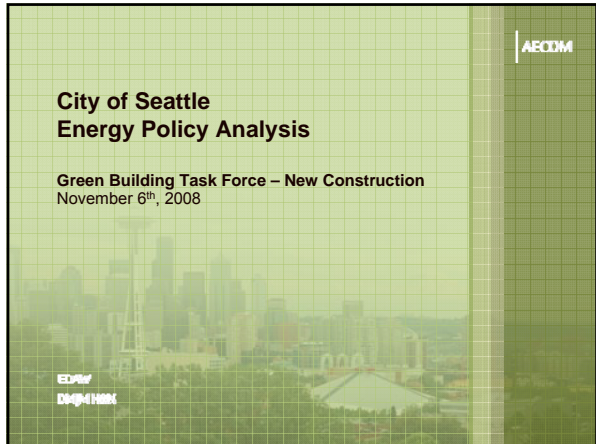


AECOM

City of Seattle Energy Policy Analysis

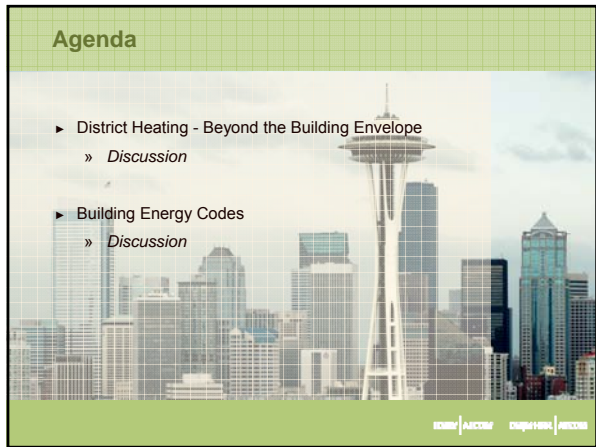
Green Building Task Force – New Construction
November 6th, 2008



EDM
Design + Build

Agenda

- ▶ District Heating - Beyond the Building Envelope
 - » Discussion
- ▶ Building Energy Codes
 - » Discussion



EDM | AECOM | DESIGN + BUILD | AECOM

District Heating

- ▶ Policy Context in Seattle
- ▶ Case Studies
 - » Vancouver
 - » London
- ▶ Policy options to consider



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District Heating - Beyond the Building Envelope

Existing Energy Suppliers in Seattle

- ▶ Seattle City Light provides low carbon electricity:
 - » Only 6.2% of the fuel mix comes from fossil fuels.
 - » Carbon content is set to rise with increasing demand.
- ▶ Puget Sound Energy provides gas (and electricity)
- ▶ Seattle Steam
 - » Currently the City's only existing district heating provider.
 - » Steam is currently generated through 100% fossil fuels but will move to 60% biomass from July 2009.



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District Heating: Beyond the Building Envelope

Existing Heating Strategies in Seattle

- ▶ **Electric Resistance Heating:**
 - » Prevalent in Seattle due to the low cost of hydro generated electricity.
- ▶ **Seattle Steam District Heating System:**
 - » Supplies district steam to over 190 customers in the downtown and First Hill areas of the City.
 - » No plans to expand the current steam network.
 - » Expansion plans focused on community sized hot water district heating systems using waste heat from industry to provide energy to the network.
 - » Long term goal to reach 100% renewable sources by 2020 through district CHP and biomass gasification plant

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District Heating: Beyond the Building Envelope

London district heating policies

- ▶ **Objective:** To help hit target of decentralizing 25% of London's energy supply by 2025, to help achieve the City's carbon dioxide reduction targets of 20% by 2015 and 60% by 2050.
- ▶ **Geographic Focus:** Major developments within London
- ▶ **Policy:** ...all major development to demonstrate that the proposed heating and cooling systems have been selected in accordance with the following order of preference
 - » Connection to existing CCHP/CHP distribution networks;
 - » Site-wide CCHP/CHP powered by renewable energy;
 - » Gas-fired CCHP/CHP or hydrogen fuel cells, both accompanied by renewables;
 - » Communal heating and cooling powered by renewable energy;
 - » Gas fired communal heating and cooling.



