

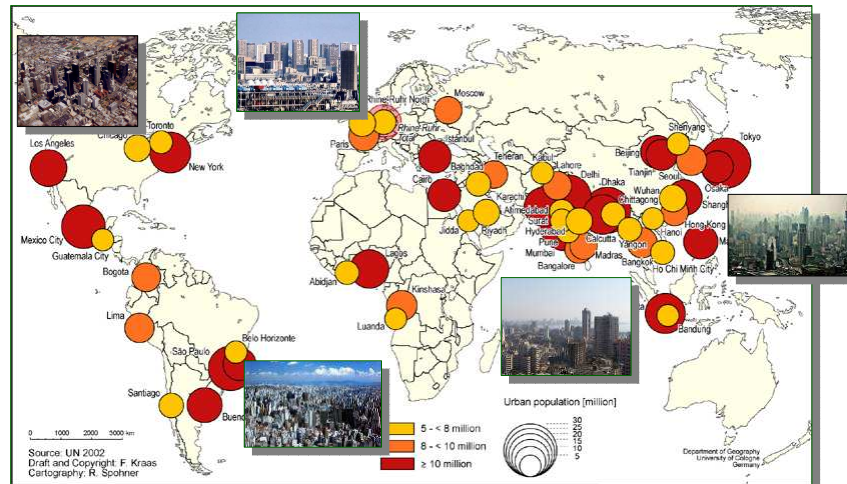
“Building a Green Community” A Conversation about Community Energy Planning



Dr Stefan Blum
Head of Clean Energy, MVV decon GmbH
Peter Garforth
Principal, Garforth International LLC

*LA Area Chamber of Commerce and German Consulate General
Los Angeles, 27th March 2008*

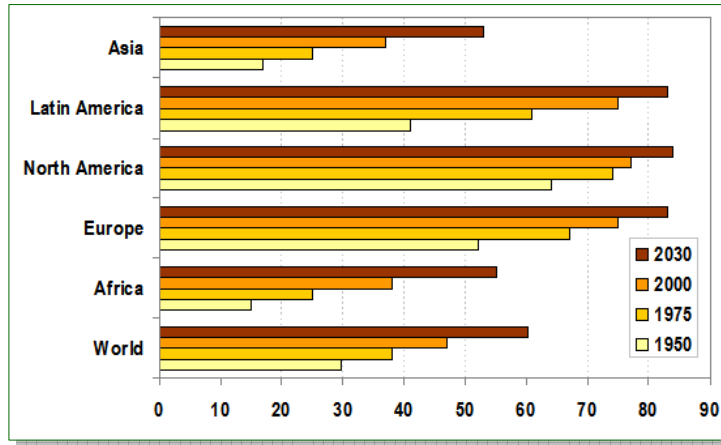
A World of Cities 3 Billion Urban Citizens



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*UN Sources

Majority of us live in cities

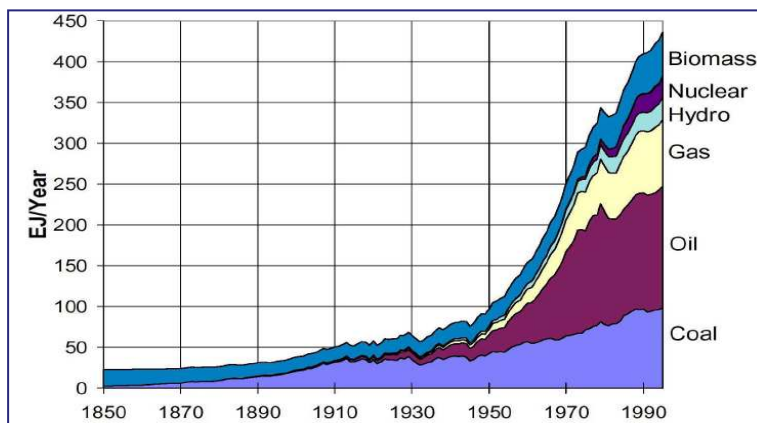


Urban Population passed 50% in 2008

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*UN Sources

Insatiable Appetite for Energy About 70% of it in Cities



Forecast to double by 2030

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New Global Energy Realities *Fundamentally different from past*

- Globalizing volatile energy prices
- Dependence on imports
- Climate change legislation
- Underinvested energy infrastructure
- China and India major new energy customers
- Trigger events – blackouts, hurricanes, tornados

Driving Global and Local Ontario Policies

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Global Cost of Energy



USA ~ \$1.5Trillion

12% of GDP

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Energy Productivity Differences

How well do we spend our \$1.5 Trillion?

