LEED ND to Zero Net

Greening Neighborhoods For Energy

Charles.Kelley@zgf.com
Portland Oregon

ZGF
ZIMMER GUNSUL FRASCA ARCHITECTS LLP
CONCEPT
Working at the Right Scale

Neighborhoods and Districts
Connect and compliment each other in cities.

• Sharing Resources
• Sharing Costs
CONCEPT  Working at the Right Scale

Neighborhoods and Districts

Design leverages systems integration.

• Multi modal improvements
• Open Space
• Services
• Diverse community interests
• Efficient energy, water, and waste systems

The right scale to share energy more efficiently through system integration that leverages public benefits.
Building Energy Efficiency
A Limitation?
Costly

Neighborhood Energy Efficiency
An Opportunity?
Pragmatic
Competitive Advantage

Measuring Energy Performance
Building
Neighborhood
Building Strategies: Energy

Buildings are optimized for low energy use through daylight, natural ventilation, and solar orientation, with western standards of comfort.
CONCEPT

What is a District Energy System

Block Strategies: Energy

- Solar hot water evacuated tubes
- Ground source heat exchange
- Central Plant
CONCEPT

What is a District Energy System

Neighborhood Strategies: Energy

- Natural Gas
- Biomethane (Future)
- Four pipe thermal loop
- Ground source heat exchange
- Air Source Thermal Exchange
- Combined Heating Cooling and Power
Neighborhood design and system planning can help buildings meet performance goals:

2030 Challenge
LEED Neighborhood Development (ND)
Executive Order (E.O.) 13514; Federal Leadership in Environmental, Energy, and Economic Performance; For Federal Properties
Living Building Challenge
2030 Challenge
100% reduction in carbon utilization below the 2003 Commercial Building Energy Consumption Survey
Measure: 2030 Challenge

2030 Challenge Energy Targets

- Baseline
- 2007
- 2010
- 2015
- 2020
- 2025
- 2030

2030 Goal
Measure: 2030 Challenge

12 West
Measure: 2030 Challenge

12 West, Portland Oregon
Measure: 2030 Challenge
12 West, Portland Oregon

Energy Use Intensity (EUI) in Kbtu/SF/yr

Key:
- Energy model
- Actual energy use
- CBECS median (2030 Challenge baseline) with 2030 goals
- Target based on occupancy date
- Code baseline
- LEED baseline
One of the first, if not the first, true “net-zero energy” biological research laboratories in the world, generating 100% of its power on site (solar power).
Measure: 2030 Challenge

J. Craig Venter Institute

- Green Roofs
- Native Low-Water Landscaping
- FSC Certified Wood
- Recycled Content
- On-Site Renewable Energy: Wind and Solar
- Natural Ventilation / Passive Cooling
- Use of Regional Materials
- On-Site Treatment and Re-use of Wastewater
- Natural Daylighting and Views
- Rainwater Harvesting
LEED NEIGHBORHOOD DEVELOPMENT (ND)

- Revitalize urban areas
- Reduce land consumption
- Reduce auto dependence
- Promote pedestrian activity
- Reduce impacts of pollution
- Energy
Measure: LEED Neighborhood Development (ND)

City Creek, Salt Lake City
Measure: LEED Neighborhood Development (ND)
City Creek, Salt Lake City
City Creek, Salt Lake City
Buildings with Separate Energy Systems

Measure: LEED Neighborhood Development (ND)
City Creek, Salt Lake City

Energy Reduction
Blue
25 – 30%
Red
30 – 35%

City Creek Center
800,000 gsf retail mall

Tower 5
(The Regent)

Tower 6&7
(Richards Court)

Building 4

Tower 1
(The Promontory)

Tower 2
(The Cascade)

Exclusive Central Utility Plant For Retail and Snow Melt

Nordstrom

Macy's

Dillards

100 SOUTH

SOUTH TEMPLE
Measure: LEED Neighborhood Development (ND)  
City Creek, Salt Lake City  
Water Features
Measure: LEED Neighborhood Development (ND)

City Creek, Salt Lake City

Scheme
Measure: LEED Neighborhood Development (ND)

City Creek, Salt Lake City

Descrete Projects
Adding Housing /Job Balance
Creating Live Work Play.
Executive Order (E.O.) 13514; Federal Leadership in Environmental, Energy, and Economic Performance; For Federal Properties

- Zero Net Energy as measured in carbon for new construction planned after 2020 and in use after 2030.

