, reduce greenhouse gases and energy consumption and reduce energy costs. Through various projects, the county has achieved 5,200,072 kW/h of energy saving between 2004 and today. Moreover, the county has already succeeded in reducing its greenhouse gases.

Interesting Links:

Energy Strategy:

<http://www.loudoun.gov/index.aspx?NID=163>

B 2.1.2 Overview of Structure and Goals of the Energy Advisory Task Force

In June, 2011, the Loudoun County Board of Supervisors approved the creation of an Energy Advisory Task Force to develop and implement a plan to grow and attract companies that provide sustainable energy. As discussed above (pg. x), Loudoun county has experienced dramatic growth in population, business establishments, employment, and non-residential inventory, and thus an increased need for energy. But since all electricity is generated outside the county resulting in significant conversation inefficiencies, focusing on developing sustainable sources of electricity will provide the greatest impact.

One of the objectives of task force is to assess the market opportunity for clean and renewable electricity in Loudoun, including market barriers and how they may be addressed. It will also identify impediments to, and best practices for, planning and permitting sustainable electricity generation facilities. Finally, it will advise staff and the Loudoun County Administrator on issues related to sustainable and affordable energy sources and make related recommendations in the areas of business development and marketing; technology development; public policy/regulation, and education/workforce.

The task force is an outgrowth of the County Energy Strategy, discussed above, adopted by the Board of Supervisors' in 2009, which includes the goal that the county be recognized as the location of choice for investment in part because of its energy strategy. It is also in response to a 2008 direction by the board to the economic development staff

that it focus on the growth clusters: (1) information and communication technology (ICT), (2) federal government contracting (FGC), and (3) international, for Loudoun's economy.

These areas are important for the following reasons:

- Data Centers are an important part of Loudoun's success in growing the ICT cluster. They are very high energy users and are estimated to consume 5 percent of electricity in Loudoun. The electric load for northern Virginia data centers is nearly 40MW, and is projected to grow to 1,200 by 2021. The energy efficiency of data centers has become an important topic globally as data center operators deal with power, cooling and space limitations. Escalating demand for data center operations and rising energy costs has made affordable and sustainable power supply a key criterion in locating data centers and in renewing data center tenant leases.
- The General Services Administration now considers sustainable energy sources as one factor in qualifying a site for lease by federal government agencies. Federal government agencies are also looking at this issue as they contract with the private sector.
- Foreign companies, particularly European companies, have a higher awareness of sustainable energy. Access to sustainable electric energy is an increasingly key part of location decisions of companies considering foreign direct investment to the United States.

It is also envisioned that this group could play an important role in supporting the implementation of the Integrated Energy Plans (IEPs). The potential symbiosis between the Loudoun County Government Support Center Campus and the Hybrid Energy Park, for example, using the IEP process to identify potential "loads" for sustainable energy solutions like Combined Heat and Power (CHP) plants could play an important role in attracting future sustainable energy providers, per the stated mission of the Energy Task Force.

The task force membership will include representatives from the public and private sector, including data center operators, utility companies, alternative energy companies, universities, the Loudoun County Economic Development Commission and the Rural Economic Development Council. Members of the task force will be appointed by Loudoun County Administrator Tim Hemstreet with primary support for the panel provided by the Department of Economic Development. There will also be a liaison group to provide broader input into the work of the task force.

The first meeting of the task force was held on October 20, 2011. Since then the task force has met monthly to hear from industry experts and gather information. This information gathering phase concluded in February, at which time the task force began discussing the work that they would like to do and the outcomes that they hope to achieve.

At the February meeting, an analysis of six peer communities provides findings was presented in two areas of interest to Loudoun County economic development: best practices and marketing strategies.

A best practice analysis of peer communities led to a list of potential initiatives for Loudoun to consider:

- Use economic development to build 21st century economy;
- Government leading by example;
- Market techniques to promote alternative/green energy initiatives;
- Establish alternative/green energy advisory committees;
- Create an integrated efficient transportation system;
- Promote green development; and
- Build a 21st century urban energy infrastructure.

The recommended industry sectors for Loudoun to focus on are cleantech manufacturing; waste management and energy and utilities (refuse derived fuel); green buildings; and retail and organic gardening (to cater to growing and affluent population). Additional marketing strategies included to: stimulate green economy and green reputation with green purchasing preferences and local government facility retrofits/LEED new construction; promote green development; build an integrated and efficient transportation system with transit and vehicle charging stations; and get the green economy growing before training the workers.

The sub-committees are planning to meet on specific issues and report back to the task force in March through September 2012. The draft recommendations are due by the end of the year. The task force is scheduled to complete its mission with the final report by January 2013.

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B3 Education and Outreach – The Roles of Community Colleges to Support Community Energy Plans

Abstract: There are many opportunities to strengthen vocational or workforce training efforts to support community energy plan (CEP) goals. A large pool of suitably qualified civic leaders, managers, and workers, particularly related to STEM (Science, Technology, Engineering, and Mathematics) jobs, will be needed to implement CEP recommendations. The Northern Virginia Regional Commission and the Northern Virginia Community College (NVCC) have begun to look at lessons from the industry-labor-government cooperation found in the German Dual System of vocational training to strengthen our workforce training efforts.

NVRC-Northern Virginia Community College Actions

Northern Virginia's Community Energy Plans set out transformational goals to greatly reduce energy use and address changing conditions caused by climate change. Meeting these goals will require implementation of many mitigation and adaptation actions. It will be essential that sufficiently large pools of qualified civic leaders, managers and workers are available with the skills and expertise to meet the implementation needs of the CEPs.

Analysis of the CEPs suggests that their implementation actions can strengthen job creation in tandem with large-scale building energy retrofits, the development of district heating and cooling systems, and design and planning of renewable energies. For example the Arlington CEP recommends that by 2040, the residents and businesses in the County improve energy performance of renovated buildings by 30 to 50% over 2007 practices, and deploy 160 MW of solar PV to reduce summer peak demand, 200 units of passive housing, and over 260 MW of gas-powered cogeneration via district energy systems.

However, finding and training the workforce needed to install and maintain these technologies will not be easy. Moreover, the Northern Virginia Regional Commission, George Mason University, and Northern Virginia Community College project a gap of over 700,000 new and replacement jobs through 2020. The pressures of globalization and technical innovation will surely complicate meeting the demand for the needed highly-skilled workforce.

To meet this, NVRC has started to work with the Northern Virginia Community College (NVCC) to promote a range of outreach and vocational training efforts related to the CEPs. The NVCC is the second largest multi-campus community college in the United States, with over 100,000 students and 2,600 faculty and staff members, spread across six campuses. The NVCC offers more than 160 degrees at the associate's level, certificate programs, extended learning and workforce development programs.

In the spring of 2012, NVRC together with NVCC, the Center for American Progress, the Blue-Green Alliance and the Friedrich Ebert Stiftung and German corporate partners VW, Siemens, Rehau and EnBW, started a program to study the German vocational training and the potential application of lessons to Northern Virginia. This effort has surfaced the following themes and issues for possible application in Northern Virginia and across the United States.

Can we reproduce the breadth and depth of cooperation among the governmental, educational, and labor sectors that supports the Dual System of vocational training? The Dual System involves, on an equal basis, governmental officials, union leaders, elected officials at the state and local levels, corporations, and chambers of commerce to support the vocational training system's "consensus basis" actions.

Can we duplicate the success of the German vocational training model via the ties between the education and industrial sectors? Today, many Community College training services to companies are narrowly defined for individual companies. If the US education system understands the occupational requirements industry expects and can deliver training that is applicable industry-wide, then the likelihood of a suitable

workforce becomes more realistic. In this case, US businesses could better define the knowledge, skills, and abilities or core competencies required for occupations. Education could then “map” its curriculum, programs, and degrees to industry requirements – a process often referred to as credentialing. The outcomes can be a sufficiently trained workforce at all levels of sophistication.

Presently, the Virginia Community College System has started a credentialing initiative as part of a cooperative national energy industry consortium. This initiative, being developed through the Virginia Energy Workforce Consortium (VEWC), has direct ties to the needed industries and skills identified through the Northern Virginia Community Energy Planning programs.

The Virginia Community College systems will explore more formal cooperation between the energy industry and the secondary education systems across the Commonwealth. For example, the VVEC is starting efforts to further institutionalize energy industry education through developing its own industry cluster.

Northern Virginia needs to expand opportunities to improve STEM (Science, Technology, Engineering, and Mathematics) outcomes. One example of corporate-industry support is Exxon-Mobil, one of the largest energy companies in the world with its downstream business management located in Northern Virginia. Exxon Mobile has launched a strategy to improve education outcomes, but this will require financial support for implementation. Northern Virginia Community College has established the Pathway to the Baccalaureate (P2B) program to help students navigate from high school to community college or related vocational training system and ultimately to a four-year university.

Northern Virginia Community College can explore pertinent opportunities for follow-up and cooperation among and between German corporations and education. This could include disciplines such as architecture & construction; STEM; information technology; manufacturing; and energy. Also, there may be opportunities for international articulation agreements.

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C Stuttgart Case Study

C1 Climate mitigation, climate adaptation and energy strategy

The sustainable development of the region has been emphasized by the “Verband Region Stuttgart” (VRS) and its Economic Development Corporation (WRS) for quite some time now. Supported and accompanied by the Regional Assembly and promoted by various regional initiatives, in recent years a number of actions on climate change and climate change adaptation have been implemented in local practice. The many good

examples are as individual elements part of a regional climate and energy plan. From the scope and number of measures taken, can be seen how much influence the RSA - as carriers of the regional planning authority and the WRS - as a presenter, and trigger for ideas and inspiration for the local economy, have. The examples also show up, where the broad instruments of the two organizations reach their limits.

Climate change mitigation

The most important control option to reduce or avoid greenhouse gas emissions is the instrument of spatial planning (for the VRS). This instrument is subdivided below in regional planning, regional transportation planning and the landscape planning framework. Apart from these formal instruments the VRS is able to use both the plan execution and informal instruments, such as incentive mechanisms to promote the desired effect. In particular, this includes the participation in the funding program "Modellregion Nachhaltige Mobilität" of Baden-Württemberg as well as the region's own funding program.

Regional Planning

In terms of CO₂ adaptation and mitigation strategies the instrument of regional planning provides:

- The development of rail infrastructure and transport services in public transport
- A compact and to the development axes oriented residential development
- Specification of routes and power plant sites and extensions
- Control of sites for large-scale retail and primary care next to places of residence
 - A significant contribution to curbing greenhouse emissions. Through an integrated settlement and transport area development, the use of public transport in relation to the individual traffic will be enhanced. Thus, the energy consumption in the region is noticeably reduced. Other options of formal nature consist in density requirements for residential land (space efficiency), the control of urbanization through development quotas (e.g.: for community self-development) and by the designation of (inter-municipal) focal points for habitation and business. Action priorities for prevention strategies are therefore primarily
- The gentle handling of non-sealed surfaces,
- Energy-efficient transport systems and
- The provision of land for renewable energy (particularly wind, biomass, solar)

Possibilities and limits of regional planning

Not relevant to spatial planning are systems for power generation from hydropower and geothermal energy. No intervention or even control options by the VRS can be made in energy efficiency measures (such as industry and business, private households) and in the final consumption (gas, oil, district heating) for industry, small businesses (retail, services) and consumers.