Region	Population	GDP	Energy	Energy /Capita	Energy /GDP
USA	4.6%	25.9%	20.5%	100	100
EU	7.5%	31.1%	15.9%	47	60
Japan	1.9%	8.1%	4.6%	54	67
China	20.0%	6.1%	15.0%	17	312
India	17.1%	2.0%	4.7%	6	291
World	100%	100%	100%	22	81

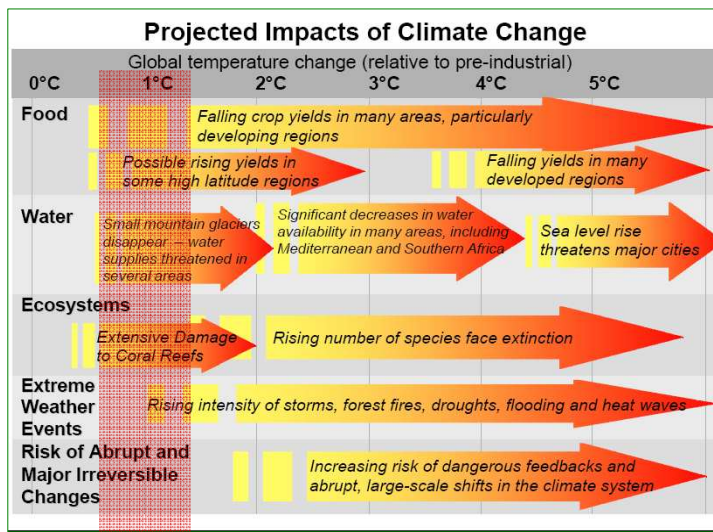
Key to Competitiveness

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*Various USEU Sources – 2007 sources

Climate Change

Range of Potential Impacts

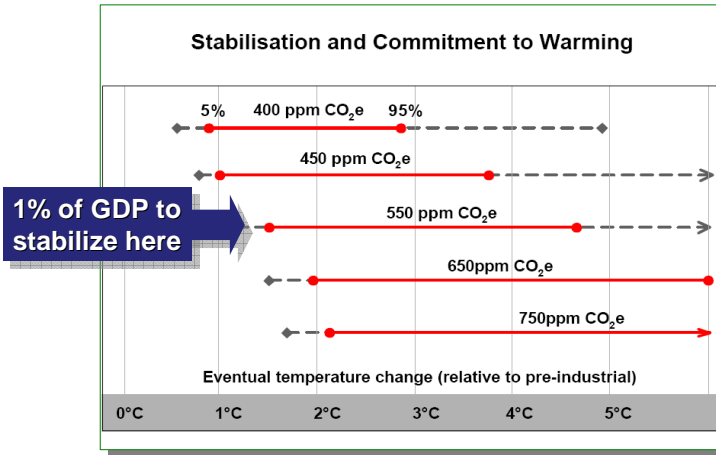


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*Stern Review

Global GHG Stabilization Levels

Risks of warming ranges - 2050



10 to 20% of GDP to fix damage

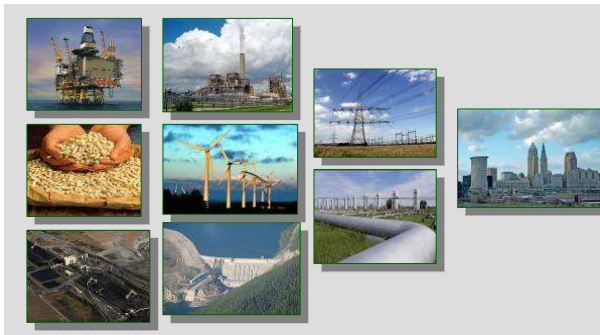
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*Stern Review

