

Integrated Resource Management

*Sustainable Innovations for
DOD Net-Zero installations*

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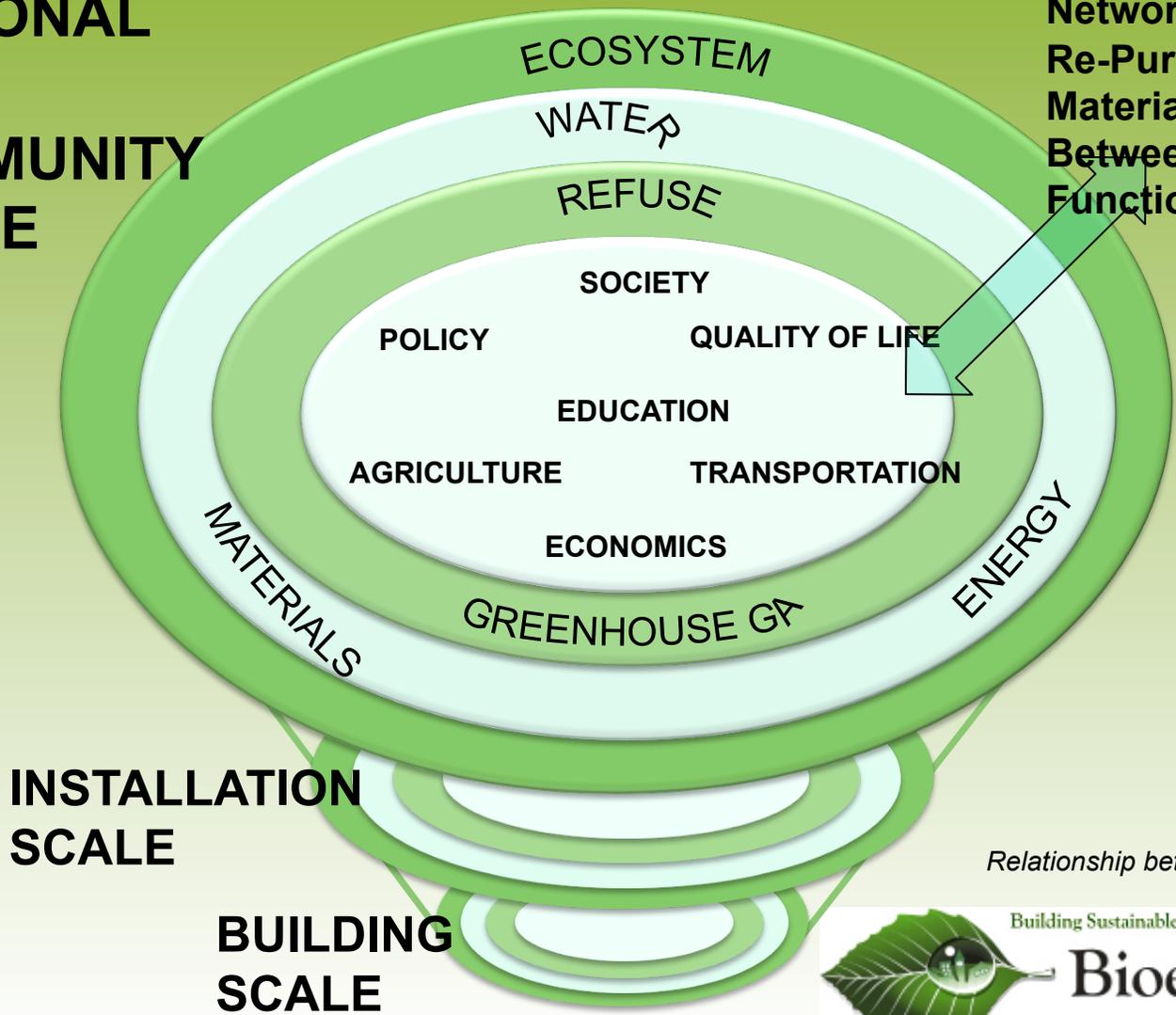


