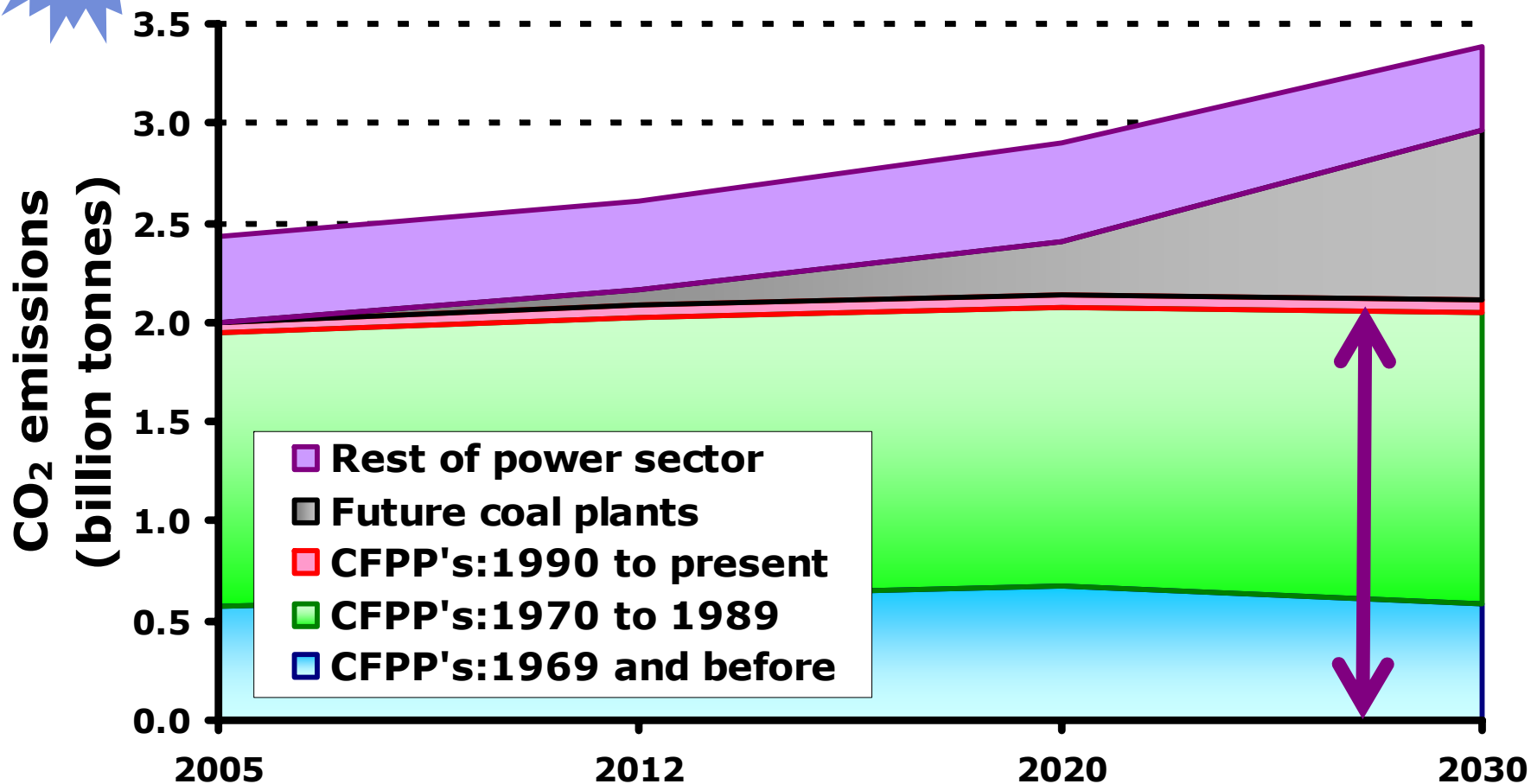
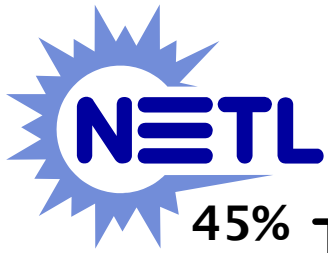