Dysfunctional Energy Supply Chain

From fuel to service

Uses 70% of all energy



25%

5%

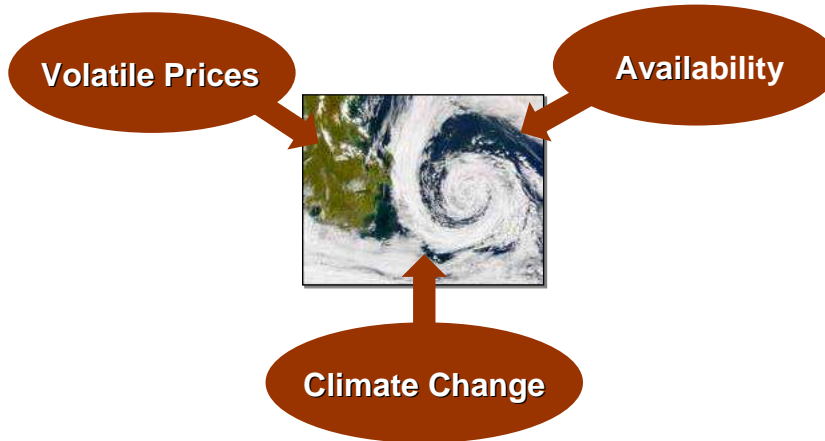


- High greenhouse gas
- High-cost low returns
- High risk

Pay for 100 get less than 10

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Today's Global Perfect Energy Storm When fears collide...



Are our reactions enough?

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Energy and Climate Indicators

■ Energy per capita per year (toe)	
■ Canada	8.3
■ USA	7.7
■ Germany	4.2
■ European Union	3.6
■ Denmark	3.6
■ Total CO ₂ per capita per year (metric tons)	
■ Canada	22.6
■ USA	21.7
■ Denmark	14.1
■ Germany	11.7
■ European Union	10.5
■ Municipal CO ₂ per capita per year (metric tons)	
■ USA – Washington DC	19.7
■ USA – Boston	14.9
■ Canada – Guelph	12.2
■ Germany - Mannheim	5.0
■ Denmark - Copenhagen	2.6
■ Canada - Guelph (2031)	5.0

Targets for Los Angeles?

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*Rough indicators - validation needed

Yesterday's Perfect Energy Storm *West Europe in the Sixties*

High Prices

Soviet Supply



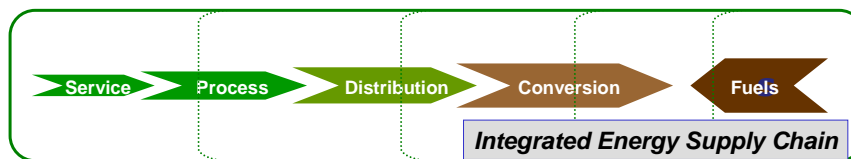
Acid Rain

Experiences for Urban Design

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Change the Thinking *Integrated view from service to fuel*

100% of total energy

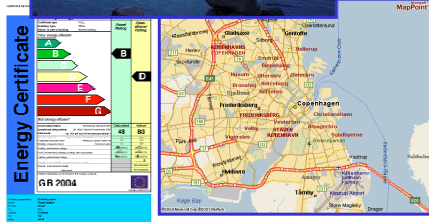


- Key questions
 - "How much energy is really needed?"
 - "How to minimize greenhouse gas emissions?"
- Multi-Decade Community Energy Plan
 - Optimize investments between efficiency, distribution, conversion, fuel
 - Sustained consistent approach
 - Future flexibility

Pay for 100 get 30 to 50 !

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Copenhagen Long-Term Master Plan for 1.7M people



- 1973 highlights energy vulnerability
- Long-term energy master plan
- Building efficiency
 - Performance certification
 - Global benchmark
- District heating
 - Municipal zoning rules
 - Upgrade legacy systems
 - Teamed between municipalities
- Energy sources
 - Clean generation with heat recovery
 - Coal and gas
 - Biomass & waste to energy
 - Long-term wind strategy
 - Industrial heat recovery
- Transport
 - Mass transit
 - Cycle route networks
 - Urban design for walkability

Global energy and climate benchmarks

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Mannheim – Efficient Energy Supply through Integration

Workshop on Community Energy Planning
American University,
Washington D.C. 25th March 2009

