Combined Heat & Power
District Energy

Opportunity for Increased Efficiency and Reduced Emissions

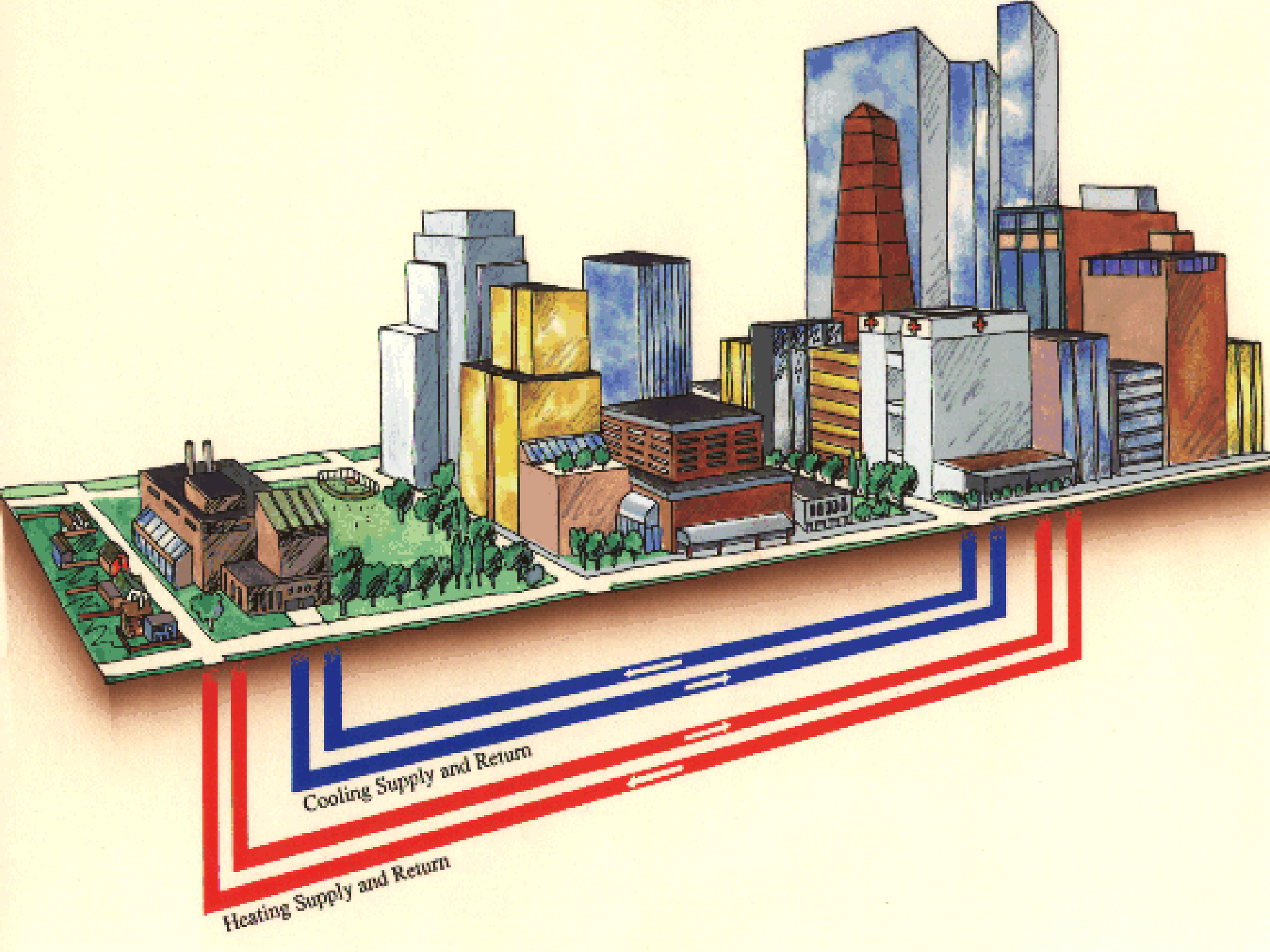
Presented to:

MWAQC

September 28, 2011

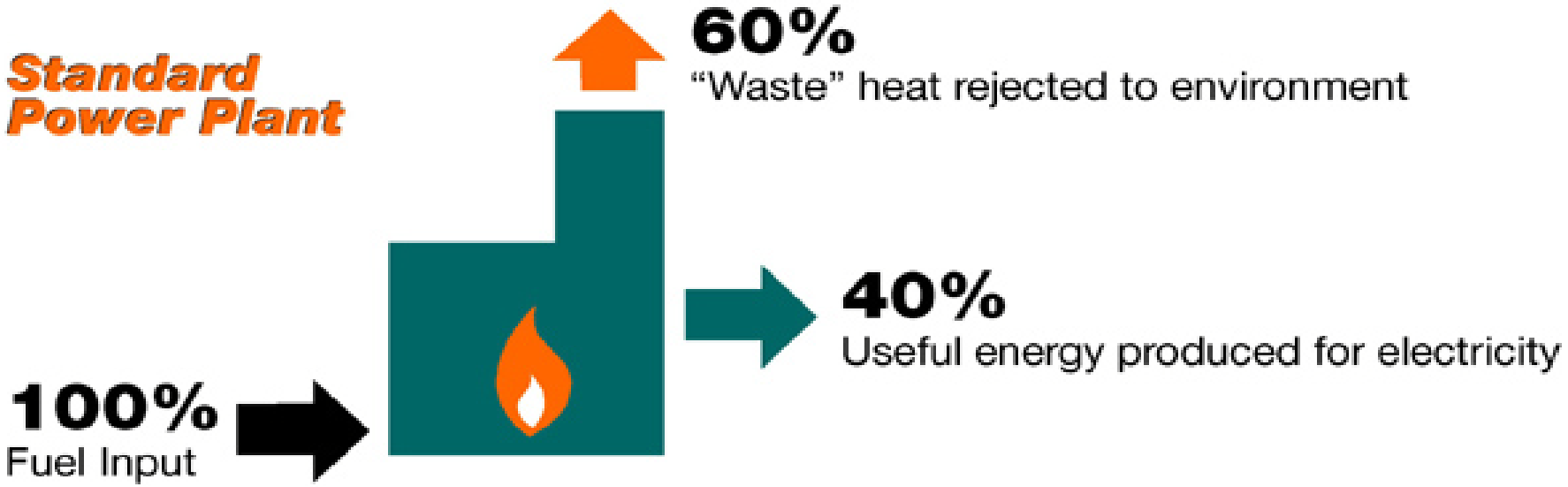
What is CHP and District Energy

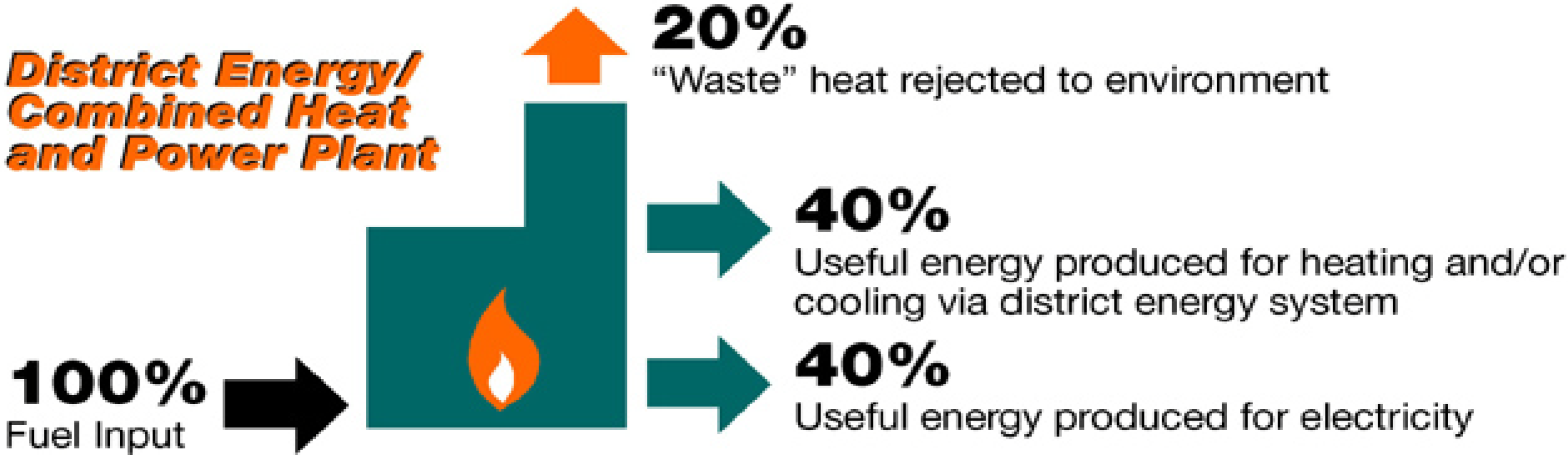
- Combined Heat and Power (CHP) is the concept of utilizing both the thermal and electricity resources when combusting fuel.
- District Energy is the distribution of thermal resource, in the form or Steam, Hot Water, or Chilled Water
- >100 year old Technology
- Widely used at campuses, military
- Many urban centers have DE systems in place, including Boston, NY, Detroit, Philadelphia, Baltimore and DC


