Clean Fuels for California and the West

The Market for CHP in the West – Why Consider CHP Now?

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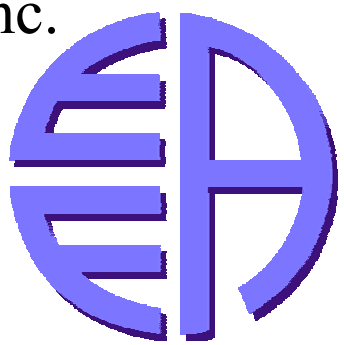
September 19, 2006
Newport Beach, CA



Agenda

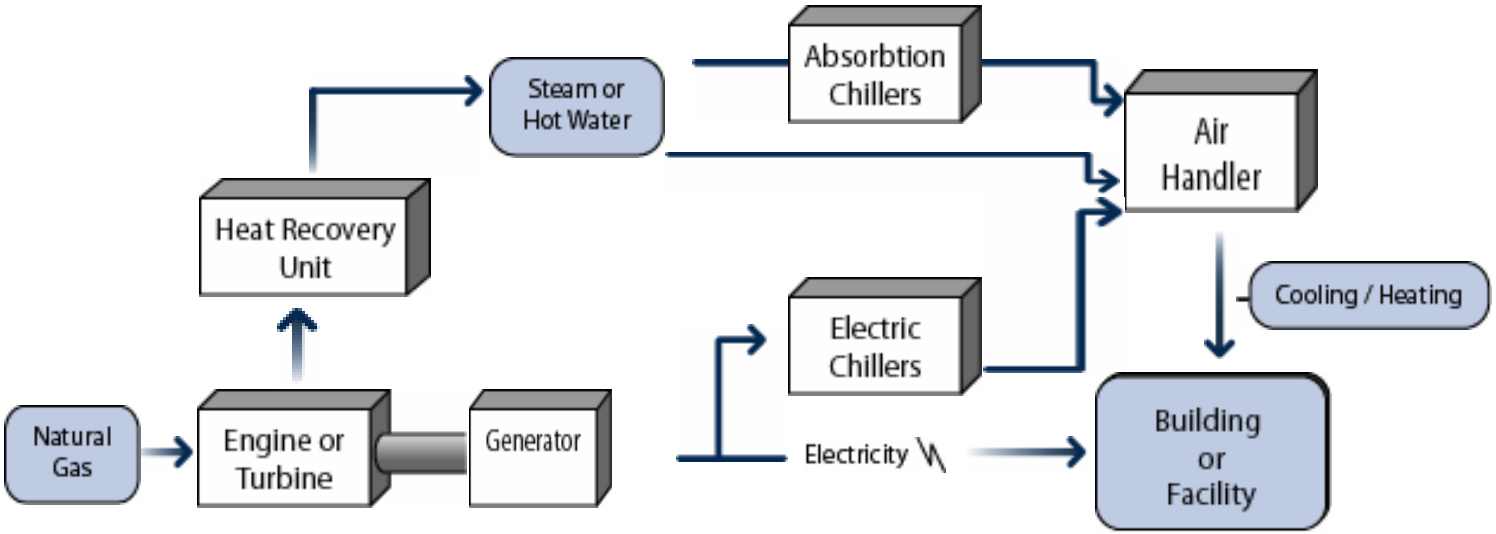
- Why CHP?
- How is CHP Currently Used in the West?
- What Are the Opportunities for Additional CHP?
- Why Should You Consider CHP Now?

What Is Combined Heat and Power?

CHP is an *integrated energy system* that:

- Is located at or near a building/facility
- Generates electrical and/or mechanical power
- Recovers waste heat for
  - ✓ heating,
  - ✓ cooling or
  - ✓ dehumidification
- Can utilize a variety of technologies and fuels