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District Heating: Beyond the Building Envelope

London District heating policies

- ▶ **Outreach:** Significant – toolkit including energy strategy template, training sessions for planners, helpline for planners
- ▶ **Administration:** 1 full time energy team, now 4 full time to consider 200+ applications/yr
- ▶ **Stakeholder impacts:** Developers very opposed due to upfront cost; Opposed revised policies in EiP process; funded study to identify strategy needed to make it happen, now positive about the approach just not the strategy



ENERGY | AIR QUALITY | CLIMATE CHANGE | RESILIENCE

District Heating: Beyond the Building Envelope

London District heating policies

Table from 'Review of the impact of the energy policies in the London Plan on applications referred to the Mayor (Phase 2) July 2007'

	Savings to date from 113 energy statements		Savings to date – scaled for 350 developments
	Metric tons CO ₂ /yr ¹	%	Metric tons CO ₂ /yr ¹
Energy Efficiency	111,492	21.3	345,329
Renewable Energy	24,039	5.8	74,457
Total	135,528	25.8	419,777

¹ Summary of CO₂ savings from energy statement data and extrapolated to 350 developments (Scaling based on 350/113)

ENERGY | AIR QUALITY | CLIMATE CHANGE | RESILIENCE

District Heating: Beyond the Building Envelope

London First proposals:


- ▶ Set up body called Energy for London
- ▶ Boroughs to develop public:private partnerships
- ▶ Boroughs to map heat loads and major developments
- ▶ Public sector to commit to connect tenant anchor heat loads
- ▶ GLA to establish Green Fund
- ▶ EFL to establish London wide standards, specifications and contacts



ENERGY | AIR QUALITY | CLIMATE CHANGE | RESILIENCE



Vancouver District Heating

- ▶ **Objective:** To create a district heating service area for lower Lonsdale – as City Council requested that planners consider energy along with land use
- ▶ **Policy:** A Hydronic Heat Energy Service Bylaw requiring that all new or retrofitted buildings greater than 10,000 square feet be connected to and use the system.
- ▶ **Operator:** Lonsdale Energy Corporation set up (public utility governed and regulated by City)
- ▶ **The System**
 - » High-efficiency gas mini-boilers
 - » 6 MWs of heat, expected to grow to approximately 11 MWs by 2010
 - » Reduces energy costs by 15%
 - » 3 energy service areas, 1,133 customers, 3,000 units, 1,000,000 square feet of mixed-use buildings have been connected to the system
- ▶ **Enforcement**
 - » Performance bond: ~\$50,000 - \$100,000 per project to ensure compliance with the by-law




Vancouver District Heating

- ▶ **Cost to City**
 - » Total system capital cost was \$8 million (in 2003 dollars):
 - › \$2 million loan from the City of North Vancouver
 - › \$2 million from CORIX utility
 - › \$4 million loan from the Federation of Canadian Municipalities
 - » Operations
 - › 3 part-time employees at Lonsdale Energy Corporation
 - › Contractors do some project review
- ▶ **Cost to Developer**
 - » Approximately 5% increase in project cost to provide infrastructure to connect to system

Vancouver District Heating

- ▶ **Difficulty in working with Developers**
 - » Developers have complained about additional cost of installing hydronic heating (vs. electric).
 - » Incremental cost of hydronic heat can be offset by Terasen which provides boilers and recovers their cost in rates charged to City
 - » Problems ensuring developers install hydronic systems that meet the necessary system specifications
- ▶ **Rate Payers benefit**
 - » LEC reduced its rate structure by more than 10% for customers
 - » For residential customers, heating costs are \$0.0864 per kWh (cheaper)
 - » LEC service is competitive considering all gas charges as well as the cost of boilers and their maintenance are included



District Heating: Beyond the Building Envelope

Policy Development for Seattle

Current Challenges:

- ▶ Carbon content of Seattle's electricity supply
 - » 86% of the City's electricity is produced by hydro power
- BUT
 - » At maximum capacity, what about long term future of snow pack? Growing energy demands will mean SCL electricity is more carbon intense
- ▶ High cost of district heating compared to electric resistance heating
 - » Electric resistance heating is around two thirds of the price of purchasing district heat from Seattle Steam
 - » Seattle Steam is currently "double taxed" compared to other utility companies
 - » Costs of installing new district heating infrastructure is high and must be recouped by the company through existing rate structures

