The Role of Natural Gas: Delivering Solutions to Customers in a New Energy Economy

Presented to:
American Society of Gas Engineers

Presented by:
Energy Efficient Technology Department

June 7, 2011

SOUTHWEST GAS
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AGENDA

- Southwest Gas/EETD Background
- What is Southwest Gas/EETD Doing?
  - Formed Energy Efficient Technology Department
  - Delivering Solutions
    - Gas cooling (available today)
    - Gas cooling (on the horizon)

SWG Service Territory

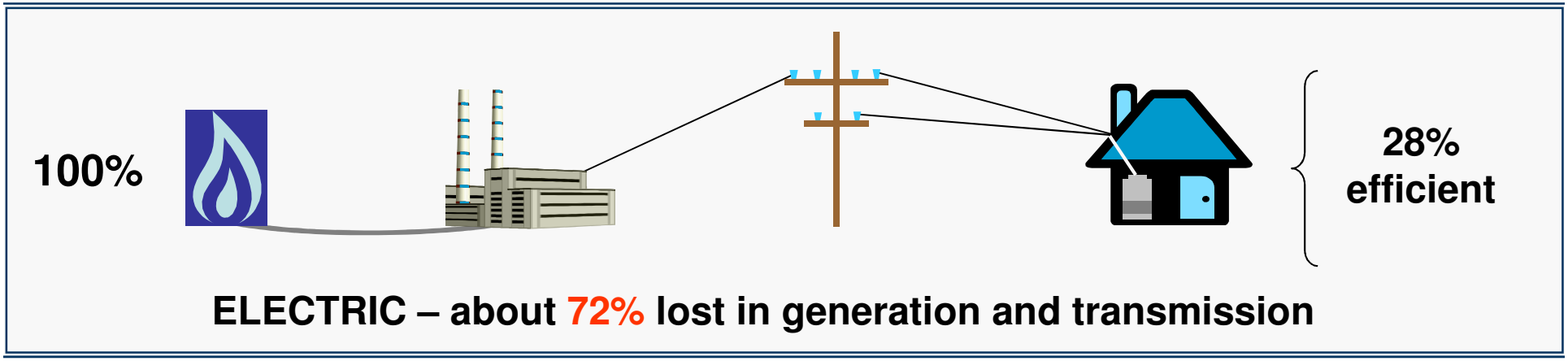
1.8 Million Customers

New Energy Economy for a Natural Gas Company

- Efficiency vs. overall efficiency
- Site vs. source (Full-Fuel-Cycle)
- Site only standards don't work in a carbon constrained global environment