Regional transportation planning

About 30 percent of the total emissions are attributed to the transport sector. This block, and in particular the competitive relationship between the PT and the MIT is thus an important point for climate protection efforts by VRS and WRS. A central planning instrument and an engaging way of reducing or avoiding emissions from transport is the regional transportation plan. It has laid the groundwork for sustainable development of transport in the region of Stuttgart. The Regional Transportation Plan considers all modes of transport, by land, sea and air. It includes the important interactions for habitation, open space and infrastructure development.

This integrated action plan forms the basis for many decisions of the Regional Assembly and for comments of the region regarding traffic. Ultimately, it is an instrument to take on investment decisions by federal, state and regional influence. The regional transportation plan includes, among other things:

- Definition of objectives and concepts
- Analysis of the traffic situation (based on 1995)
- Forecast of the traffic situation in 2010
- Assessment of the impact and urgency of actions for
 - Non-motorized transport (walking and cycling)
 - Public transport
 - Private road ("motorized private transport")
 - Commercial transport, air transport, shipping
 - Organizational, regulatory and price policies
- Assessment of costs and financing

Updating the regional transportation plan

The current version of the 2001 plan is currently being adapted to the changing demands on the transport infrastructure. The aim is to develop for both passenger as well as operational infrastructure options on the basis of a comprehensive and current data base. The plan is a three-stage approach. To obtain current information about what kind of ways the inhabitants of the region of Stuttgart cover and what kind of means of transport they use, there was a region-wide household survey made for 2009 and 2010. Based on this updated data base, goals of transport development will be developed. This also includes specific proposals for infrastructure improvements in rail and road.

The possibilities to reduce CO₂ emissions through changes in the proportion of different transport of the total ("modal split") have not been investigated very qualified so far. A transparent and easily understandable presentation of various possible actions, that could lead to saving effects is supposed to complement the decision-making process. With such a process called "climate-proofing" as an extension to the regional transportation plan could the contribution of regional or regional transportation planning for climate change be made visible. The aim is to show what savings (in CO₂ equivalents) are possible by changes in the modal split. These include in particular:

- Shifts in the modal split
- Technological advances (e.g.: electric vehicles)

- Reductions in mileage
- Intelligent traffic control
- Integration of different transport

Attention will be also drawn to aspects of settlement structure, e.g.: the reachability of residential and commercial sites with public transport, cycle densities, distances to the workplace or commuter movements and the susceptibility to traffic jams of different route sections.

With the supplement to the practice of "Climate proofing", it would also be suitable to incorporate the climate protection efforts in the project "model region of sustainable mobility."

Landscape Park Region Stuttgart (master plans)

Not only protecting landscape but also enhancing and shaping. This is the basic idea of the "Landscape Park Region Stuttgart", which is a specific chapter devoted to the landscape master plan. The goal is a diverse, visible network of open spaces, parks, trails, attractions and monuments. One such park is also just and recreation. For the Neckartal, the Filder, Glemstal and Remstal the planners have deepened their approach. Further parks are supposed to follow. The VRS is responsible for the implementation of the landscape park in the Stuttgart region. As part of its support framework, the association again co-funds the towns and villages in the region for concrete landscape park projects which should be realized in 2012.

Participation in the national project "model region of sustainable mobility"

The state of Baden-Wuerttemberg started a project called "model region sustainable mobility" with the aim of promoting sustainable mobility in the Stuttgart region. The processing time is planned to be about five years and the project budget is estimated at around seven million € state funds. The project participants are currently adjacent to the land itself with the Fraunhofer Institute for Industrial Engineering IAO and the Institute of Social Sciences at the University of Stuttgart, two scientific institutions and the state capital Stuttgart, the WRS and the VRS. The overall project currently includes seven start projects with different project managers. Other subject areas and work packages can be added as needed.

- 1 Mission Statement Sustainable Region Stuttgart
- 2 Innovative public participation processes
- 3 Intermodal travel chain
- 4 Current traffic conditions in the regional road network - online
- 5 Environmentally Friendly Mobility Systems
- 6 Increased integration of transport and urban planning
- 7 Freight and logistics

Regional Program "Sustainable Mobility" of the Stuttgart region

The Stuttgart region is living from a functioning mobility on land, sea and air. It is reliant on mobile people, efficient transport infrastructure and well-functioning product

streams need to be in the competition of business locations for a successful long term positioning. Sustainable mobility thereby has to cope with different requirements. In addition to environmental, social and urban needs, the interests of the economy and the people who live in our cities need to be considered, (Sitzungsvorlage 77/2011, Verkehrsausschuss).

Against this background, the WRS has developed guidelines for the program "Sustainable Mobility". The aim of this program is to create entrepreneurial opportunities (especially in the electrical mobility), to enable social and economic ties and to enhance the quality of life in the region. In this respect, the aspects of climate require a very special consideration. The Stuttgart region with its huge automobile industry has to take this especially into account. The action must therefore also act as an impetus in the context of economic development. The program will also make a major contribution to the transformation of the local economic area: from the "Car Region" to the mobility region. The Stuttgart region is for the current year 2012 co-financing in the amount of one million Euros for projects ready to contribute to sustainable mobility. Funded projects are individual and collaborative projects in the following fields of activity:

- Economic development / Business traffic
- Electric Mobility
- Information and communication technologies for mobility
- Intermodality / multimodality

Eligible applicants are municipalities, both in the Stuttgart region and private sector enterprises. Examples of sustainable mobility could be:

- Increase of the proportion of cycling
- Mobility card i.e.: combination of multiple providers (train, car sharing, Pedelec ...)
- Facilitating the access to public transport through communication technologies

Climate change adaptation

Adapting to climate change can only be accomplished by many different actors. This is partly due to the diversity of climate impacts and due to different responsibilities and capabilities of the relevant governmental and nongovernmental actors. Local actors play a key role in developing concrete adaptation measures.

Regarding the adaptation to the impacts of climate change, spatial planning plays a significant role in the extent that it is able to control long-term settlement patterns and other uses.

Assurance of greenhouse-free areas	Principle of protection of climate relevant greenhouse compensation areas (Pls. 3.1.11) Open space protection through green corridors and green spaces as a planning objective (Pls. 3.1.1, 3.1.2) to protect areas of cold air and ventilation lanes
Assurance of retention areas / flood protection	The principles for flood protection (Pls. 3.4.2) refer on the rise of extreme weather situations due to climate change. An increased flood risk is expected. Retention areas are currently protected by regional green corridors and green spaces of the risk of overbuilding.

The protection and the reservation of land, both for the protection of resources and for the prevention or mitigation of future impacts of extreme weather events and other impacts are of fundamental importance. Eminent in the context of climate relevant protection of open space was the Digital Climate Atlas of the Stuttgart region, which served local authorities as an important source of information and planning assistance in the year 2008 already (see Chapter 4, successes). Other priority areas for action on adaptation strategies are

- The preventive flood protection in river basins
- The protection from heat effects in residential areas (bioclimatic stress areas)
- The reservation of climate-related areas and / or corridors
- A regional water scarcity
- The shift of the habitats of animals and plants

Climate change adaptation aims for the conservation and increase of the adaptability of natural and social systems. Climate change adaptation does not mean to downplay the tasks of climate change.

Vulnerability analysis for the Stuttgart Region

In a pilot project of Regional Planning (MORO), the vulnerability of the Stuttgart Region in relation to climate change has been extensively studied based on three sectors. The objectives of the pilot project were:

- The development of a multi-sectoral vulnerability analysis, as a technical basis for the strategy development and action planning
- The establishment of a regional actor network ("Climate Network") on issues of regional climate change adaptation/mitigation strategies
- The development of a regional climate change strategy as an informal, regional development concept

- The provision of integrated technical data base (Climate Information System of Stuttgart, KISS)

With financial support from the Federal Ministry of Transport, Building and Urban Development, and supported by the Institute for Urban Planning and Urban Transport at the Rheinisch-Westfälische Technische Hochschule Aachen (Prof. Dr. Dirk Vallée), three questions were the focus of analysis:

- In which sectors is the region particularly vulnerable to climate change?
- How to adapt the region to the changing climate?
- What contribution can the regional planning make in adapting to climate change?

The two-year research project "KlimaMORO", which ended at the beginning of 2011 was carried out together with the Institute for Regional Planning and Development Planning at the University of Stuttgart (Prof. Dr. Stefan Siedentop), the two partner cities of Ludwigsburg and Esslingen am Neckar and with the WRS. Broad support got the project especially for the actor-network with more than 50 experts from the fields of agriculture, forestry, water management, health and species and habitat protection.

The aim of the regional vulnerability analysis was to provide a cross-sectional survey of the related potential impact of climate change in the Stuttgart region, as well as to find out about adaptation requirements and possibilities. It should be identified where and in which sector space-related action is necessary and what priorities should be placed here. Therefore, three thematic working groups were formed to find appropriate methods for assessing the vulnerability. The methods are based on innovative approaches to indicator-based spatial data processing as well as on elements of discursive processes.

Using a complex system analysis, the working group "water" could identify the following aspects as priority topics:

- The high flood damage potential in floodplains because of the strong colonization of floodplains, particularly in the Neckar Valley, combined with steep catchments through the topography and the so given risk of "Flash Floods"
- The potential shortage of cooling water from rivers and streams associated with risks to energy supply in the region (critical infrastructure)
- The low natural amounts of ground water and the pronounced dependence of the long-distance water supply

The analysis and evaluation of the working group shows the need for action for the region. In this context, a more effective flood control system is given particular significance.

In the Working Group "Health" were mainly the heat problem and its health consequences in the heart of the debate. The vulnerability of the region is here evaluated as consistently high. In addition to the threat of increased incidence of problems such as heat stroke, heat exhaustion and heat collapse also play loss of well-being and work performance in hot summer periods a role. In addition, a moderate concern to the region is suspected

- with vector-borne diseases,
- the increased exposure to allergens through longer growing seasons,
- from air pollution-related diseases and impairments in mental state by ozone in the summer heat

For example, urban planning and urban development are becoming increasingly complex. When future developments or projects of district it has to be planned and built in a different way, especially concerning the rise of hot days in the summer. In the future, there must be planned more with shading, green roofs, the (promising cooling) element of water and with adjusted building geometries.