Building Sustainable Communities on an Ecological Foundation

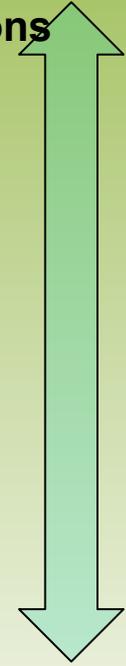
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Integrated Sustainability Themes

**REGIONAL
AND
COMMUNITY
SCALE**



**Reduce Waste by
Designing Cycles and
Networks to Capture and
Re-Purpose Water,
Materials, and Energy
Between Scales and
Functions**



Relationship between the 13 Themes



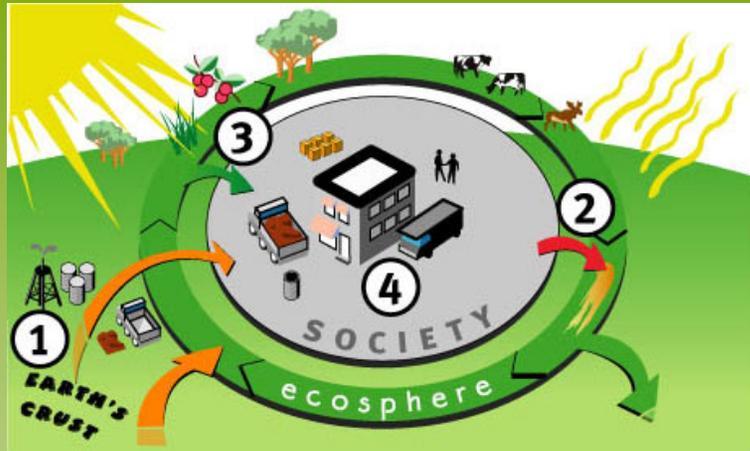
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The four system conditions

1. Substances from the earth's crust must not systematically increase in nature
2. Substances produced by society must not systematically increase in nature



The four system conditions

3. The physical basis for the productivity and diversity of nature must not be systematically deteriorated
4. We must be efficient enough to meet basic human needs

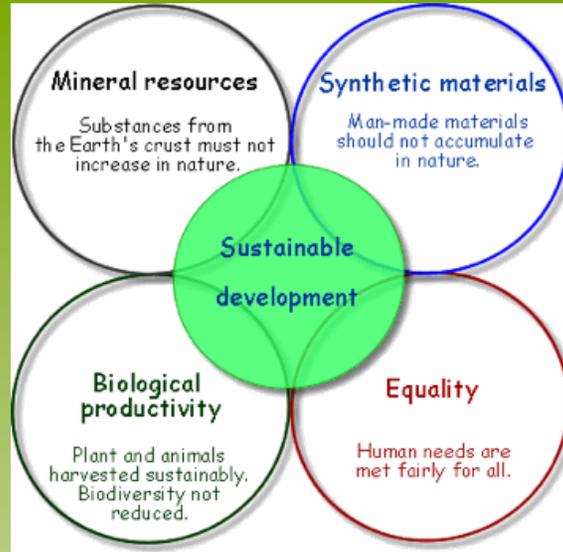
Basic science foundation

1. **Nothing disappears: Conservation of matter; First Law of Thermodynamics**
2. **Everything spreads: Second Law of Thermodynamics; organic matter decays, pollution disperses**

Sustainability

*Implies Healthy Ecosystem Function
and Efficient Economies
with Social Equity*

- **Water is retained**
- **Soil is improved**
- **Nutrients are recycled**
- **Contaminants are degraded/assimilated**
- **Impacts and benefits are distributed fairly**
- **Materials are reused**
- **Entropy is minimized**



**Each project, and its budget,
is your next opportunity to
transact sustainability...**

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WATER

Conquer the Engineering Problem or Steward the Ecological Resource?



