Fairfax County Energy Task Force

Leveraging Technology for a Sustainable Future

June 30, 2011

Presented by
Bob Bryant & HC Yu
President and CEO
HC YU and Associates

Agenda

- Introduction
- Energy Strategies
- Concepts applied
- Benefits

HCYU AND ASSOCIATES

Energy Task Force

Create a new energy strategy for Fairfax County.

Source: Private Sector Energy Task Force Mission Statement

Energy Task Force

Implement scalable, community-wide energy efficiency projects focused on measurable results for businesses.

Source: Private Sector Energy Task Force Mission Statement

National Perspective

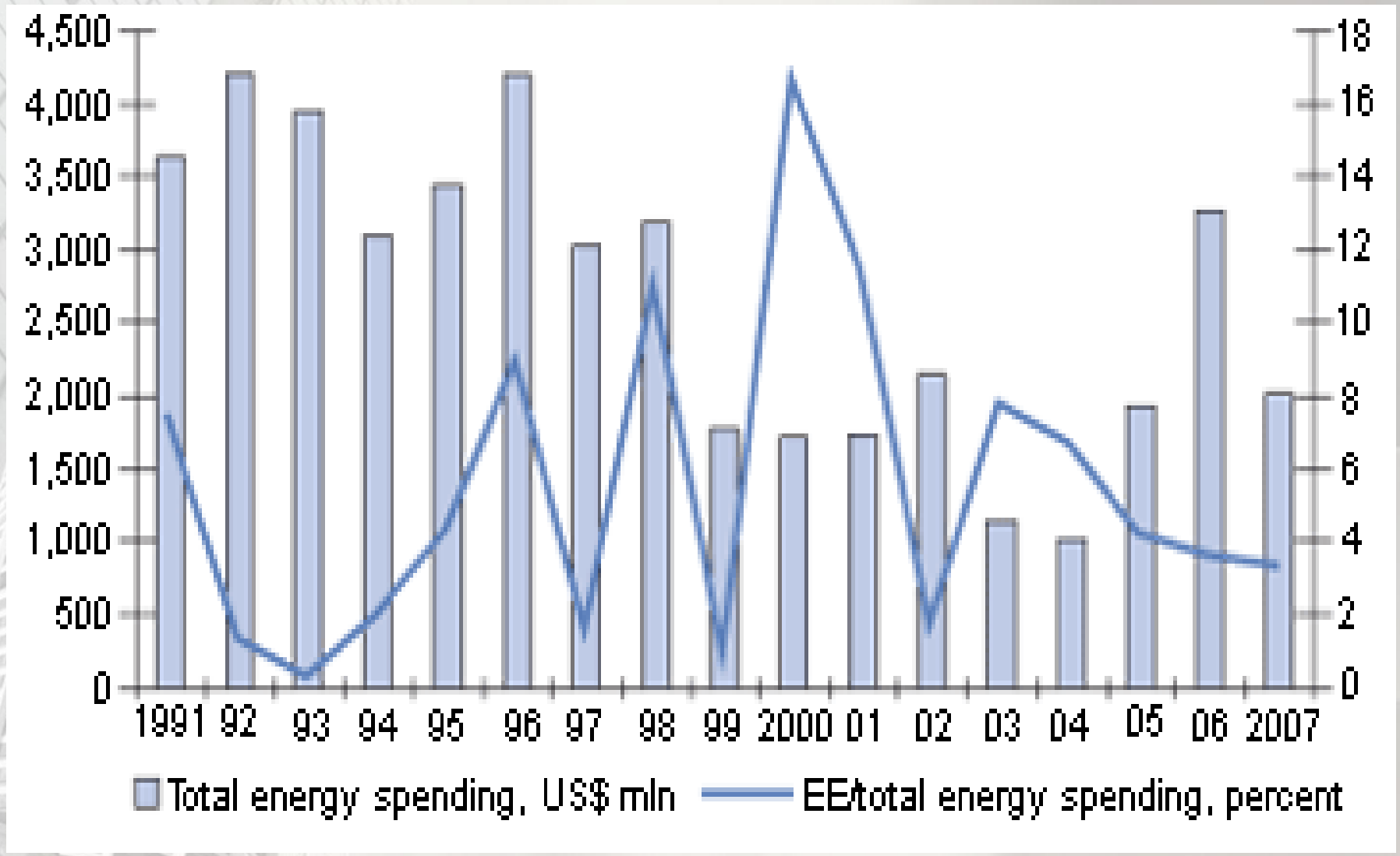
Proposed Clean Energy Standard

March 2011

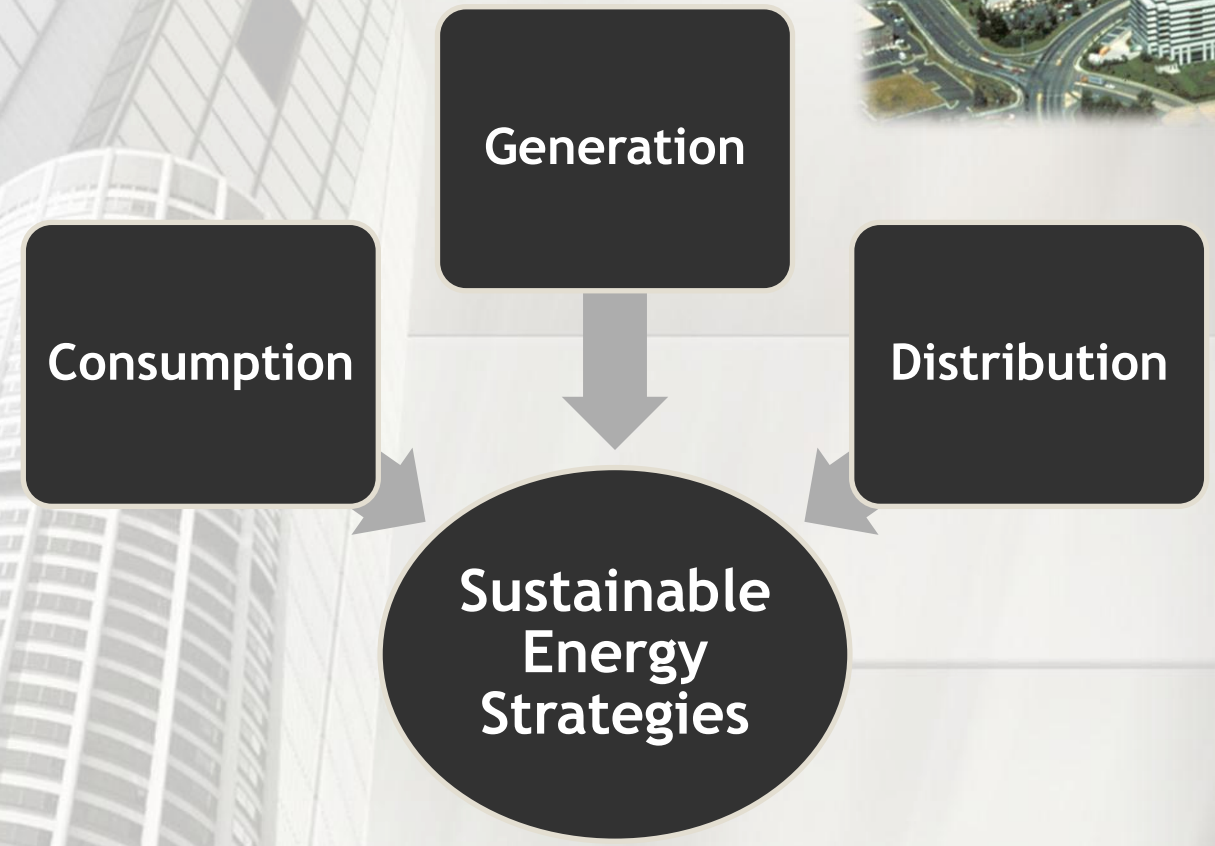
Background

A significant share of the total energy consumption and greenhouse gas emissions comes from efforts to heat, cool, and power spaces we live, work and play in!