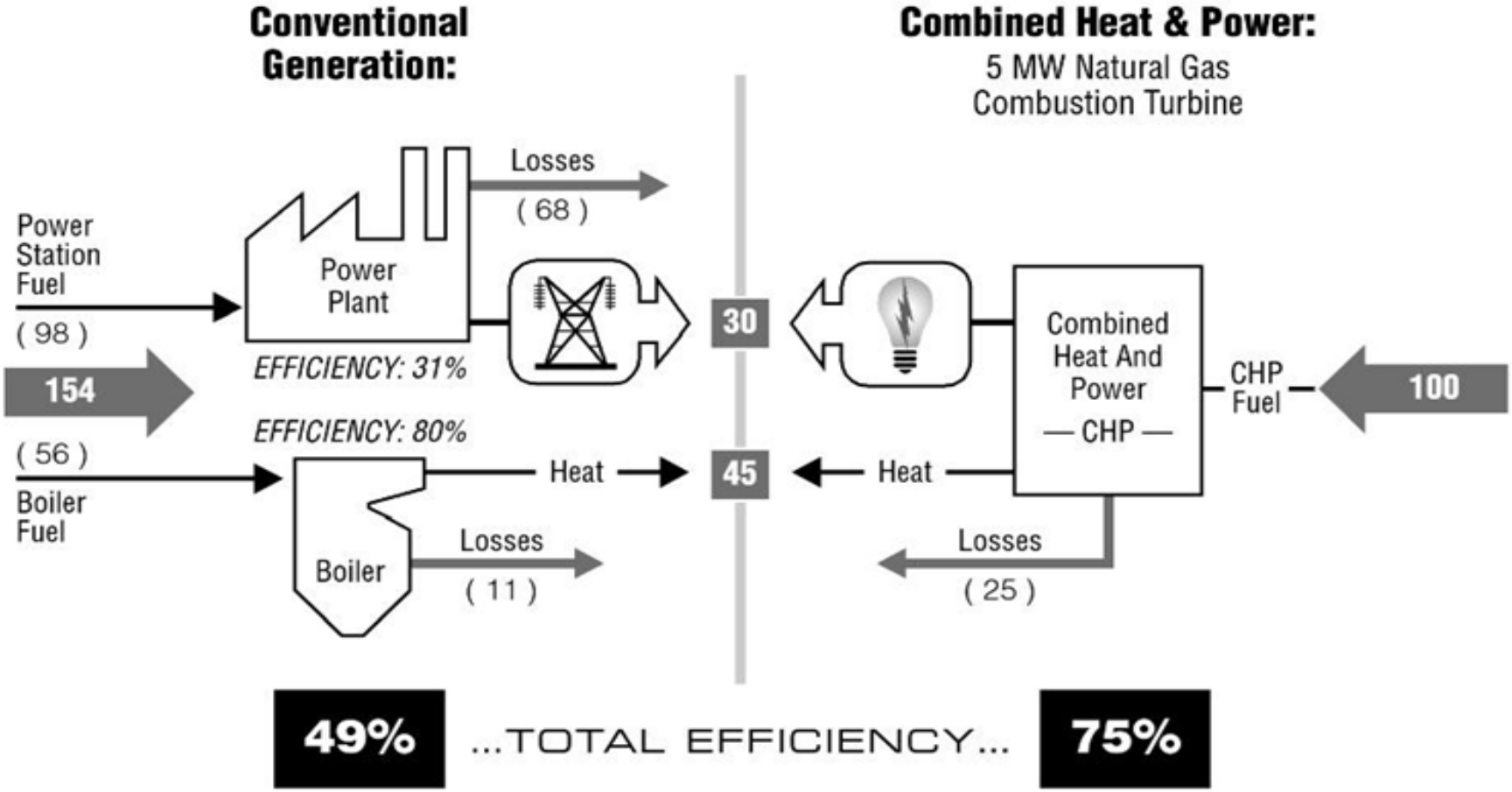
What Is CHP?


Steam or Hot Water
Absorbtion Chillers
Air Handler
Heat Recovery Unit
Cooling / Heating
Electric Chillers
Natural Gas
Engine or Turbine
Generator
Electricity
Building or Facility

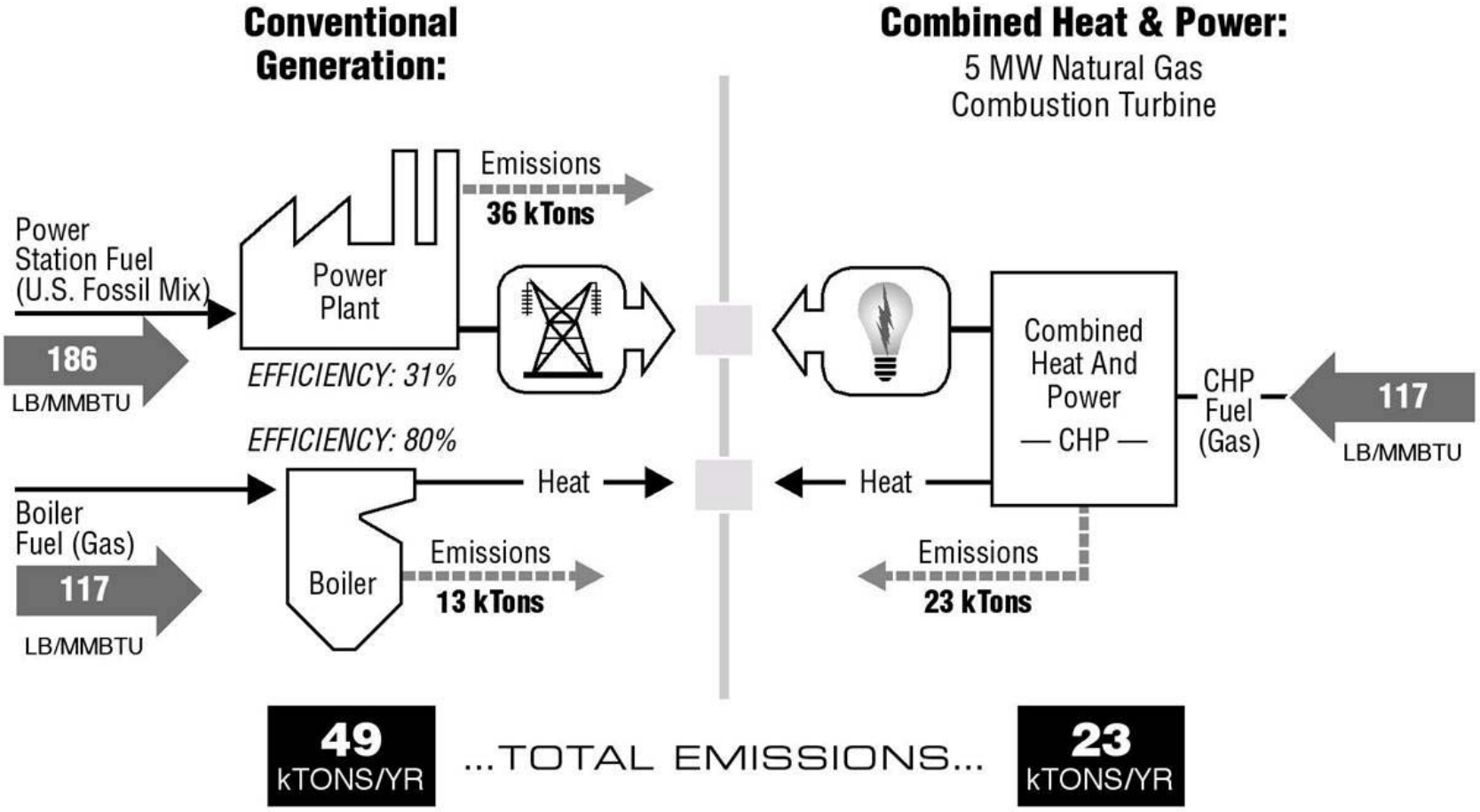
What Are the Benefits of CHP?