In the working group "Biodiversity, agriculture and forestry" were named a series of possible climate effects, indicating an increased attention in the spatial and sectoral planning.

Biodiversity / nature conservation

Climate change requires more dynamic strategies for nature conservation. To enable dynamic development processes means to provide ways of retreat and evasion possibilities for species and to create the precondition for the emergence of new living communities. This requires that the landscape is permeable to the migration of species. To create a functional network of the landscape is therefore one of the most important tasks of adaptation to climate change. Habitat network systems must be developed and require conceptual adjustment to the new challenges arising from the interaction of climate change with other risk factors.

Agriculture

The working group on agriculture acts on the assumption of a direct vulnerability derived from climate change. For the Stuttgart region, the following climate effects are considered to be particularly significant:

- Increased soil erosion by water
- A lack of water availability for crops
- Direct damage to crops caused by heavy rain and hail events

Overall, also the agricultural sector needs significant reactions. However, the regional planning has hardly any tools that have a direct influence on the type and intensity of agricultural land use. The responsibility for climate change adaptation is in this case clearly seen in the technical planning of agriculture. Basically, regarding the plant cultivation climate change adaptation measures are necessary in the following areas:

- Crop selection and crop rotation
- Tillage, soil conservation
- Plant food, fertilizer and humus reproduction
- Irrigation / water management

Conclusion: The experience in the Klima-MORO have shown that, in addition to the use of "hard" instruments, the regional planning commitments of relevant planning stakeholders could be a successful approach. Target agreements are possible, which

include not only substantive and formal planning goals. In formal terms, it would be conceivable, for example, that the support of development planning in areas of high heat vulnerability - delimited in creating maps of the regional plan - requires the mandatory implementation of effects of climate change when executing construction projects.

For the Verband Region Stuttgart, as a carrier of regional planning, the project showed major requirements for action. An example is the local shape of regional planning open space goals, including the control systems of cold air areas and ventilation lanes. Especially in the tight interaction of the two planning levels, the administrative-boundaries-crossing approach is immanent.

Adjustment in land use planning

Climate impacts can be locally different and space structures are often very individual in their vulnerability. Thus, a differentiated, on the individual case focusing implementation is required (prioritization, time line). Also, a subdivision in stock and new construction plans is necessary because the interventions in the stock are significantly lower than in the area of new construction. In the individual areas of climate change-friendly urban development, possibilities and limitations of planning interventions have been written down.

Action area health

The reservation of cold air or fresh air corridors (before development or other change) takes into account the health of citizens and especially for poor weather conditions of great importance. Here, the Regional Plan, by adopting green areas has already created a basic framework. In inner-city locations (e.g.: public places) may the provision of drinking water dispensers improve the quality of stay for the citizenship / for city tourists. An additional, subsequent shading of such places would be desirable but calls for conflict in the implementation (less parking space, root spread, tree care, disposal of leaves).

Action field energy

In the new designation of building areas, local authorities often already make commitments like the use of renewable energies. But with the use of solar energy (in the form of photovoltaic and solar thermal) and wind energy it comes to conflicts in practice (glare, unsightly roof-mounted, unwanted shadows,...). Potential for conflict also has the domestic heating with wood pellets.

In a new research project the material flows within an industrial area (GE / GI) could be researched in regard of potential savings and efficiency potentials (e.g.: cold / heat networks). This could include Local Agenda groups and architects.

Action area transport infrastructure

An urban development policy to enhance intermodal transport (e.g.: cycling) is intentional but will require adjustments in the transport area, to the disadvantage of other road users (e.g.: parking garages for rented bicycles) and requires the building of infrastructure (e.g.: charging stations).

Action area parks, open spaces

Increased use of vacant lots and waste land - in terms of densification in the urban centers - is in discrepancy to the demand of more green spaces and recreational areas in town centers. In this context, a few local authorities try to mark vacant lots as "climate comfort islands" with the aim that these areas can not be deducted as densification areas / internal development reserves (in order to plan more on areas in the outer urban area). Nevertheless, it may be useful as a balancing act to declare climate lawns in built-up areas that are stressed in a bioclimatic way.

In general, participants stressed that the quality of a location in municipalities (e.g.: as a residential area) as soft factor are getting always more important. E.g.: for the establishment of technical and management personnel. The issue of climate change however, often gets in conflict with other fields of municipal design options and is therefore often being neglected because of the long planning phase and the not immediate affection.

Information, communication, informal instruments

- **Digital Climate Atlas Region of Stuttgart**

According to the Building Code, climate and air are important issues in spatial planning, which should be considered in the assessment. While in larger cities laminar climate researches are being performed more and more, a general lack of such assessments can be recognized at the regional level. The Climate Atlas Region of Stuttgart, released in 2008, was presented to the public, to close this gap. It gives basic information about wind, solar radiation, temperature and precipitation in the region of Stuttgart. On this base, statements were made, where cold air is created and how the air-exchange proceeds. In the so-called climate analysis maps one can find the values for air pollution in different areas of the Stuttgart region. The Climate Atlas also gives indications of how developed or undeveloped areas affect or encourage the exchange of air. Large areas of woodland, meadows and fields are important "green lungs" for the region. Designed as a planning tool for municipalities, it is used for further planning at municipal and community level.

- **Civil dialogue "Future of Energy"**

In the summer of 2011 the IFOK Institute together with the Verband Region Stuttgart as cooperation partners organized as part of the civil dialogue "Future of Energy" a one-day public conference in the House of Sport, Stuttgart and two public workshops (one in Sindelfingen and one in Waiblingen). This civil dialogue "Future of Energy" goes back to an initiative by the Federal Minister Annette Schavan and builds on the work of the Chancellor appointed by the ethics committee "Secure energy supply". Interested citizens could apply in advance for participating in the citizens' conference, ask questions and participate in various discussion formats.

With this event more than 150 citizens in the region could participate in a lively exchange of views with representatives from academia, business, civil society and politics. The findings and recommendations of these three events carried out in the Stuttgart region were incorporated into a civil report, which was published in November

2011. The citizen report contains concrete recommendations for the design of the energy-turn. The key messages are:

- In all areas of education new standards and a new sense of value creating should be established
- Create sustainability through decentralization - depending on local and regional conditions
- Create laws, rules and incentives for energy-efficient production and consumption-reducing structures
- Power generation, network and storage infrastructure should be adapted to the needs of renewable energy generation and cooperate on all levels

- **Model region for electric mobility**

The Community model region for electric mobility in the Stuttgart region contributes to visualize electric mobility in the public space, explore different paths towards electric mobility and ultimately accelerate the market introduction of electric vehicles. Considerably more than 1,000 electric vehicles - pedelecs, electric scooters, cars, vans and buses were traveling in summer 2011 on the roads in the region. Hundreds of charging points in public and semi-public spaces (such as car parks) are the first step in the necessary area-wide infrastructure development.

The Stuttgart region as birth region of the automobile is the most important automotive cluster in Europe. Around 180,000 jobs in the vehicle industry are located in the region. Thus, the region is affected to a considerable extent by the impending change in individual behavior and mobility. Manufacturers and suppliers of the automotive industry are aware that on the way to electric vehicles, the vehicle itself must be reinvented and the aim thereby is to tackle that challenge together.

The federal government encouraged the expansion and the market introduction of electric vehicles from 2009-2011 with a total of 500 million Euros from the economic stimulus package II. Therefore, eight pilot projects will be supported with a total of 130 million Euros by the BMVBS through the funding priority "e-mobility in model regions". This is enhanced by complementary funding means of the industry. Actors from academia, industry and the participating municipalities are working closely together with these pilot projects to advance the development of infrastructure and the incorporation of electric mobility in public spaces.

The Stuttgart region is one of eight award-winning model regions for electric mobility. The joint mission of the participating partners is to respond in a holistic approach to key issues of market and technology preparation of electric vehicles in Germany and thus the goal of the federal government to contribute to integrate one million electric vehicles on German roads in environmentally friendly mobility concepts by 2020.

Measures in the model region of Stuttgart

Deployment and testing of vehicles

Design and integration of charging stations in public places

Preparation of integrated urban and regional mobility concepts

Integration of local authorities, infrastructure operators, manufacturers, users, trade and service companies in joint mobility concepts

Developing a roadmap of electric mobility

Installation of an electric mobility center of excellence

- **Competence Center in Ludwigsburg Energetikom**

Energetikom is a competence center for energy, climate change and eco-design. Constituted as an association of public and private actors, it is a think tank for innovative energy projects that promote climate protection and energy efficiency. The organization supports projects from initiation to implementation. The service offer is divided into different areas of competence: information, advice, training and education, cooperation, networking and research & development.

An important goal is to save energy and emissions through new concepts. Other objectives are to strengthen the social awareness of energy issues and climate change, creating sustainable jobs and the anchoring of a European network for energy and climate change. As an initiative of the city of Ludwigsburg, Energetikom also supports the local sustainable urban development. The development and expansion of the competence center was funded mainly by the National Urban Development Policy of the BMVBS, by EU funds from the project "Living Green" and the Stuttgart Region Economic Development Inc.

Summary and Outlook

The climate and energy plan Stuttgart region unifies all available information on the topics of climate, environment and energy. It shows possible regional demands for action, but also the limits on regional control and provides answers to four questions:

- Where are we today?
- What have we done?
- What should we do?
- Where do we stand in 2020?

Roadmap for climate protection and energy in 2020

Neither the causes nor the effects of the (global) climate change end in technical and administrative boundaries. Mitigation and adaptation strategies must therefore be developed and coordinated on the regional level. The core is to establish a regional discourse about practice and proven strategies for climate adaptation paths through a network of experts from industry, associations, utilities, government and society. Both approaches, climate change mitigation and climate change adaptation are backed with best-practice examples and transparently communicated, both nationally and internationally and being reflected and developed jointly with the owners of land-use planning and sectoral planning. In parallel, a close interaction takes place with the Regional Transportation Plan and with partial updates to the regional plan (e.g.: wind power). Centrally important for the active participation and involvement of stakeholders in a facilitated process are:

- Manageable costs
- A clear objective
- A timeline and prioritization
- Defined roles

It is important to design dialogues to establish platforms and exchange knowledge and experience. During this dialogue, the control level should be separated from the working level. Good examples are:

- Organize inter-sector communication
- Linking decision makers from business and non-governmental organisations
- Include the operating level: affected people and "practitioners"

Well-intentioned appeals alone will not be sufficient. Local authorities, business and the civil society should be invited to develop their own concepts or a codex to the master plan - even if self-regulated.

It is of key importance to agree on common goals, communicate those goals and the financial transparency and describe as accurately as possible the time required and the desired measures of climate and climate change adaptation. Here, a master or action plan with a time horizon of the year 2020 would be adequate.