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ENERGY

Bring Fuel and Power to the Site or
Harvest what is Present?



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MATERIALS

To the Dump or the Next Cycle of Use
for Materials and Stored Energy?

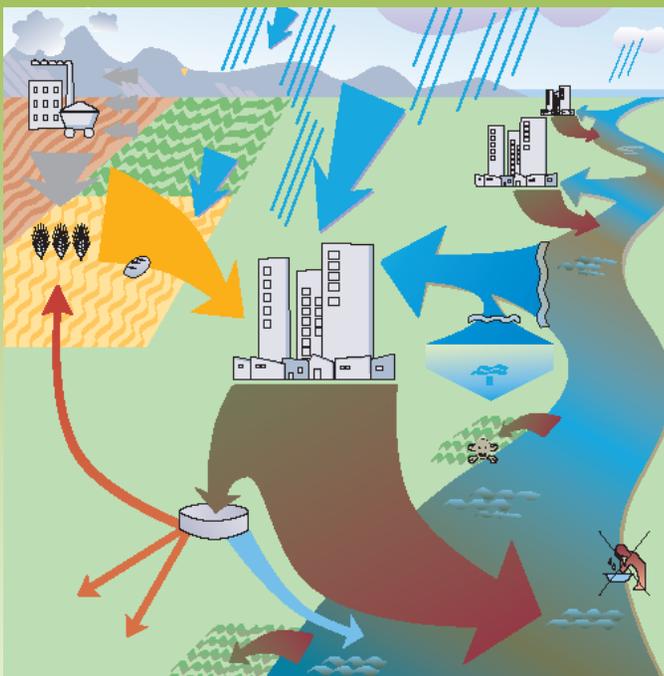


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We need a cultural shift

Current: use water & energy once
& dispose of it (tax payer costs)



Open linear system:
waste management

Integrated Resource recovery
(tax payer revenues)