RESOURCE OPTIMIZATION

Site versus Source



Fossil Fuel Emission Levels

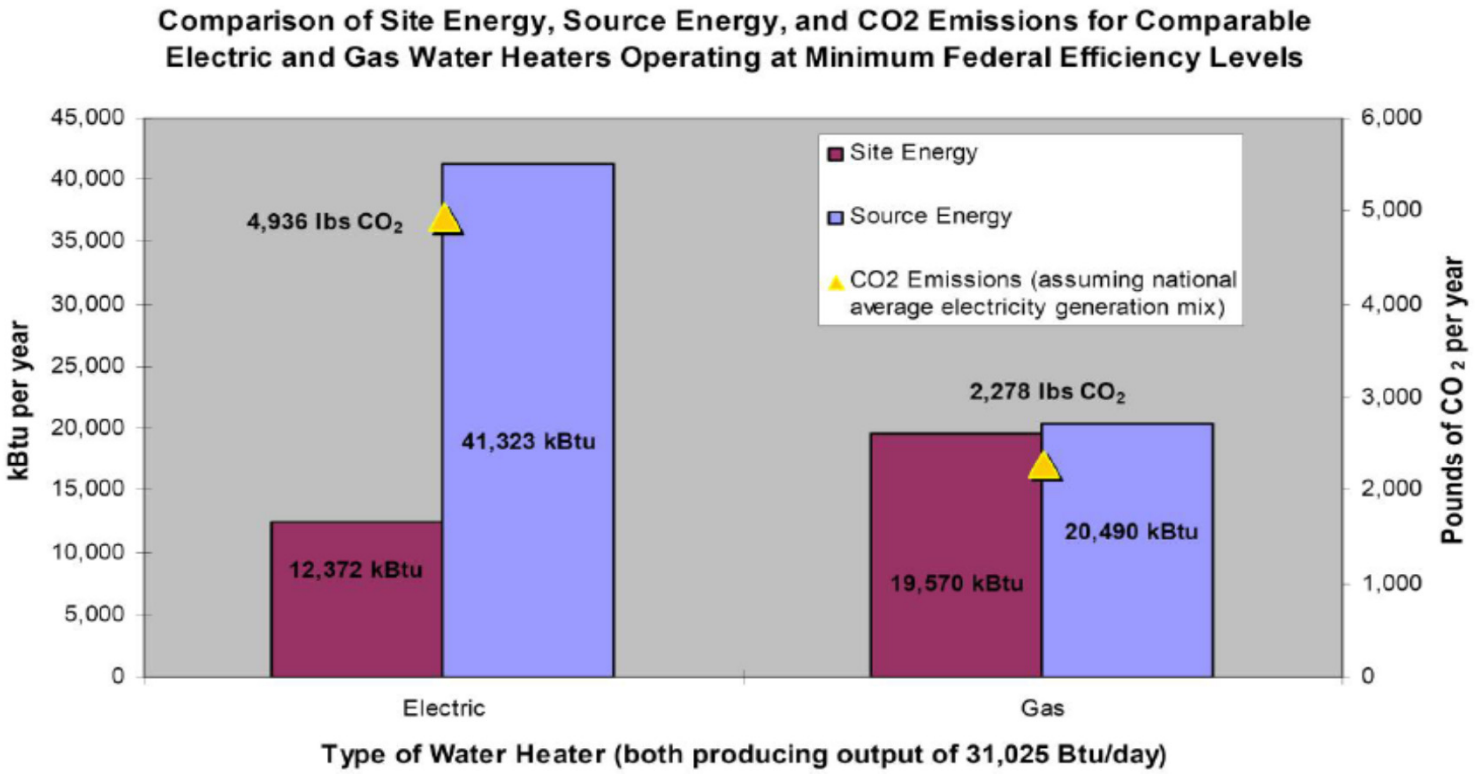
Pounds per Billion Btu's of Energy Input

Pollutant	Natural Gas	Oil	Coal
Carbon Dioxide	117,000	164,000	208,000
Carbon Monoxide	40	33	208
Nitrogen Oxides	92	448	457
Sulfur Dioxide	1	1,122	2,744
Particulates	7	84	2,744
Mercury	0.000	0.007	0.016

Source: Energy Information Administration (EIA) – Natural Gas Issues and Trends 1998

EPA Water Heater CO_2 Analysis

Example: Electric and Gas Water Heaters
Site vs. Source Energy Comparison



What is Southwest Gas/EETD Doing?

