



URBAN THERM



IDEA 2014

Seattle, WA

IDEA *noun*

2. a thought

3. an impression

4. an opinion

5. a plan of action

*from the Greek
idein 'to see'*

Where We Started



the IDEA



Heat for 2 m SF

1/3 = residential density

2/3 = office/industrial density

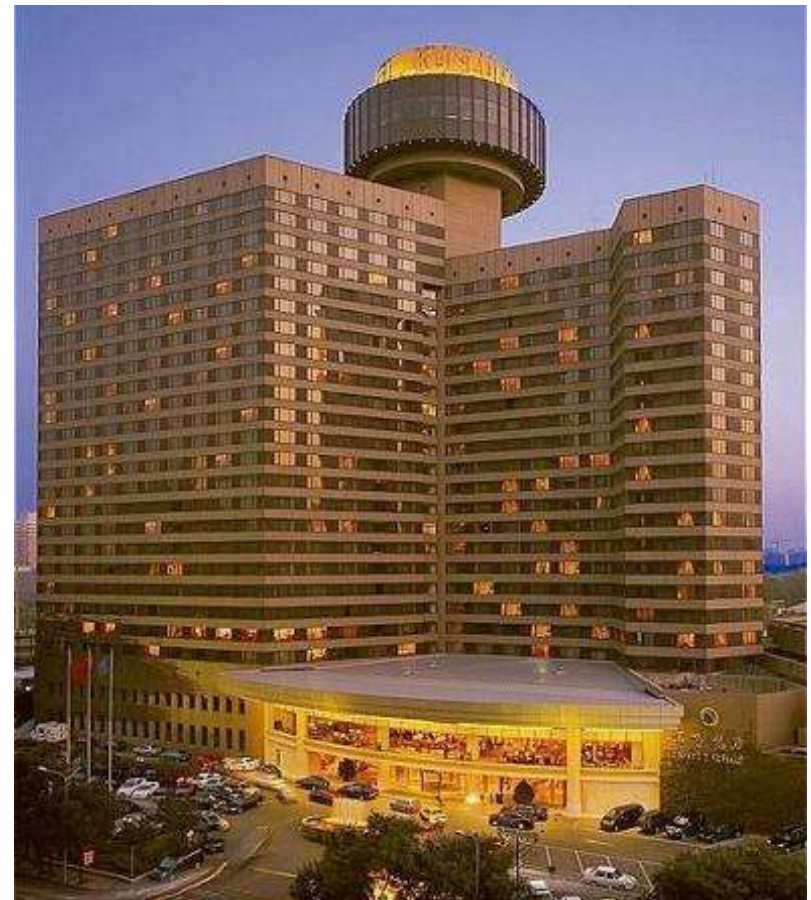


South Beijing Station

- 2,700,000 SF
- Completed 2008



Source: Google Earth



Source: Hotel Kunlun

Hotel Kunlun

- 931,000 SF
- Retrofitted 2010



Filter