- 26% reduction in water and energy by 2020.
Incremental integration of Federal Properties to improve livability and meet the Executive Order.
EXECUTIVE ORDER Southwest EcoDistrict

Energy Reduction
Light Rehab +/−15%
Rehab > 50%
New > 70%

Redevelop
Rehab
Infill
Central Utility Plant
Right of way and public open space improvements
EXECUTIVE ORDER Southwest EcoDistrict

- Ground Source
- Solar/ PV Arrays
- Decarbonize Central Plant
- A revitalized place to live, work and play
Living Building Challenge Imperatives:

- Site
- Water (zero net)
- Energy (zero net)
- Health
- Materials (zero net)
- Equity
- Beauty

https://ilbi.org/lbc/casestudies

Tyson Living Learning Center

Omega Center for Sustainable Living

https://ilbi.org/lbc/casestudies
Translating the Building Scale to the District

LIVING BUILDING CHALLENGE™ 2.0

Each Living City Design™ Competition team will envision a city that meets all of the imperatives of the Living Building Challenge™ 2.0.
LIVING BUILDING CHALLENGE

LIVING CITY DESIGN COMPETITION

WWW.ILBI.ORG/LIVINGCITYDESIGN
TEAM Project

Competition Boards
EcoDISTRICTS

Neighborhoods are the right scale to accelerate sustainability – small enough to innovate quickly and big enough to have meaningful impact. Their varied behavior and characteristics are a asset providing resources to share across a city. For example, a district with ample sun exposure can fuel a downtown that consumes more than its solar potential. Together, they create balance and a city in symbiosis whose sum is greater than its parts.
1. University District

An urban, higher education district that provides a bounty of thought leadership, demonstration and innovation power, and resource capacity to support the city; it lacks student housing, a retail core, open space and an ability to provide its own energy, food, or water.

2. South Waterfront

A new high-density, brownfield redevelopment is anchored by a regional medical research facility that is a model for sustainability and health and its community of high rise residential living minimize individual resource footprints; though walkable and open, the area suffers from a poor connection to the city, limited space dedicated to producing food, and the lack of a retail core with a dynamic mix of uses and affordable housing.

3. Lloyd District

A mid rise office district in the central east side with excellent transit access and a well organized business community committed to investing in its future; it suffers from lack of residential buildings that create mixed-use activity or a culture of place or diversity due to the dominance of large-business and institutions.

4. Lents

A low density, low income, and diverse residential area in outer east Portland that suffers from years of poor urban planning and frequent flooding. With recent investments to improve the historic town center, transportation access, watershed health and urban farming, Lents has the potential to become a new model for suburban sustainability.

5. Gateway

A former low-density suburb lies at the nexus of the region's transportation system allowing it to hold on to the retail services that support its local residential communities and has an abundance of vacant land to manage and treat stormwater and provide urban habitat and food production; the neighborhood's diverse immigrant populations are not integrated and a freeway severs the district's connection to nearby residential neighborhoods.
GATEWAY EcoDISTRICT

Leverage Points

- Repurposing the Big Box
- Re-envisioning Main Street

BIG MOVES

1. Rich street life: shifting right of way from autos to pedestrians and bikes
2. Green infrastructure: conveying water, connecting habitat, growing food, and processing waste
3. Net zero energy and water: connecting energy and water sources and uses across the district
4. Urban agriculture: growing on green spaces, greenways, rooftops and green walls

existing site conditions

four big moves
putting the streets to work
above and below the surface
TEAM Project

Competition Boards - Petals

1 SITE

SITE

restoring a healthy coexistence with nature

Site instills a deep appreciation for place. Retail and residential uses intertwine around the regional transit system, building community in places that connect across the city. Vacant and underutilized land is used for its best purpose—housing retail services to support district communities or building natural refuges for habitat or food production. Dedicated natural spaces work to clean air and grow resources, safe from human interference.

1 Site

1. limits of growth
   Concentrate new development on centers + corridors
   Preserve prime agriculture and forest lands with growth boundaries that separate urban and rural development.