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District Heating: Beyond the Building Envelope

Policy Development

- ▶ Future policy could largely be focused on facilitating infrastructure development:
 - » Remove gas use tax liabilities on district heating suppliers
 - » Encourage / incentivize the selling of waste heat to power community district heating networks
 - » "Savings by design" rebate scheme (incentives to building owners who through reduce load on transmission lines through design/serving)

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District Heating: Beyond the Building Envelope

Policy Development

- ▶ Policy could also encourage connection to district heating schemes:
 - » Develop 'energy masterplans / action areas' identifying existing plant, sources of waste heat, anchors loads, new development areas
 - » Require mandatory participation in district heating systems in specific areas
 - » Restrict the use of electric resistance heating to small development
 - » Offer connection grants to offset additional costs of hydronic heating systems
 - » Help to standardize contractual agreements
- ▶ Subsidize heat from the district heating network so it is cost equivalent with electric heating in the short term
- ▶ Provide low cost borrowing to fund extension of steam network
- ▶ Bring tax liabilities of district heating providers in line with those of other utility companies

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Discussion: Beyond the Building Envelope

- ▶ What (revenue neutral) role is appropriate for the City to play?
- ▶ What recommendations do you have on a specific policy proposal to encourage this?
- ▶ What other thoughts, comments, ideas do you have on these policy options?
- ▶ Should the recommendations to the Mayor include anything on this topic?

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Energy Codes

- ▶ Current Policy in Seattle
- ▶ Case Studies
 - » England and Wales Part L Energy Code
 - » California Energy Code
 - » Albuquerque Energy Code



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Energy Codes

Current Seattle Energy Code

- ▶ **Route to compliance:** Performance and prescriptive, (and trade-out) routes available.
- ▶ **Route to compliance:** Majority of buildings (with the exception of large, complex buildings) choose the prescriptive compliance path.
- ▶ **Stringency:**
 - » Estimated to be around 15% more stringent than Washington State codes
 - » Approximately 20% more stringent than ASHRAE 90.1:2004.



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Energy Codes

Attaining 2030 Challenge Goals

- ▶ Requires all new buildings to be carbon neutral by 2030.
- ▶ Reliance on prescriptive routes recognized as not being able to achieve 2030 Goals.
- ▶ Increasing use of performance based routes necessary to achieve 2030 goals.
 - » Carbon based codes required to fit in with 2030 challenge goals.
 - » Allows for more direct comparison between codes - difficult to do with prescriptive codes.

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Energy Codes

England and Wales – Part L

- ▶ **Objective:** Energy standards for residential and non residential projects
- ▶ **Geographic Focus:** England and Wales
- ▶ **Compliance Approach:** Mandatory performance based compliance standards
 - » **Carbon based performance standards**
 - » **In Design:** Requires simulation of the building to demonstrate an improvement in CO₂ over baseline to be achieved.
 - » **In Construction:** Performance calculations rerun based upon As-Built information and air pressure testing
 - » **In Operation:**
 - › Large public buildings must show "Display Energy Certificates" (DECs)
 - › Energy Performance Certificates (EPCs) required on building sale or lease which reflect the "inherent" energy performance of a building.
 - › Home Information Packs required for residential buildings.



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Energy Codes

California Energy Code – Title 24

- ▶ **Objective:** Energy standards for residential and non residential projects.
- ▶ **Geographic Focus:** State of California
- ▶ **Compliance Approach:** Prescriptive or performance based compliance standards for all new residential and non residential new construction projects. Expected to be performance based only from 2013
 - » **In Design:** Mandatory requirements for all projects. Prescriptive or performance routes can then be followed. Performance based approach focuses on Time Dependent Valuation Energy, which penalizes energy used at peak times greater.
 - » **In Construction:** Acceptance testing required for non residential projects. Some residential projects (non coastal) require duct leakage testing to be carried out.
 - » **In Operation:** Beginning in 2010 owners of commercial buildings must disclose their energy usage and Energy Star rating to potential buyers, lessees, and financiers.