**Heat
Exchanger**



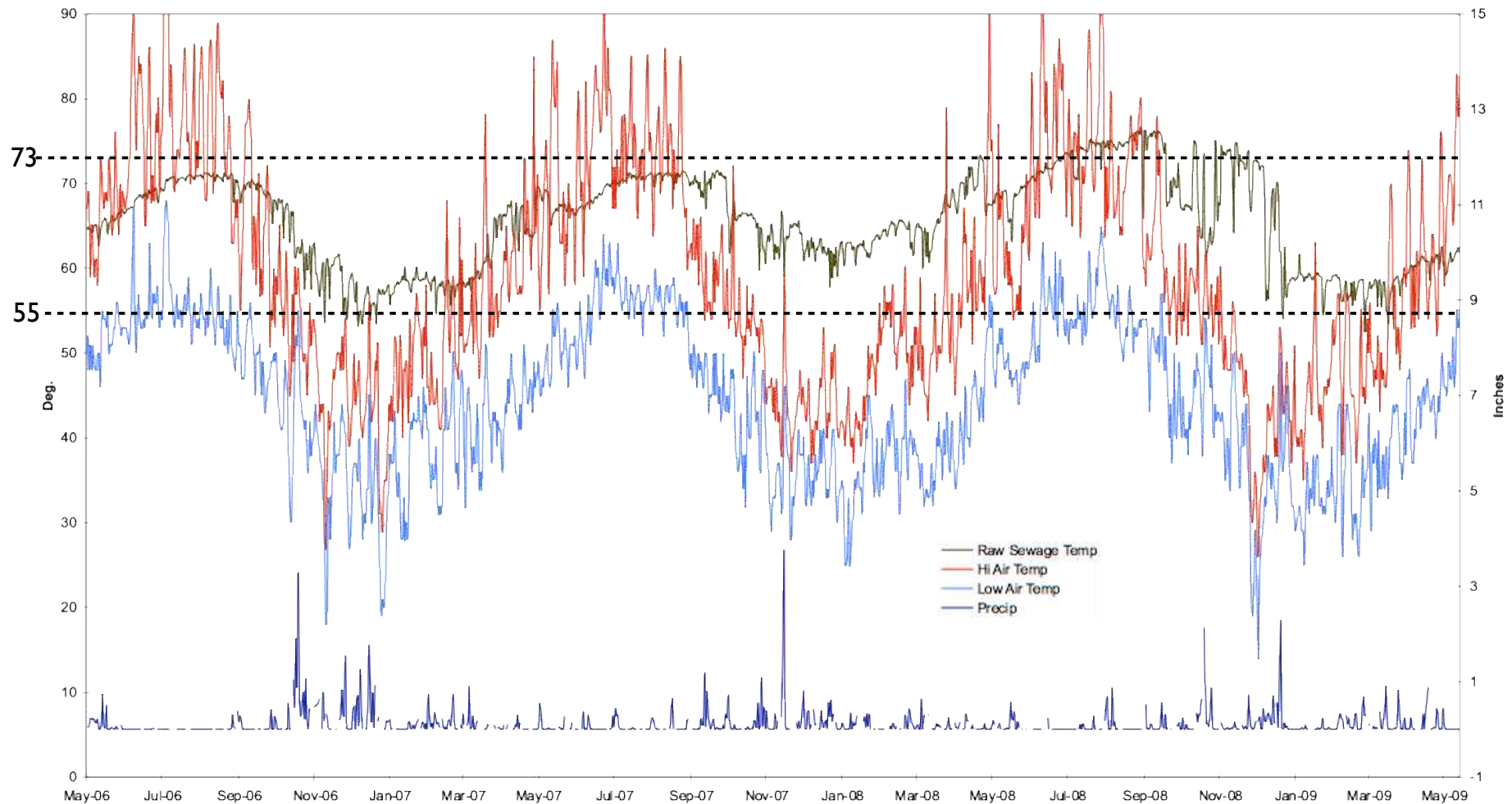
Hot Water



Chilled Water



Heat Pump



Wastewater temperature remains between 55 and 73 deg F

Shared Infrastructure



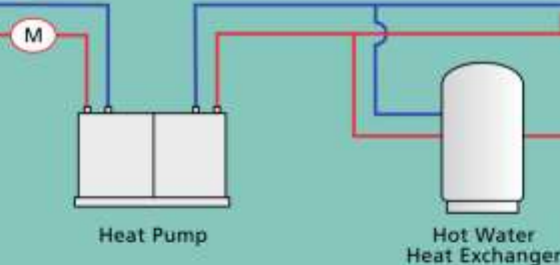
Building Systems



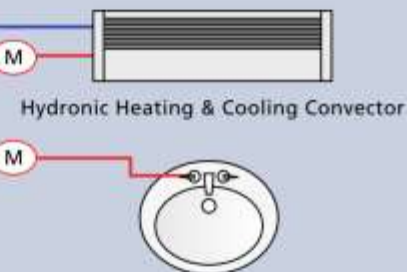
End - User



Building Equipment



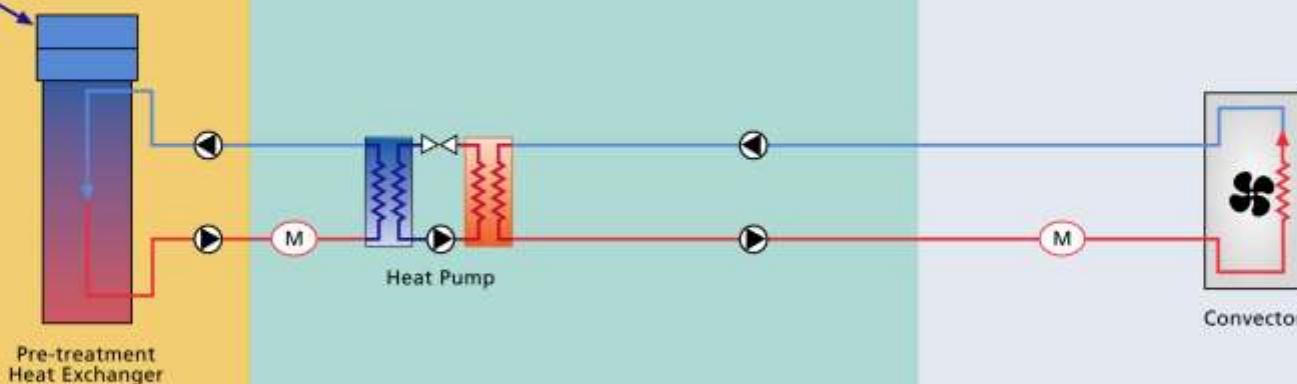
Unit Heating & Hot Water Delivery

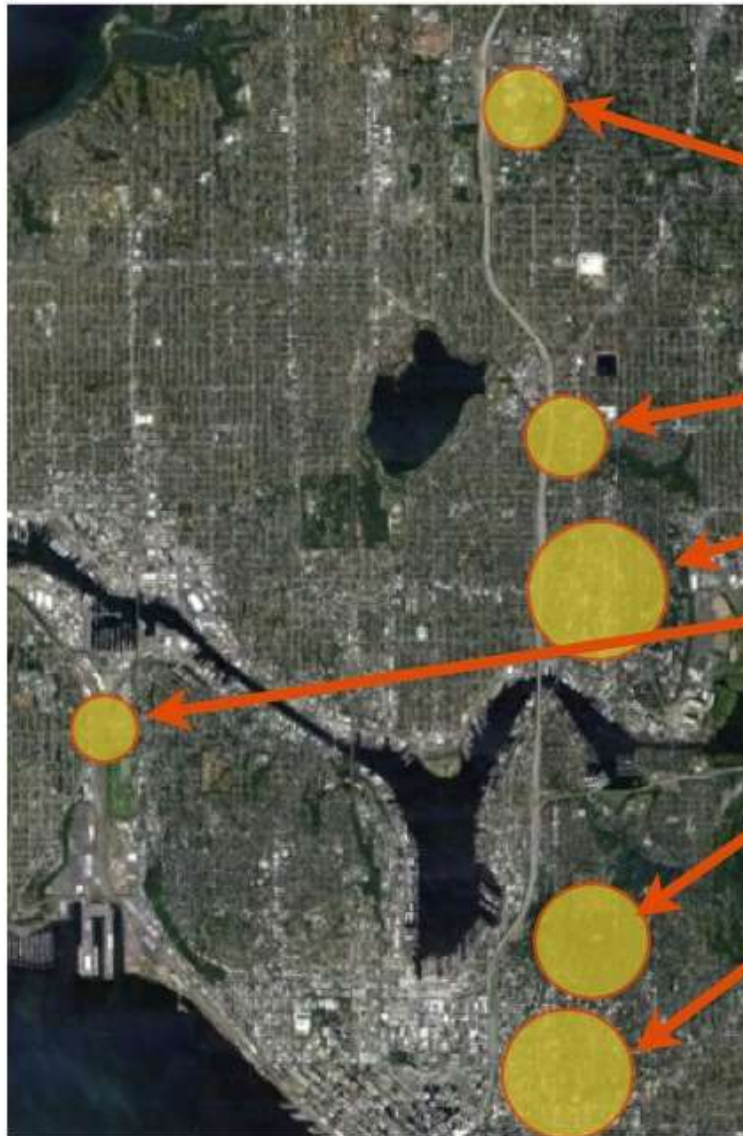


Freehold Energy is developing a District Heating Utility to provide space heating / cooling and domestic hot water to serve 2M SF in Interbay. Waste heat will be captured from the 8ft. diameter King County sewer main then pumped via a warm water loop throughout the district.

The utility will:

- Be competitive to the cost of electricity
- Reduce electrical use by up to 80%
- Provide decades of energy stability





Source - Seattle Comprehensive Plan, Seattle Housing Authority & University of Washington