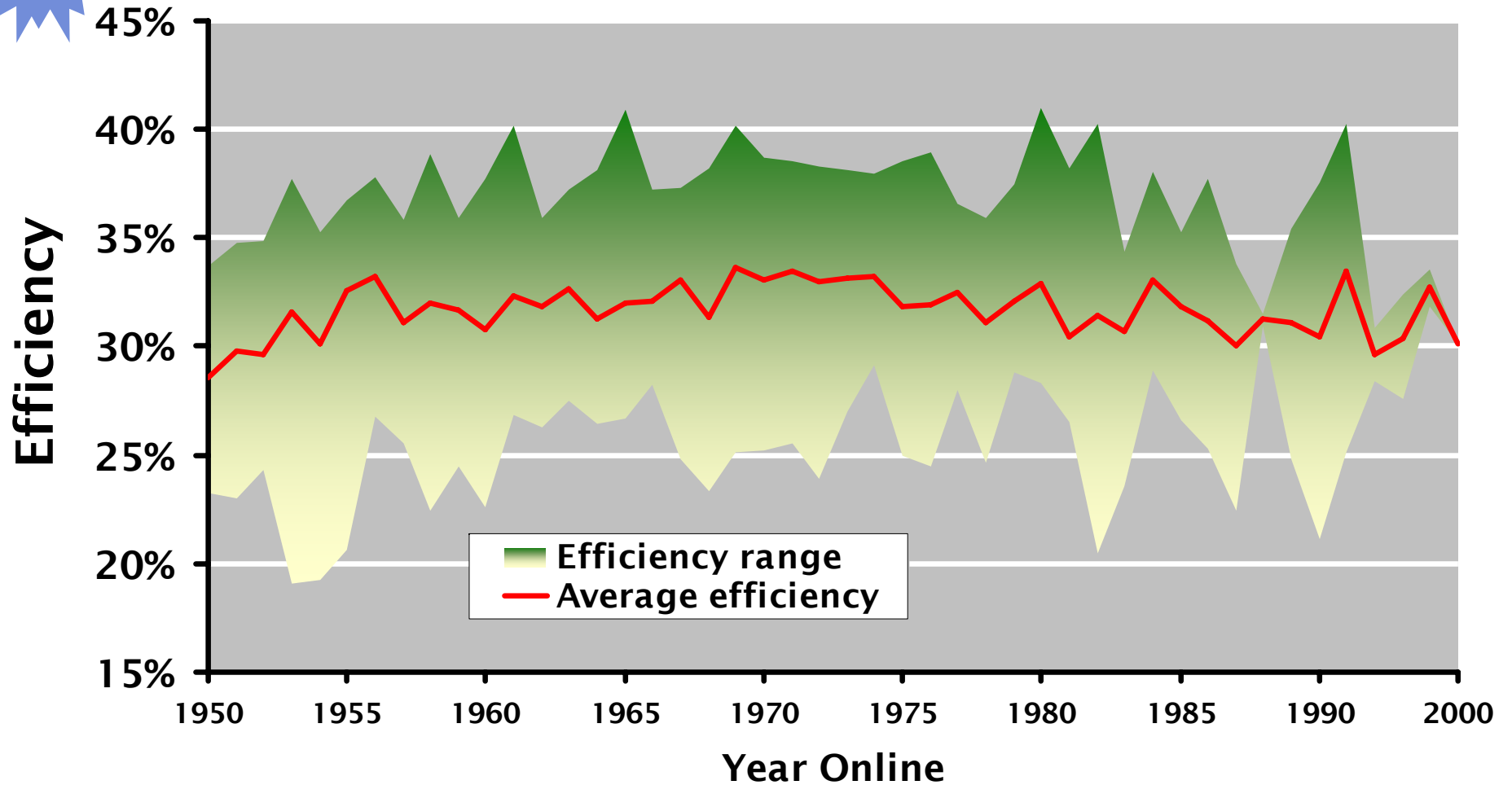
Projected Power Sector CO₂ Emissions



Data source: NETL analysis using the Energy Information Administration's Annual Energy Outlook and Carben model.