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Energy Codes

Cost of Policy Implementation ★★★


- ▶ **Cost to City strongly dependent on the compliance path mandated:**
 - » Enhancing prescriptive requirements could be done as part of the existing code development infrastructure.
 - » Performance requirements would impose greater requirements on City staff – particularly in building inspection.
- ▶ **Increased compliance standards will increase costs to developers:** Performance based requirements in particular would increase developer costs in the way of computational simulation fees.
- ▶ **Post construction requirements** (e.g. Display Energy Certificates, Energy Performance Certificates) would place an additional administrative burden and cost onto the City and to developers.



Energy Codes

Cost Effectiveness ★★★


- ▶ **Direct City Benefit Cost -16.4** (\$16.40 of energy savings per \$1.00 of program costs to the city)
- ▶ **Net Benefit Cost -0.2** (\$0.20 of benefits for every \$1.00 of costs to the city and developer)
 - » Low due to the financial investment required by the developers to comply with the standard
 - » Little corresponding benefit to the developer in terms of additional rents or offset costs
- ▶ **Cost per MWhr Saved - \$2.90**



Energy Codes

Administrative Feasibility ★★★


- ▶ **Administrative feasibility:** Strongly dependent on the required route to compliance.
 - » Increased prescriptive requirements are relatively easy to implement provided standards do not contravene Washington State laws.
 - » A performance based code currently exists in Seattle, though is not a mandatory route to compliance.
 - » Mandating a performance based route would place an additional administrative burden on both developers and the City – particularly enforcements staff.



Energy Codes

Stakeholder Impacts


- ▶ **Opposition from development community towards the implementation of mandated performance based standards:**
 - » Additional costs of modeling on small buildings
 - » Consider mandating performance based approach for buildings over sq ft criteria.
- ▶ **“In operation” performance requirements:** Additional costs to comply (e.g. Home Information Pack costs) may be opposed by homeowners and developers.



Energy Codes

Energy Modeling


- ▶ **Energy Modeling**
 - » Key to performance based routes.
 - » Can be expensive depending upon availability of tools
 - › Both England and Wales, and California have developed standard tools to simplify performance based modeling of simple buildings.
 - › Adopting ASHRAE 90.1 as baseline allows for use of existing software.
 - » Consider use of mandated performance route only above certain sq ft to reduce cost impact on smaller buildings.



Energy Codes

Compliance Validation

- ▶ **As Designed**
 - » Performance based compliance through simulation
- ▶ **As Constructed**
 - » Calibrated simulation based upon as-built information and building leakage
- ▶ **As Operated**
 - » Implement requirement for monitoring actual energy use through ENERGY STAR or IMPVP process



Energy Codes

Policy Scorecard

SUMMARY RATINGS (★★★★★ = best/most feasible)

ENERGY EFFICIENCY POTENTIAL	★★★★★	COST EFFECTIVENESS	★★★
ECONOMIC BENEFIT	★★★★	ADMINISTRATIVE FEASIBILITY	★★★
COST OF IMPLEMENTATION	★★★		

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Energy Codes

Recommendations to Consider

- ▶ Stringency of building requirements and the associated level of financial burden to impose on the developer industry
- ▶ How should post construction and in occupancy energy performance be considered in policy design?
- ▶ Should a performance based compliance path be mandated or incentivized by the City?
- ▶ How far can Seattle's policies be developed independently of state and federal code development?
- ▶ Suggestions for improvements to the Washington State Codes end on 31 March 2008 (for the next 3 year cycle)

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Discussion: Energy codes

- ▶ Should the City be advocating for any particular changes in how the State controls the residential code, and if so what?
- ▶ Is it appropriate/necessary for the Seattle Commercial Energy Code to independently push beyond the goals/approach of the anticipated WSEC updates?
- ▶ If so, which of the following issues should be addressed, and how:
 - » Mandatory performance targets
 - › Energy vs. carbon targets (site vs. source)
 - › Limit to specific sectors, building size or other thresholds
 - » Post occupancy evaluation
 - » Plug loads and other behavioral or "non-permanent" changes to a building
 - » Embodied energy
- ▶ What other thoughts, comments, ideas do you have on these policy options?

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