- CHP is *more efficient* than separate generation of electricity and heat
- Higher efficiency translates to *lower operating cost,* (but requires capital investment)
- Higher efficiency *reduces emissions of all pollutants*
- CHP can also *increase power reliability and enhance power quality*
- On-site electric generation *reduces grid congestion and avoids distribution costs*

Efficiency Benefits of CHP

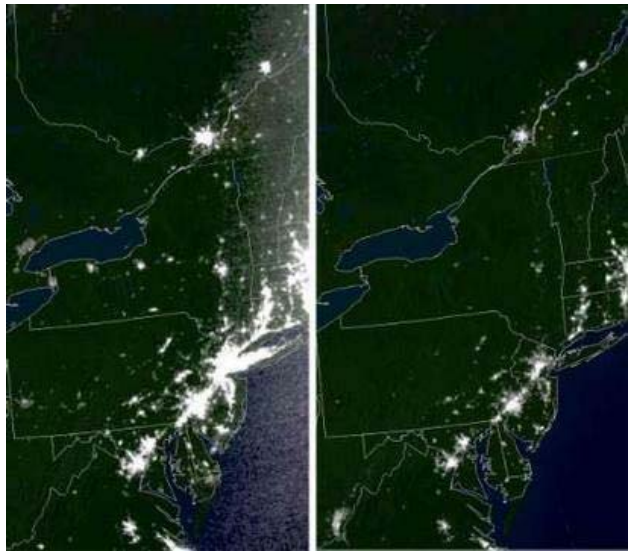


Environmental Benefits of CHP- CO2



Power Reliability Benefits of CHP

- Blackout of 2003: Affected portions of the Midwest, Northeast, and Ontario, Canada
- Power out for up to four days in some locations
- Over 50 million people affected
- Total losses estimated at $10 billion



Traditional Emergency Generators Had Problems

- "Half of New York City's 58 hospitals suffered backup power failures during the blackout" – *New York Times, 8/16/2003*
- "Lack of backup power allowed 145 million gallons of raw sewage to be released from a Manhattan pumping station" – *Times Union, 8/29/2003*
- "Jail's emergency generator fails during blackout, again…" – *Times Union, 8/16/2003*
- "Generator failures at a Verizon office …caused communications gaps for 911 dispatchers…" – *Daily News, 8/17/2003*

CHP Systems Kept Facilities Running

- Montefiore Medical Center; New York City
  - ✓ Site down for 5 minutes, then fully operational throughout the duration of the outage
- Spring Creek Towers, New York City
  - ✓ Independent of grid, never lost power and was able to provide for some needs of the community
- South Oaks Hospital, Amityville, NY
  - ✓ Seamless transfer to CHP system only; staff unaware of blackout until police call

CHP Kept Power on During Katrina

- Baptist Hospital, Jackson, MS
- 624 bed urban hospital, 3000 employees
- 3.2 MW gas turbine CHP system – installed 1994
- Steam used for hot water, sterilization and absorption chillers
- Grid down for 52 hours starting August 29, 2005 due to Katrina
- CHP system ran islanded and provided power, hot water and air conditioning

CHP Is Already Important to the West

- 10,155 MW of CHP capacity at 947 sites

	California	Arizona	Nevada	Hawaii
Retail Customers (1000s)	13,623	2,352	981	435
Generating Capacity (MW)	56,663	19,442	6,856	2,267
Generation (Million MWh)	184	94	32	12
Retail Sales (Million MWh)	235	63	29	10
Active CHP (MW)	9,121	167	321	544
CHP Share of Total Capacity	16.1%	0.9%	4.7%	24.0%