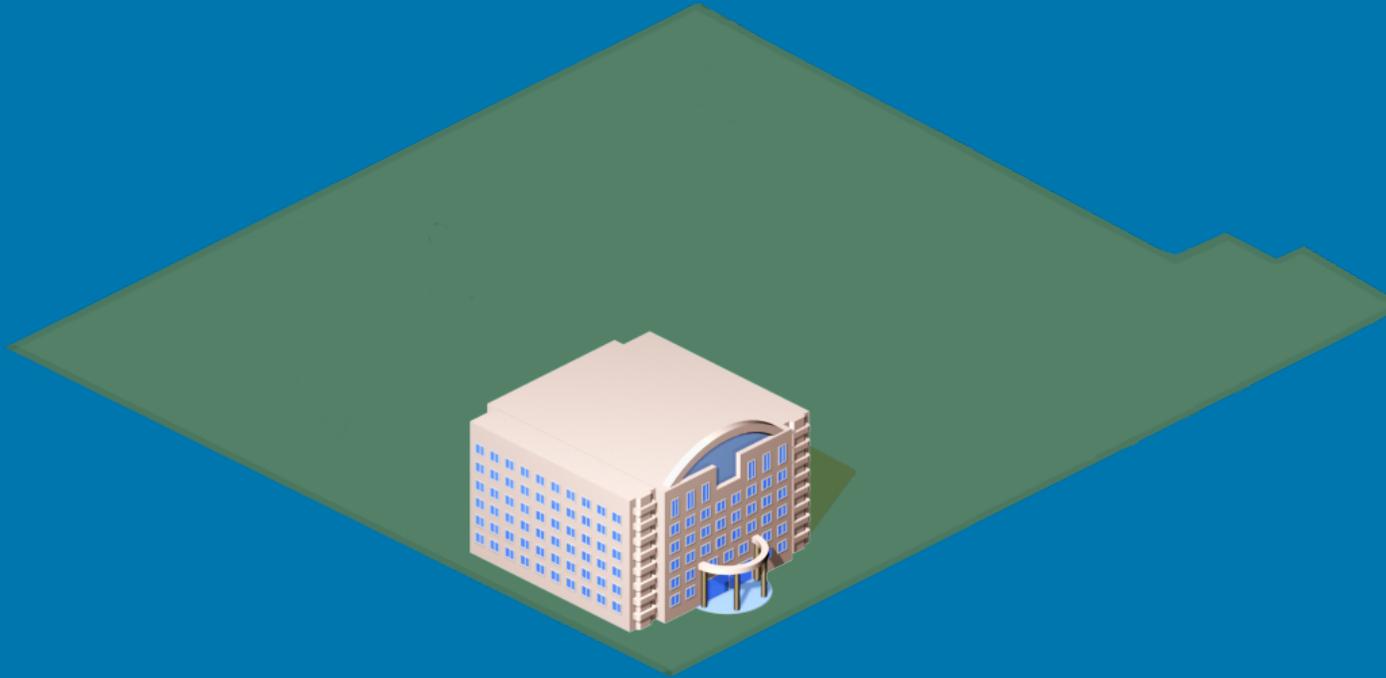


Closed loop system:
resource recovery

Modified from Dr. Nicholas Ashbolt, EPA

DISTRICT ENERGY SHARING & WATER RECOVERY

Modern Building Challenge



Modern buildings attempt to balance their own heating and cooling demands to reduce the energy required to heat and cool the building.

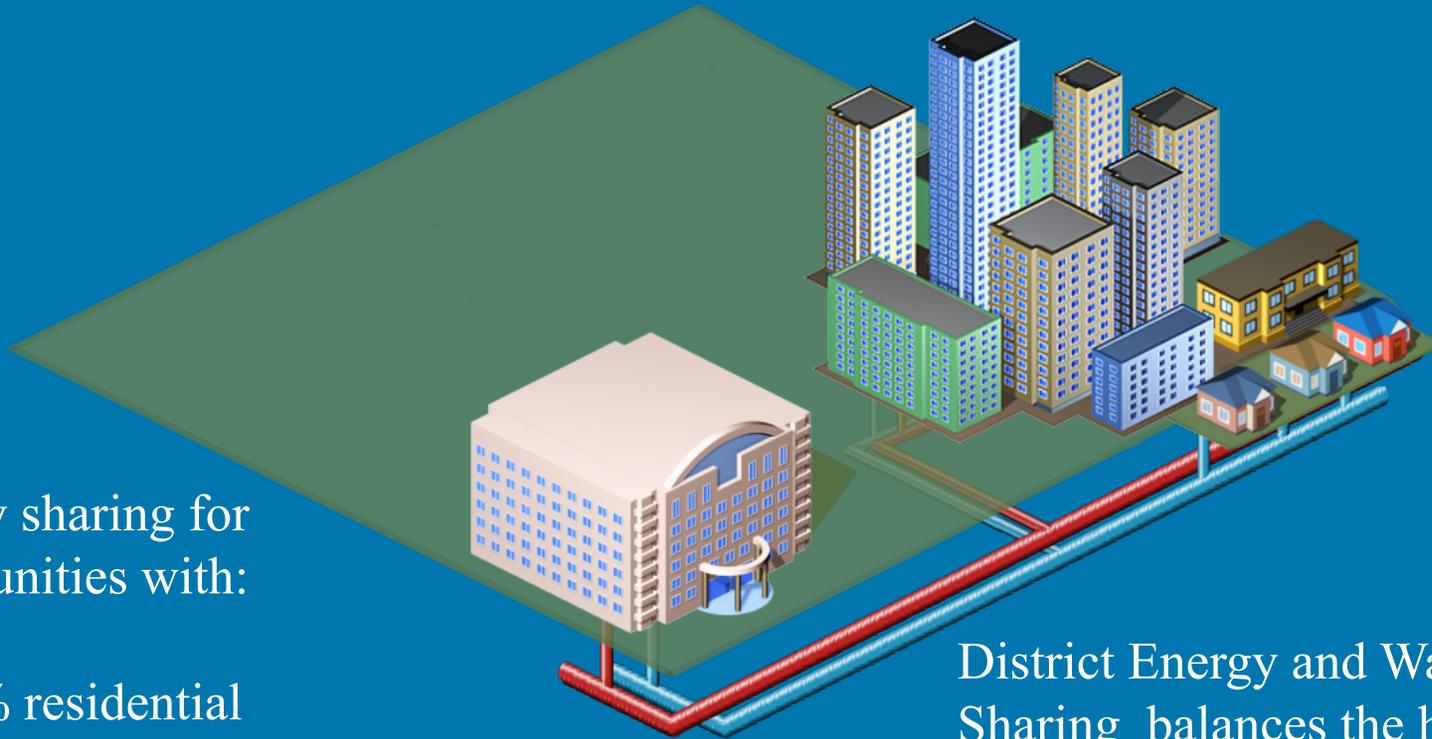
DISTRICT ENERGY SHARING & WATER RECOVERY