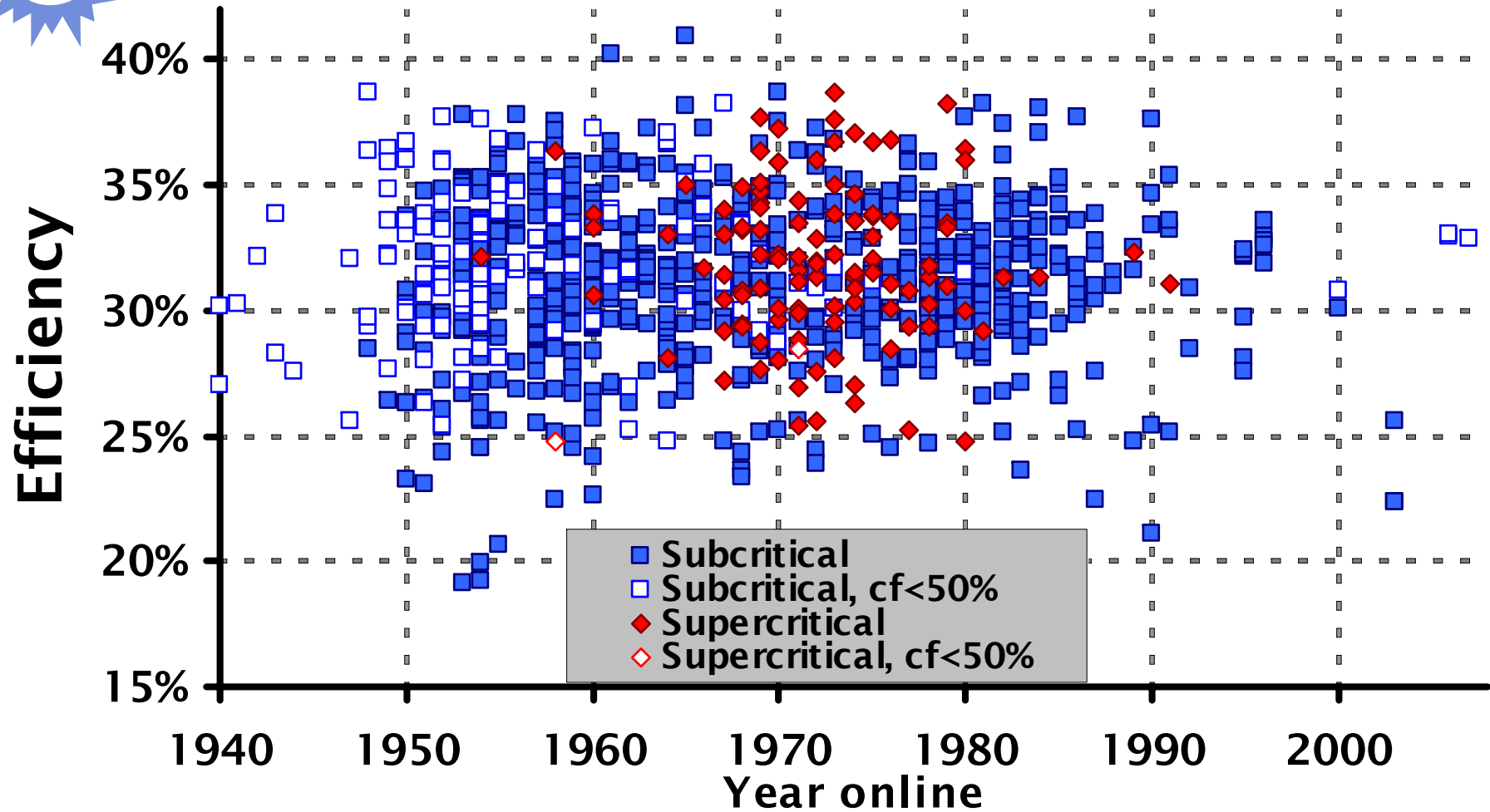
CFPP Average Efficiency and Range for 2007



Data source: Energy Velocity Suite, May 2008



CFFP Efficiency by Year Online, Steam Cycle Type and Capacity Factor (2007)



Data source: Energy Velocity Suite, May 2008

Literature review of heat rate improvement projects

Improvement Projects	Efficiency Increase (percentage points)
Air Preheaters (optimize)	0.16 to 1.5
Ash Removal System (replace)	0.1
Boiler (increase airheater surface)	2.1
Combustion System (optimize)	0.15 to 0.84
Condenser (optimize)	0.7 to 2.4
Cooling System Performance (upgrade)	0.2 to 1
Feedwater Heaters (optimize)	0.2 to 2
Flue Gas Moisture Recovery	0.3 to 0.65
Flue Gas Heat Recovery	0.3 to 1.5
Coal Drying (Installation)	0.1 to 1.7
Process Controls (installation/improvement)	0.2 to 2
Reduction of Slag and Furnace Fouling	0.4
Sootblower Optimization	0.1 to 0.65
Steam Leaks (reduce)	1.1
Steam Turbine (refurbish)	0.84 to 2.6