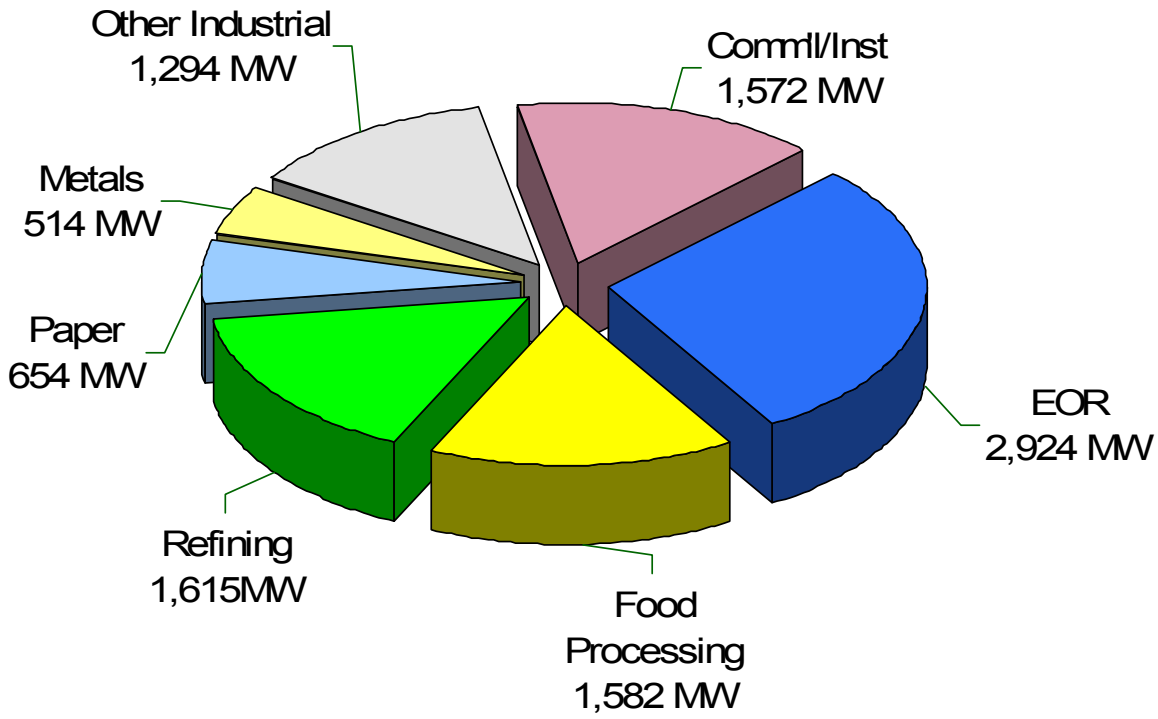
EIA 2002 data

Existing CHP in the West

- Average capacity is 10.7 MW
- 55% of installed capacity is in systems greater than 50 MW
- Existing CHP saves over 370 TBtu of fuel each year
- Existing CHP eliminates over 50 billion tons of CO2 emissions each year

Existing CHP Capacity in the West Is Primarily in Industrial Applications……

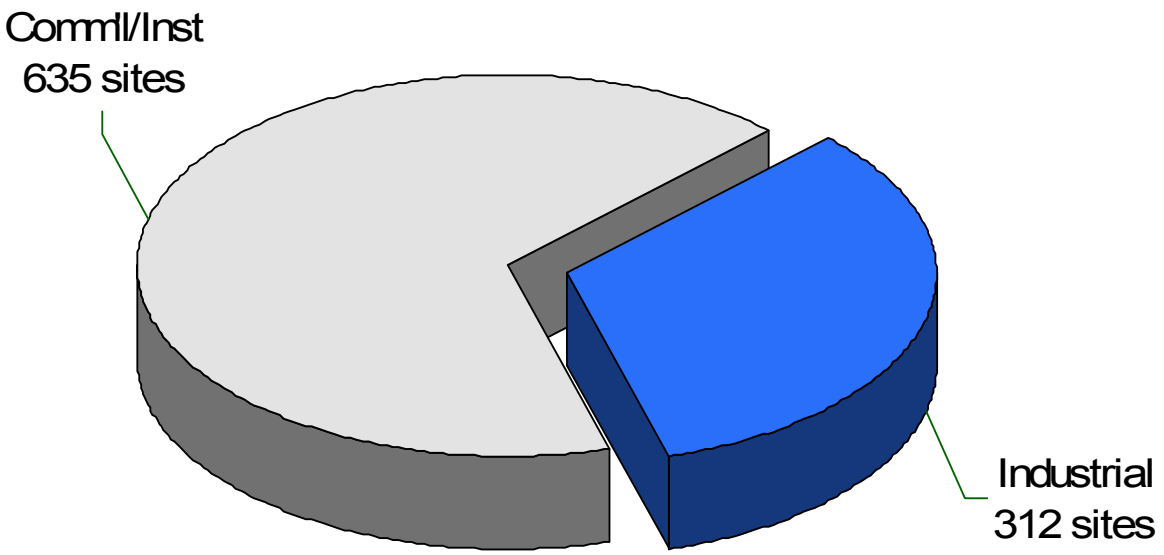
- *Existing CHP Capacity (2006) = 10,155 MW*



