

# CHP with Combustion and Steam Turbines

**Presented by  
EDWARD STOERMER  
LATHROP TROTTER CO  
513-833-5800**

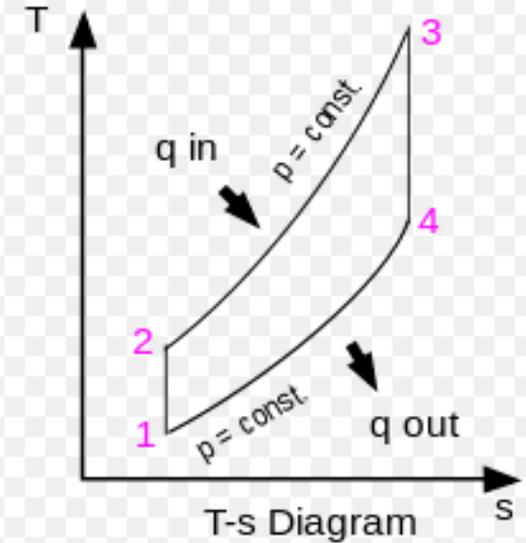
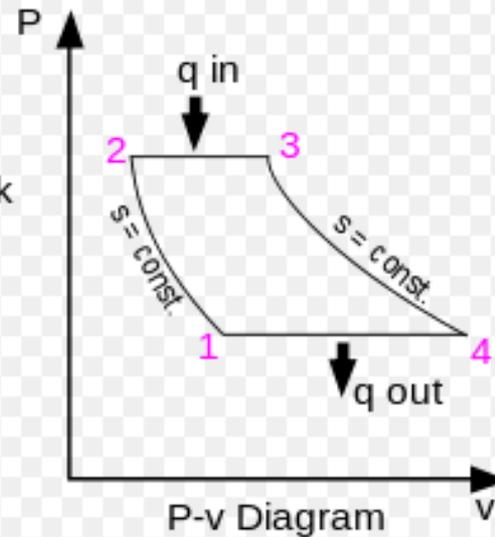
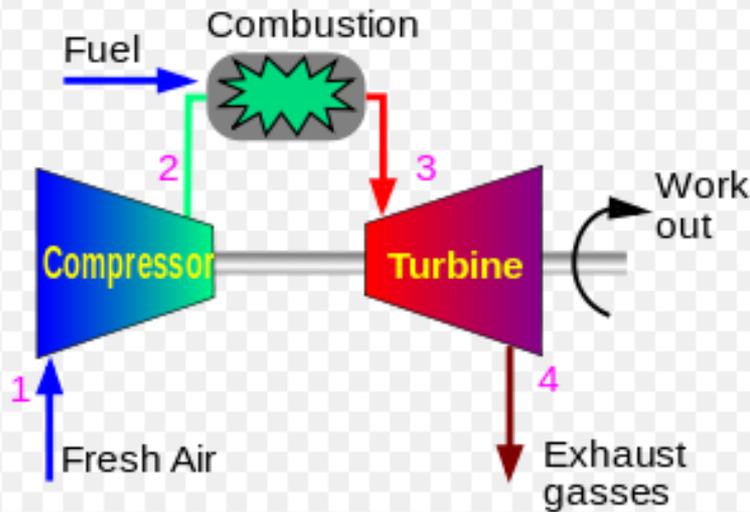
# Solar Turbines has Extensive Experience in CHP