Using the Energy Imbalance

Energy sharing for communities with:

- 45% residential
- 30% office
- 25% retail

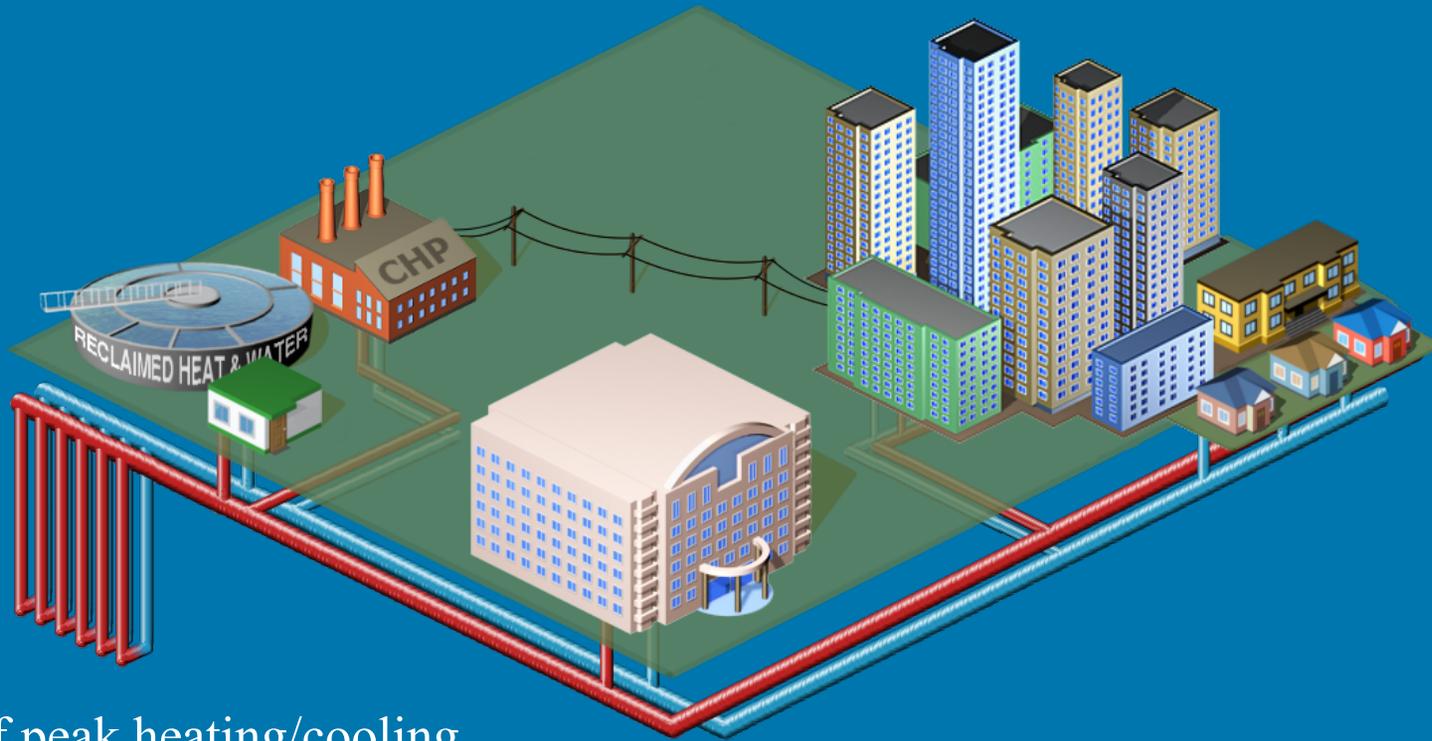
Can supply 25% to 34% of the total thermal energy