Source: EEA

But CHP Is Used by a Wide Variety of Commercial and Institutional Applications

- *Existing CHP Capacity (2006): 947 sites*



Source: EEA

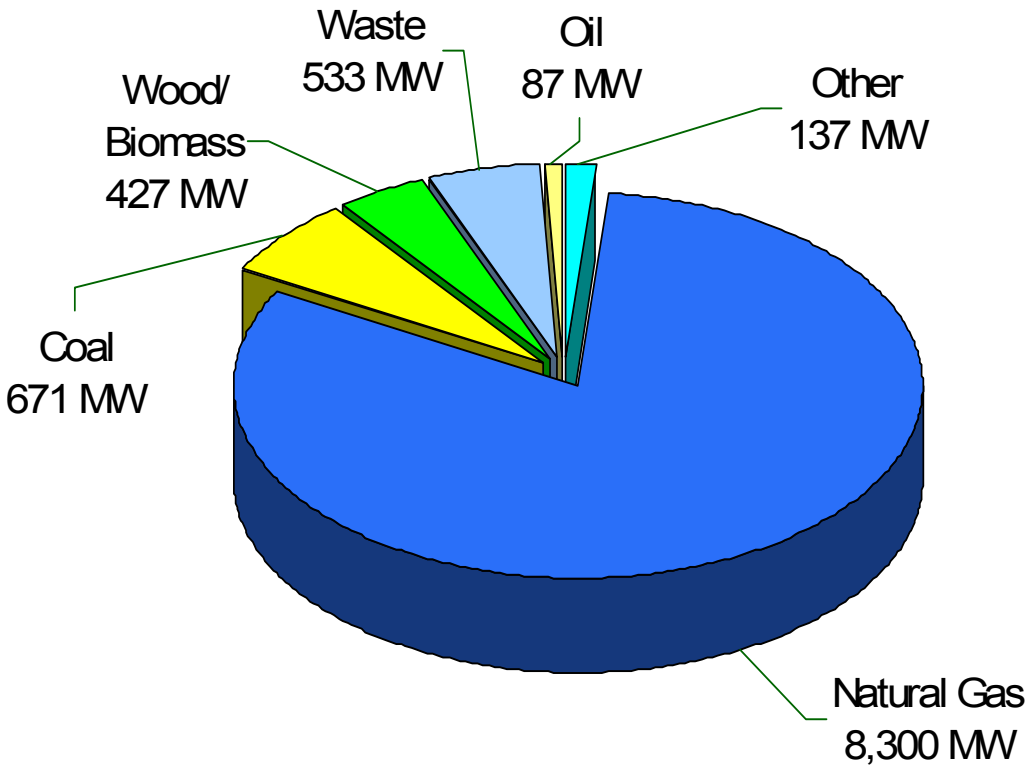
CHP In Commercial/Institutional Applications

Application	Number of Sites	Capacity, MW	Avg Size, kW	Technologies
Schools	109	9.1	83	Recip Engines, Microturbines
Laundries	64	1.1	17	Recip Engines
Hotels	67	36	537	Recip Engines, Microturbines, Fuel Cells
Health Clubs	46	6.2	135	Recip Engines, Microturbines
Colleges	50	330	6,600	Gas Turbines, Recip Engines
Hospitals	49	184.7	3,769	Gas Turbines, Recip Engines, Boiler/Steam
Office Buildings	43	34.9	812	Recip Engines, Microturbines, Fuel Cells
Waste Water Treatment	32	116.6	3,644	Recip Engines, Gas Turbines, Microturbines
Apartments/Condos	29	2.0	69	Recip Engines, Microturbines
Nursing Homes	17	4.9	288	Recip Engines
Government Facilities	32	150	4,688	Recip Engines, Gas Turbines, Microturbines
Military Facilities	12	157.2	13,100	Recip Engines, Gas Turb ines

Source: EEA

Existing CHP in the West Is Primarily Natural Gas Based…..

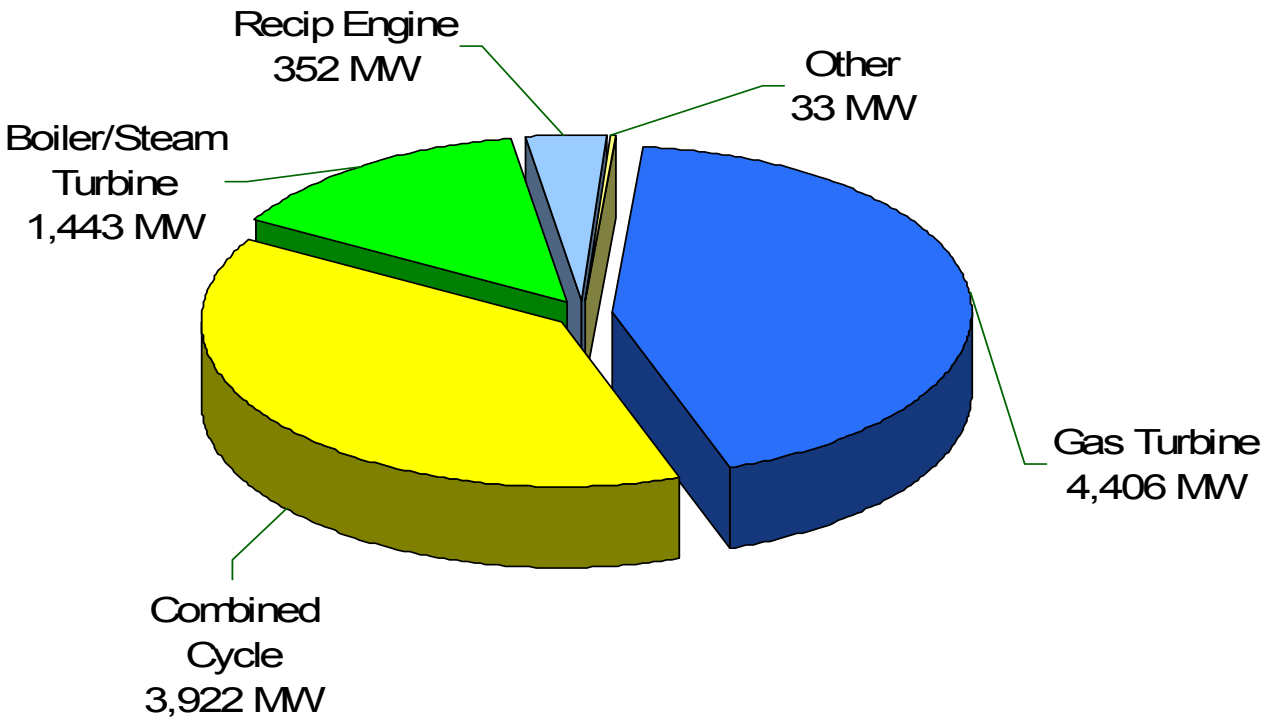
- *Existing CHP Capacity (2006): 10,155 MW*