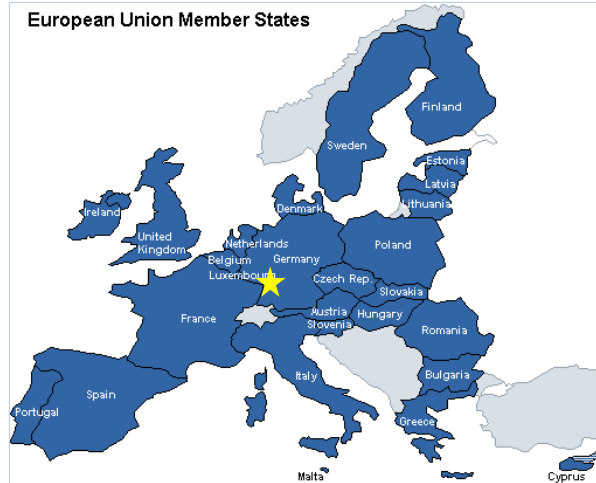


Dr. Stefan Bluem, Head of Clean Energy
MVV decon GmbH – MVV Energie AG Group



Mannheim – At the centre of the EU

European Union Member States



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Mannheim, Baden-Württemberg, Germany



- ▶ Population 350,000 in City, 2 M in Rhine Neckar Metropole Region
- ▶ University town
- ▶ Industrial Base
 - ABB
 - John Deere
 - Siemens
 - Mercedes Trucks
 - BASF
- ▶ South of Frankfurt
- ▶ On Rhine & Neckar rivers
- ▶ MVV - City/Private partnership
- ▶ Multi-utility structure

Among lowest CO2 globally



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EU Energy & Transport Directives

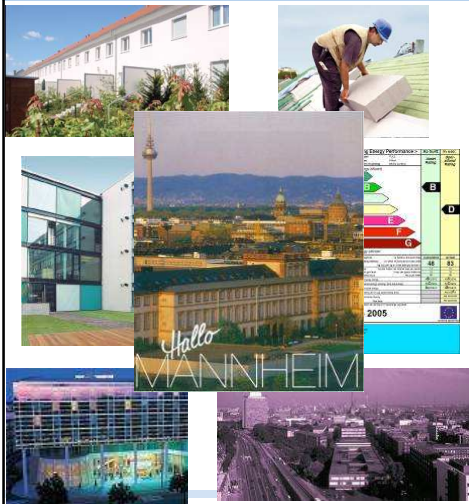


Integrated Legislation



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Serving Efficient Buildings and Industry



- ▶ Codes systematically increased since 1975
- ▶ Current EU Efficiency Directive fully in force in 2007
- ▶ Energy efficiency certification from 2006
- ▶ Most connected to district heating
- ▶ Tailored industry energy service packages



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Serving Efficient Transportation



- ▶ City wide light rail system
- ▶ Regional light rail system
- ▶ Inter City European Rail network
- ▶ Airport rail link
- ▶ Trams renewed in last 15 years
 - Reduce energy demand
 - Improve passenger comfort
- ▶ Conscious Car/Rail/Walk strategy

Low carbon portfolio



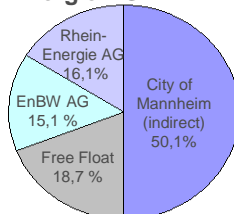
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MVV Energie AG Shareholder Structure & Key Indicators 2007/2008