2. urban agriculture
   Cultivate backyards, rooftops and terraces to grow food for individuals and households.
   Create community with shared plots, communal food and community gardens.
   Provide food and teach skills to sections, local farmers and students through school gardens and healthy green food banks.
   Support local markets of produce grown by local farmers.

3. habitat exchange
   Dramatically reduce freeway lanes to create continuous space for wild and domesticated animals.
   Connect watersheds and natural areas with ribbons of habitat.

4. car free living
   Provide transit options for short to long trips with options for light rail, bus and carpool.
   Connect a mix of uses and pathways through geographically appropriate infrastructure.
   Accommodate all levels of users in bicycle networks and grade-separated pathways.

Vehicle Miles Traveled

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Model Split (SOV)</td>
<td>10%</td>
<td>70%</td>
</tr>
<tr>
<td>Density</td>
<td>25 FAR</td>
<td>2.5 FAR</td>
</tr>
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</table>

Gateway today is typical of an early low-density suburb with wide streets, large blocks, overabundant parking and limited pedestrian connectivity. It is one of the graying districts in the entire city and the average resident travels 29.7 miles per day by car. In the future, Gateway’s super blocks and wide streets will be scaled to its residents providing better connections to the many services already in the district. Open spaces will provide urban habitat and agriculture. Gateway’s nexus as a regional transportation hub means that in the future, residents won’t need personal vehicles.
Competition Boards - Petals

2 WATER
creating water independent sites, buildings and communities

Water flows echo natural cycles, flowing along watersheds and into the Columbia and Willamette rivers. Impervious surfaces are minimized, aided by areas of increased infiltration that mimic the region’s historic forests. Precipitation lines define a community’s water use, and neighborhoods share water across wetter and drier parts of the city. Water is not a single use item, with potable water reused multiple times, treated naturally, and eventually released to recharge local aquifers.

5 Net zero water
Use less than the amount of annual precipitation and share across neighborhoods to buy the city's water.

6 Ecological water flow
Process water efficiently and naturally through restoration of the urban watershed and rehabilitation of the urban grid.

Predevelopment

Vehicle Miles Traveled

now 11,000 miles
future 4,000 miles

Modal Split (SDV)
now 10%
future 70%

Density
now 25 FAR
future 2.5 FAR

Gateway today is typical of an early low-density suburb with wide streets, large blocks, over-abundant parking and limited pedestrian connectivity. It is one of the grayest districts in the entire city and the average resident travels 25.7 miles per day by car. In the future, Gateway’s super blocks and wide streets will be scaled to its residents providing better connections to the many services already in the district. Open spaces will provide urban habitat and agriculture. Gateway’s nexus as a regional transportation hub means that in the future, residents won’t need personal vehicles.
Competition Boards - Petals

Energy

3

relying only on current solar income

Energy is a local equation. District energy captures efficiencies of scale in production and distribution, replacing resources pulled from across the state or further. Wind, water, waste and sun provide fuel, while the earth regulates temperatures in buildings on its surface. Through combining compatible uses, neighborhoods capture their own efficiencies and change behaviors in place to lighten energy needs.
Competition Boards - Petals

Oregon Regional Energy Sources

1. Wave
2. Wind
3. Solar
4. Vortex Hydro

Oregon map with icons for wave, wind, solar, and vortex hydro.
Competition Boards - Petals

energy

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<tr>
<td>Regional Energy</td>
<td>100%</td>
<td>25%</td>
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<tr>
<td>Local Energy</td>
<td>0%</td>
<td>75%</td>
</tr>
<tr>
<td>Renewable Energy</td>
<td>5%</td>
<td>100%</td>
</tr>
<tr>
<td>Biomass</td>
<td>0%</td>
<td>20%</td>
</tr>
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Today, the majority of Gateway’s energy comes from non-renewable grid power. In the future, district energy systems will produce 75% of power through local, renewable means with fuel from biomass and other renewable sources. The remaining 25% of power will come over the regional utility grid from entirely renewable resources. Vertical heat exchangers will link geothermal energy to horizontal heat exchangers connected through buildings and blocks. Renewable power generation will fill the rooftops of the district’s many large, institutional buildings.
TEAM Project

Competition Boards - Petals

3 ENERGY

Energy is a local equation. District energy captures efficiencies of scale in production and distribution, replacing resources pulled from across the state or further. Wind, water, waste, and sun provide fuel, while the earth regulates temperatures in buildings on its surface. Through combining compatible uses, neighborhoods capture their own efficiencies and change behaviors in place to lighten energy needs.