The Energy Paradox



Sustainable Energy Strategies



Perspective

Utilize commercially proven technologies to leverage improvements in all three!

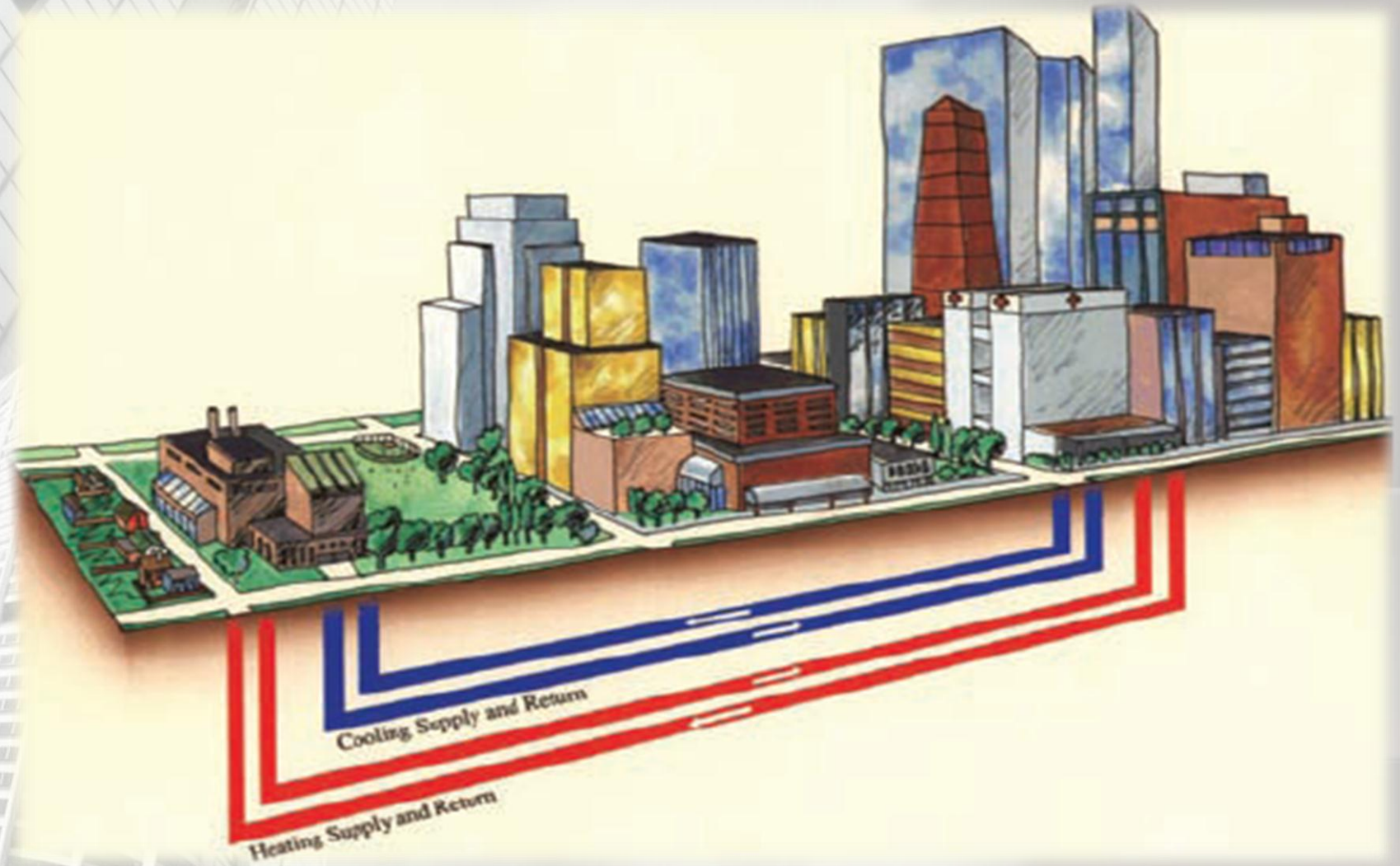
Strategy Options

District Heating & Cooling
DHC

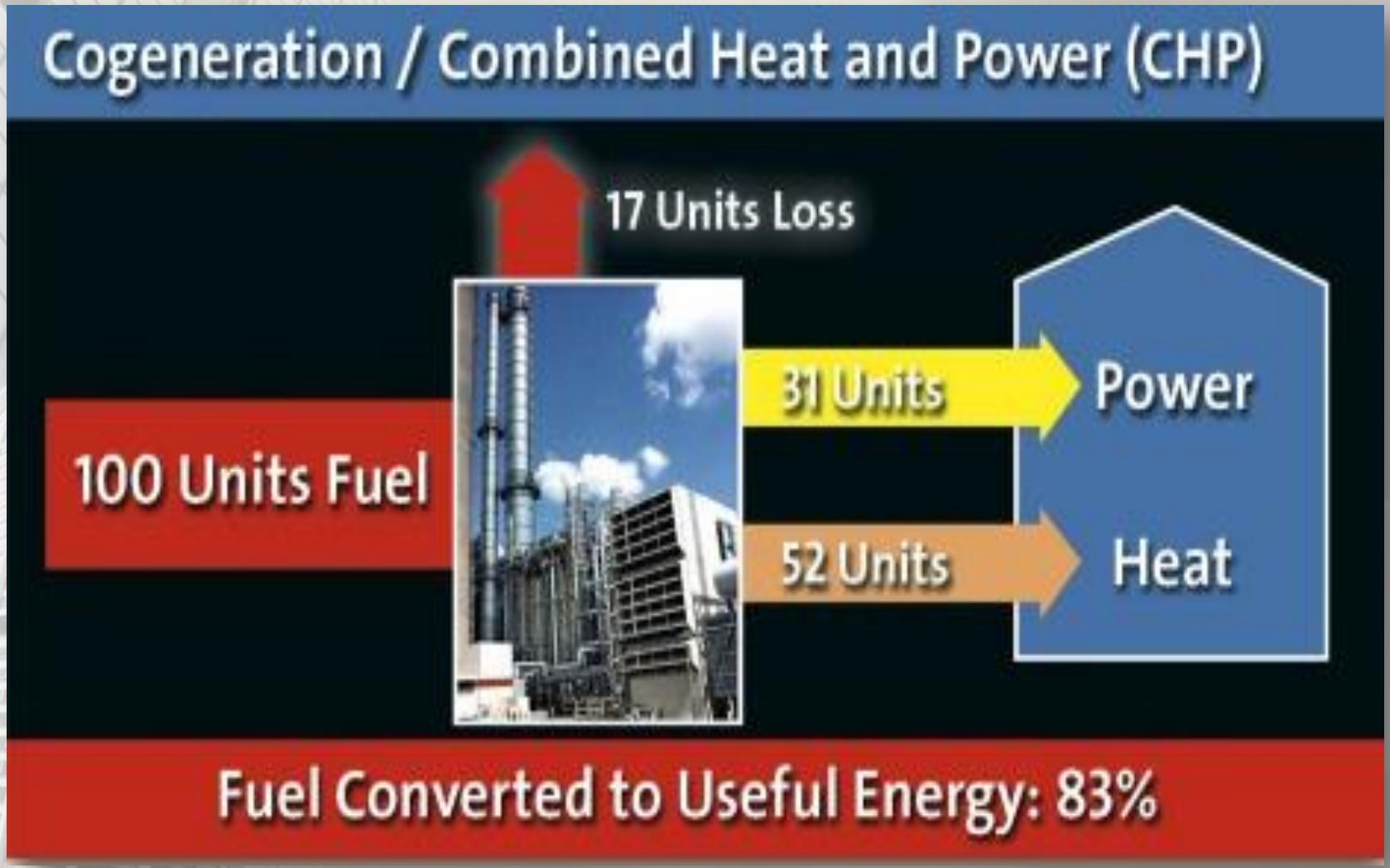
Combined Heat & Power
(Cogeneration) CHP