Northgate 2,500

Roosevelt 2,200

University 4,450

Interbay 1,600

Capitol Hill 3,500

Yesler Terrace 4,000

Total New
Households 18,250

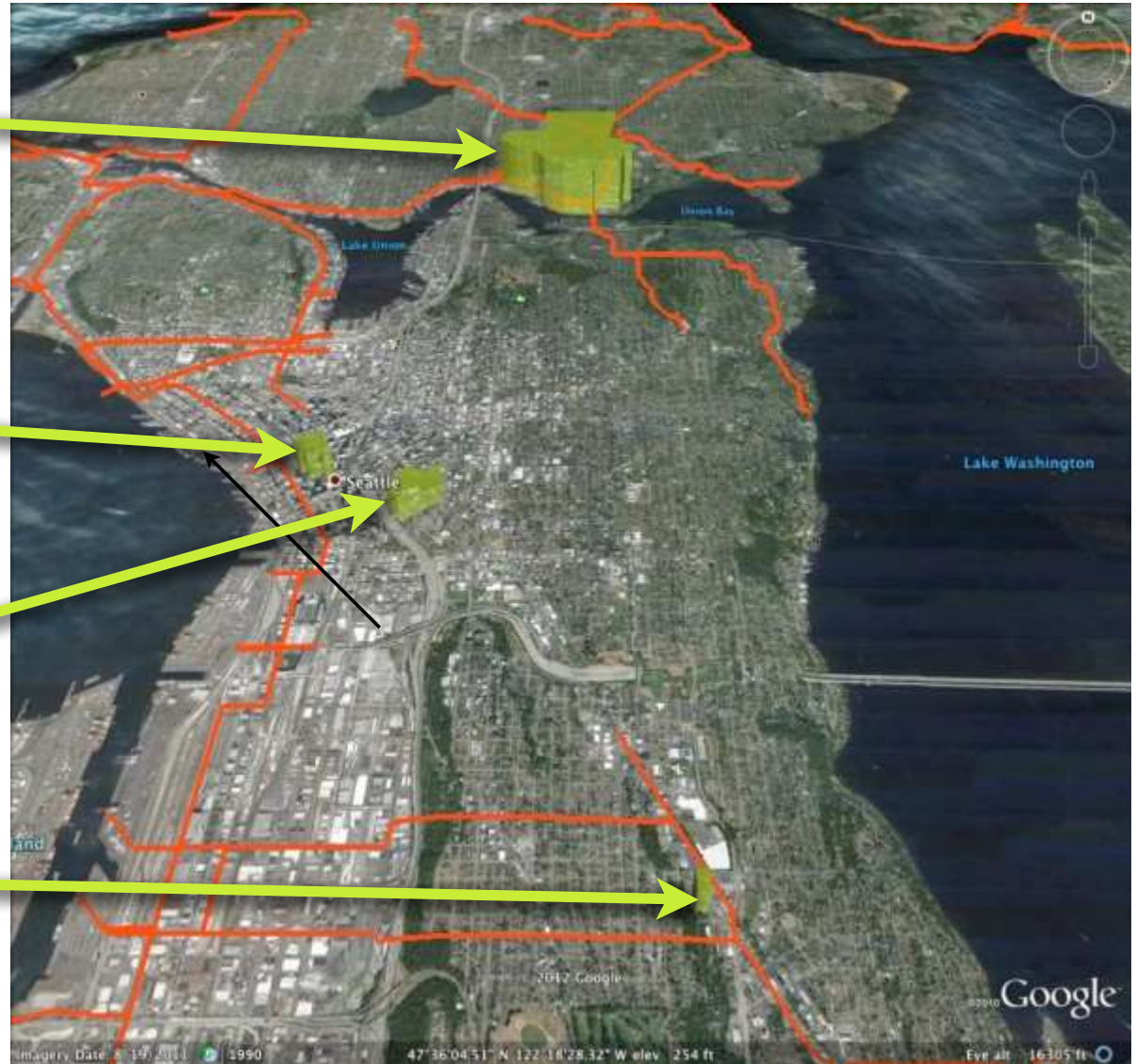
Updated Projection
28,000

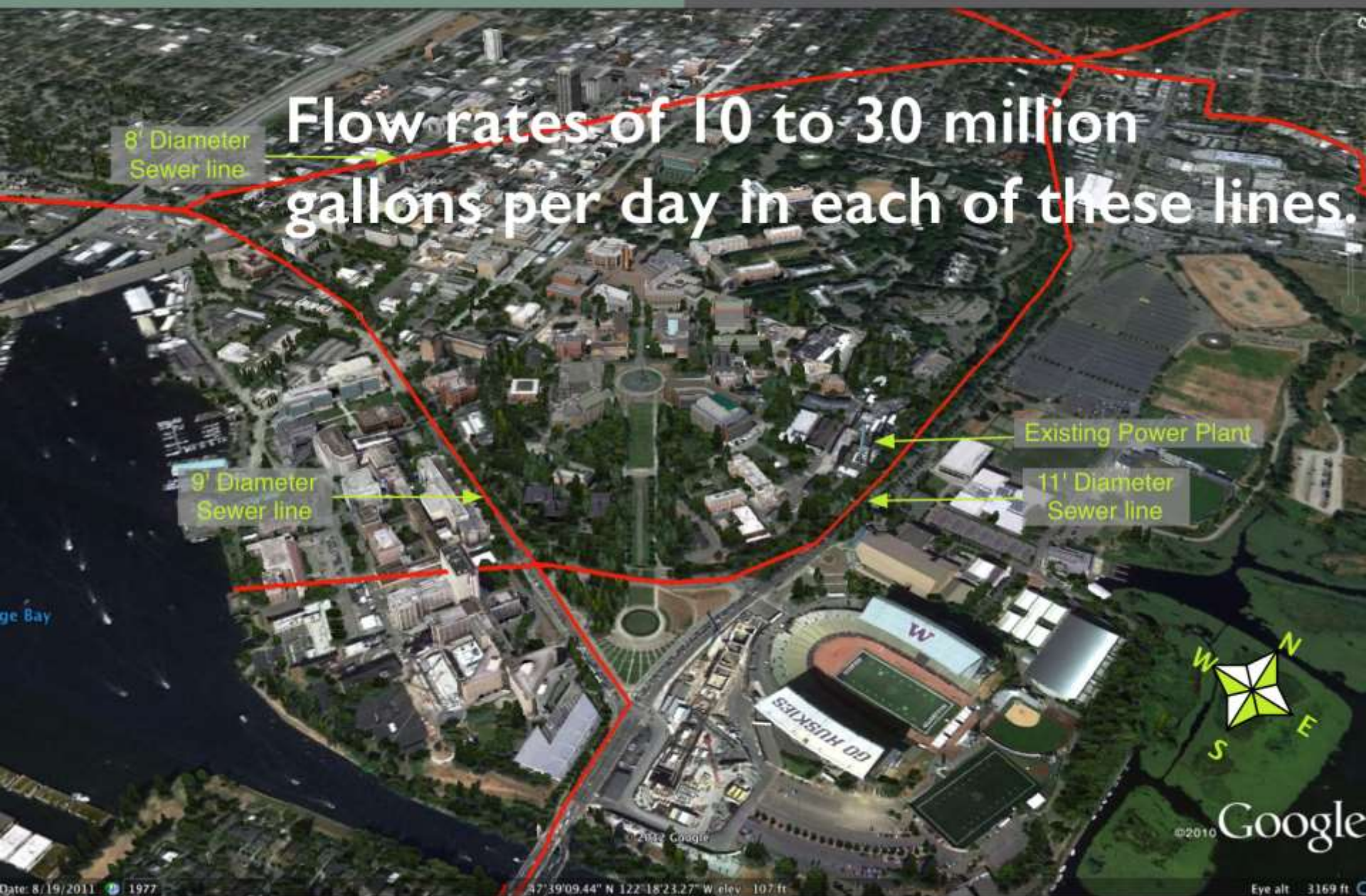
West Campus

**Metropolitan
Tract**

**Harborview
Medical Center**

UW Laundry





Financial Model: One Building at a Time

Development Costs 100 Units (700 sf avg)		70,000 sf									
Year		1	2	3	4	5	6	7	8	9	10
Hydronic System Costs	\$ (208,684)	\$ (208,684)									
Wastewater Heat Recovery Costs	\$ (121,380)	\$ (121,380)									
Contingency	\$ (47,082)	\$ (47,082)									
Development	\$ (37,715)	\$ (37,715)									
Subtotal	\$ (414,861)	\$ (414,861)									
Investment Tax Credit	\$ 20,618		\$ 20,618								
Accelerated Depreciation	\$ 66,062			\$ 42,060	\$ 11,216	\$ 6,730	\$ 4,038	\$ 2,019			
SCL Conservation Incentive	\$ -	\$ -									
PSE Incentive Rebate	\$ 17,500	\$ 17,500.00									
Subtotal	\$ 104,180	\$ 17,500	\$ 20,618	\$ 42,060	\$ 11,216	\$ 6,730	\$ 4,038	\$ 2,019	-	-	-