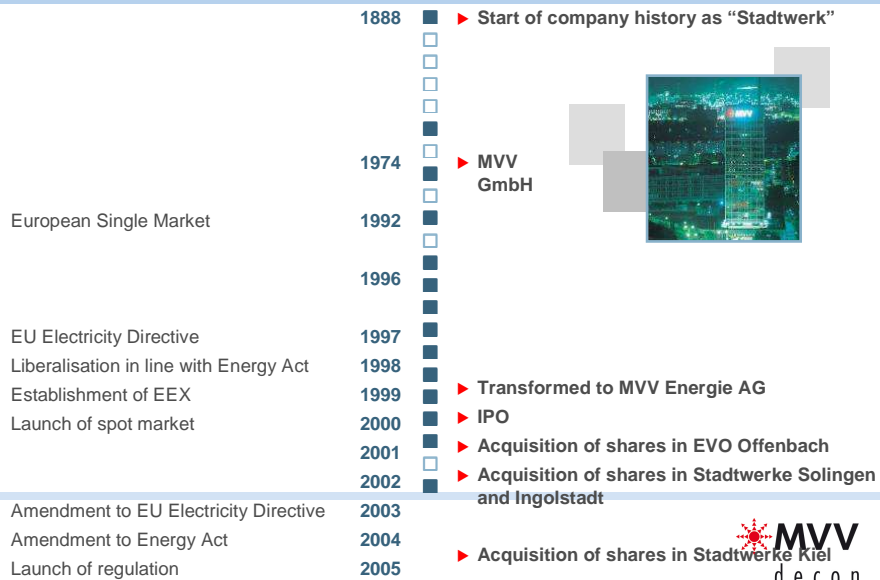
- ▶ **Headquarters:** Mannheim
- ▶ **Number of employees:** 5'900
- ▶ **Sales:** 2'636 Million Euro
- ▶ **EBIT:** 249 Million Euro
- ▶ **Multi Utility Network: Participations**
 - MVV RHE AG (100%)
 - Stadtwerke Kiel AG (51%)
 - Stadtwerke Solingen GmbH (49,90%)
 - Energieversorgung Offenbach AG (48,78%)
 - Stadtwerke Ingolstadt Beteiligungen GmbH (48,40%)
 - Köthen Energie (100%)
 - Stadtwerke Buchen GmbH (25,10%)
 - Stadtwerke Schwetzingen GmbH & Co.KG (10%)
- ▶ Delivers 20 Bn kWh electricity and 11 Bn kWh district energy

MVV Energie AG



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Where have we come from?



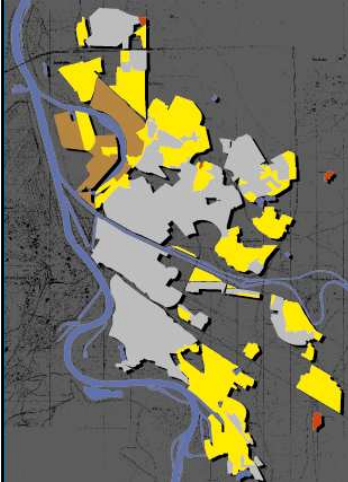
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Products and Business Segments



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Flexible Utility Architecture



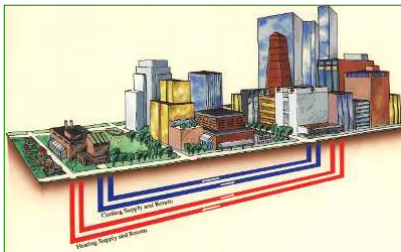
- ▶ Energy zoning
 - District energy (heat/cool)
 - Natural gas
 - Industrial Steam
 - Heating Oil
- ▶ Multiple heat & power sources
 - Regional Gas/Electric Grids
 - Coal generation with 80% heat recovery
 - Bio-mass co-generation
 - Waste-to-Energy cogeneration
- ▶ Multi-utility business structure

100 years of Evolution



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Overview of District Energy



- ▶ Centralized production
 - Hot (or chilled) water
 - Steam
 - Often combined with electricity
- ▶ Use:
 - Space heating
 - Domestic hot water
 - Air conditioning
- ▶ Benefits:
 - High fuel efficiency
 - Mixed fuel possibilities; easy integration of renewable
 - Buildings with lower capital costs
 - Lower energy costs
 - Additional building space
 - Around the clock professional O&M
 - High system reliability
 - Cleaner environment

Serves over 200M Europeans



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Coal Co-Generation



- ▶ 2,000 MW Power Station
- ▶ Supplies electricity and heat
- ▶ Heats most of Mannheim and Heidelberg
- ▶ Mannheim/Heidelberg heat feeder – 26 km
- ▶ Teamed with other heat sources
- ▶ At peak demand 60% of heat recovered

Make Coal net lower CO₂



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District Energy - A profitable business



- ▶ Thermal Sales
 - € 276 Million
 - 5,700 M kWh hot water
- ▶ 360 M kWh industrial steam
 - Cooling added in 2005
- ▶ More profitable than electricity
- ▶ Heating grids
 - Over 1,900 km
- ▶ MVV operate multiple systems
 - Mannheim
 - Kiel
 - Offenbach

Multiple Heat Sources



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District Energy Adds Cooling