Combined Cooling, Heat & Power
(Trigeneration) CCHP

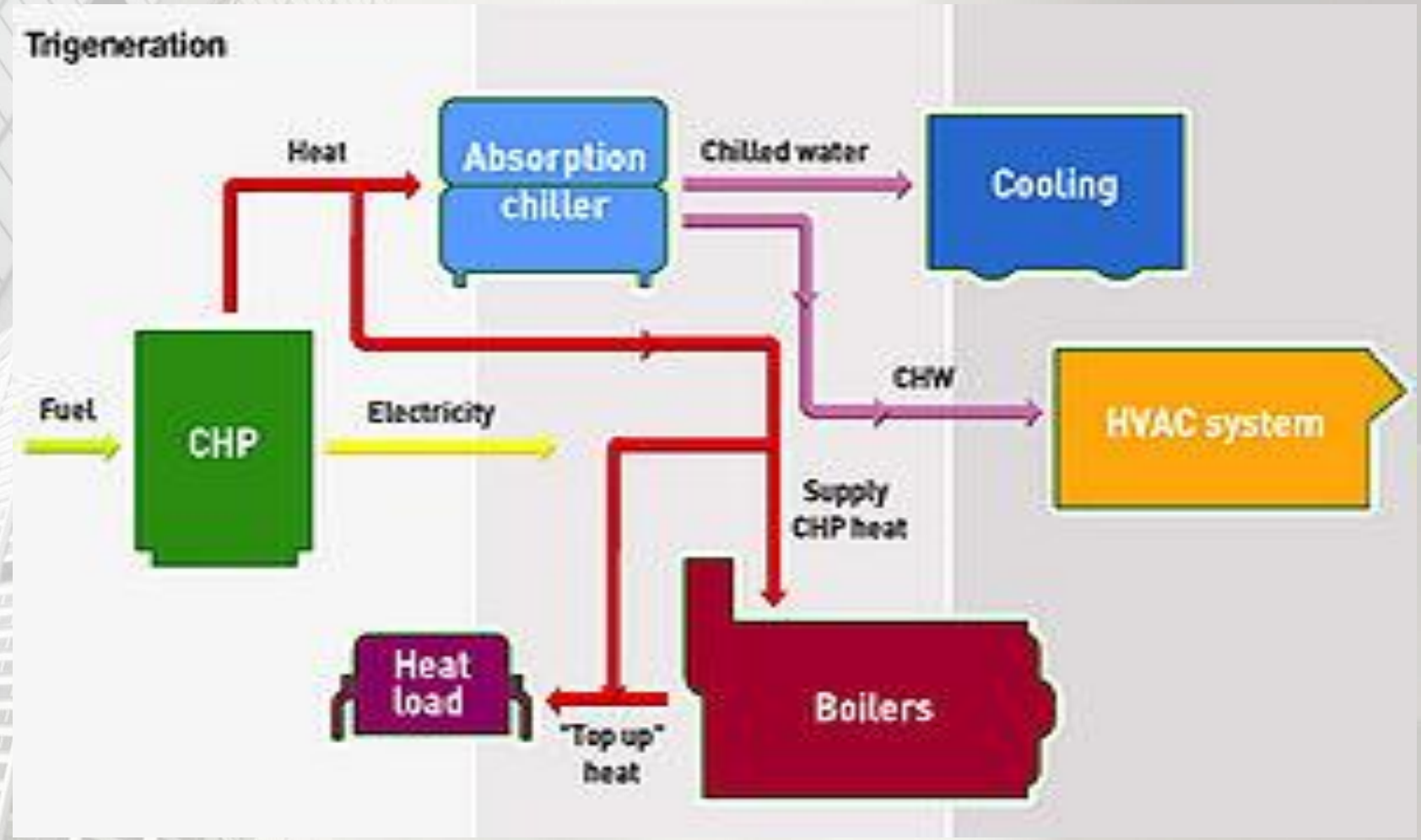
District Heating and Cooling Plants



Combined Heat and Power Plants



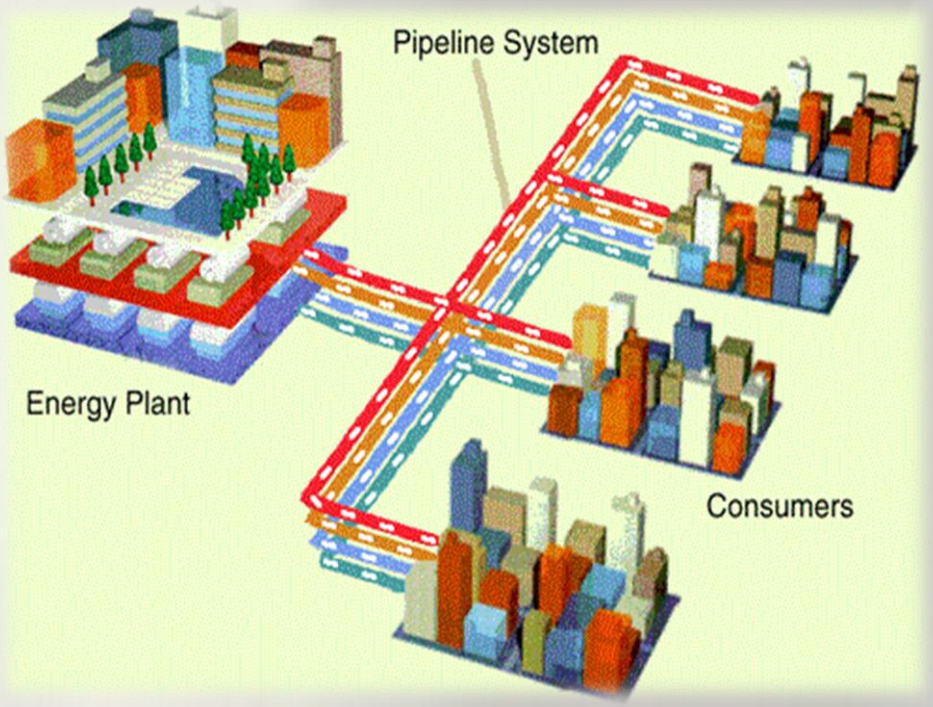
Combined Cooling, Heat and Power Plants



Why is it important?