**Over 14,900 Units Installed Worldwide**

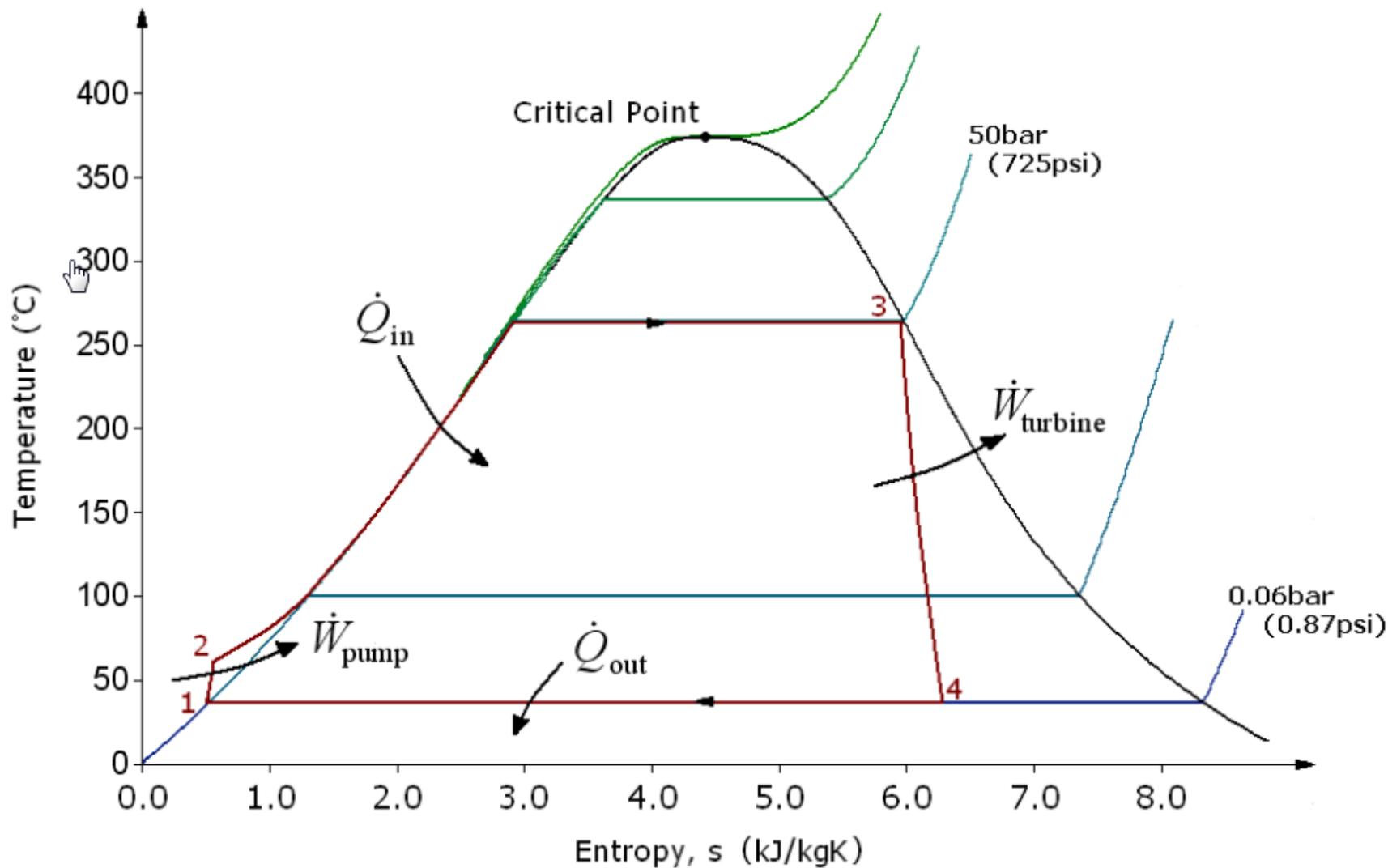
**Over 1.5 Billion Operating Hours**

**Installations in 94 Countries**

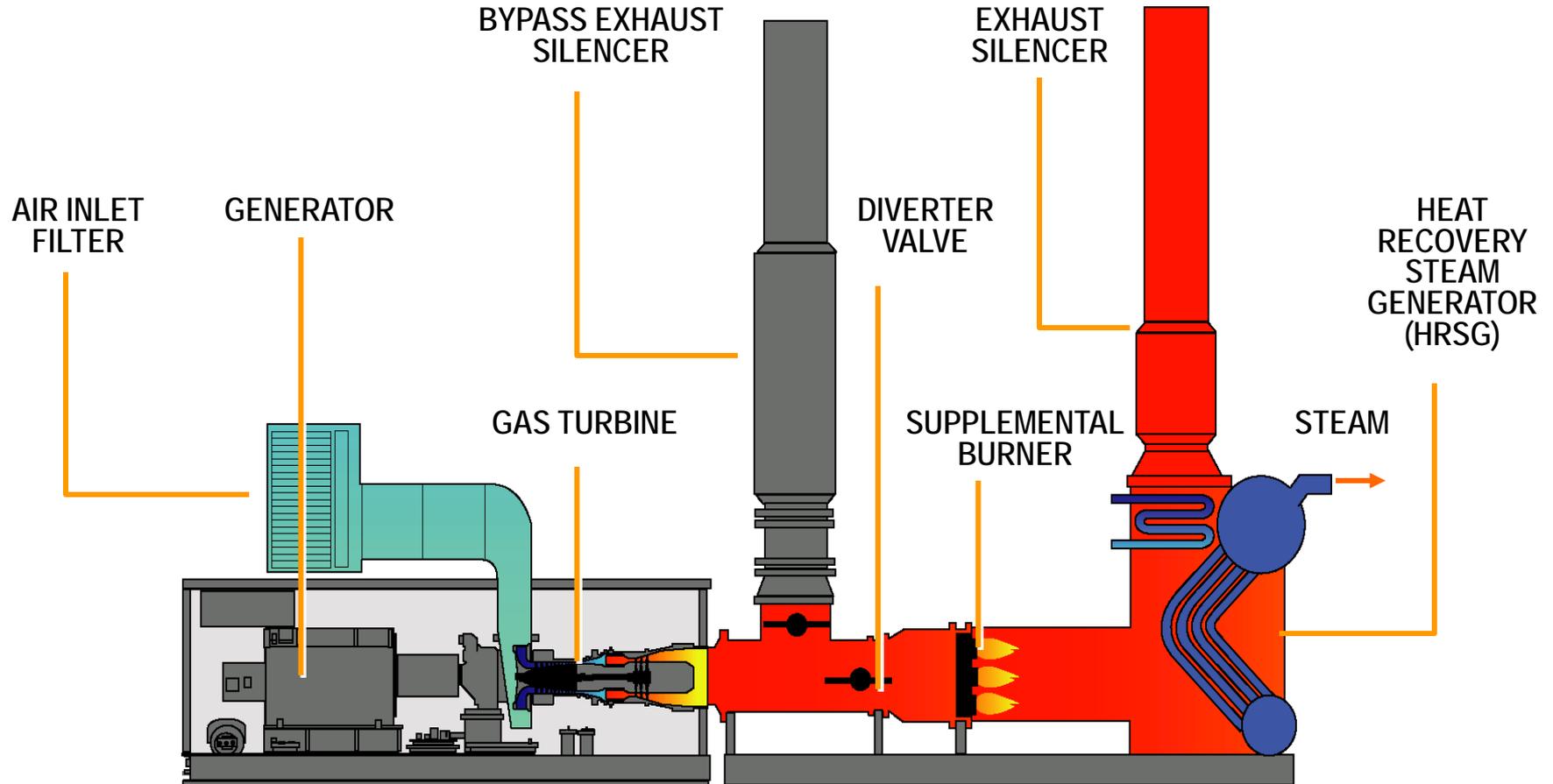


<http://www.youtube.com/watch?v=qRjHYcuwQHQ&feature=youtu.be>

# Rankine Steam Cycle



# CHP SYSTEM WITH SUPPLEMENTAL FIRING



# GENERATOR SET PERFORMANCE

PRODUCT	POWER MWe	HEAT RATE Btu/kW-hr	SITE SPECIFIC POWER– Thousand lbs/hr				
			EXHAUST TEMP °F	EXHAUST FLOW lb/hr	STEAM PRODUCTION		
					UNFIRED	FIRED 1600°F	FIRED 2800°F
Saturn 20	1.2	14 025	952	51.5	8.9	18.5	40.0
Centaur 40	3.5	12 240	835	149.6	19.6	53.3	113.2
Centaur 50	4.6	11 630	956	150.3	25.3	53.0	112.4
Mercury 50	4.6	8 863	710	140.4	13.8	49.4	104.4
Taurus 60	5.7	10 860	960	171.3	29.8	62.0	130.5
Taurus 65	6.3	10 373	1032	163.4	32.1	60.5	128.3
Taurus 70	7.5	10 100	914	212.3	34.4	76.1	158.6
Mars 90	9.5	10 710	875	316.2	46.8	113.3	239.5
Mars 100	10.7	10 520	915	329.1	51.8	117.4	248.1
Titan 130	15.0	9 695	932	392.2	64.5	141.4	298.2
Titan 250	21.7	8775	865	541.5	77.5	298	

*ISO Performance: 59F (15°C); Sea Level; No Inlet and Exhaust Losses.*

*Specific Site Performance: 102 mm (4 inches) Inlet, 254 mm (10 inches) Exhaust Losses; Saturated Steam @ 10.3 Bar (150 psig)*