Source: EEA

But Uses a Variety of Technologies

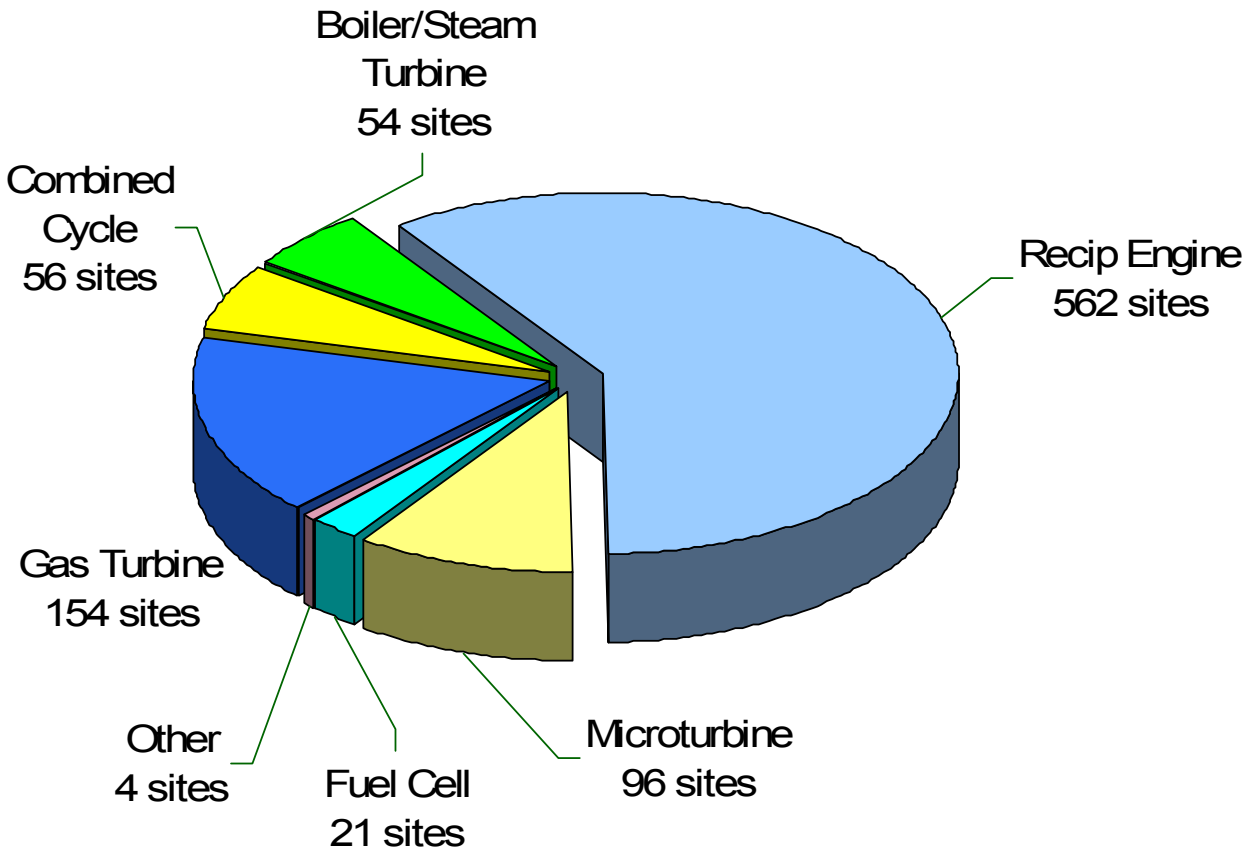
- *Existing CHP Capacity (2006): 10,155 MW*