Net zero energy
- Comprise heating and cooling between buildings in district scale systems
- Combine a complementary mix of users to offset heating and cooling byproducts
- Change community behavior to consume less energy; buildings and infrastructure that operate at maximum efficiency
- Capture energy from wind, sun, water and, where appropriate, from biogas, waste.

Now Future
- Local
- Regional
- National
- Global
- Land Use
- Water
- Energy
- Biogas
- Biomass

Now
Future
- Regional Energy: 100% 25%
- Local Energy: 0% 75%
- Renewable Energy: 9% 100%
- Biomass: 0% 20%

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**Health**

Maximizing physical and psychological health and well-being.

Health enters the public realm. Streets and pathways concentrate services for healthy lives and play host to natural systems that clean air and water. People stumble upon nature at every turn, interacting with lush plants, mountains and rivers to soothe the spirit and play home to other species. Neighborhoods do more than lessen threats to health through abundant access and nature they give reason to be active and healthy.

**Civilized Environments**
- Distribute fresh air and daylight across a district by linking streets and other open spaces.
- Tune outdoor and interior spaces seasonally to connect humans to nature.

**Healthy Air**
- Ensure clean outdoor air as a foundation for healthy interior air systems.
- Exceed the highest quality standards for waterways and air.

**Biophilia**
- Improve health and restore spirit through connection to biological systems.
- Connect places with an abundance of plants to process air, water, sun and soil matrices with pathways.

**Now** | **Future**
---|---
Impervious Area | 70% | 40% |
Tree Canopy | 10% | 50% |
% of Area Covered by Parks | 4% | 25% |
Adult Obesity | 40% | 10% |

Today, Gateway has poor air quality and a disproportionately low amount of natural areas because of the freeway running alongside it. In the future, the district will use open spaces for nature and landscape instead of pavement. Streets will be transformed to encourage pedestrian and bike access to provide natural routes for exercise and fresh air. The freeway will be reduced to two lanes and natural areas, restoring air balance to clean air and support a thriving community.
MATERIALS

Endorsing products and processes that are safe for all species through time

5. Materials

MATERIALS

Endorsing products and processes that are safe for all species through time

Competition Boards - Petals

Materials move in a cycle. Pacific Northwest forests form the base of a regional material system where most materials flow in a nutrient loop between forests and communities. The remaining demand drives metals, glass, and plastic in closed loops of salvage and recycling. A material's production, use, and disposal are free of toxic byproducts, creating clean industries and jobs for local residents.

11. Red List

Close the nutrient loop with forests through natural building blocks for red list materials.

12. Embodied Carbon Footprint

Sequester carbon in protected estuaries and forests across a region. Enhance urban uses by protecting restorative natural areas.

13. Responsible Industry

Support a sustainable material stream and a regional economy through truly restorative forestry practices and resource reuse.

14. Appropriate Sourcing

Use materials primarily from local, renewable sources. Supplement with components coming from regional salvage, recycling, and landfill mining and reclamation.

15. Conservation and Reuse

Return natural materials to the forest as biomass. Return materials into closed loops through salvage and recycling.

In Gateway today, materials arrive from around the world with little thought given to place of origin. Meanwhile, the district's concentration of medical facilities and restaurants generates significant waste. In the future, materials consumed in building and eating will be indigenous to the region and small, locally owned. Organizations will team forces, sort waste, and coordinate waste management to process and treat biomass.
EQUITY

Equity is open for enrolment. Neighborhood stewardship unites communities around common goals. All residents have opportunities to benefit from community improvements without fear of losing their right to call it home. Outdoor neighborhoods are fully recognized as places to read the city’s vibrant inner core. Neighborhood blocks are ripe with social oases, creating a reason to stop and interact. Access becomes inevitable, with no barriers to clean air, sun or water.