District heating and cooling with combined heat and power represents the best energy solution for urban heating and cooling needs

What is District Heating and Cooling?

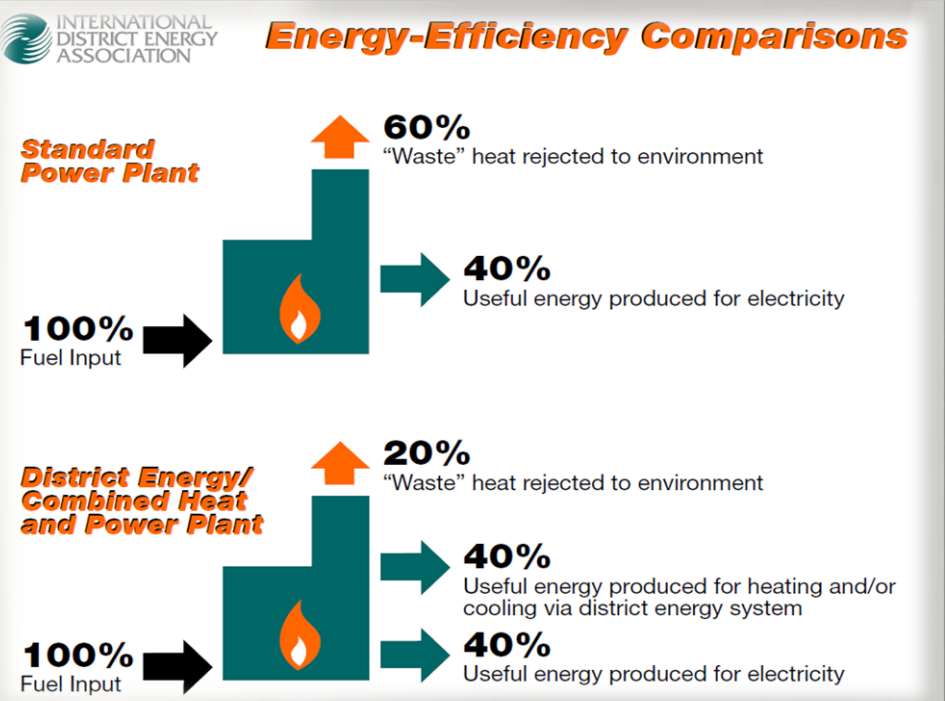


Connects multiple buildings to a central plant that produces hot or chilled water and distributes it through an underground network to heat or cool buildings.

What are the benefits?

- Improved energy efficiency
- Enhanced environmental impact
- Fuel flexibility
- Ease of operation and maintenance
- Reliability
- Comfort and convenience for customers
- Decreased life-cycle costs
- Improved architectural design flexibility

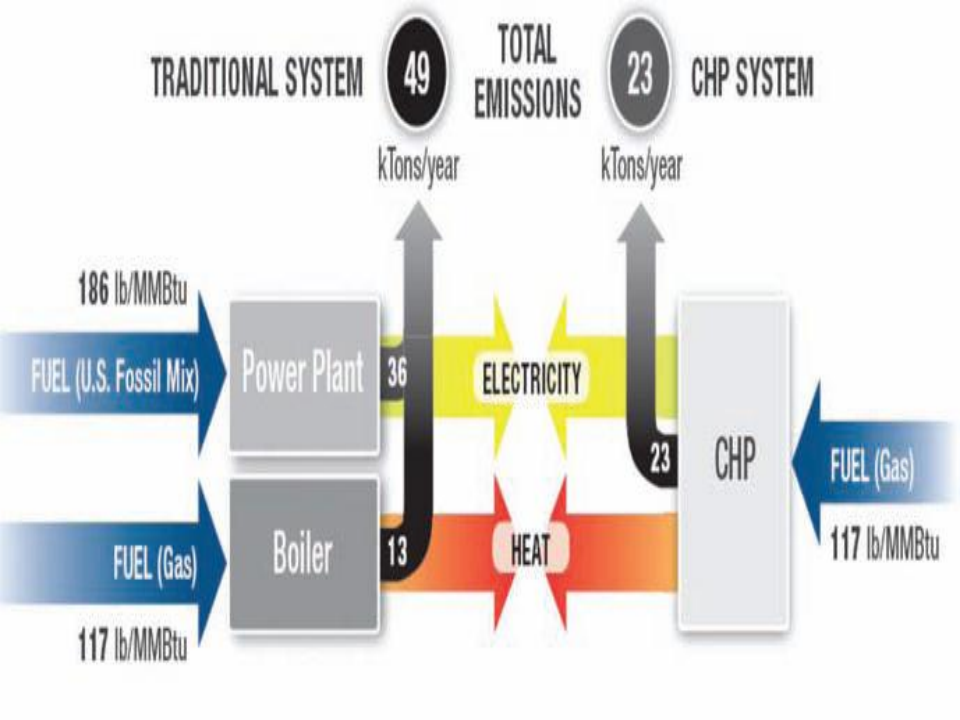
Improved Energy Efficiency



District energy systems can use the "reject heat" that results from burning fuel to produce electricity at a power plant, dramatically increasing the overall efficiency.

Source: IDEA Combined Heat and Power (CHP)

Improved Energy Efficiency



When the reject heat is used, the system becomes a combined *heat and power* system generating both

- ✓ **heating and cooling**
- ✓ **electricity**

Source: IDEA Combined Heat and Power (CHP)

Reduced Environmental Impact

The less energy used, the less sulfur dioxide and carbon dioxide and other emissions are expelled into the environment.

Fuel Flexibility

Can use a variety of conventional fuels such as coal, oil and natural gas, whichever fuel is most competitive at the time.

Ease of operation and maintenance

Customers do not need boilers or chillers, so there is less maintenance, monitoring and equipment permitting.