A kickoff event providing the ideal platform to gather different actors and their knowledge could serve as starting point. There should equally being included specialists for sectoral considerations, but also generalists with a view for system interdependencies and domino effects.

Finally, the regional energy plan should be accessible for the relevant stakeholders and for the public. This is done most easily by focusing on three key projects. This not only facilitates media coverage, but also the relationships within the actor network "Climate, Energy and Environment" are strengthened. A strong involvement and participation of these actors creates trust and creates a feeling of WE. Especially desirable are such core projects that help to overcome existing limitations of regional cooperation and work together across levels and with high interdisciplinary character.

The medium-term goal is to uncouple economic growth in the Stuttgart region of fossil fuels and to provide significantly more energy from renewable sources. In addition the energy productivity should be enhanced .

Conclusion: The central task of spatial planning will be to formulate guiding principles and requirements for adaptable, sufficiently robust spatial structures. Including space structures, which are understood to provide a robust and flexible response to extreme events and potential damage of climate change. Danger zones and "hot spots" of spatially relevant climate change impacts and utilization competitions have to be identified spatially and illustrated sufficiently. The aspect of vulnerability has to be considered more than ever in planning concepts. This requires a discussion about risk and value of protective goods. A more flexible approach of spatial planning and the set of instruments should be encouraged to deal with uncertainties, for example through the use of scenario techniques, rather than through rigid zoning or through the integration in accompanying management (governance) processes.

C2 Energy and the Built Environment: Implementation Actions in Community Energy

C2.1 Connecting social and ecological interests: the general principle of the residential building corporation Siedlungswerk, Stuttgart

The Stuttgart administration, building industry, and politicians closely cooperate on improving the environmental sustainable development in the urban area of Stuttgart.

Interesting fact to consider is that the largest amount of the energy consumption in the urban districts of Stuttgart is not caused by industry or traffic, but by the energy demand of the built environment. However, by increasingly implementing the innovative techniques for energy supply and by applying the new insulation methods, it is possible to find solutions for energy efficient urban development. A paramount example of how the new corporate strategy links social and ecological interests are the projects that promote a reactivation of the former industrial locations for housing and social issues. The re-densification of Bad Cannstatt is one of such projects. Bad Cannstatt is a tradition-steeped district of Stuttgart and a former freight depot.

A successful integration of new buildings into grown surroundings makes this project significantly challenging for the stakeholders.

Interesting Link:

Verband Region Stuttgart:

<http://www.region-stuttgart.org/vrs/main.jsp?navid=70>

<http://www.region-stuttgart.org/vrs/main.jsp?navid=65>

C2.2 Consideration of climatic conditions

The project aimed to develop an old industrial area (ca. 1.6 ha) into a new urban quarter adapted for people in various living situations. High ecological standards were expected to work in line with the urban planning guidelines and social transformation of the area.

Additionally, some of the existing buildings should be partly integrated into new built environment.

According to the Stuttgart regional Climate Atlas, Bad Cannstatt can be described as a highly problematic area in terms of sustainable urban planning. Climate Atlas is an essential tool for the Stuttgart region that helps to create climate analysis maps and indicates current local climate situation.

Interesting Link:

Climate Atlas of the Stuttgart Region:

[http://www.region-](http://www.region-stuttgart.org/vrsuploads/Klimaatlas_2008_13_Kapitel_Analysekarten_148_154.pdf)

[stuttgart.org/vrsuploads/Klimaatlas_2008_13_Kapitel_Analysekarten_148_154.pdf](http://www.region-stuttgart.org/vrsuploads/Klimaatlas_2008_13_Kapitel_Analysekarten_148_154.pdf)

The Stuttgart Climate Atlas marked Bad Cannstatt as a “Klimatop”. Defining “Klimatop” as a sector that is characterized by an intense heat island effect, low humidity and low air exchange, Bad Cannstatt is considered as an extremely high pollution load area. This factor has to be taken into account both while planning the density of the urban development and in regard to the energy supply and to the improvement of the microclimate in Bad Cannstatt.

C.2.3 Sustainable energy concept: implementation of innovative techniques for energy supply

The implemented sustainable energy concept has an assertive pilot character. It is a great opportunity to demonstrate how the corporation Siedlungswerk Stuttgart managed to use the existing resources in line with the challenging requirements of the project. For example, the local public sewer was equipped with a 75 meters long heat exchanger and now the base load of heat and hot water for the entire area is generated from sewage. A separate combined heat and power plant provides electricity for the operating pumps and various aggregates and covers the temporary peak loads. Thus it is achieved that the recycled ecologically clean energy, that otherwise would be wasted, supplies the residential area of Bad Cannstatt.

The main prerequisite for the innovative urban development in the project area was the excellent cooperation with the Stuttgart administration. The Stuttgart administration has approved the private utilization of heat produced from sewage in Bad Cannstatt. Moreover, all the buildings in the area are currently energy-efficient. All these factors have contributed to the CO₂ emissions reduction by more than 40% per year.

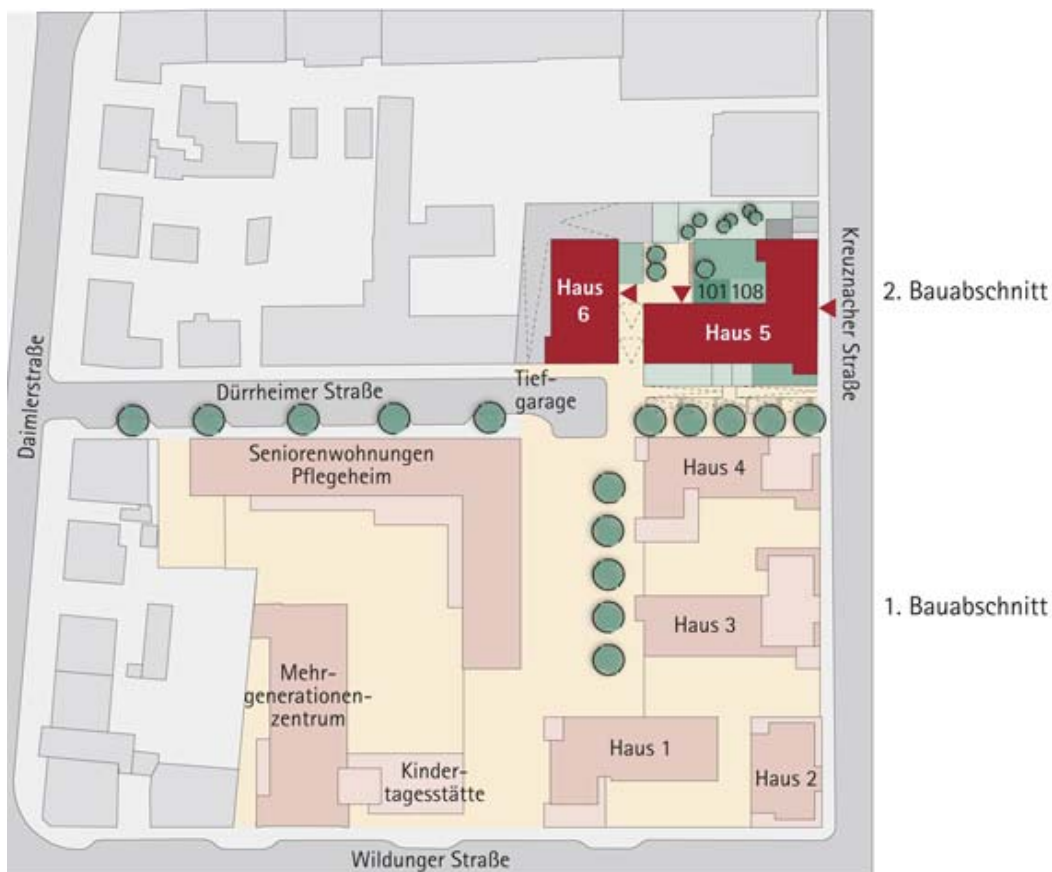
C2.4 Building bridges between young and old, home owners and tenants

All apartments in Bad Cannstatt have been constructed with regard to the varying family situations, income and age of the potential residents. In addition to the family-friendly apartments, there are also plenty of barrier-free apartments that are in great demand by the elderly. A nursing home with the fifty assisted living community rooms and thirty assisted living condominiums for senior citizens was built in cooperation with the St. Anna-Foundation Ellwangen. The latter was looking for a new building suitable for a nursing home and found the participation in the sustainable project very appealing.

Another example where the reactivation of an industrial location for housing and social issues has taken place is the former knitwear factory. The former factory has been partially integrated into the newly constructed building. This building has accommodated a day-care nursery, living community for the senior citizens, assisted living apartments for disabled people and other rental housing.

The property developers and promoters along with the community of Bad Cannstatt have placed special emphasis on encouraging a vibrant neighborhood right from the start. The residents and the landlords have been invited to actively share their ideas about the holistic design of the area. A network of friends has arisen as a result from such cooperation.

The SeelbergLeben actively promote and support socially friendly coexistence in the neighborhood. A wide variety of opportunities for friendly encounters between different age groups in the area had been thoroughly planned. For example, the garden of the nursing home is connected with the playground of the day-care nursery. There is also a main open neighborhood square that invites people to come together and get into conversation.



Example: Stuttgart-Bad Cannstatt - Source: Siedlungswerk

Interesting Link:

<http://www.siedlungswerk.de/>

Questions to discuss:

- 1. How to motivate landlords to pay more attention to the energy saving issues?**
- 2. How do public bodies balance climate issues and re-densification?**
- 3. How to better interlink public and private sectors?**

C3 Maximizing Jobs and Investment

The Stuttgart housing market is a highly competitive business sector. Traditionally, in order for the construction companies to flourish, they would rather concentrate on the profit-based projects and would pay little or no attention to the issues such as climate change or lack of social responsibility. Therefore, the implementation of the projects that link social and ecological issues would indicate a longer payback period and would represent higher economic risk for the involved stakeholders.

Subjects such as a promotion of renewable energy or an implementation of the innovative techniques for energy supply are usually not put on the planning agenda of the construction companies unless specifically required by the contracting authority. This attitude could be explained by the varied corporate philosophies of the construction companies. Furthermore, there are companies that primarily work with the current assets and their policy differs from those that work with the capital assets. These companies that solely operate the current assets tend to develop the short-timeframe strategies for their planning, construction and marketing. However the companies that focus on the non-current assets need to accomplish the long-term strategies (from twenty to fifty years) for their management concepts and for the long-term maintenance of value. These contrasting strategies have been bundled within the framework of the project in Bad Cannstatt.

The building project in Bad Cannstatt was considered as environmentally and socially friendly due to the special land use zoning that incorporates residential areas, a day-care center and a nursing home. The idea to connect social and environmental goals and offer people of all generations and in all possible living situations the unique opportunity to live in the same area was a starting point of the project initiated by the corporation Siedlungswerk Stuttgart. This brought together the stakeholders from the different backgrounds, for example the charitable church foundation St. Anna.