District Energy and Water Sharing balances the heating and cooling demands of an entire community to reduce the energy and water required to meet the needs of the community.

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Reducing Energy Consumption



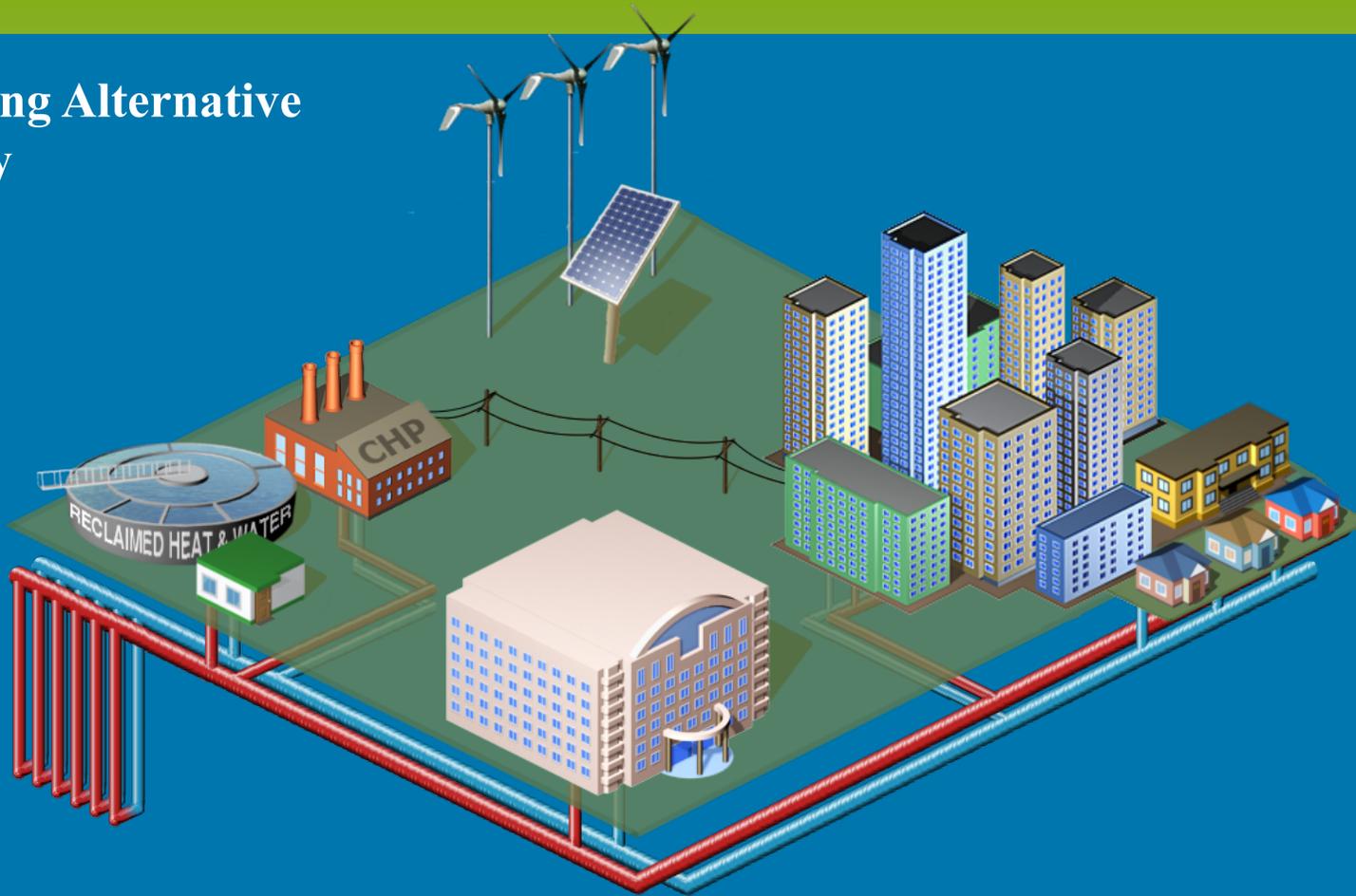
50% of peak heating/cooling provides 90% of annual energy