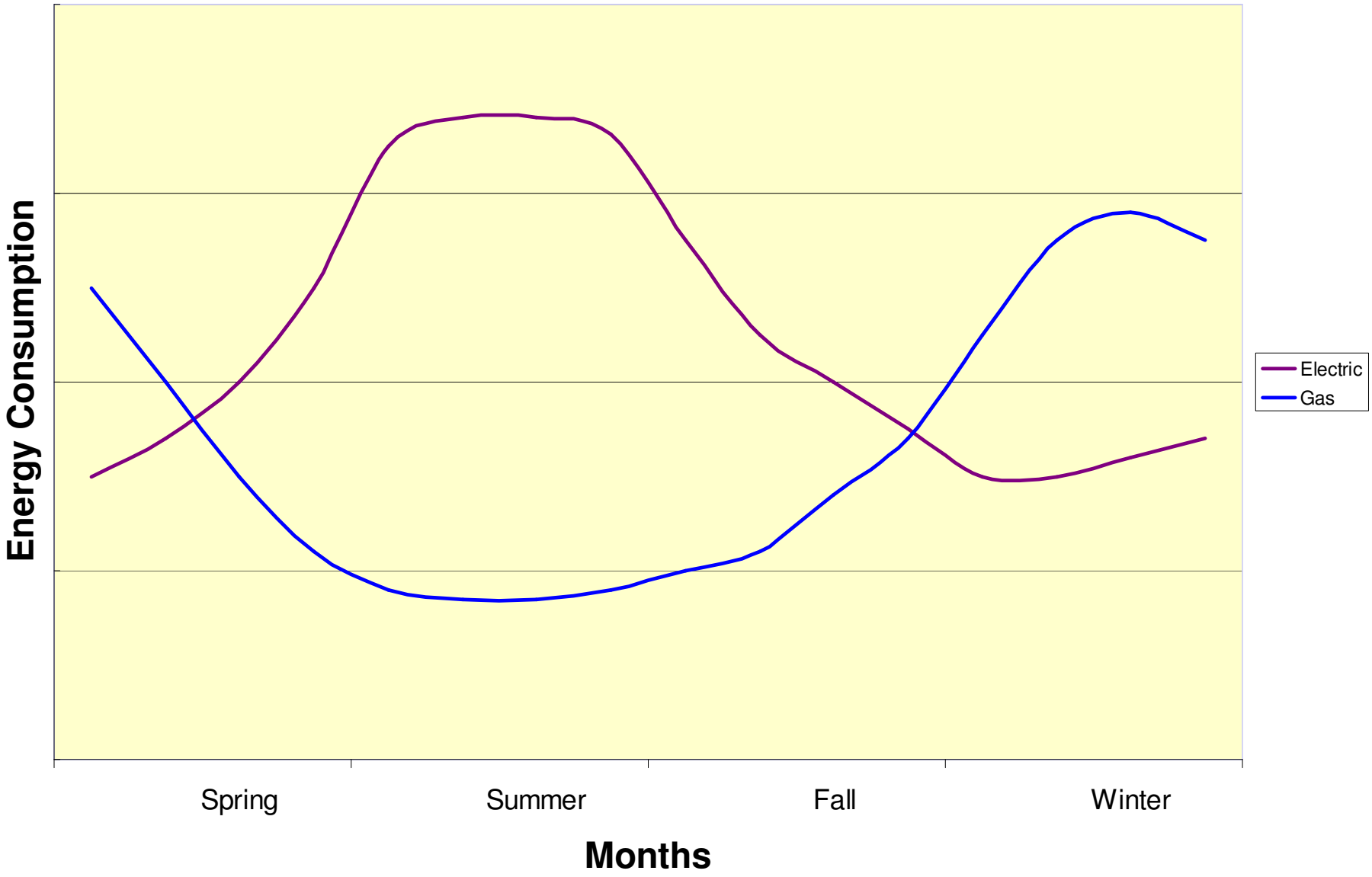
- SWG Energy Efficient Technology Department Projects:
  - Gas heat pumps (GHPs)
    - 8-ton & 15-ton multi-zone GHPs
    - 11-ton packaged GHP
    - Residential GHP in development
  - DSM program to increase customer awareness of energy efficient products on the market today