The corporation Siedlungswerk is a housing association of the two major shareholders: 75 percent belong to Bistum Rottenburg-Stuttgart and 25 percent to the Landesbank Baden-Württemberg. The project area in Bad Cannstatt is characterized as the quarter with the mixed utilizations. In order to construct the utilizations that cannot be funded by the main shareholders because of some contract limitations, it is necessary to find the external investors. The external investors usually get involved in a project right at the start-up phase. They take an active part in defining common goals of the project. The corporation Siedlungswerk as well as the project investors benefit from such cooperation because it provides a coordinated planning, joint procurement of the construction services and a visible improvement of the marketing opportunities.

Project Infrastructure and Partners

Strategic location

The project area is centrally located and is close to the railway station and other local public transportation. Such services benefit the commuters and offer an easy access to the various cultural activities outside of the residential area.

Infrastructure

There is a large commercial center that was built between 2003-2006 and includes not only a shopping mall, but also doctors' offices and a gym.

The well-developed neighborhood community provides services such as babysitting, domestic and shopping aids.

Project promoters and partners

The corporation Siedlungswerk Stuttgart is the main promoter of the project in Bad Cannstatt. The Siedlungswerk has been involved in the construction of more than 27,000 residential units in the region and is ranked as the one of the most prominent companies in terms of urban development in Baden-Württemberg.

Other strategic partners of the project in Bad Cannstatt are:

- The company **ImmoTherm** specializes primarily in planning, financing, installation, operation, maintenance and servicing of technical equipment in energy contracting sector. The ImmoTherm has also taken on the purchase of fuel, the maintenance and repair of the equipment and electricity billing services for the project in Bad Cannstatt.

Interesting Link:

<http://www.immotherm.de/index.php>

- **SWV** is a 100% subsidiary daughter company of the Siedlungswerk. The company is responsible for the administration of the housing units and for the renovation and modernization arrangements.

Interesting Link:

<http://www.siedlungswerk.de/verwaltung>

- **EGS-plan** is a planning office that develops sustainable energy and climate concepts for buildings and settlements.

Interesting Link:

http://www.stz-egs.de/?page_id=56&langswitch_lang

Close cooperation between all project partners in Bad Cannstatt is based on openness, mutual trust and respect. Such communication ensures the longevity of the project beyond the planning and implementation phases.

The example of the building project in Bad Cannstatt demonstrated many positive intersections of cooperation between the Stuttgart administration and private investors.

For example, close interactions between private and public bodies enabled the purchase of the municipal land with the realignment of boundaries under the commitment to integrate municipal housing buildings in the overall project. Other advantages of such collaboration suggested the involvement of the community representatives in the architectural competition and provided major support of the municipal urban planning offices. The last but not least advantage from this private public partnership was a construction of a day-care center that the city could lease or purchase and an integration of the urban housing subsidy program PWE (affordable home ownership for the young families).

Questions to discuss:

- 1. How to motivate the stakeholders from industry? What kind of incentives does work in practice?**
- 2. What are the strengths and weaknesses of private-public-partnership?**
- 3. How to win promoters from industry as advocates and proponents?**

C4 Education and Outreach

A currently ongoing research project examines a complex development of the ecologically sustainable business concepts in the field of urban planning. The research project analyzes the process from the data gathering to the management and implementation. Factors such as institutional and technical capacities play an enormous role in the implementation phase. Therefore, the interactions between the involved project participants are being closely monitored and studied. Additionally, the corporate strategy and marketing processes alongside of the user behaviour are being examined as well. The estimated duration of the project is 2012-2013.

Because of the practice-oriented nature of the research, it is expected to gain a transparent discourse and communication strategy both for the promoters and for the residents. Bad Cannstatt has recently completed a survey of more than 60 households in order to collect data about the regional energy supply and demand. The survey was accomplished with the high response rate of nearly 45 percent. The homeowners and tenants were asked about the factors that motivated them the most to buy or to rent a flat in the designated area. For example, the close proximity to the public transportation, to the local schools and shopping centers etc. were the main factors that have been mentioned. The residents also were expected to explain their point of view about the finiteness of fossil energy carriers and about the significance of the renewable energy concepts for the residential areas. The construction corporations need to offer the tenants and the landlords some potential solutions of how they could save money in the long-term, for example by reducing the expenses for the energy supply.

The survey has proved that the majority of the residents are highly pleased with their living conditions. The insights and the perspectives of the local residents on the issues of energy, climate and environment were extremely helpful and provided the basis for the future projects.

However, it is vital to emphasize that the topics such as climate protection, energy conservation and ecology are still considered as rather controversial in a corporate selling strategy of the housing associations. The economic incentives that would encourage climate protection and climate change adaptation in the building industry are still lacking in Germany.

Questions to discuss:

- 1. How to sensitize tenants (especially younger ones) for climate or energy saving issues?**
- 2. How to overcome barriers between science and industry?**
- 3. How to increase students interest for climate / environmental / sustainable issues?**

D North Rhine-Westphalia Case Study

D1 Energy and the Built Environment: Implementation Actions in Community Energy

D1.1 Best Practice: InnovationCity Ruhr

The example of the project InnovationCity Ruhr will demonstrate how the specifically chosen model city Bottrop will be transformed into environmentally friendly city of the future. The duration of this project is 10 years.

The Innovation City aims not only to strengthen climate protection and maximize energy efficiency of its own, but in the long-term to become a national role model in the field of sustainable development. Bottrop has set an ambitious goal to become the greenest city in Germany and to reduce its CO₂ emissions by 50% by 2020.

A successful cooperation between the local politicians, business practitioners and scientists in Bottrop results into numerous pilot projects. One of the original projects that show the strategic approach of the green transformation in Bottrop focuses on the renovation of the built environment. The primary objectives of the project include the climate-friendly urban planning and redevelopment of the residential and non-residential buildings.

Bottrop has won the competition of the Ruhr Region Initiative and now officially carries the title of Innovation City. Bottrop has created the center for information and counseling (Zentrum für Information und Beratung: ZIB). The counseling center was established in September 2011. All the individuals interested in redevelopment can attend various lectures on the topic of sustainable reconstruction and also obtain a comprehensive consulting service where the energy experts give many useful, implementation-oriented advices. Such individual counseling proves the fact that the renovated buildings provide much more comfort and energy efficiency and still remain affordable for the tenants.

The comprehensive door-to-door counseling is also expected to activate the initially disinterested homeowners to take part in the initiative. By using the energy checks in houses, the need for renovation can be assessed directly. The door-to-door consultations have been running since December 2011. Since then about 25 percent of all homeowners have been already consulted.

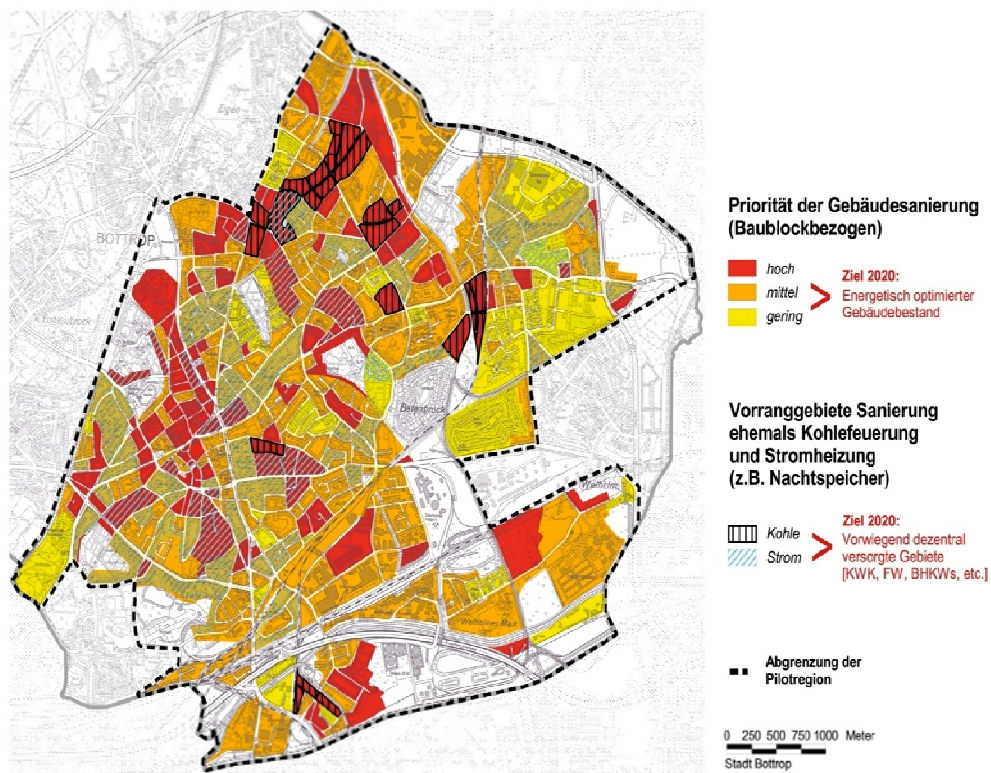
The pilot area of the city of Bottrop and of the surrounding districts includes about 12,500 buildings. Many of these buildings are old mining housing estates or other industrial and residential buildings from the 70s or the 80s that require reconstruction. These old buildings require a lot of the heat energy and emit an excessive amount of carbon dioxide (CO₂). To avoid the unnecessary energy consumption in such houses it is advisable to use thermal insulation. The power generation and heating systems also must be brought up to a modern and environmentally friendly state in order to promote energy efficiency. About 10.200 buildings in the designated area belong to the private homeowners. Thus, the private property owners have to be informed and motivated eminently.

Interesting Link:

Strategic pilot projects in Bottrop

http://www.bottrop.de/microsite/ic/medien/bindata/ICB_A_1_1_Leuchttuerme_2010-09-29.pdf

The diagram shows the potential of redevelopment in the pilot area in Bottrop. It depicts areas heated with coal and/or electricity. The specific strategies for individual reconstruction can be created based on this data set. It is vital to encourage the respective homeowners to invest in their buildings and thus save energy and money.



Source: InnovationCity Ruhr

Generally North Rhine-Westphalia (NRW) offers a wide variety of the incentive programs within the context of the green transformation of the InnovationCity Ruhr.

The urban project in Bottrop was developed jointly with the NRW Bank, City of Bottrop and ZIB (counseling center).

The first phase of the project focuses on creation and operationalization of the specific local concept for the renovation of the residential areas. Subsequently, this concept should also be applicable in other locations in the future.