Cooling Supply and Return
Heating Supply and Return

INTERNATIONAL DISTRICT ENERGY ASSOCIATION

Energy-Efficiency Comparisons





It’s a Proven Technology That Works

- Recent Example:
- Thermal Energy Corporation (TECO) Serves the Texas Medical Center – the largest medical center in the world with18 Institutions, all not-for profit, including 7 hospitals 2 medical schools and 3 nursing schools
- Largest district chilled water system in the Country – 120,000 tons
- $377 Million Expansion – Built by Burns and Mac
- Will save $200 million over 15 years
- Further improved reliability
- Reduces load on the Texas Grid & Assists with grid stress during peak demand
- Increased overall fuel conversion - Efficiency from 42% to over 80%
- Reduced carbon dioxide by 302,000 tons per year, equivalent to taking 52,000 cars off the streets

Texas Medical Center Campus, Powered by Efficient CHP and District Energy

This is the CHP system in the middle of the Texas Medical Center Campus

You can use heat to cool. These are steam driven chillers.

Utility Perspective

- Utility Boilers vs CHP Efficiency
  - Older utility boilers ~30 percent efficient
  - New combined cycle ~50-60 percent efficient
  - CHP can achieve >80 percent
- Utility Boilers vs CHP Efficiency Capacity
  - CHP is relatively small
  - Texas Grid 68000 MW vs. TECO 50 MW
- Incumbent utilities have established franchise rights to sell electricity

Why It's Worthy of Further Study

- Where feasible, it's possible to double efficiency and reduce fuel use by up to half
- Enables multiple fuels – natural gas, biomass, solar thermal
- Can reduce variability during peak summer months
- Looking for the Delta T
  - deep lake cooling, sewer heat exchangers, data centers, waste heat from MSW incineration

Interesting Policy and Program Initiatives/Challenges

- Congress considering Infrastructure Financing Authority – thermal infrastructure eligibility?
- Massachusetts – mandate thermal efficiencies for power plants (aka CAFE standards)
- Treatment of CHP/DE as eligible under RPS
- Big Challenge – enabling 3rd party sale of electricity where incumbent utilities have monopoly. 3rd parties often needed for project viability to provide finance and to realize tax benefits.

COG Areas of Focus

- Task Force started in Fall 2010
- Study Tours/Workshops
- Database of systems in our region
- Hired Consultant - FVB Energy
  - Review of policy and programs, gap analysis
  - Technology Summary, Costs/Benefits, Business Case
- Final Reports anticipated in November.

Policy and Program Preliminary Recommendations

- Recommendations from FVB Report:
  - Establish community energy working groups
  - Conduct opportunity assessments
  - Work with stakeholders to prepare Integrated Energy Master Plans
  - Develop model franchise agreements
  - Provide incentives for building owners to connect
  - Modify zoning to encourage density and locations for CHP plants
  - Require district energy feasibility studies

Air Quality Implications

- Preliminary Findings from FVB Study:
- Compared to traditional grid-connected building chiller/boiler solutions, the following emission reductions are possible:

	% Reduction in CO2	% Reduction in NOx	% Reduction in SO2
Engine CHP	187	328	650
Turbine CHP	97	228	394
Combined Cycle CHP	206	370	680

Final Thoughts...

- Commonly heard from practitioners/believers:
  - This is “Back to the Future”. It’s a proven technology that has been used for more than 100 years.
  - The U.S. invented this in the 1800s, but we are not world leaders in its implementation now.
  - Thomas Edison actually found that he could only make his electricity business profitable by selling the thermal resource as well.
  - We’re in the business of selling thermal resources, the electricity is just a by-product.
  - CHP and District Energy can increase efficiency, reduce costs, provide higher reliability, and enhance environmental protection.
  - Who wouldn’t want this deal?