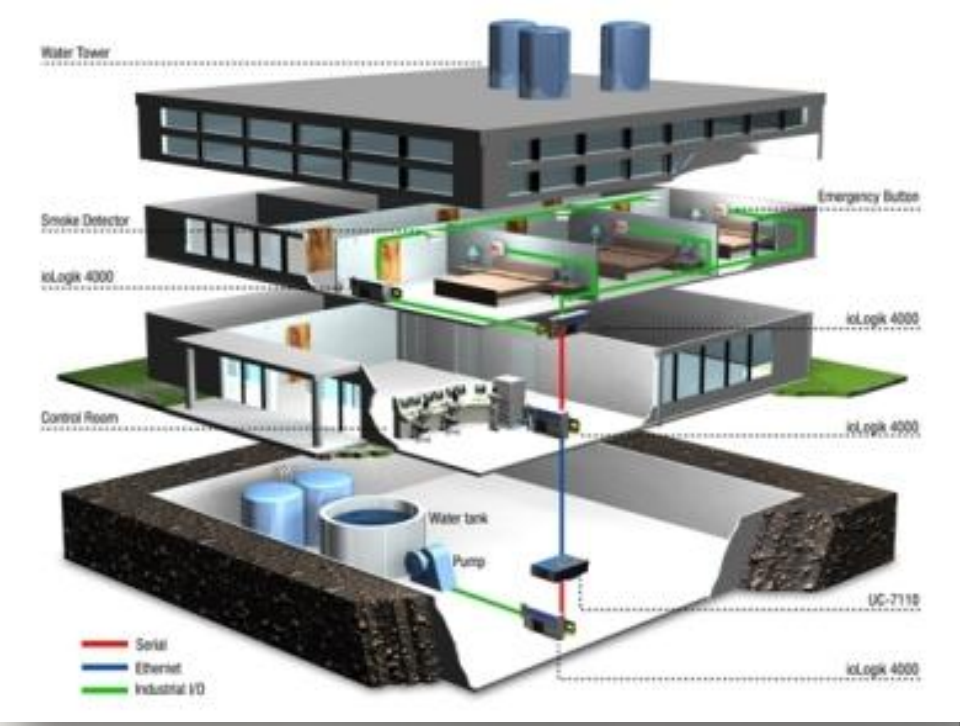
Ease of operation and maintenance

Eliminates the need for fuel deliveries, handling and storage so there are fewer safety and liability concerns for employees and building occupants.

Ease of operation and maintenance

Frees up valuable building space by eliminating the need for mechanical rooms.

Reliability



Building owners can count on higher reliability since District energy systems operate around-the-clock and have backup systems readily available.

Comfort and Convenience

District energy service allows building operators manage and control their own indoor environments.

Comfort and Convenience

Even during unusual conditions, a building can receive chilled water or hot water for air conditioning, without starting up its own chillers.

Comfort and Convenience

Reduced vibrations and noise problems that could annoy building occupants.

Decreased life-cycle costs

Reduced upfront capital requirements and ongoing operating, maintenance and labor costs.

Architectural Design flexibility

Architects can easily design or renovate buildings to be more versatile and aesthetically pleasing for both potential occupants and the community.

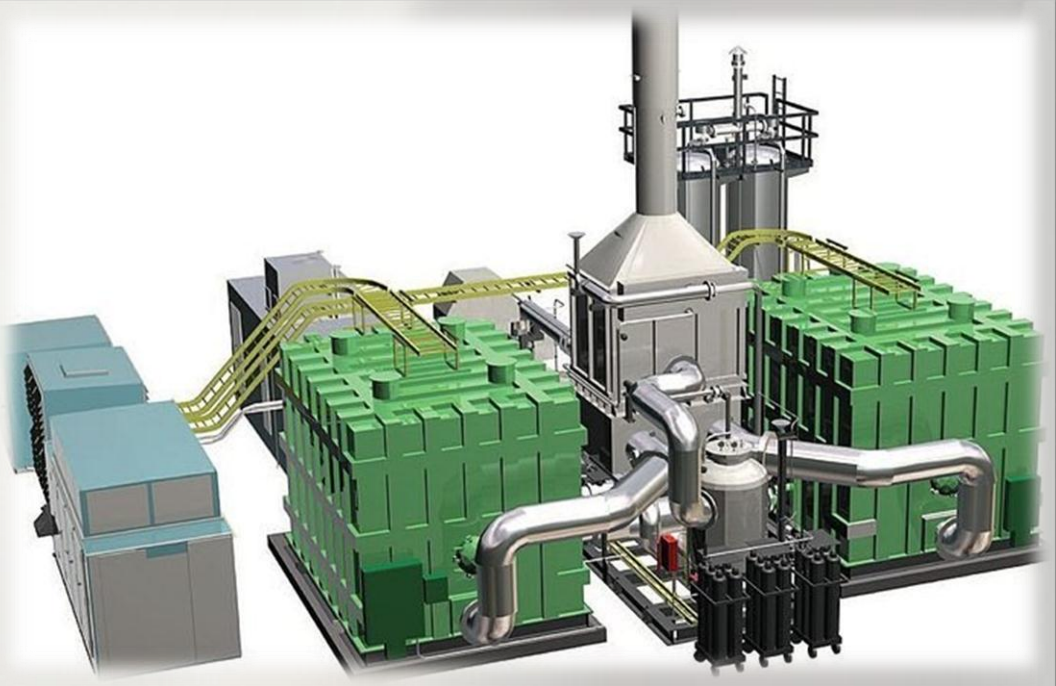
Best Markets

Large central business districts and university campuses are the most common users of district energy systems in the U.S.

What trends are emerging?

Owners of legacy district energy systems are investing in new technologies and new infrastructure to improve efficiencies, and expanding their networks.

What trends are emerging?



Secondly, they are investing in Combined Heat and Power plants.

What trends are emerging?

Thirdly, new construction projects, notably for mixed-use development projects which combine residential, commercial and office space incorporate these concepts

A Vision for Tysons

The comprehensive plan for Tyson's Corner provides the right opportunity to leverage this technology.

Revitalization Plan

Development Areas	Total new capacity in Millions of sq ft
Spring Hill Station	6.5-7.5
Dominion Square	4.4
Solutions Plaza	4.9
Tyson's Central	1.3
Capital One	4.9
Scotts Run Station	8.0-9.0
The Commons	2.5
Mitre 4 & 5	.490