This project concentrates on the renovation of the single-family houses built between the 1950s and the 1970s. The initial target of the project is the "3-liter house" or the passive-house standard. This standard is more stringent than the American LEED standards.

Currently about 100 residential units are being picked for this project. The respective owners of the private property (homeowners) are being encouraged to invest in energy efficient renovation. A successful mobilization of the homeowners to participate in the project includes both consultation and information exchange and also an elaborate cost analysis for the renovations.

The Duration of the project is 2012. Update on the project is going to be presented in Virginia in Mai 2012.

Interesting Link:

Renovation of the built environment:

http://www.bottrop.de/microsite/ic/Projekte/wohnen/WO_1-3_Energetische_Erneuerung_50er_bis_70er_Jahre.php

In addition to the reconstruction of the old building stock, the expansion of the district heating has also been adopted.

Initially about 80 apartments in a housing association will be connected to the district heating. The conversion of the heat supply in these buildings has been completed by the beginning of the heating season 2011/2012. Another 80 apartments will follow and be connected to the district heating next year. These measures will presumably save about 825 t of CO2 per year.

Furthermore, in order to encourage the homeowners and the tenants to participate in the project, the district heating company STEAG will promote the first 100 households in the pilot area. The financial subsidy will depend on the heat requirements of the building. The basic requirement claims the house to be accessible for the district heating network within the economically appropriate range. In addition to funding from the STEAG, further funding might also be requested from the program "progres.nrw".

Interesting Link: <http://www.progres.nrw.de>

Moreover, programs such as "Social City NRW" and "Urban Renewal West" award subsidies for the residential areas and landscaping measures. The so-called "house-and-yard" programs support the renovation of the facades, windows and doors because the facade improvements include measures for the energy efficient renovations.

Different programs from the European Union are also present in the NRW. Such EU programs provide consulting services directly to the homeowners. European subsidies are provided for projects on local climate protection, building renovation, and individual energy technology developments (heat pumps, wood heating, ventilation systems, solar thermal and mini-CHP).

D1.2 Dinslaken: City and Municipal Energy Supplier

Dinslaken is located on the western edge of the Ruhr area and is bordered by the Rhine. With about 71,000 residents on 48 square kilometers, the city has with 1,480 people per square kilometer a regionally typical high population density.

The city owns the "Stadtwerke Dinslaken" that are as a private company responsible for electricity, heat and water supply in the urban area. The municipal energy supplier is economically linked with other energy producers in the region through shares, affiliated companies and joint projects.

After the common understanding of the political stakeholders in Dinslaken, a local authority can - also with a strictly economic approach - independently contribute to a significant reducing of CO₂ emissions and improve the regional climate. The city, its businesses and actors of the urban society see this as a permanent, common task.

Here are some examples:

Electricity and heat generation

While in many other cities local measures and concepts for climate-friendly renovation have been taken only in recent years, the city of Dinslaken and the municipal energy suppliers - sometimes in partnership with public utility companies from neighboring towns - are realizing such projects for many years already.

These include for example its own biomass power plants (31 400 MWh per year), the intensive use of industrial waste heat, the local production and distribution of electricity and heat through cogeneration, an increasing annual capacity of solar energy utilization (currently 740 MWh per year) and an extensive district heating network in the entire urban area.

Based on this approach with a cross-combination of different, more environmentally friendly fuels, the emission values in the electricity and heat generation in Dinslaken are well below the average of the Federal Republic of Germany.

Examples:

- The CO₂ emissions for electricity and heat production comply with the average of the Federal Republic of Germany at 0.8 tonnes and 2.1 tonnes per person per year.
- In Dinslaken the corresponding values for the Power Generation are: 0.69 tons per person / year and for the generation of heat: 0.77 tons per person / year.

Overall, the proportion of sustainable energy in Dinslaken is

- in electricity generation: 20.7%
- in the heat: 48.0%.

The corresponding values for the Federal Republic of Germany are on average

- 15.6% in power generation and
- 12.1% in the heat generation

Thus, the values in the city Dinslaken are

- **for electricity generation by 30% above the national average**
- **and with the heat production by 400% above the national average**

The reason is that a considerable part of the energy requirement can be met through the use of renewable raw materials and industrial waste heat.

About 20% of the heat demand and 15% of the electricity needs are produced solely from biomass. Another 10% of the heat demand is covered through the use of industrial waste heat. There is also solar energy and the use of natural gas from the coal mine and a intensively used power-heat cogeneration.

The distribution of heat is provided by a district heating network, whose length is 585 km in the urban area. Compared to a conventional system with remote oil or gas burners alone, this means an annual saving of around 250.800 tonnes of CO₂.

Current projects to improve the climate and to reduce energy consumption

A sustainable **climate change strategy** requires not only new forms of energy production but also a reduction in energy consumption. The city, its businesses and the actors of urban society are constantly striving to bring new and transferable initiatives on the way. Again, the economic aspect is the focus of action. Examples are:

Climate concept for the whole city

At the end of 2012 a general concept of urban climate strategies is going to be presented. The concept is to first of all provide an analysis of the climate situation for the whole city (results: May 2012) to develop and elaborate proposals for further improving the overall climate.

For this aim, in June / July 2012 public forums with experts, citizens and businesses are being carried out. These will develop proposals for the following sectors:

- 1) Private households
- 2) Local Government
- 3) Urban Development and Transport
- 4) Economic and energy supply

Proposals will be evaluated by autumn 2012 and summarized along with other suggestions of the consultants, ordered in short, medium and long term perspectives in an overall package. Climate Analysis and realization proposals are being presented at the end of 2012 to the City Council Dinslaken.

Exemplary new model of the municipal savings bank

The Municipal Savings Bank has taken in service a new administration building for about 200 employees in March 2012. The building engraves the citiscape of Dinslaken and is a "passive house" construction. Through the exemplary construction, alone in this building every year around 160 tonnes of CO₂ will be saved.

Fifty-Fifty: Community project to reduce energy consumption in schools

Based on the suggestion of a local Agenda 21 initiative, schools in the city can participate in the project "fifty-fifty". In this competition for the economical use of heat, water and electricity consumption, the consumptions will be determined jointly and energy savings will be awarded. The municipal budget benefits only 40% from the savings. 50% of the savings receive the schools for its own use, 10% receive the janitors of the schools. Within two years, 15 schools have already registered.

According to the results available so far, the schools involved in the first year saved 39 621 kwh of electricity and 480 233 kWh in heat. Water consumption has risen to 2276 cm³, however, this has to do with more stringent regulations of the State of North Rhine-Westphalia, which requires regular flushing of water lines due to avoid the formation of bacteria.

In the areas electricity and heat the voluntary savings of the schools are between 0% and 27% (electricity) and 1% and 33% (heat). Overall, within one year € 51,000 could be saved. Due to the competition rules, 50% of this amount go to the schools and their janitors.

The Energy Lab: Creative.Quarter Lohberg

In the north of the city Dinslaken on a former mining area, a 40-hectare urban quarter with offices and studios is developing in new and landmarked buildings. 200 new apartments and a commercial area are designed. In some years, some 1,000 people will live and work in the "KQL".

Even today - in an early stage of the project development - many events are hold there. Around 20 designers from all fields of art, photography, film and music have already settled in the buildings. The civic representatives from the neighboring district of Lohberg are involved in the project development.

At the end of the year 2012, the first implementation phase begins with the preparations for the construction of the new "mountain park" on the site. For the energy optimization of the new district a first draft is available. City administration, public utilities, the landowners and Ruhrkohle Montan Immobilien have agreed to develop the district on the basis of an intelligent energy strategy for a CO₂-neutral site.

The concept is based on three pillars:

1. Energy Efficient Building
2. Implementation of low-energy standards
3. CO₂-neutral energy production on site.

Energy sources are solar, wind, biomass, geothermal, methane (CH₄) and long-term use of mine water from abandoned mining operations. The electricity generated in Creative.Quarter Lohberg will be used locally for heat pumps and promoted commercially. The excessive electricity is to be used in the neighboring garden city Lohberg.

The implementation of the concept is yet to begin in 2012 with preparations for the constructions of pipes and due to the realization of the overall project it should be completed by 2020.

D1.3 Focal points: Renewable Energy Sources

- Renewable energy sources serve as a catalyst for creation and growth of the new environmental values in NRW.
- Renewable energy sources indicate a trend towards decentralized energy supply that would increase regional economic growth in the most populous federal state of Germany.

The expansion of renewable energies in Germany mostly takes place locally in the communities and regions. As the head of the IÖW research field "Sustainable Energy and Climate Protection," Dr. Bernd Hirschl emphasizes the importance of the local environmental values as a crucial factor for the economic growth in the region. "In our studies we have proved that the renewable energy sources annually provide enormous financial contributions to the local municipalities.

Given that the expansion targets for renewable energies in Germany would increase steadily, the innovative technologies would offer a great potential for the future positive economic growth in the communities and especially in the rural areas."

Source: www.unendlich-viel-energie.de

The Ministry for Climate Protection, Environment, Agriculture, Nature Conservation and Consumer Protection of the German State of North Rhine-Westphalia is optimistic about the further development of renewable energies.

Interesting Link:

www.umwelt.nrw.de/ministerium/presse/presse_aktuell/presse120330_c.php

The Agency for Renewable Energies in Berlin praises North Rhine-Westphalia for the rapid implementation of the policies for energy transition.

The latest Annual Federal Renewable Energy Report of 2011/2012 that was introduced to the public in March 2012, certifies the fact that NRW is on "the right track and has taken the right steps." According to the Minister for Climate Protection of the NRW Johannes Remmel "NRW is not only a pioneer in climate protection in Germany, it has

also provided the correct decisions for the implementation of the energy transition." The Minister also stated: "the expansion of renewable energies, increased energy efficiency and energy conservation are an integral part of our climate and energy policy." NRW is not only the largest energy consumer in Germany, but also the largest electricity producer. Thus the Annual Federal Renewable Energy Report focuses on the innovative achievements in NRW such as the new installed geothermal heating system (about 40,000 kilowatts in 2010), the intensive heating systems by wood pellet (450 million kilowatts of heat). The creation of new jobs in the renewable energy sector and in the energy research field (about 24,000 jobs) is also one of the focal points of the Report.

Interesting Link:

www.unendlich-viel-energie.de/de/service/mediathek/publikationen-bestellen.html

D1.4 Solar Energy Housing Estate in NRW

Renewable energy development plays an important strategic role in the green transformation of the region. Increased number of the renewable energy sources such as wind energy, solar or geothermal energy is being successfully integrated in a long-term innovation strategy for the cities and towns in NRW. German Renewable Energy Act keeps encouraging the stable growth of the photovoltaic industry. North Rhine-Westphalia is currently the European leader in solar energy housing estate.