- ▶ New SAP Arena connected to municipal energy system
- ▶ Cooled from heat recovery via district heat system
- ▶ Begins to create summer heat load
- ▶ Avoided electricity for cooling lowers carbon

Continuing Integration



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Industrial Steam and Heating from Municipal Waste



- ▶ MVV owned and operated
- ▶ Evolved/upgraded since 1963
- ▶ Integrated in city heating system
- ▶ Zoned for industrial steam
- ▶ Avoided customers' investments
- ▶ Avoids land-fill in past – now closed
- ▶ Paid to take fuel
- ▶ Plant Performance
 - 100 MT/process steam/hr
 - 500,000 MT / year domestic waste
 - 18,000 trucks/year
 - Exceeds statutory emissions limits by at least 70% - including CO₂
 - Gas and oil supported firing
- ▶ Highly profitable for MVV

Paid to take low CO₂ fuel



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Heat and Power from waste wood



- ▶ MVV owned and operated
- ▶ Integrated in municipal networks
 - District heating
 - District steam
 - Electricity
- ▶ Avoids land-filling
- ▶ Plant performance
 - 20 MW electricity capacity
 - 80 MT/steam/hr at 65 bar
 - 130,000 MT / year scrap timber
 - Avoids 150,000 MT CO₂ per year
- ▶ Meets tough clean-air standards



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Smart energy grids Integrating thermal and electrical energy

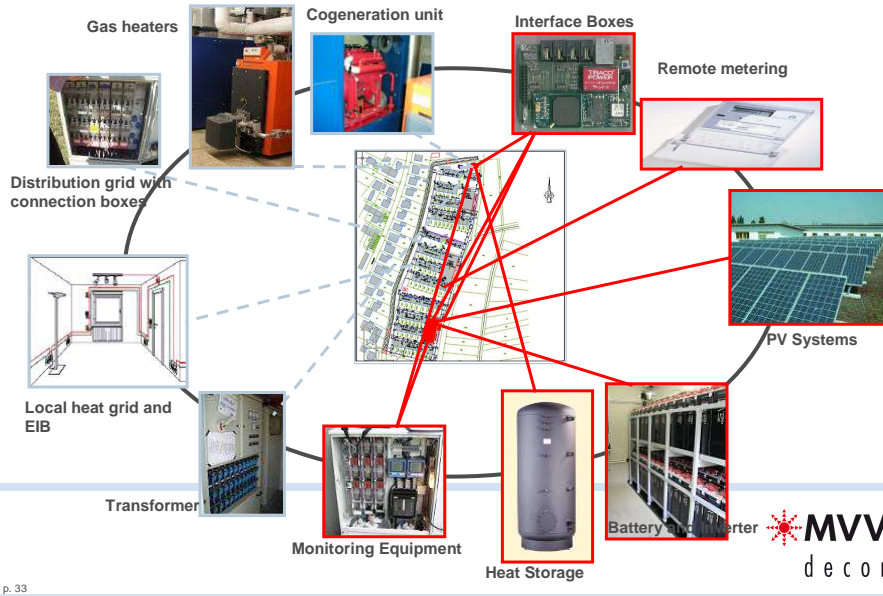


Source: M.Sanchez



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Ecological Settlement „Am Steinweg“ Pilot for Smart Grid Integration



Summary - Mannheim energy system

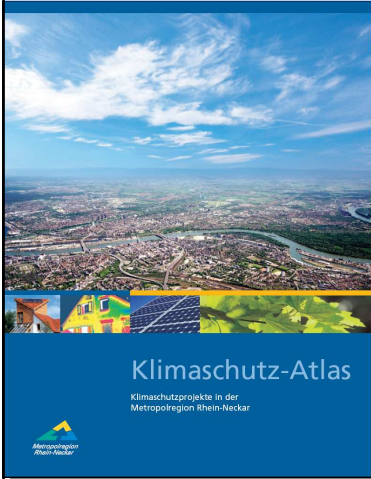


- ▶ Efficient Buildings and Industry
- ▶ Efficient Transport
- ▶ Energy networks
 - Electricity
 - Gas
 - District energy – heating, cooling, Industrial steam
- ▶ Combined Heat & Power
 - 1600 MW Coal Plant
 - Bio-mass generator
 - Waste-to-Energy plant
- ▶ Customers
 - Residential, Commercial, Industrial
- ▶ Customer specific tailored energy solutions