Total	\$ (310,681)	\$ (397,361)	\$ 20,618	\$ 42,060	\$ 11,216	\$ 6,730	\$ 4,038	\$ 2,019	-	-	-
Revenue											
Energy Sales		\$ 47,471	\$ 49,370	\$ 51,345	\$ 53,399	\$ 55,535	\$ 57,756	\$ 60,066	\$ 62,469	\$ 64,968	\$ 67,567
Taxes		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
SCL PPA		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
SCL RECS		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Operations and Maintenance		\$ (2,374)	\$ (2,469)	\$ (2,567)	\$ (2,670)	\$ (2,777)	\$ (2,888)	\$ (3,003)	\$ (3,123)	\$ (3,248)	\$ (3,378)
Cost of Electricity		\$ (7,595)	\$ (7,899)	\$ (8,215)	\$ (8,544)	\$ (8,886)	\$ (9,241)	\$ (9,611)	\$ (9,995)	\$ (10,395)	\$ (10,811)
Cost of Gas		\$ (3,513)	\$ (3,590)	\$ (3,669)	\$ (3,750)	\$ (3,832)	\$ (3,917)	\$ (4,003)	\$ (4,091)	\$ (4,181)	\$ (4,273)
Total		\$ 33,990	\$ 35,412	\$ 36,893	\$ 38,435	\$ 40,040	\$ 41,711	\$ 43,450	\$ 45,260	\$ 47,144	\$ 49,105
Return on Cost											
	\$ (310,681)	11%	11%	12%	12%	13%	13%	14%	15%	15%	16%