Project Initiation and Implementation:

At the end of the 90s the state government of NRW and the Energy Agency NRW launched the project for the construction of the fifty solar energy housing estates. This project aimed to increase energy efficiency by promoting solar energy and was called "Building with the Sun - 50 Solar Housing Estates in NRW". The solar energy housing estates are located in 34 cities and towns in NRW.

Project Development:

NRW has already completed 37 solar energy housing estates with about 3,700 residential units. Another 14 projects are currently under construction.

Project Coordination:

The holistic approach of the project emphasizes the energy optimization of the single buildings on the one hand and connects energy efficiency, social and ecological aspects of the built environment on the other hand.

Quality Assurance:

The interdisciplinary panel examines all the applications very thoroughly before conferring the status of the "solar village". It is therefore absolutely certain that the highest quality standards are always ensured.

Special feature of the Project:

The Energy Agency NRW enables the online-overview of the photovoltaic projects and their funding opportunities.

The Energy Agency.NRW is thoroughly supported by the state administration of the NRW. Among other things, the EnergyAgency.NRV is supported in the field of the information brokerage and communication. However, the lack of information is still a major obstacle in the implementation of the energy transition. Therefore, the EnergyAgency.NRW strengthens the public acceptance of renewable energy sources by "filling the gaps in knowledge". Within this framework, one of the Europe's largest corporate training programs has organized the cluster "EnergyRegion.NRW" that has over 3,000 participants.

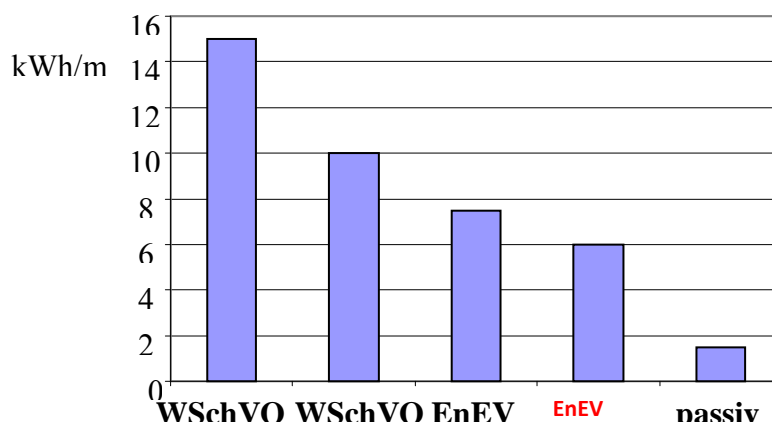
Interesting Link:

<http://www.energieagentur.nrw.de/solarsiedlungen/page.asp?RubrikID=5526>

Energy Efficient residential buildings – 50 Solar Energy Housing Estates in NRW

100 Climate Protection Estates in NRW

Heat Demand – German New Building Regulations



Maximum heating energy demand, heat losses of distribution system

State of Project

51 Locations, 37 projects with 3600 units realized (9.000 Inhabitants),
14 projects under construction



State of Project 100 Climate protection estates

April 2012: 35 Projects certified by the selection committee, 11 Projects in the building phase



D1.5 National Background

Energy Efficiency in Urban Planning in the German urban and regional planning policy: metropolitan areas

1. Planning policy

The German regional planning policy has until now been pursued for decades in the "decentralized concentration". Furthermore one has introduced the principle of "strengthening the strengths", i.e.: a certain modification of the existing funding policy. Still, the principle of **equivalent living conditions in the city and the countryside** is

valid. This has led to an area-wide, excellent infrastructure, which many local authorities cannot afford any more.

So, if you want to develop the strong points even more to enforce also weak areas, you must make certain regional boundaries, which are the cities and their surrounding community. Both have to develop a certain responsibility together. This has led to the definition of 11 metropolitan areas in the Federal Republic.

Sure, these metropolitan areas can not be compared with cities like London or Paris. The largest metropolitan area in Germany is the Rhine-Ruhr - region with approx. 8 million inhabitants, with more than 150 cities and towns, and very different economic power. It turns out on closer inspection, however, that these so-defined metropolitan areas carry out metropolitan functions in very different ways.

The technical discussion is therefore about the question of a continuation of the compensation policy, as in the "countries financial compensation" and the funding policy has always been a principle of German regional planning. This applies particularly to the housing policy.

This shift is now very evident in matters of energy policy and the modernization and energy refurbishment of existing buildings.

The Urban Development Act (Städtebauförderungsgesetz) is still one of the most important laws for urban development, as it promotes integrated disadvantaged neighborhoods, education and training with the development of local economy, relocation, rehabilitation and resettlement of farms and jobs.

2. Urban policy

With the insertion of the word "urban development" in the title, the Ministry made it clear that the cities play a strong role in future development to growth, social and territorial cohesion and the integration of people from more than a hundred different countries.

"Urban Development" means the implicit emphasis on the "urban dimension". This is not on stake in most of the EU countries but it has always been an issue in Germany.

The urban programs of the EU have brought a strong change in the perception of public policy in this respect. At the local level of cities and neighborhoods the paradigm of this type of integrated urban development policy has been practiced already for a long time. "Districts with special development needs" or "the social city" were and are programs that one tries to integrate in Germany.

In the shrinking cities of the former heavy industry, demolition of vacant dwellings and upgrading strategies for inner cities and the remaining settlements are instruments to create competitive capabilities.

Ecological aspects, Agenda 21 and the MDGs as well as a significant involvement of civil societies on the one hand, and the involvement of private capital through PPP-projects on the other hand, are typical for these developments.

They reflect a growing self-confidence of cities as places for the design of individual life in a community of responsibility. This includes the establishment of the "Federal Foundation for Building Culture" (Bundesstiftung Baukultur), which helps the cities in the preservation and design of public space to secure the necessary qualities.

3. Innovative urban planning

German cities have a strong position in local self-government through the territorial jurisdiction of the municipality. The subsidiary principle is an instrument to take over the responsibility for the design of the habitat of its citizens. On the one hand, this requires that the citizens identify with the city in which they live, so it is an increasing competition among cities for residents and the establishment of innovative enterprises. On the other hand, this stands against an increasingly strong desire of citizens for participation and influence on decisions, not only for information or consultation.

The local planning authority requires that cities determine the order of its development and that there is a sophisticated planning law, which is a framework law to a liability to everyone.

In recent years more and more elements of a consensual process in municipal planning and negotiation processes have found support. The combination of these two elements gives German cities much scope for the integration of its citizens on the one hand and the participation of interested investors on the other hand.

Especially the need to motivate the private owner to participate in the necessary transformation of energy systems requires making community participation processes possible and more important.

Innovative urban planning means in this context to discuss the major objectives of urban development with the participation of citizens and at the same time in many very different approaches to stimulate the private sector to advise, to moderate and to assist in financing. Finally promoting the legal framework should not be overseen. As always in all processes some people can only be forced to communal behavior over sanctions.

In this respect the key role remains on urban planning. Stakeholders as well as citizens have to be convinced to common action within their community on the basis of careful planning and balanced considerations. This is particularly important given the current paradigm shift in the German energy policy.

For the questions of energy policy, there is a wealth of research projects and individual approaches in university and community collaboration, which has fortunately increased at the local level as well as in universities.

More and more, it is possible to involve companies in these alliances. A large area is the mega-city research, which is definitely not a one-way street. Urban agriculture, the economy from waste transport systems, remote sensing data for the elaboration of principles for the protection of energy concepts in the development of building types are just a few important examples.

Global Knowledge Transfer is as well as the experience within the EU, especially with the URBAN and URBACT networks a mutual enrichment.

D2 Maximizing Jobs and Investment

Example: InnovationCity Ruhr is currently pursuing approximately 100 individual projects. About half of those projects are funded by industry.

InnovationCity Ruhr has won a few large companies to support the ongoing projects. The cooperation with industry in Bottrop consists of a number of initiatives that launch the companies in terms of climate protection. The expertise and commitment are asked from the companies in order to rebuild the pilot area in a climate-friendly manner. The industry, on the other hand, expects to gain the insights about the innovative redevelopment of their products and services and to facilitate a new access to the markets. Thus, such cooperation not only increases the competitiveness on the market, but also secures more jobs.

Companies such as RWE, E.ON Energy Research Center, RWE Efficiency GmbH, RAG Aktiengesellschaft, STEAG district heating, Bayer MaterialScience AG / EcoCommercial Building Program, EMSCHERGENOSSENSCHAFT, BETREM Emscher Fuels Ltd., ELE Emscher Lippe Energie GmbH, GERMAN ROCKWOOL mineral wool GmbH & Co. OHG, Saint-Gobain Weber GmbH, Viessmann Group and many more are participating in the project.

The currently ongoing initiative “Zukunftshauswettbewerb“ is a unique part of the competitive innovation project launched in Bottrop.

The objective of the project is to transform three chosen building categories according to the positive-energy standard. Project involves respectively one single-family house, one double-family house and one multi-family house. After the reconstruction these houses are expected to produce more energy than they can consume. The entire project is supported by a variety of business partners. The RWE Effizienz and Bayer MaterialScience are the major economic partners, each supporting the respective building category.

The involvement of the business sector indicates a successful example of public-private partnership in the region. Benefits for business alliances point to join forces in initiatives, collaboration and sharing knowhow.

Additionally, some smaller locally operating industrial and economic networks have been created. Craftsmen, consultants and service providers play an important role in the successful development of the project. Many small and medium-sized companies specialize in energy efficient building refurbishment or act as consultants on the topic of energy conservation. Such companies work in direct contact with their customers in order to implement construction and rehabilitation concepts.

D3 Education and Outreach

The NRW is the most populous metropolitan area in Germany and the 5th largest in Europe with around 12 million inhabitants. NRW is also the national leader in investing in energy research and the one of the most important industrial and scientific centers in terms of the renewable energy development.

NRW offers a wide spectrum of education, advanced education, training and Research and Development. Science and research play a significant role in the green transformation of the region. Collaborative projects such as pro Ruhrgebiet, the Initiativkreis Ruhr and the Wissenschaftsforum Ruhr provide great examples of the valuable resources and skills.

Interesting Link:

<http://www.i-r.de/>

NRW also hosts numerous trade fairs and exhibitions. Deubau is the annual International German Building Trade Fair that takes place in Essen. Subjects such as energy consumption and sustainability are dominating the discussion in the building trade. Aspects relating to all facets of the replanning, restructuring and revival of the urban districts remain in the focus of attention at the Deubau.

Interesting Link:

www.deubau.de.

In order to cover the complex requirements of the modern building tasks there are numerous training opportunities in the NRW. To name a few training centers for the building and construction industry: the Vocational Training Center for Building Industry NRW, the Institute for Business Administration in Construction Industry GmbH (BWI-Bau) and Association for Construction and Technology Quality (GBT).