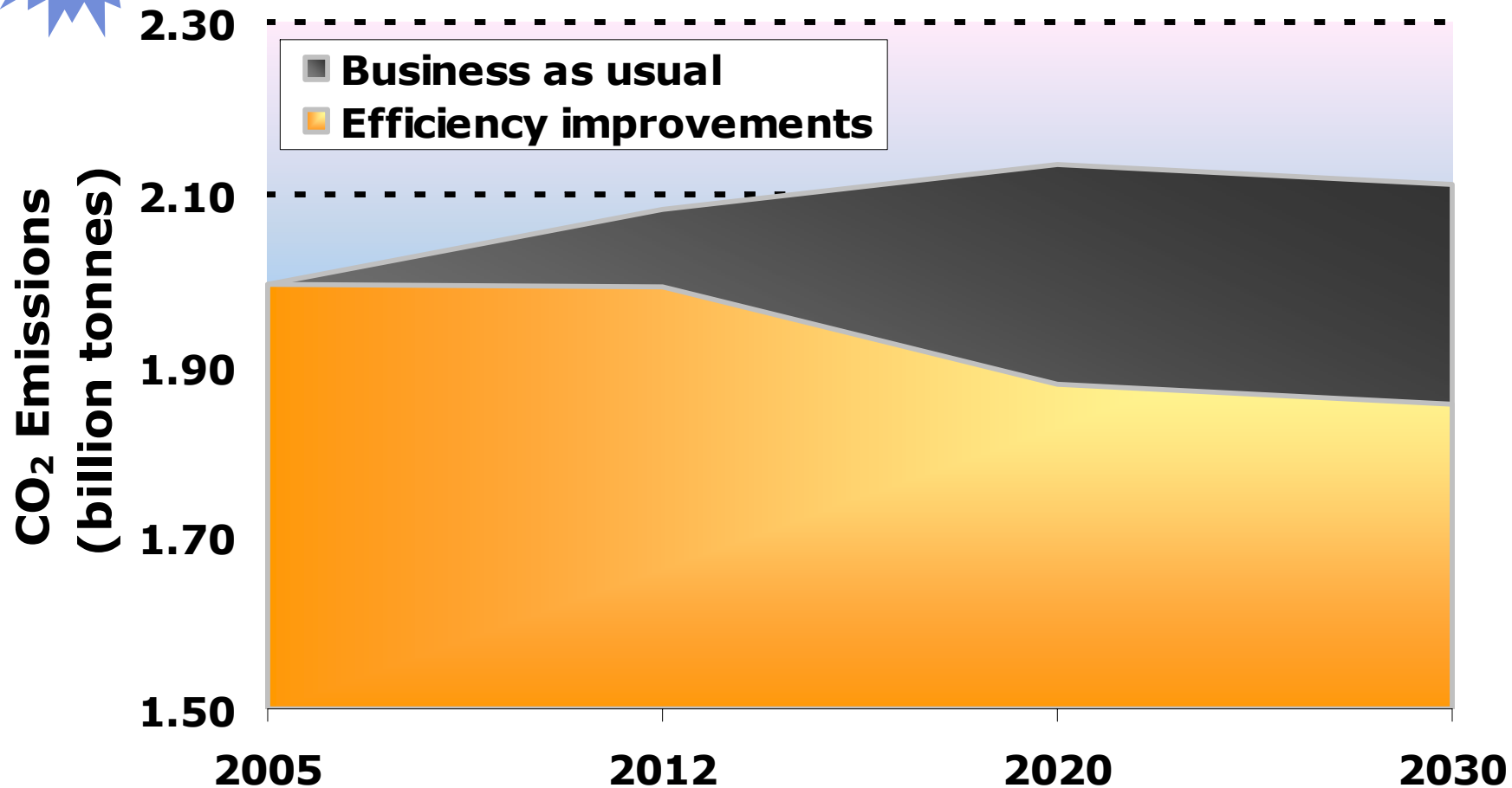
Unit Efficiencies by Age Band and Steam Cycle Type