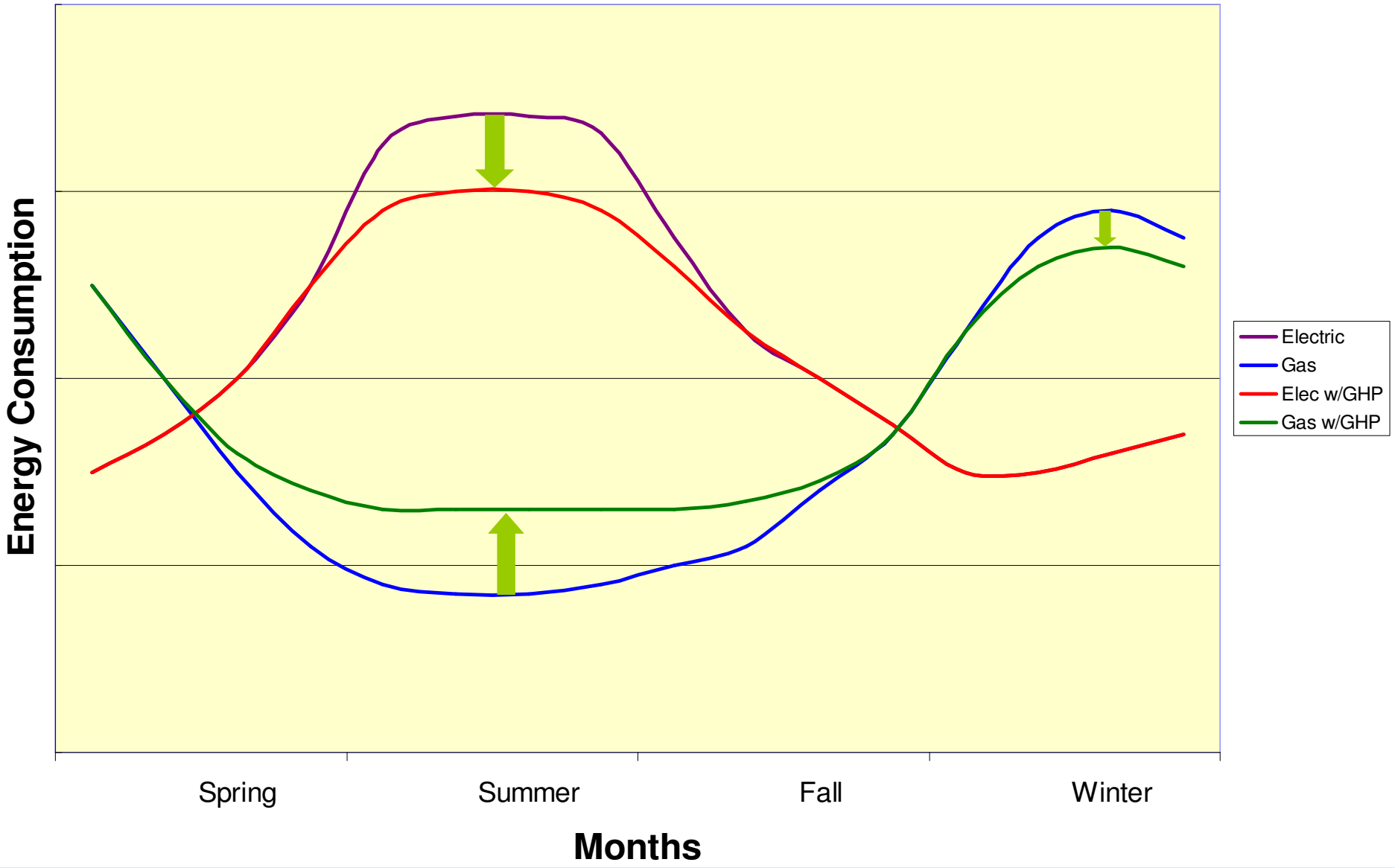
Gas-Fired Heat Pumps (GHP)

- The basic system for the heating and cooling cycle is the same as an electric heat pump (EHP)
- Main differences are:
  - A GHP uses a natural gas (or propane) fired engine to drive its compressors instead of an electric motor
  - Captures and uses waste heat from the engine
  - Variable speed / variable capacity (versus on/off for electric units)
    - Maximizing fuel economy
    - Maximizing comfort