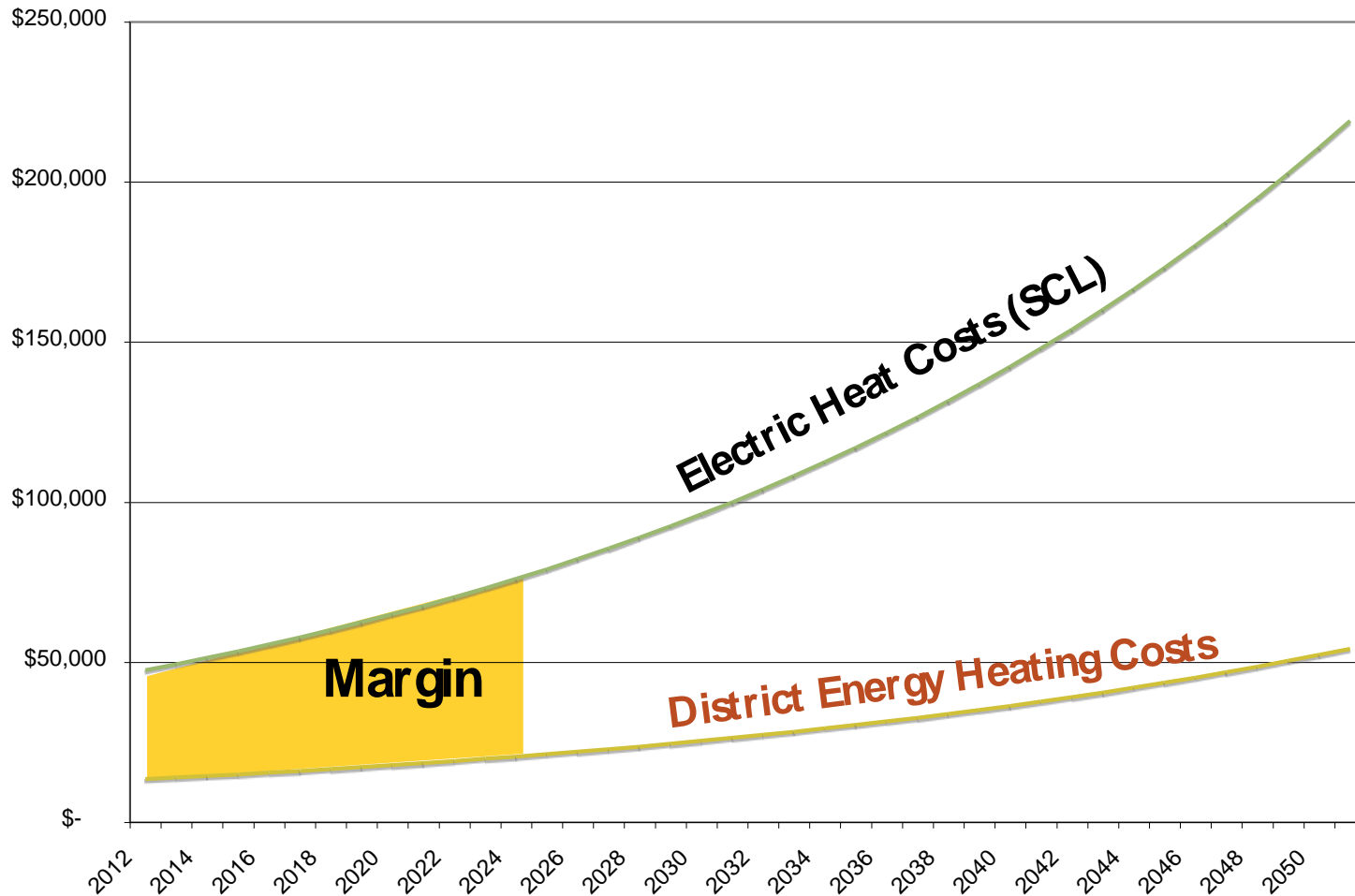
Return on Cost: 11% 13% 15%

Financial Model: An Incremental District

	Size	Building Systems	Infrastructure	Total Cost	Annual Consumption	Annual Revenue	Value
Northgate	7,850 kW	\$4,669,021	\$3,489,275	\$8,158,296	33.18 GWh/yr	\$1,303,465	\$26,069,305
Roosevelt Station	8,200 kW	\$4,877,194	\$3,644,848	\$8,522,042	30.82 GWh/yr	\$1,210,628	\$24,212,555
University Station	15,341 kW	\$9,124,516	\$6,818,977	\$15,943,493	60.77 GWh/yr	\$2,387,486	\$47,749,727
Interbay	7,133 kW	\$4,242,564	\$3,170,573	\$7,413,137	23.88 GWh/yr	\$938,000	\$18,760,000
Yesler Terrace	18,070 kW	\$10,747,670	\$8,032,000	\$18,779,670	59.99 GWh/yr	\$2,356,687	\$47,133,744
Capitol Hill Station	11,180 kW	\$6,649,638	\$4,969,439	\$11,619,076	46.69 GWh/yr	\$1,834,201	\$36,684,022
Total	67,774 kW	\$40,310,603	\$30,125,111	\$70,435,714	255.33 GWh/yr	\$10,030,468	\$200,609,353

Cost to Value: 2.86 x investment

Heating Costs Over Time





Residential Electrical
35 year outlook


-0.7 % growth rate

Commercial Natural Gas
35 year outlook

1.30% growth rate

A close-up photograph of a vintage car's chrome side mirror and headlight. The mirror is in the foreground, reflecting a blue sky with white clouds. The headlight is visible in the background, also reflecting the sky. The text "The Future will look different from the Past" is overlaid on the mirror's reflection.

**The Future
will look different
from the Past**



It will be newer...
and more crowded.

Chicago 1906

Millennials

Boomers:

confrontation oriented, compromise morally unacceptable
(red & blue states)

Generation X:

autonomy over collective process, pursue the bottom line.