*Food Processing*



*Pharmaceutical*



*Pulp and Paper*



*Manufacturing*



## 30 MW Natural Gas and Refinery Gas CHP





**Solar Turbines**

*A Caterpillar Company*

# 30 MW LFG GTCC Plant In Southern California



# University that Replaced Coal with NG CHP



**Solar Turbines**

A Caterpillar Company

# 100 MW Waste to Energy IGCC Plant that Burns MSW



STOC03ML-13





2 x 14 MW GT w/ 80,000 lb/h HRSG

1 x 5 MW ST





Kent State University



University of Cincinnati

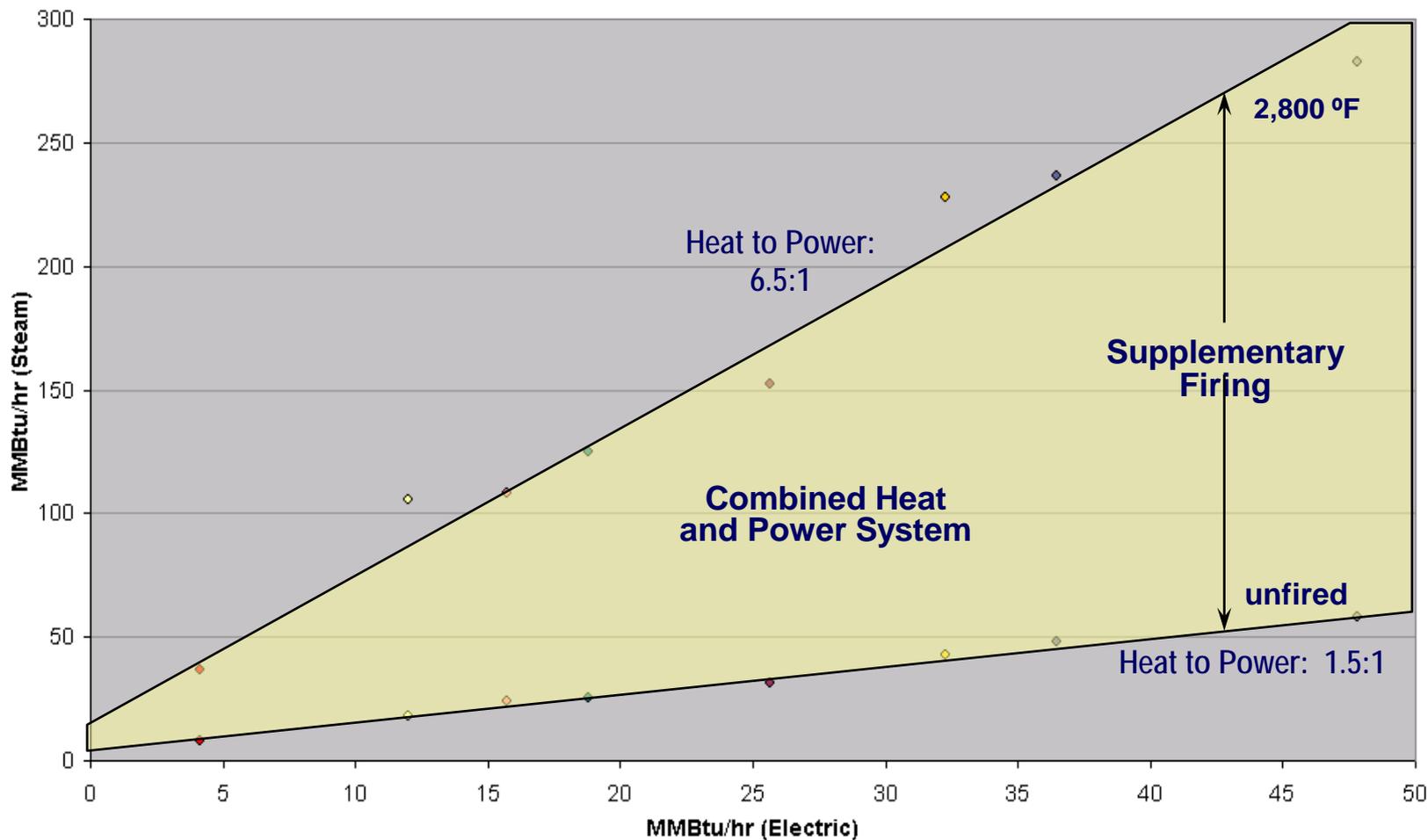




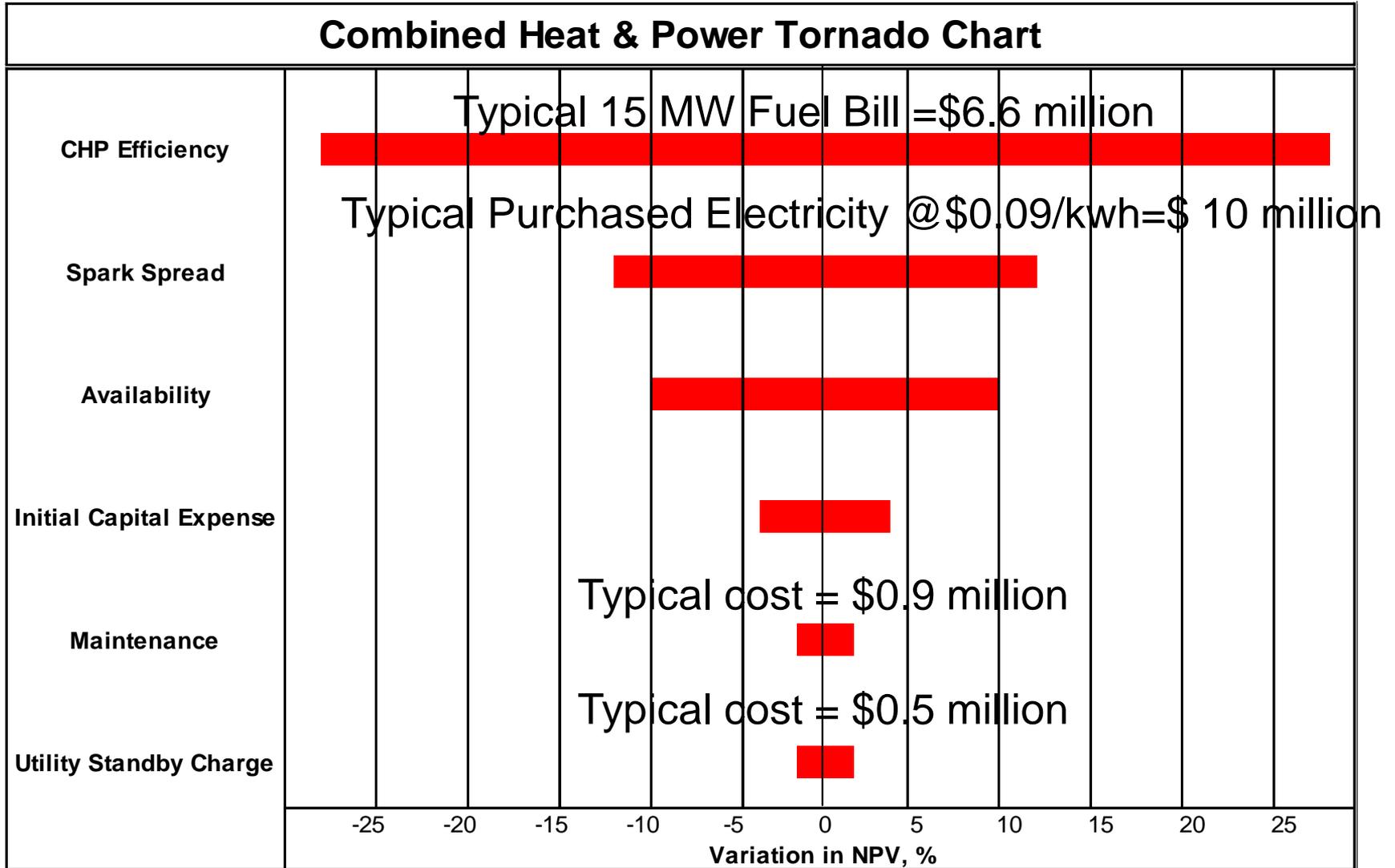
## CHP is also for Chilled Water



# HEAT / POWER RATIOS FOR CHP



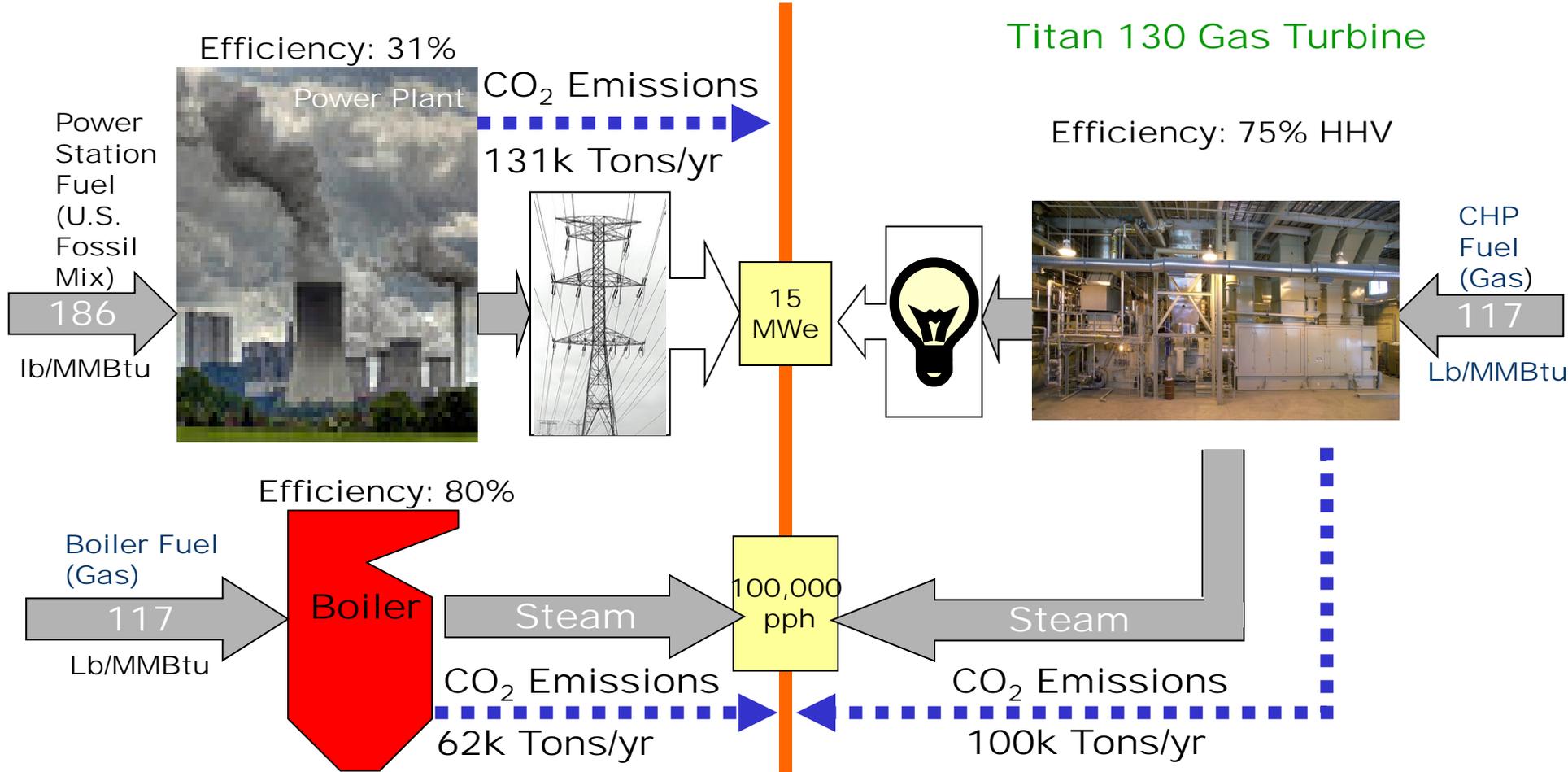
# Factors that Impact CHP Economics



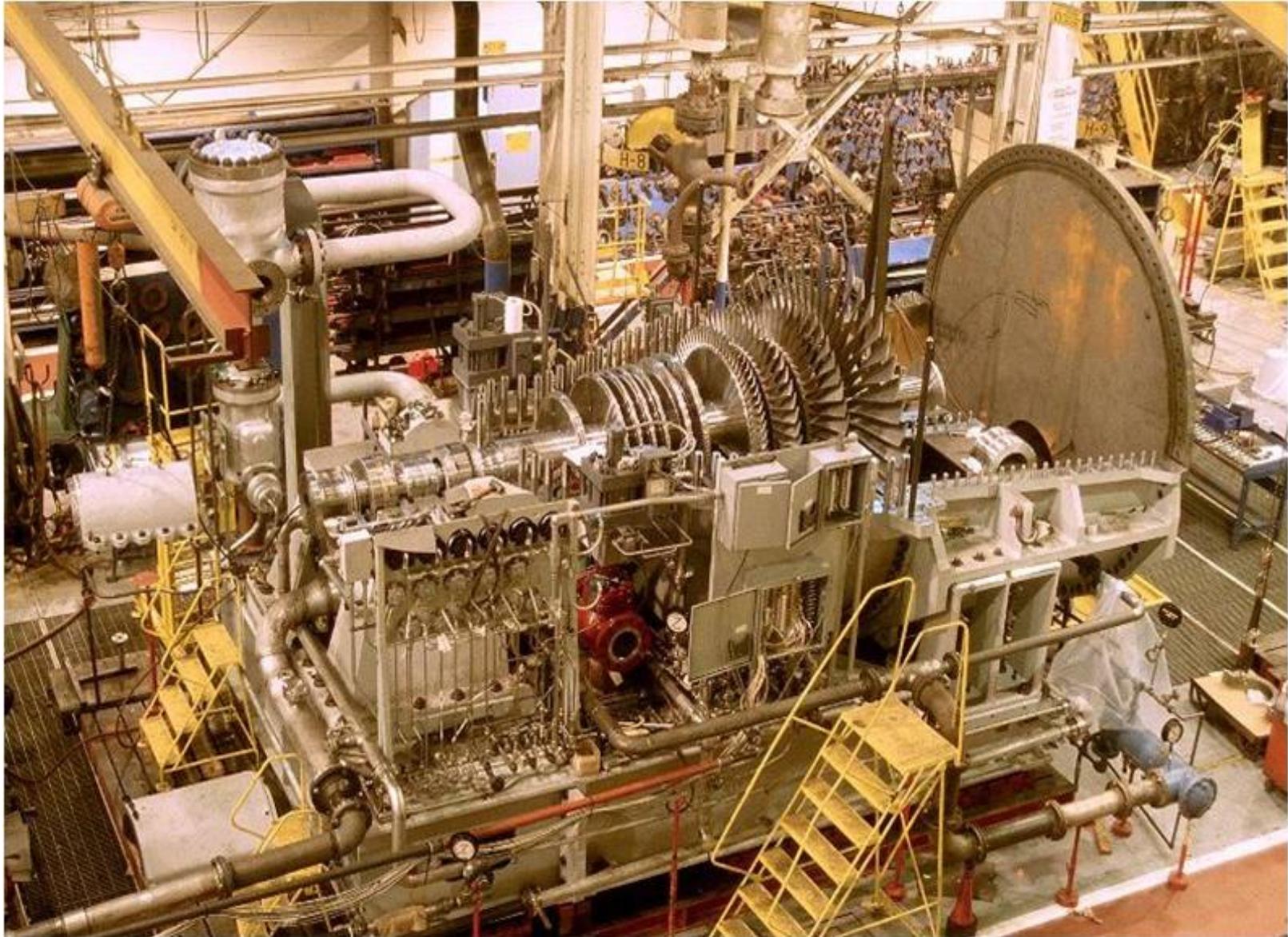
Note - input parameters were each varied +/- 5%.

### Conventional Generation

### Combined Heat & Power: Titan 130 Gas Turbine



# 55 MW Dresser Rand Steam Turbine



## Lathrop Trotter local Rep for Dresser Rand Steam Turbines

- Five steam turbine manufacturing facilities in the US and Europe
- Single Stage Back Pressure Steam Turbine Drives and TG Sets up to 3.5MW
- Inlet Conditions up to 900PSIG/950 Degrees F  
Back Pressures up to 175 PSIG
- Multistage Steam Turbine Drives and TG Sets up to 100 MW
- Inlet Conditions up to 2000 PSIG/1050 Degrees F.
- Condensing/Non-Condensing/Single or Double Auto Extraction



## Questions and Discussion

Ed Stoermer

1-513-833-5800

Email: [ed.stoermer@lathroptrotter.com](mailto:ed.stoermer@lathroptrotter.com)

**T.J. Mueller**  
Sales Engineer

**The Lathrop-Trotter Company**  
5098 Oaklawn Drive Cincinnati, Ohio 45227  
Office: (513) 731-5000 x 104 / Cell: (513) 477-1931  
Fax: (513) 731-5004 / Email: [tj.mueller@lathroptrotter.com](mailto:tj.mueller@lathroptrotter.com)