Drivers for Gas Cooling

- Air conditioning load is the dominant energy use in the Southwest Gas service territory
  - Most of our customers are in the three largest metro areas (Las Vegas, Phoenix, Tucson)
- A viable solution to alleviate increasing electric demand
  - Gas cooling can save over 80% of the electric usage compared to electric air-conditioners
- Help flatten the company's load profile
  - Purchase more 12-month gas and less winter peak gas
- 100+ year supply of inexpensive natural gas


Energy Consumption
Electric
Gas
Spring
Summer
Fall
Winter
Months


Energy Consumption
Electric
Gas
Elec w/GHP
Gas w/GHP
Spring
Summer
Fall
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Months

Gas Heat Pumps – Packaged & Multi-Zone

Provides heating, cooling
& captures waste heat

Research, Development & Demonstration Partners

UTILITIES

SOUTHWEST GAS

Southern California Gas Company

A Sempra Energy utility™

RESEARCH

INTELLICHOICE ENERGY

DEPARTMENT OF ENERGY

NETL

OAK RIDGE National Laboratory

DEPARTMENT OF DEFENSE

US Army Corps of Engineers®

Engineer Research and Development Center

NEXTAIR 11-Ton Packaged GHP

NEXTAIRE Packaged GHP Overview

Features	Application	Benefits
➢ 11-ton ➢ R-410A ➢ Rooftop package ➢ Built in the U.S. ➢ Made for harsh temperatures of the desert Southwest	➢ Commercial ➢ Retrofit ➢ New construction ➢ Mounted on rooftop curb, similar to electric rooftop units	➢ Avoid high demand and time-of-use electric charges ➢ Highly efficient in both heating and cooling modes ➢ Captures and utilizes waste heat from the engine ➢ Saves water compared to electric units

Environmental Merit of GHPs

- Lower emissions
- Save primary energy
- Smaller carbon foot print
- Ozone friendly
- Water savings

2010 Product Award

NEXTAIRE GHP Demonstration

Department of Defense Demonstration Projects

- Barstow, CA (Barstow Marine)
- Phoenix, AZ (Luke AFB)
- Las Vegas, NV (Nellis AFB)
- Yuma, AZ (Yuma Marine)
- CA desert (Ft. Irwin Army)*

Tucson, AZ (Davis Monthan AFB)