Source: EEA

Recip Engines Are the Systems of Choice

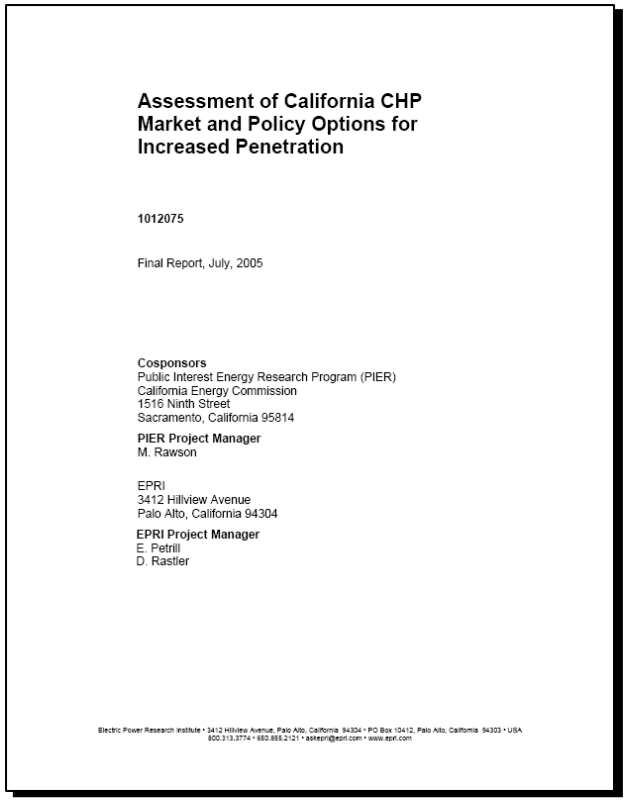
- *Existing CHP Capacity (2006): 947 sites*



Source: EEA

What Is the Remaining Opportunity for CHP in the West?

- Studies for CEC and DOE
- Evaluated technical and economic potential for CHP
- Considered commercial and industrial applications with thermal and electric loads conducive to CHP



Assessment of California CHP Market and Policy Options for Increased Penetration

1012075

Final Report, July, 2005

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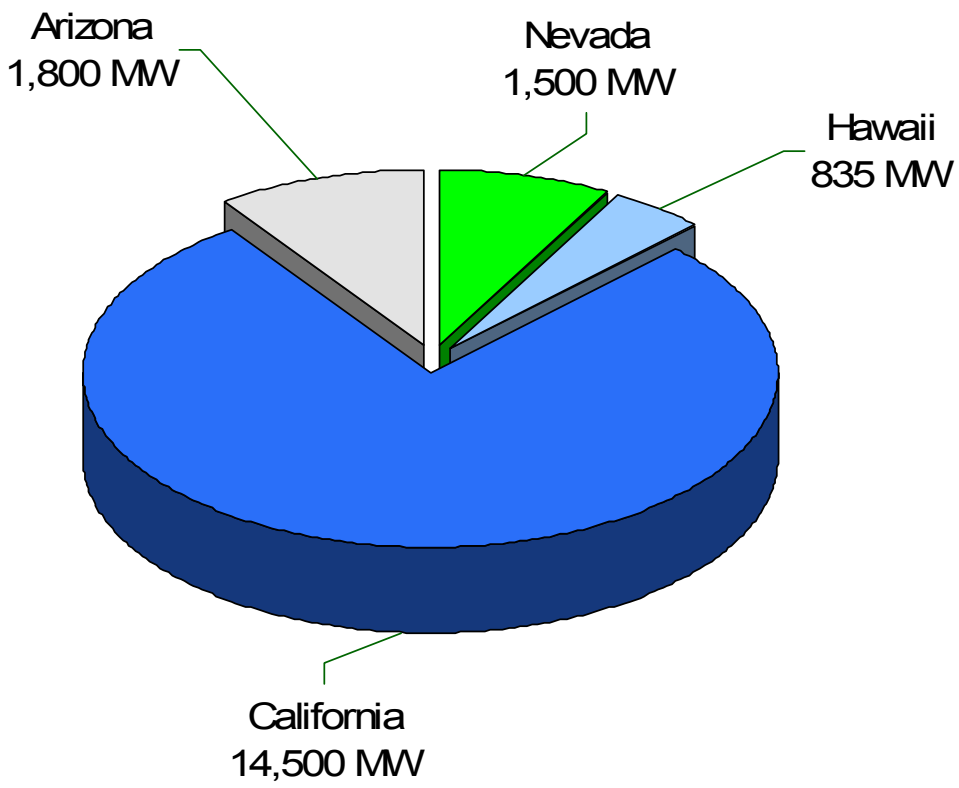


Future Opportunity Is Very Different from Existing CHP Profile

- Two thirds of the opportunity is in commercial/institutional applications
- Primary opportunity is within the fence systems sized for thermal loads
- Over 75% of the potential is in systems below 5 MW in size
- Much of the potential is in applications with limited experience with CHP
  - ✓ Industrial – fabrication and assembly, food processing, chemicals
  - ✓ Commercial – lodging, hospitals, schools, office buildings, wastewater treatment, nursing homes
- Potential to utilize non-traditional fuels

Will this Potential be Realized?

- Is CHP worth considering? Are there any operational savings?
- Is CHP potentially compelling? Are there other values or cost offsets which will positively affect the economics of the project?

What Can CHP Offer Users?

- Reduces energy costs
- Enhances power reliability and power quality
- Provides a hedge against unstable energy costs
- Reduces greenhouse gas emissions and other environmental impacts
- Contributes to a *Green* image

The CHP Value Equation

- Reduced purchased electricity costs

+ Incremental fuel costs

+ Incremental O&M costs

+ Incremental capital expenditure

- Displaced capital?