Source: Tyson's Revitalization Plan 2011

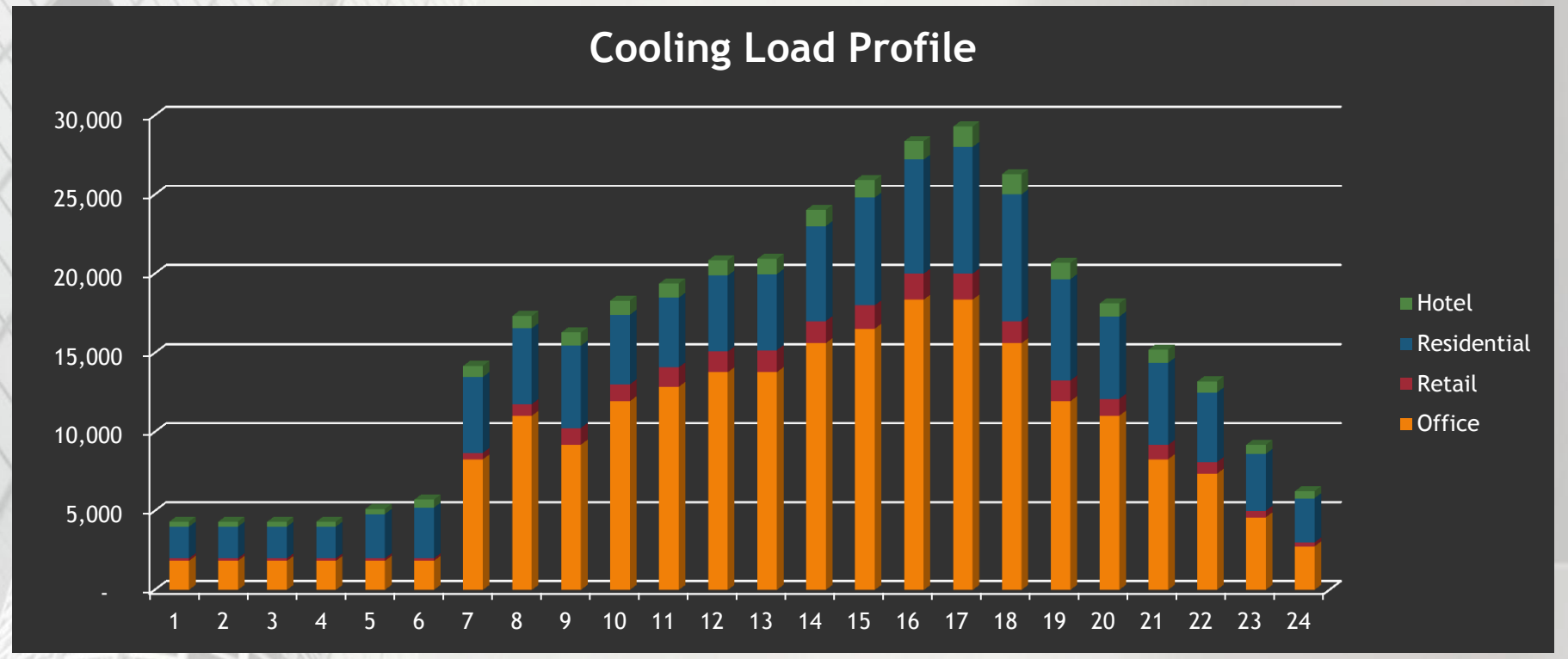
Opportunity

- What is the potential impact of District Energy strategies in Fairfax County?

Energy Model

Buildings & District	Time of use	Seasonal Impact	Uses	Energy
• Masterplan • Zoning • Envelope • Inherent technologies	• 24 hour profile • Day of the week	• Month of year • Weather conditions	• Occupants • Desired conditions	• Sources • Costs • Environment

Demand Model



10 million sq ft development

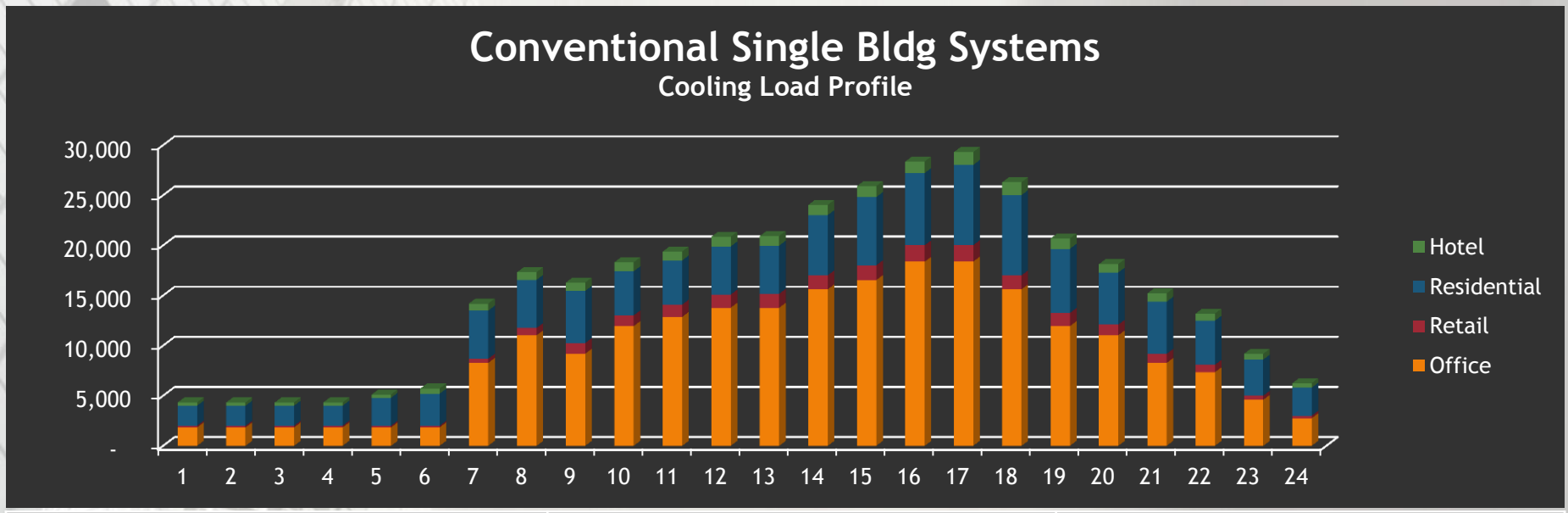
Office	Residential	Retail	Hotels
• 55%	• 35%	• 5%	• 5%

Many Design Options

- Conventional single building system
- Local central plant system
- District plant system
- District plant system with ITES*
- District CCHP plant system