Continuing Evolution



Rhein-Neckar Regional Climate Protection



- ▶ City Utility Teaming
 - Mannheim, Darmstadt, Ludwigshafen, Heidelberg ...
- ▶ Major Industries
 - BASF
 - ABB
 - Alstom...
- ▶ Regional Energy Planning
- ▶ Intelligent Transport Solutions
- ▶ Optimizing district energy nets
- ▶ Scale renewable energy
- ▶ Passive buildings
- ▶ Industrial energy efficiency

Also available in English at <http://www.klimaschutz-rhein-neckar.de>



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MVV Multi-Utility history – Lessons learnt



- ▶ Transformation from municipal cost center to profitable diversified company
- ▶ Experience from that process transferred to new markets
- ▶ Multi-Utility expertise:
 - Multiple energy supplies
 - Municipal “packages”
 - Tailored services for different customers
 - International consulting & engineering
 - Institutional and regulatory support
 - Carbon monitoring & monetization



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Thank you for your attention!
Questions, Feedback:

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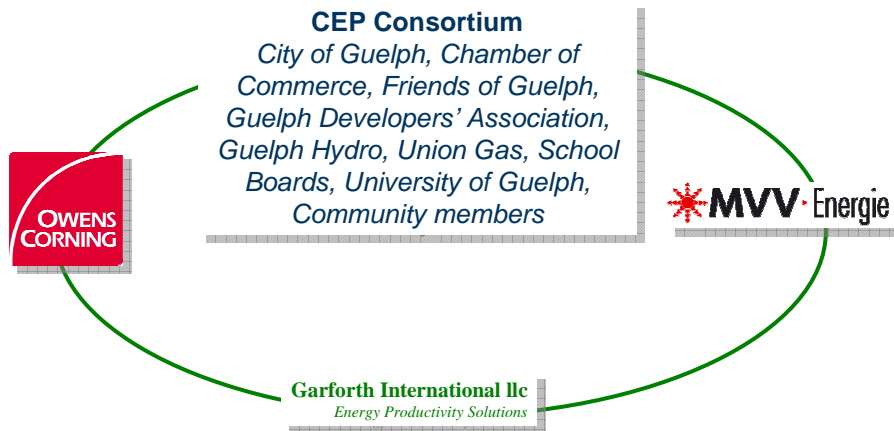
City of Guelph

A Role Model for Community Energy Planning

Guelph will create a healthy, reliable and sustainable energy future by continually increasing the effectiveness of how we use and manage our energy and water resources



Community Teaming *Open to Global Experiences...*



Community Commitment - The Essential Tool!

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Community Energy Plan *Goals*

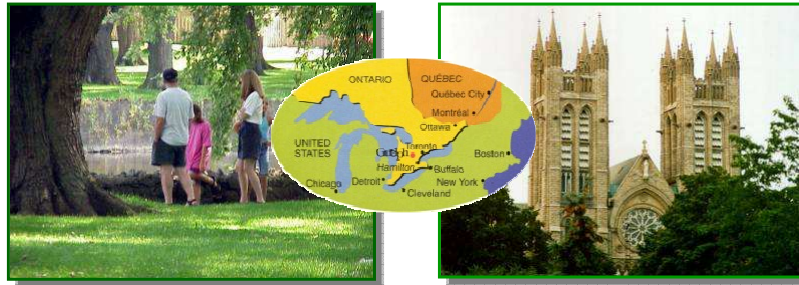
1. Guelph will be the place to invest supported by its commitment to a sustainable energy future
2. Guelph will have a variety of reliable, competitive energy, water, and transport services available to all
3. Guelph energy use per capita and resulting greenhouse gas emissions will be less than the current global average
4. Guelph will use less energy and water per capita than comparable Canadian cities
5. All publicly funded investments will visibly contribute to meeting the four CEP goals

Simple, Measurable, Eternal

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Guelph Community Energy Plan *Support Growth and Community Values*

- 115,000 today; 180,000 in 2031
- Sustainability - key principle of growth strategy



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Guelph Community Energy Plan *Prioritized strategies 2008-2031*

- Building efficiency standards
 - Exceed code upgraded from 2012
- Energy Performance Labelling
 - Required on all construction – national pilot
- Transport efficiency
 - Urban design, lifestyle, commuting and vehicle choices
- Heat distribution and recovery
 - District heating infrastructure
 - Industrial heat recovery
- Renewable and Clean Energy Supply
 - Biomass and solar
 - Distributed clean cogeneration
- Flexible community energy services company
- Immediate start on 4 “Scale Projects”
 - Gain early critical mass

Integrated Solution – Not a Buffet!