Steam cycle type	Age band	No. of Units	Nameplate capacity (MW)	Generation (BkWh)	Avg. eff.	Efficiency Range	Eff. of Top 10%
Sub-critical	1969 and before	410	77,789	447	31.3%	19.1 – 40.9%	36.3%
	1970 to 1989	273	127,675	824	31.4%	20.5 – 38.7%	36.3%
	1990 to present	27	7,477	51	29.9%	21.1 – 37.6%	35.9%
Subcritical subtotal		710	212,942	1,322	31.3%	19.1 – 40.9%	36.4%
Super-critical	1969 and before	34	19,467	114	34.9%	22.5 – 40.1%	38.8%
	1970 to 1989	74	60,169	398	35.1%	29.8 - 41.0%	39.1%
	1990 to present	1	1,426	10	40.2%	N/A	N/A
Supercritical subtotal		109	1,061	522	35.1%	22.5 – 41.0%	39.3%
Grand Total		819	294,003	1,844	31.8%	19.1 – 41.0%	37.4%



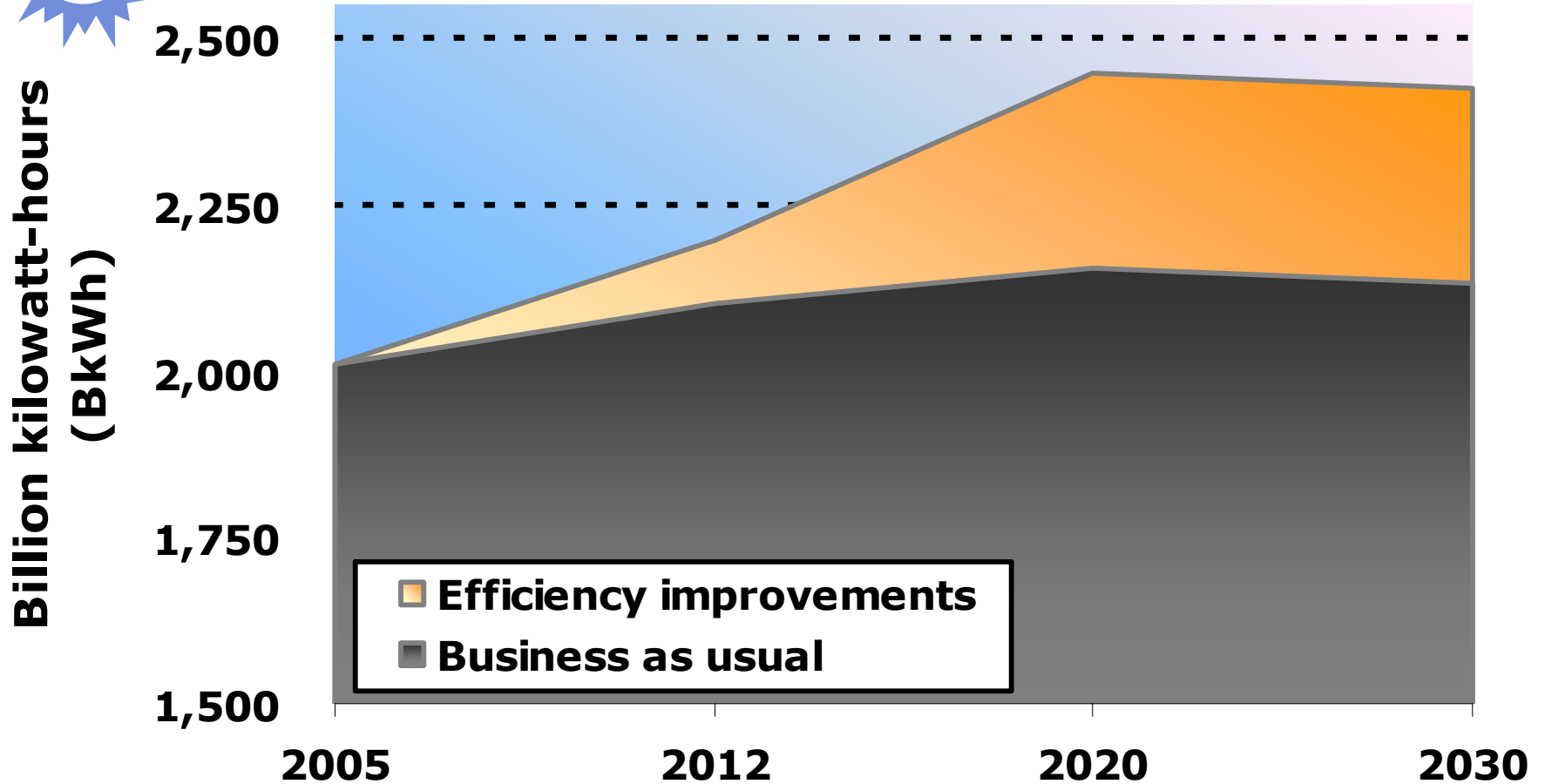
Improved PC efficiency, constant power scenario