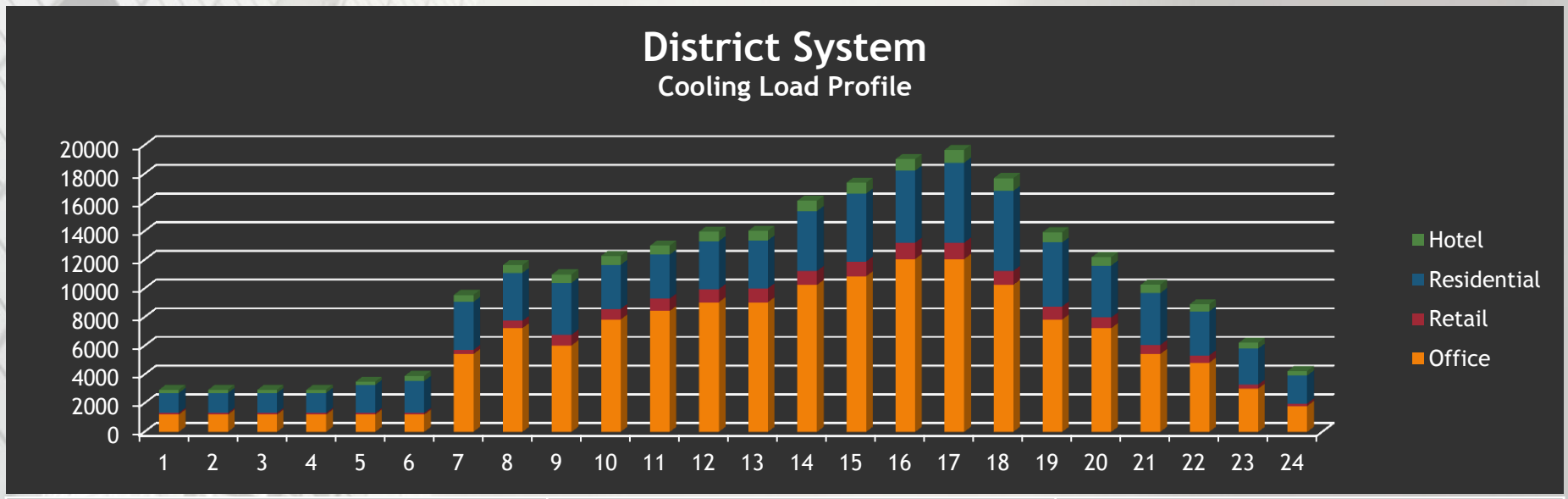
ITES: Ice Thermal Energy Storage

Demand Model



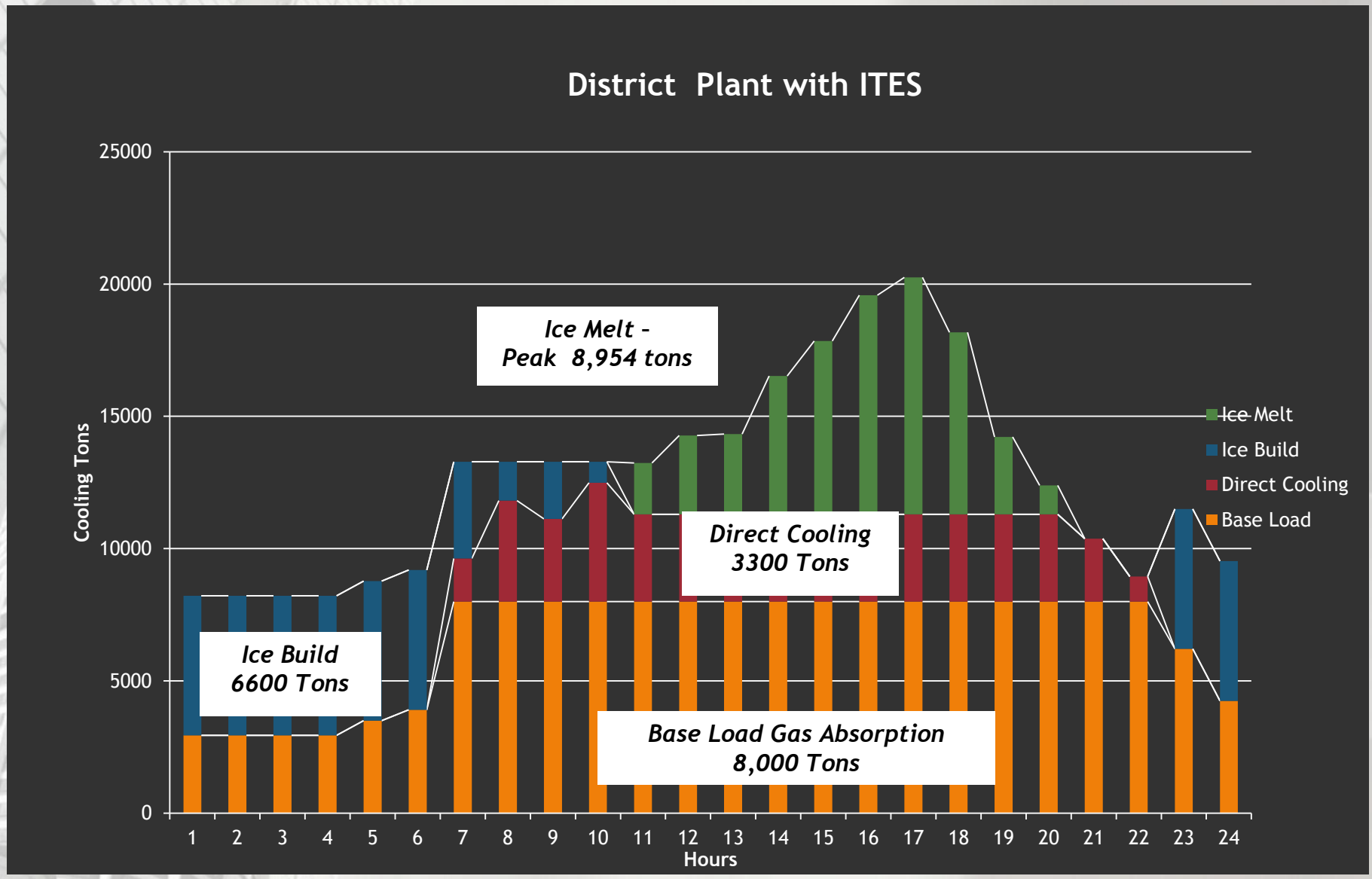
Load Analysis (Demand)	Typical Single Building Design (tons of cooling)	Local Central Plant Cooling (tons of cooling)
Estimated Load (Demand)	30,000	30,000
Equipment Required (Supply)	30,000	25,000