- Kitchen
- IT Building
- Two Offices
- Weapons Hanger

** Fueled by propane*

Commercial Applications

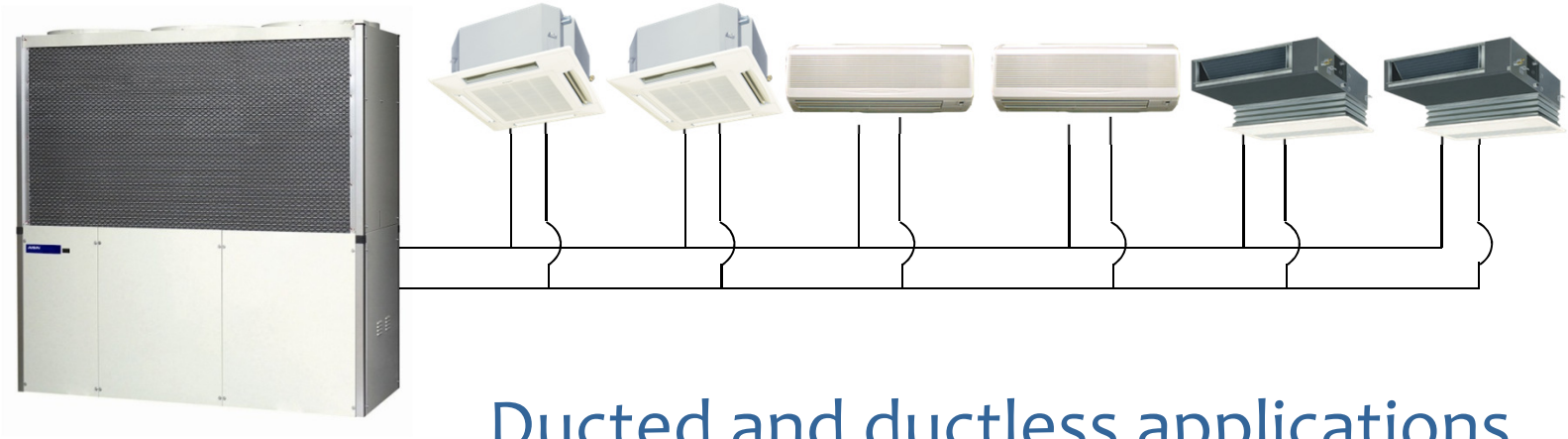
Future DOD Applications

- Power Generation
- Domestic Hot Water Heating
- Dark Start (operate when grid down)
- JP8

DOE Projects – Residential GHP

- Funded through a Cooperative Research & Development Agreement between SWG and ORNL
- Multi-function GHP – may include
  - Domestic Hot Water Heating
  - Hydronic Heating
- 3 – 5 Ton capacity single family unit

NEXTAIRE Multi-Zone Air Conditioning System



Ducted and ductless applications

NEXTAIR Multi-zone GHP

Features	Application	Benefit
• 8-ton & 15-ton • R-410A • Multi-Zones (up to 33 zones) • Ground or roof mounted • Designed to operate in extreme high and low temperatures • Space saver on existing or future mechanical rooms • Quiet as a whisper, 58 dB • Lower operating cost than two or four pipe systems • Manufactured in Japan	• Commercial buildings • Custom & semi-custom residential • New or retrofit construction • Ducted, ductless, or combination of both • Outdoor unit can be set back as far as 400 feet from the building • Up to a total of 1,706 relative feet • Can handle large 100, 200, 300+ tonnage applications	• Highly efficient in both heating and cooling modes • All-in-one heating and cooling unit • Multi-zone feature provides higher comfort level • Potential for innovative building design with ductless capabilities • Fully optimizing part loads (IPL) • Freeing up electricity for redistribution within the facilities

SWG Office Buildings

Bullhead City, Arizona

Phoenix, Arizona

SWG Office Building in Las Vegas

South Operations

Only 150 sq ft needed for almost 60 tons of conditioning

Site Savings – Energy / Water

One year of operation, July 2009 – July 2010

		Site Use								
HVAC System	Tons of Cooling Capacity	Natural Gas (therms)	Natural Gas Cost	Electric (kwh)	Electric Cost	Water Use (Gallons)	Water Cost	Total Energy & Water Cost	Cost / sq. ft.	Cost / ton cooling
GHP	113	42,000	$ 38,000	44,000	$ 5,000	-	$ -	$ 43,000	**$ 0.74**	**$ 381**
Gas Chiller/Gas Boiler	120	30,000	$ 27,000	269,000	$ 28,000	2,246,000	$ 7,000	$ 62,000	**$ 1.07**	**$ 517**
Electric Chiller/Gas Boiler	120	20,000	$ 18,000	629,000	$ 66,000	2,246,000	$ 7,000	$ 91,000	**$ 1.57**	**$ 758**

$19K savings (GHP vs. Gas Chiller)

$48K savings (GHP vs. Electric Chiller)

Note: Chiller and boiler systems are estimated based on calculations

Source Savings Energy / Water / Carbon

One year of operation, July 2009 – July 2010

		Source Use		
HVAC System	Tons of Cooling Capacity	Primary Energy (therms)	Total Water Use (gallons)	CO_2 Production (lbs)
GHP	113	54,000	18,000	540,000
Gas Chiller/Gas Boiler	120	68,000	2,354,000	680,000
Electric Chiller/Gas Boiler	120	101,000	2,498,000	1,010,000

Using Natural Gas On-Site Can Be a "Bridge" or "Super Highway" To a More Efficient, Secure, and Environmentally-Friendly Era of Energy Use.