Carbon dioxide emissions from existing CFPPs



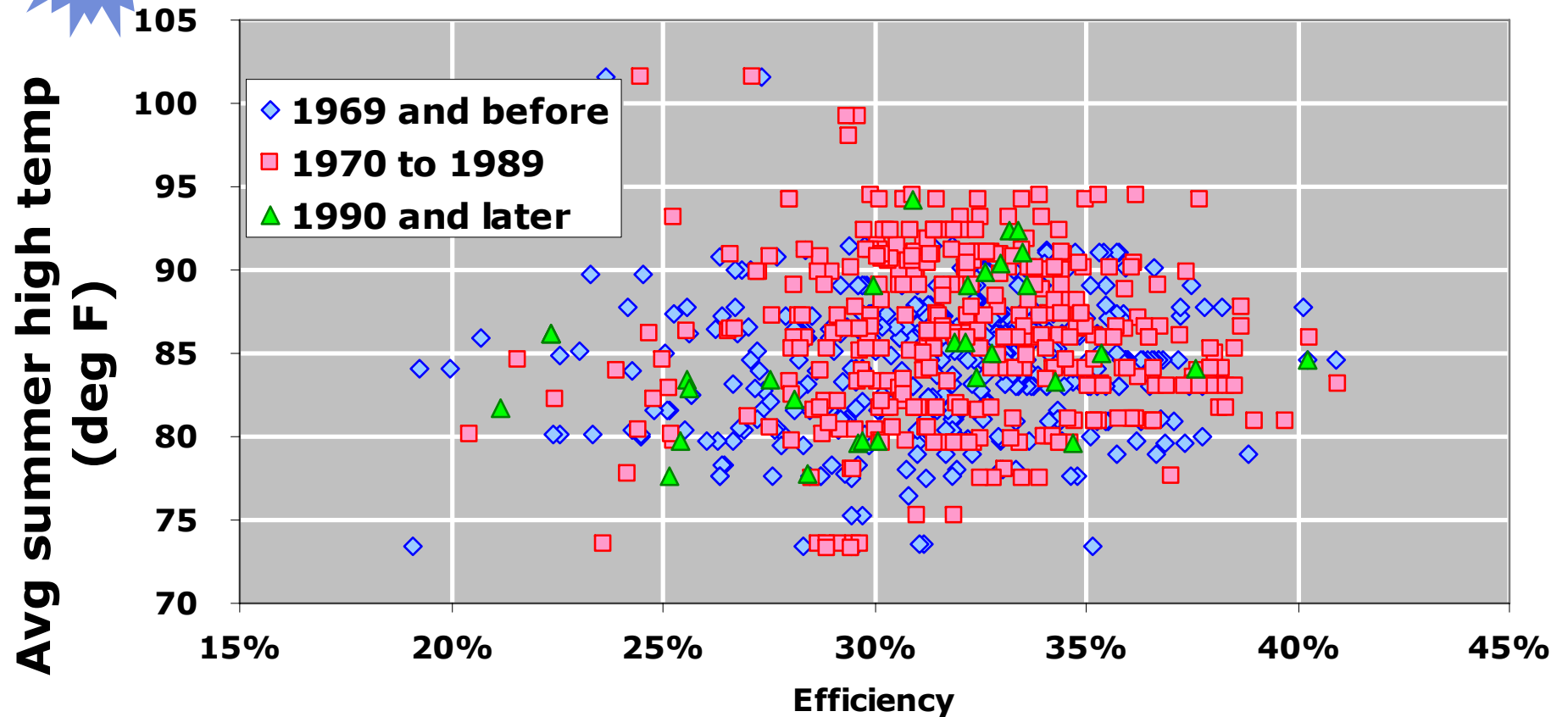
Improved PC efficiency, constant coal scenario