- Reliability or other operational savings?

Overall Savings

Is Your Site a Good Candidate for CHP?

- Do you pay more than $.07/ kWh for electricity?
- Are you concerned about high or rising utility costs?
- Does your facility have a central chilled water system?
- Are you considering adding or replacing backup generators?
- Are you planning an expansion, new construction or major retrofit of your facility?
- Do you have access to alternative fuels?
- Are you interested in reducing the environmental impact of your site's operations?

What Stands in the Way?

- CHP systems cost too much
- Natural gas prices are too high
- CHP technologies are too risky
- Generation is not my core business

CHP Systems Cost Too Much

- California *Self Generation Incentive Program*
  - ✓ $600 to $1,000 per kW incentive
  - ✓ Payments applied up to 1,000 kW in capacity (for systems up to 5,000 kW in size)
  - ✓ Over 200 CHP systems representing 125+ MW funded since 2001
- Non-traditional financing options
  - ✓ Third party financing
  - ✓ Build, Own, Operate
- Integrated packages emerging

Vineyard 29, Napa Valley, California

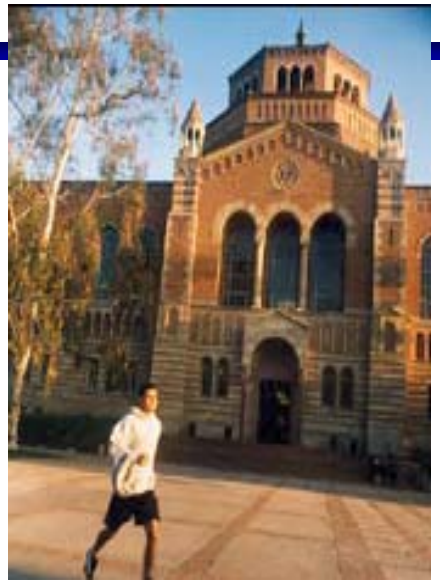
- Two Capstone microturbines installed in 2003
- 120 kW power; 800,000 Btu/hr hot water and 22 tons chilling
- Qualified for *$120,000 SGIP* payment

- 3 year payback (including SGIP)
- Eliminated the need for a standby generator

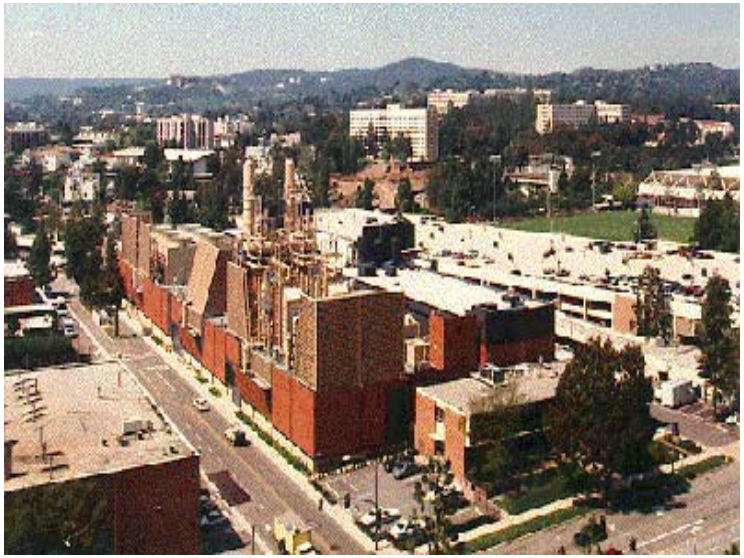
Natural Gas Prices Are too High

- Efficiency can be a critical hedge when energy prices are high
- CHP gas rates available – discount from regular distribution tariffs
- Explore alternative fuels
  - ✓ Biomass
  - ✓ Process wastes

University of California Los Angeles



- Two 14.5 MW gas turbines / 13 MW steam turbine – installed in 1993
- 43 MW system provides 85% of campus electricity needs and 234 MMBtu/hr thermal energy for heating and cooling
- Natural gas use cut by one third through the use of landfill gas from nearby Mountaingate Landfill



- 36 ton reduction in smog-forming pollutants per year
- System has enhanced power reliability to the campus – supplied power to the surrounding area during Northgate earthquake

Technologies Are Too Risky

- Over 560 reciprocating engine CHP systems reliably operating in California – some since the mid 1980s
- Close to 100 microturbine systems in operation in a wide variety of applications (over 2500 microturbine units sold worldwide)
- Integrated packages entering the market incorporating proven prime movers, chillers and controls
- Developers/suppliers offering service packages and guarantees

Generation Is Not My Core Business

- Let the experts do it
  - ✓ Service contracts
  - ✓ Operating contracts
  - ✓ Build, own operate

Where Can I Get More Information?

- Pacific Region CHP Application Center- www.chpcenterpr.org
- U.S. DOE - www.eere.energy.gov/de
- ORNL - www.ornl.gov/sci/eere/der
- EPA CHP Partnership - www.epa.gov/chp
- U.S. CHP Association – www.uschpa.org
- California Energy Commission - www.energy.ca.gov/distgen

Thank You!

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