Interesting Link:

<http://www.bauindustrie-nrw.de/html/leistungen/berufsbildung.php?curmain=2&cursub=5>
http://www.bauindustrie-nrw.de/public/facts_figures/Praes-KonjunkturStruktur.pdf

There is also a variety of additional training for architects and craftsmen in the close coordination with the Chamber of Architects and the Chambers of Crafts.

Interesting Link:

<http://www.aknw.de/akademie/index.htm>.

The region is home to five universities: the Ruhr University Bochum, the Dortmund Technical University, the University of Duisburg-Essen, Hagen distance-learning university and the Witten/Herdecke private university. The development of environmental technologies is a focal point of research in the region.

University Ruhr Bottrop, West Campus (HRW) is a new state-run university of applied sciences committed to high-quality teaching and research. It is based in the cities of Bottrop and Mülheim. HRW is closely connected with companies in various industries in the region.

The Ruhr University West has established a new campus in Bottrop with a special way of teaching and research where innovative and efficient use of energy is integrated into higher education. Thus, students have the courses such as "Applied computer science", "Energy computer science" and "Industrial Engineering - Energy Systems". They learn how to deal with renewable energy sources and technologies in order to increase energy efficiency in their own "building as a laboratory." The university building gets the nature of a laboratory where, for example, students of electrical engineering can learn how to test the efficiency of the photovoltaic systems or how to produce heat from sewage.

The energy consumption of the West Campus is expected to be 30 percent below the levels required by the German Energy Conservation Regulations (EnEV) 2009.

In addition, the university offers dual study degree programs. It is a high school degree with integrated internships in local and regional businesses. Compared to the "traditional" courses it has a higher practical relevance, which benefits both students and industry. During their studies, students can establish contacts with potential employers, work in local companies and gain practical experience.

Interesting Link:

<http://en.hochschule-ruhr-west.de/the-hrw/portrait/hrw-history.html>

The Wuppertal Institute for Climate, Environment and Energy is involved in the accompanying scientific research on the Innovation City Bottrop. The accompanying scientific research takes several tasks. From observation and evaluation of the implementation process (empirical analysis) to the transfer of the gained knowledge. The partner network is not just advising the real estate owners, it also offers the participants a platform for ideas exchange and cooperation. Moreover, a wide spectrum of the further education closes potential gaps in training, ensures a continuous quality checks and guarantees an independent Audit Committee.

Interesting Link:

<http://www.wupperinst.org/>

The initiatives such as " Marktplatz Klimaschutz" provide the companies and partners with the possibilities to present their products, projects and solutions for climate protection to the public. Which causes more public awareness to the topics such as the environmentally friendly renovation of the built environment.

Conversely, for the visitors it is a unique opportunity to compare different providers and choose the most convincing products such as insulation, heat pumps and micro-CHP. The initiative "Marktplatz Klimaschutz" is opened to all interested citizens and is also used by the energy consultants in order to demonstrate energy saving techniques.

The InnovationCity Ruhr pays a special attention to the educational measures in order to attract young generations to the project and to increase their understanding about various sustainability issues. The certain campaigns that are taking place in Bottrop aim to involve students in the discussions about the ongoing sustainability projects. Young people deal with issues such as energy efficiency or renewable energy sources. In 2012 the following action is being planned: "Schools of the Future" in the InnovationCity where boys and girls can try themselves in the sustainable jobs and get some

information about the future market opportunities on the subject: “ WE and the innovation of our home city in the future”.

For more information about other projects in Bottrop- interesting Link:

<http://www.bottrop.de/microsite/ic/Projekte/index.php>

3 Biographies for elected officials and speakers

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. Mr. 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.

Paul Hallacher is Director of Research Program Management and Lecturer in Political Science at Pennsylvania State University. He is responsible for assisting faculty members across the University develop large scale, multidisciplinary research and technology transfer initiatives, and has established numerous national research and technology transfer centers at Penn State in a variety of disciplines. He serves as Director of the Penn State Engineering Innovation Program and Director for Management and Administration of the Greater Philadelphia Innovation Cluster for Energy Efficient Buildings, a DOE Energy Innovation HUB headquartered at The Navy yard in Philadelphia. His research interests are in science policy and politics, organization theory, and technology based economic development. Before joining Penn State in 1989, Hallacher served in several policy development and program management positions in Pennsylvania state government.

Dr. Michael Heidinger

1984 – 1990 Studies of Economics - Diploma
2000 Promotion Dr. rer. oec.

1998 – 2005	Referent of the SPD-parliamentary group for work, health and social affairs
2005 – 2009	Head of the Unit Employment Policy and Vocational Education of the Ministry for Work, Health and Social Affairs of North Rhine-Westphalia
Since 2009	Mayor of Dinslaken

Rob Kerr is the Community Energy Plan Manager for the City of Guelph. Rob 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. Rob'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, Rob 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 Rob'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. Rob 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, Rob joined the City of Guelph as the Community Energy Plan (CEP) Program Manager. Rob will represent the City of Guelph as a cornerstone partner in a community-wide effort to implement Guelph's CEP. Rob will play a key role in educating the public and keeping stakeholders informed of the goals, progress and successes of the plan.

Annette Nüsslein

Degree in Social Service, Journalist
windConsultant – Annette Nüsslein, Owner
GADORE Center USA, Founder

Has been active for 10 years in the environmental technology field (Fields: wind, solar, thermal energy, biogas, waste to energy, green building and waste management).

- Consulting
- Seminars and conferences for companies
- International pavilions in the US
- Close cooperation with american organization (AWEA, ACORE, BTEC and others)

Dr. John Randolph

2008-2009	Chair, Urban Affairs and Planning program, SPIA, Virginia Tech
2003-2008	Director, School of Public & International Affairs, Virginia Tech
1995-2003	Head, Department of Urban Affairs and Planning, Virginia Tech
1988-1995	Director, Virginia Center for Coal and Energy Research, Virginia Tech

1991-1992 Acting Chair, Ph.D. Program in Environmental Design and Planning, Virginia Tech
 1985-1992 Associate Professor, Urban Affairs and Planning, Virginia Tech
 1986-1987 Assistant Director, Virginia Center for Coal and Energy Research, Virginia Tech
 1979-1985 Assistant Professor. Urban and Regional Planning. Virginia Tech
 1978-1979 Member of the Faculty, The Evergreen State College (Olympia, WA)
 1976-1978 Assistant Professor of Environmental Science, University of Puget Sound (Tacoma)
 1973-1976 Research Assistant; Stanford University
 1973 Teaching Fellow; Stanford University
 1969-1971 Planning Development Engineer, Quality Control Engineer; Bemis Company, Inc., Nashua, New Hampshire

Prof. Dr. Miranda Schreurs is the director of the Environmental Policy Research Centre and Professor of Comparative Politics at the Freie Universität Berlin. Prior to this she was Associate Professor in the Department of Government and Politics, University of Maryland. Schreurs' work focuses on comparative environmental politics and policy in Europe, the US, and East Asia. She was born and raised in the United States and has also lived for extended periods in Japan and Germany and briefly in the Netherlands. Her PhD is from the University of Michigan and her MA and BA from the University of Washington. She has also spent time researching or teaching at Harvard University, Utrecht University, the Freie Universität Berlin, Keio University, Chuo University, and Rikkyo University and has held fellowships from the SSRC-MacArthur Foundation Program on International Peace and Security Affairs, the Fulbright Foundation, and the National Science Foundation/Japan Society for the Promotion of Science.

In July 2008 Miranda Schreurs was appointed to the German Advisory Council on the Environment.

Her key research areas are: Environmental governance, climate change policy and politics, energy policy, German, EU, US and East Asian environmental policy.

Markus Siehr

1993 – 1994 Postgraduate course at Nuertingen University
 Degree: diploma for environment protection

1986 – 1992 Academic studies, biology, at University Stuttgart-Hohenheim,
 Degree: diploma

since 2009 Project manager, Energy, Climate and Environment, Verband Region Stuttgart

2004 – 2008 Project manager, Demographic Change and Health Care, Stuttgart Economic Development Corporation

2002 – 2003 Chief Executive Officer, BioRegio STERN Management Corporation

1995 – 2001 Project manager, Infrastructure planning and waste management, Verband Region Stuttgart

1994 – 1995 Project manager, Waste management and sewage management, Weidleplan engineering consultant

Bernd Tischler began his term as lord major of Bottrop in 2009. In 2004, he was elected technical deputy by the council of the city of Bottrop. Part of his department are the building agency, the urban planning agency, the survey agency, the cadaster agency, the building inspection agency, the civil engineering agency, the environmental agency, the public green space agency and the department of building stock. Tischler's department also oversees the sports and public pool facilities of Bottrop.

Mr. Tischler holds a diploma in city and regional planning from the University of Dortmund. After a traineeship with the county government in Cologne, Tischler passed the state exam for higher technical administrative service in 1987 in Frankfurt. He then worked as a deputy chief officer in the agency for city development and economic promotion of the city of Dormagen. In 1989 Mr. Tischler transferred to the city of Bottrop where he started working as a department chief for environmental planning. He then worked as a department chief for obligatory area development planning and later became deputy chief officer. In 1995 Mr. Tischler was promoted to the post of chief of the city planning agency that was charged with tasks regarding urban renewal and the tasks of the housing office. In 1996 Bernd Tischler was appointed to the post of an executive building director.

During his time in the planning office, Bernd Tischler played an important role in major building projects, the reactivation of industrial fallow lands, for instance the former "Hüls-Area" (Hüls-Gelände), and in the establishment of Warner Bros. Movie World and the Alpin-Center. Among his special projects as chief of the planning office is the ongoing renewal of the Bottrop downtown area and the renewal of the land-use plan. Bernd Tischler represents the interests of Bottrop in meetings, such as those of the Emscher association (Emschergenossenschaft) in Essen. Tischler is also part of several administrative boards. He volunteers as a director of the not-for-profit construction company Bottrop.

Annette Voigt, Project Manager, Foreign Economic Relations France, North America, Ministry for Economic Affairs, Energy, Building, Housing and Transport of the State of North Rhine-Westphalia

1990 - 1992	University of Public Administration Ludwigsburg Diplom-Verwaltungswirtin (FH)
1992 - 1997	Regional Government Düsseldorf
1997 - 1998	Ministry for Economic Affairs North Rhine-Westphalia, Economic Development and Financing
Since October 2006	Ministry for Economic Affairs North Rhine-Westphalia, Group Foreign Economic Relations

Areas of activity

- Economic relations to the U.S., Canada, France
- Maintenance and development of commercial contacts
- Project management and development (new materials, MicroNano, electro mobility, renewable energies, environmental technologies)
- Cooperation with embassies

- Organisation and realization of delegations of the minister/state secretary, support of delegations at home and abroad
- Coordination and planning of events, trade fairs
- Support of company activities abroad