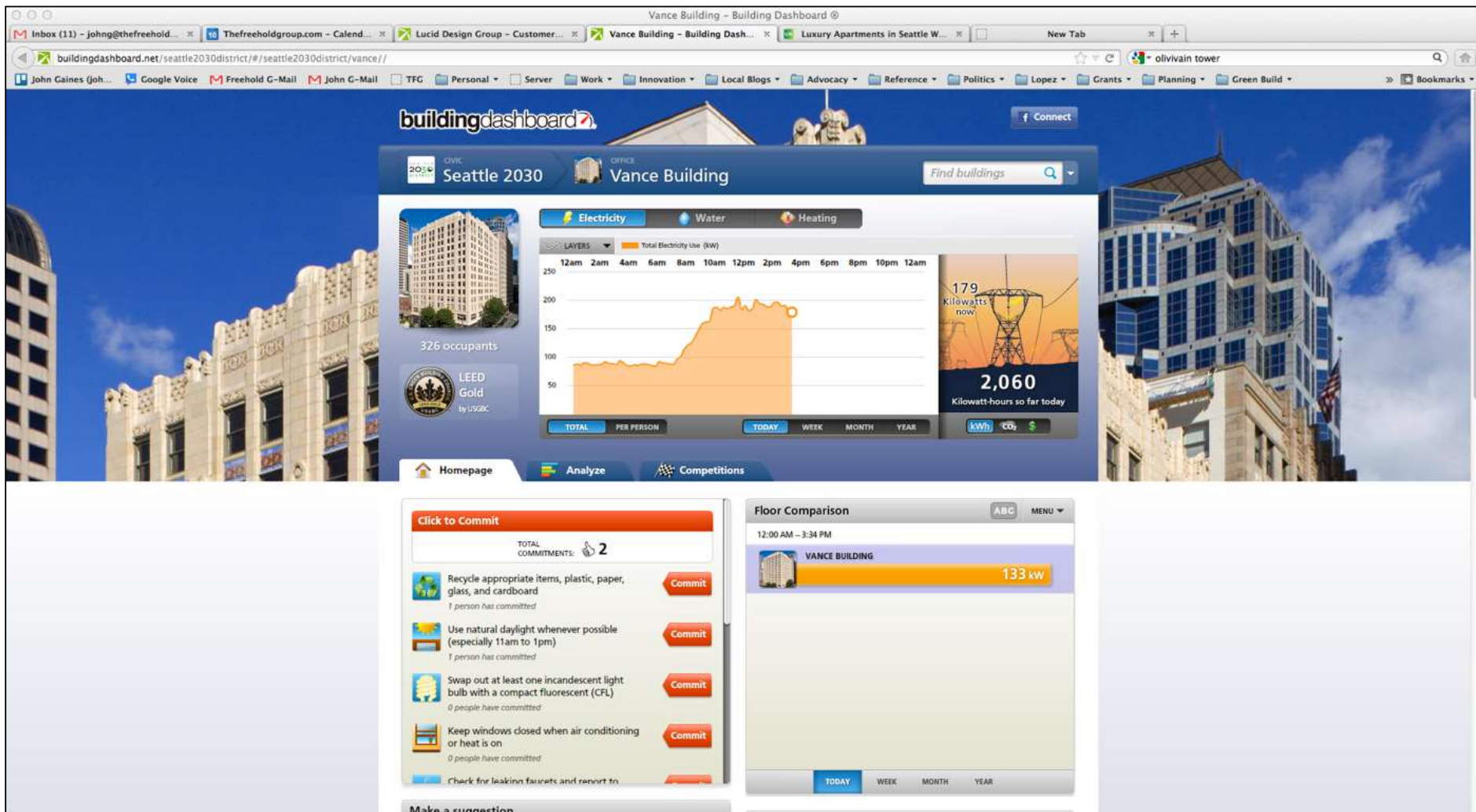
Millennials:

by 2020 = 1 in 3 adults / by 2025 = 75% of workforce
willing to advance the group welfare, desire experiences over things,
will measure success differently



Never Again.

Seeking Transparency



Convergent

*adj 2. (of forces, IDEAs, etc)
tending towards the same
result; merging*

U.S. Population
added in 2014

2,450,000

U.S. Population
June 2014

318,155,000

U.S. Population 2050

400,000,000

26% more in 36 years

U.S. Inventory of Built Space

2000 and 2030 (projected)

Inventory	Before 2000		After 2000	
In 2000	302 billion SF		0 billion SF	
Obsolete Space, replaced by new between 2000-2030	-88 billion SF		88 billion SF	
New Space added between 2000-2030	0 billion SF		124 billion SF	
In 2030	214 billion SF		212 billion SF	

Source: "Toward a New Metropolis: The Opportunity to Rebuild America"
The Brookings Institution Metropolitan Policy Program (2004) www.brookings.edu/net