60% of a building's energy consumption is heating & cooling

Heat recovery and alternative high or low grade thermal energy sources are used to store or provide the net energy demand.

DISTRICT ENERGY SHARING & WATER RECOVERY

Enabling Alternative
Energy



Reduction in energy demand
maximizes feasibility of other
alternative energy sources



Net Zero Installation



Proposed Definition

A net zero installation is one which applies an integrated approach to management of energy, water, and waste to capture and commercialize the resource value and/or enhance the ecological productivity of land, water, and air.

Its key attributes are:

- A fundamental shift towards cyclical handling of resources, virtually eliminating the concept of waste.
- Ecologically derived design method to systematically support resource recovery by synergistically combining outputs and inputs.
- Operates through breaking down “stovepipes” of assessment and design decision-making rather than following traditional approaches based on single technical discipline problem solving.
- Focus on capturing value, not minimizing initial cost, through effective inter-disciplinary project teams.

Net Zero Installation Concept



Value Management Study

- Use existing dollars and contract vehicles to conduct assessments and prepare recommendations
- Science, policy, and engineering experts plus installation personnel, researchers, Design-Build contractors, and other stakeholders
- Spend a full week assessing an entire installation, or even multiple installations

Our expertise includes:

- Energy Policy Act of 2005 (EPAAct 2005)
- Energy Independence and Security Act of 2007 (EISA 2007)
- Executive Orders 13423 and 13514
- ASHRAE 189.1 (2013)
- LEED Certification
- NPDES Phase II Compliance
- Sustainable Site Initiative
- Net-Zero Initiative
- Integrated Resource Management for Energy/Water/Waste
- Life Cycle Cost Analysis

Our professionals include:

- Geotechnical/Geothermal, Structural, Mechanical, and Civil Engineers
- Water Resources Engineers
- Building Science Professionals
- Building Energy Modelers
- Landscape Architects
- LID and Pre-Development Hydrology Designers
- Renewable Energy Planner/Designers
- Relevant Specialized Cost Estimators
- Certified Value Specialists
- Policy Experts
- Trained Facilitators

Sustainability Optimization Charrette Tailored Value Management process

- **Method for accelerated attainment of key energy, water, and waste management objectives in connection with installation sustainability and net-zero performance**
- **Achieves cost savings, and improved compliance with key legal and policy requirements, often improving livability and environmental impacts**
- **Aids installation managers in solving current problems rapidly**



Features and Benefits

- Course correction on current projects--no lag time
- Emphasizes resources available, not new needs--Self financing
- Life Cycle Cost based decisions
- Leverages private investments by beginning with end in mind
- Solve problems previously unaddressed
 - Energy Security for Installations
 - Efficient Infrastructure for Reduced Demand
 - Systematic Compliance with EOs and public laws