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Urban Development Models

Major Impacts on Energy

“Suburban Nation”

- Separation of work, living and play
- Low-density construction
- Minimal public transport
- Wide drivable roads
- Large percentage of land for parking
- Developed by single use large sub-divisions

Energy & Water Intensive

“New Urbanism”

- Work, play and living intermingled
- Much higher average density construction
- Range of public transport
- Narrower, walkable roads
- Developed a block or building at a time

Energy & Water Productive

Zoning for Mixed Use Neighbourhoods

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Getting Started

Initial Scale Projects



St Patrick's Ward & Downtown



South Industrial Lands

- **Form Project Teams**
- **Integrated Master Plans**
- **Prioritize implementation**
- **Interoperable systems**
- **Sized to interconnect**



University of Guelph



York District

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Guelph Community Energy Plan Aggressive 2031 Targets

Sector	2005 GWh _e /yr	2031 GWh _e /yr	2005 MWh _e /cap	2031 MWh _e /cap
Residential	1,610	1,473	14.00	8.18
Commercial	1,046	1,076	9.10	5.98
Industrial	1,631	1,848	14.18	10.27
Transport	1,743	1,126	15.16	6.26
Total (Net)	6,030	5,523	52.44	30.68
Electrical conv.	2,445	612	21.26	3.40
Total (Gross)	8,475	6,135	74.04	34.08

- Growth from 115,000 to 180,000 people
- Greenhouse Gas Per Capita:
 - 7.0 tonne in 2031 from 16 tonne in 2005
 - Slightly lower than Germany and Sweden today

Guelph CEP Gaining Global Recognition

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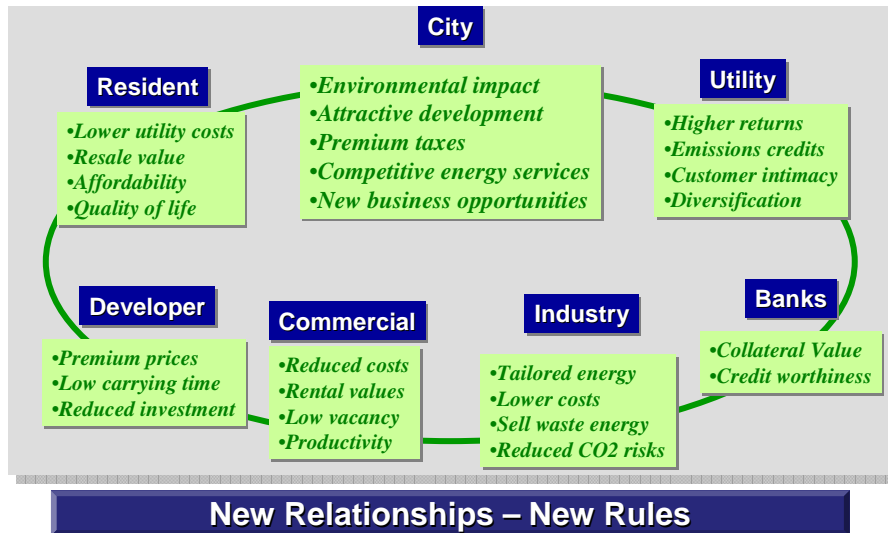
Rocket Science it is not! *The trick is doing it – year after year!*

- Efficiency - *If you don't need it don't use it*
- Heat Recovery - *It it's already there – use it*
- Cogeneration – *Why waste fuel at power plant?*
- Renewable energy - *If realistic, go carbon free*
- Team with utilities – *Invest where it makes sense*

Leadership, Discipline, Community Engagement

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Benefits of Winning! *Competitiveness - Sustainability - Flexible*



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Are we all doing enough - NOW?



Perfection can be the Enemy of the Good

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Thank you!

*“Only Use what you Need, When you Need it,
In the Amount Needed!”*

*Courtesy of Toyota Manufacturing