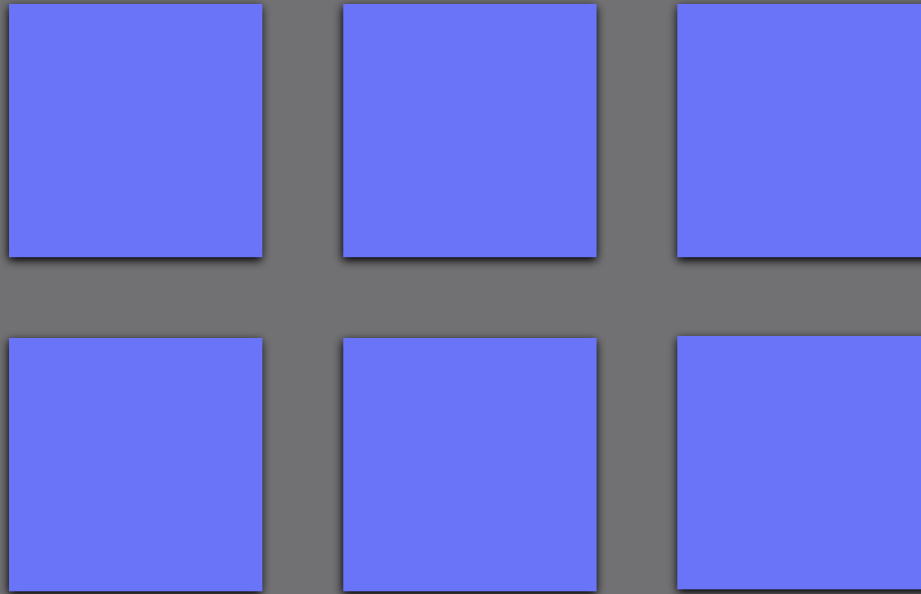
Projected New U.S. Construction

2000 - 2030

Class of Space	Total New Construction	Growth Construction	Replacement Construction
Residential	108 billion SF	71 billion SF	37 billion SF
Commercial / Institutional	96 billion SF	52 billion SF	44 billion SF
Industrial	8 billion SF	1 billion SF	7 billion SF
In 2030	212 billion SF	124 billion SF	88 billion SF

Source: "Toward a New Metropolis: The Opportunity to Rebuild America"
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Boundaries & Silos Hold Back Opportunity



Problem

In spite of the multiple benefits of district energy systems, the District Energy market in the United States has been restricted to large institutions and campuses because:

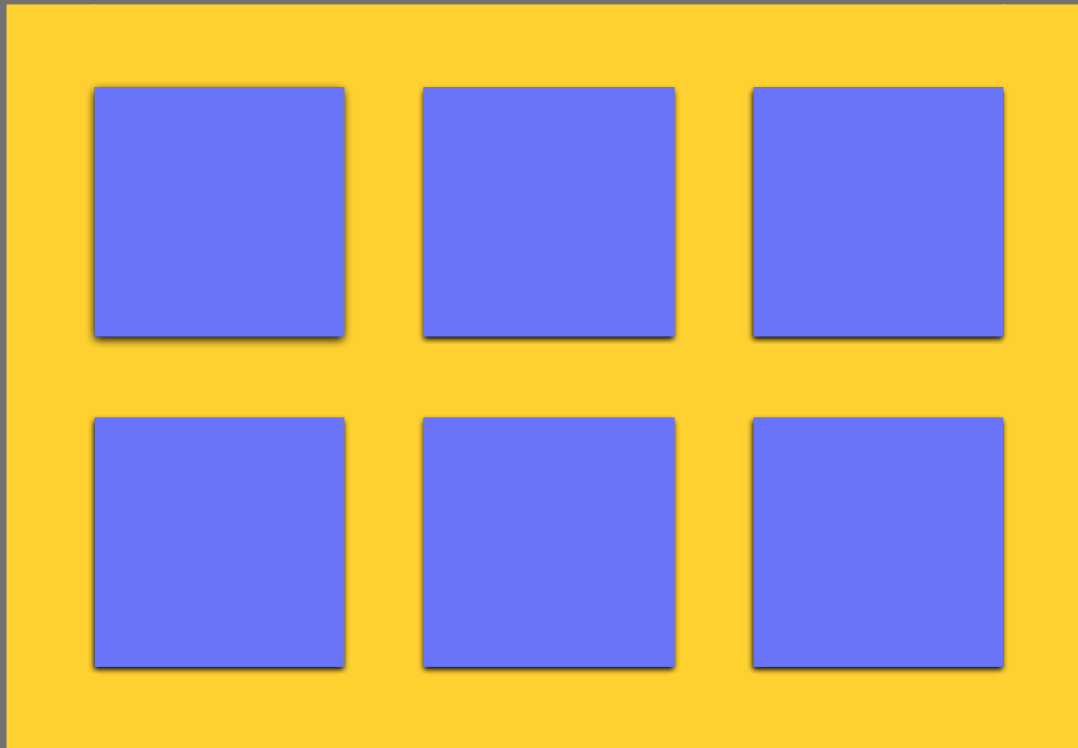
- **Risk** – Longterm planning is focused on engineering choices.
- **Compatibility** – Once constructed, multifamily housing and commercial buildings are generally invested in stand alone systems and not compatible with district energy systems.
- **High First Costs** – Lacking a ready customer base, the financial burden of shared infrastructure costs make district energy systems poor investments.

Opportunity

To grow a District Energy market in the United States we need to think differently:

- **Value** – Provide property owners a competitive approach to creating better buildings by offsetting costs in exchange for utility services that enhance the property value.
- **Customer Orientation** – Re-focus to thinking of the customer as a *person* and provide the information resources from which the customer will ‘pull’ the option for District Energy.
- **Incremental** – Create the customer base first. Engineer, install and fund the shared system to meet actual and not theoretical demand.

The future of DE is in a Market Based Approach



Systems Focus:

Fuel - pursuing the cheapest

Comfort - peak load capacity

Operations - labor and repair costs

Renewal - trading efficiency for capital

Connected Focus:

Choices - balanced resource management

Transparency - individual engagement

Resiliency - thrive with volatility

Appreciation - additive value



**URBAN
THERM**