human scale + humane
- Create spaces for people through urban design and green buildings
- Create places for interaction, with social spaces at regular intervals
- Limit sites for parking and focus on stellar transit connections

democracy + social justice
- Ensure equal access to all places and opportunities
- Create spaces to reinvigorate consumption with benches, seating and shopping points
- Create local ownership opportunities for any resident to accrue the benefits of neighborhood revitalization

rights to nature
- Give all people and properties access to clean air at any level
- Let all properties access the sun for daylight, energy generation and shelter
- Turn natural waterways into community amenities

Variability of District:

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<tr>
<td>9% walk to 90% of destinations</td>
<td></td>
<td>80%</td>
</tr>
<tr>
<td>Local residents who own property or business in the district</td>
<td>20%</td>
<td>80%</td>
</tr>
</tbody>
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Today, Gateway’s community of east Portland natives exists amid an influx of immigrants. The district’s diverse populations have yet to integrate and the district is failing to meet basic needs of its changing population. In the future, secure and resilient lives will be possible for a range of incomes, abilities and languages, aided by urban design and economics that ensure opportunities and community services. Each resident will be able to invest in the neighborhood, through in-kind and service as well as traditional means, providing means to share ownership in the redevelopment value of the district.
beauty

celebrating design that creates transformative change

Beauty is a community that realizes and reflects itself. Peer-to-peer education builds the foundation for a community’s spirit. Collective action by neighborhood associations, community groups or like-minded neighbors nurtures a neighborhood at many scales; from street to block to building. District improvements are in harmony with daily life; creating places where visitors wonder in awe at a neighborhood’s unique character.
TEAM Project

Competition Boards - Petals

gateway sustainable education  new regional park  returning the freeway to pedestrians  public plaza network  green streets, walls, and roofs

beauty

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<tbody>
<tr>
<td>Community Projects Per Year</td>
<td>5</td>
<td>24</td>
</tr>
<tr>
<td>Community Maintenance Events</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>Artist in Residence in Local Schools</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Languages Served</td>
<td>3</td>
<td>75</td>
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Today, Gateway has an active citizen community that has led the conception and execution of several inspiring projects including Gateway Green, a regional park between two freeways, and the Gateway Education Center, a regional green jobs training center. In the future, even greater community organization and investment will expand these collaborations to more fully transform the neighborhood into the vision of its inhabitants.
7 BEAUTY
celebrating design that creates transformative change

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peer education builds the foundation for a community’s spirit. Collective action by neighborhood associations, community
groups or like-minded neighbors nurtures a neighborhood
at many scales: from street to block to building. Distinct
improvements are in harmony with daily life: creating
places where visitors wonder ‘to awe’ at a neighborhood’s
unique character.

19 beauty + spirit
Meet basic needs to create a foundation for wonder and
spirit.
Engage people in projects built by and for the community.
Some multiple objectives with innovative projects.
A community defines a wonderful place that strikes awe in
visitors.

20 inspiration + education
Reach out, individually to educate neighbors and build
community.
Organize around community goals.
Transform catalytic sites into centers of education for
maximum impact.

Today, Gateway has an active citizen community that has led the conception and execution of several inspiring
projects including Gateway Green, a regional park between two freeways, and the Gateway Education Center,
a neighborhood center that integrates learning. In the future, even greater community organization and investment will
fully transform the neighborhood into the vision of its inhabitants.
Districts Seem to be the Right Scale to share:

• Share Transportation Improvements
• District Energy
• District Stormwater Treatment
• Share Waste Energy and Water Recovery
• Open Space
• Cost.

Seems to be an incidental cost if district systems leverage other improvements overtime.

Otherwise, too costly for each building to bear individually.
a breath of fresh air
re-envisioning main street

Imagine going from an environment full of asphalt and fast moving traffic to a place for bees, bikes, babies, and birds. What would that place be like? It would be an ecologically supportive environment teeming with the most vulnerable residents of our planet. It is filled with pedestrians, bicyclists and public transport replacing autos. Copenhagen reminds us that bicyclists are not part of transport, they are part of public life. We have accommodations for commuter bicyclists and eight year olds out with their grandparents. One could imagine that every drop of water that falls on main street stays on main street or leaves cleaner than when it fell. In that sense, it defines an incremental watershed in anticipation of its role in developing a fully functioning EcoDistrict over a period of time. It is, simply, a place you would rather be that is good for you.
LEED ND to Zero Net

Greening Neighborhoods and Districts