Demand Model

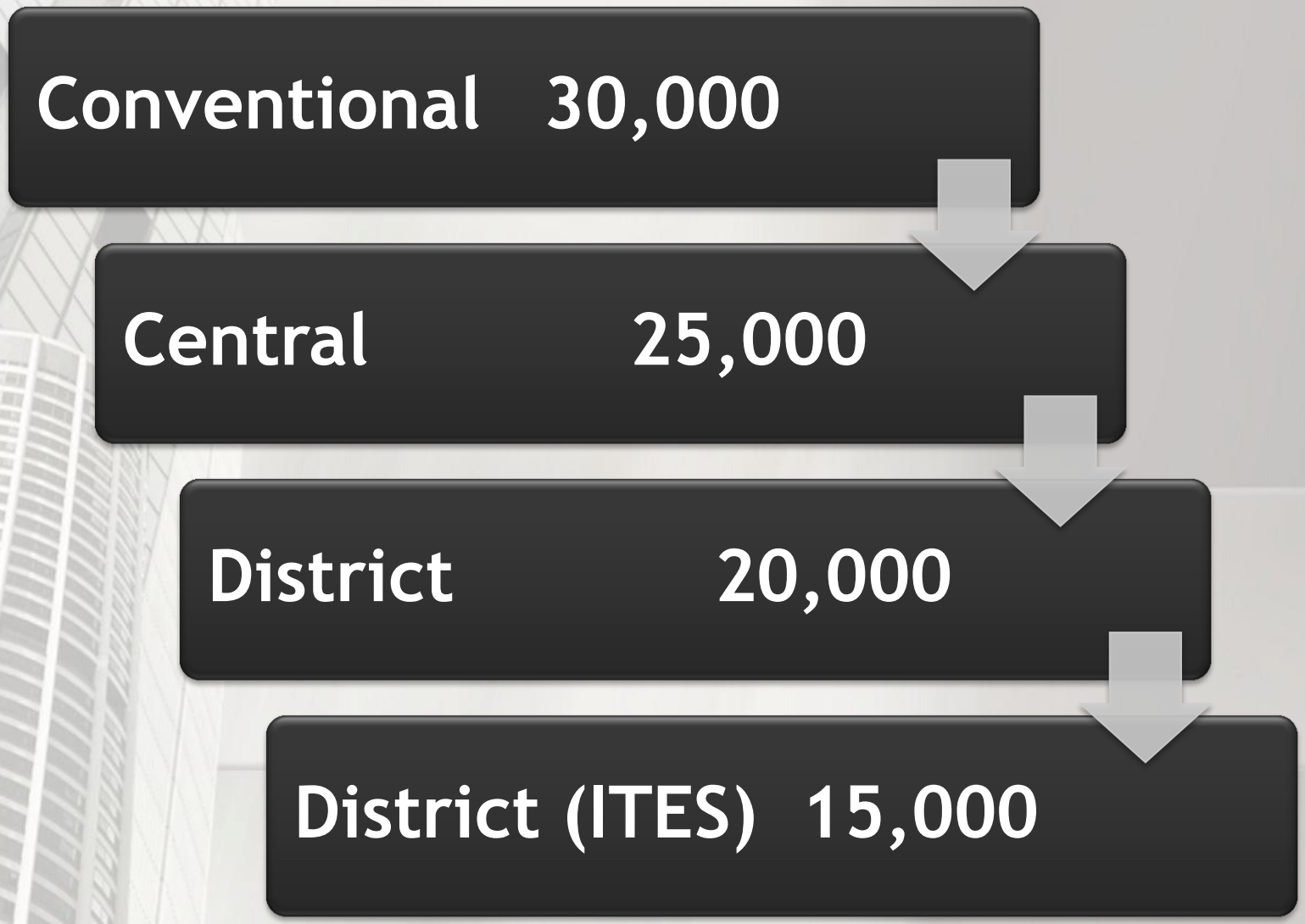


Load Analysis (Demand)	District Plant (tons of Cooling)	District Plant with ITES (tons of Cooling)
Estimated Load (Demand)	30,000	30,000
Equipment Required (Supply)	20,000	15,000

How is this achieved?

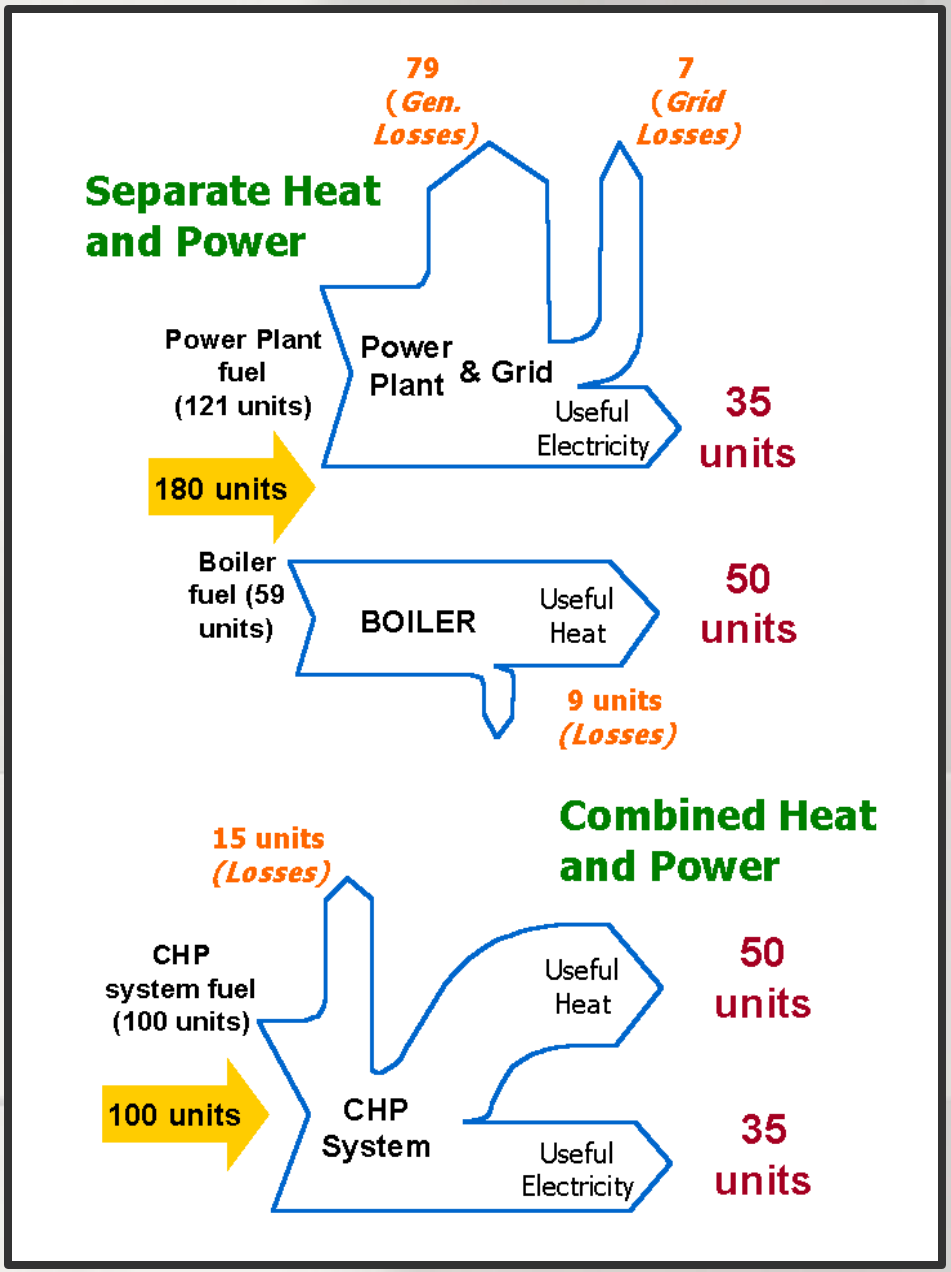


Huge Efficiency Opportunities



Reduction in power generation

Systems	Space	HVAC	Total*
Separate Heat & Power	30	20	50
Central Plant	28	15	43
CHP	24	12	36
CCHP	24	6	30



Source: Green Power Management

* In MegaWatts

Reduction in Carbon Dioxide generation

Estimated to be 300,000 tons of CO_2 year.

Financial possibilities

CCHP can be attractive investments for private developers, public private partnerships or utility companies

Recommendations

- Identify viable sites for applying these strategies
- Encourage investment in the technologies

We are Evangelists

- Our team has the experience with more than 200 million square feet of District Systems worldwide.
- Including
  - Chicago
  - Baltimore
  - Phoenix
  - Beijing
  - Shanghai
  - Riyadh
  - Kuala Lumpur

HOYU AND ASSOCIATES

Questions?