Electricity generation from existing CFPPs





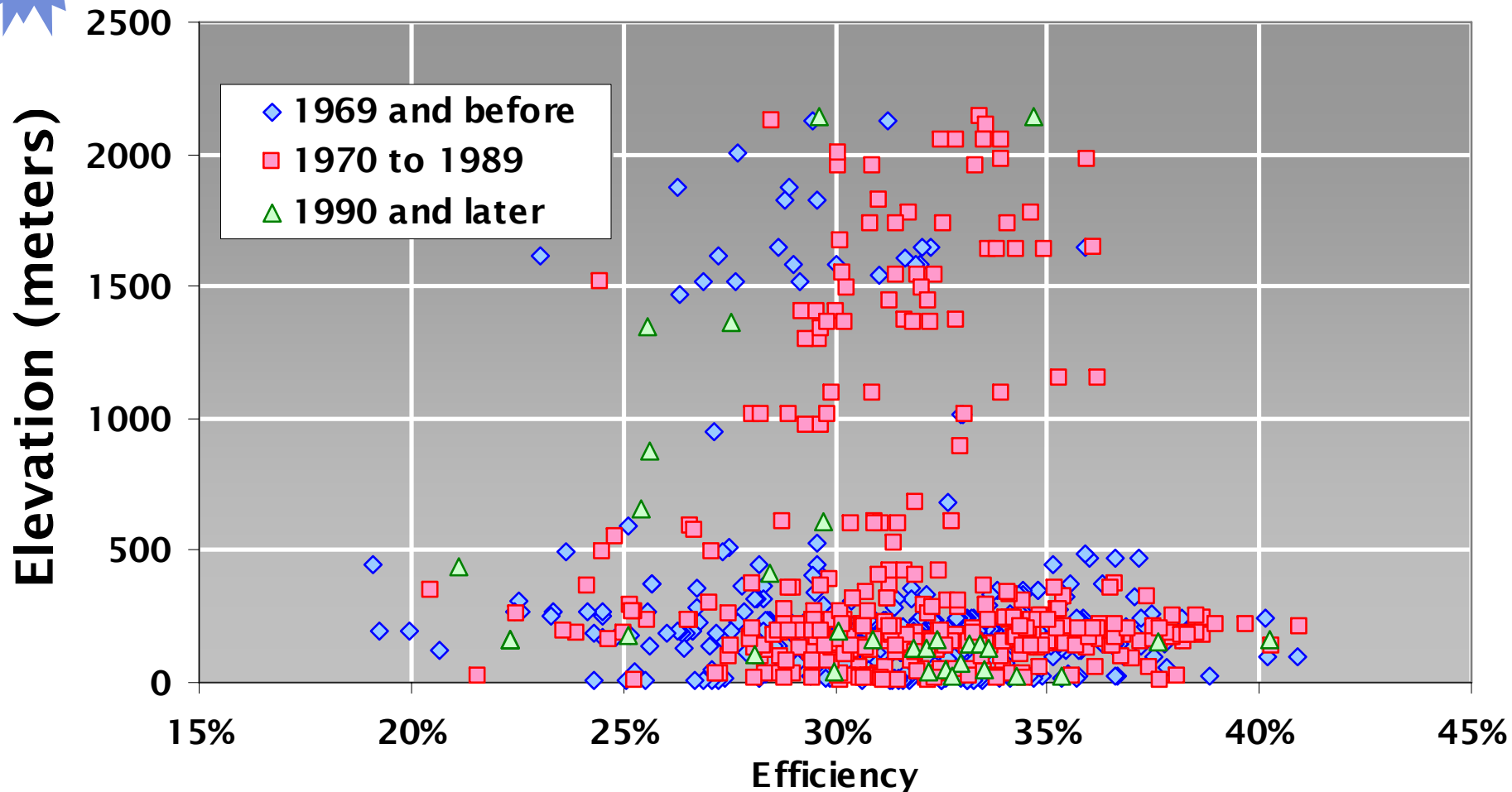
CFPP Efficiency and Temperature (2007)



Data sources: Plant efficiencies – Energy Velocity Suite, Oct 2007; Elevation - ESRI Digital Elevation Model; Temperature – Dept. of Agriculture’s National Resources Conservation Service



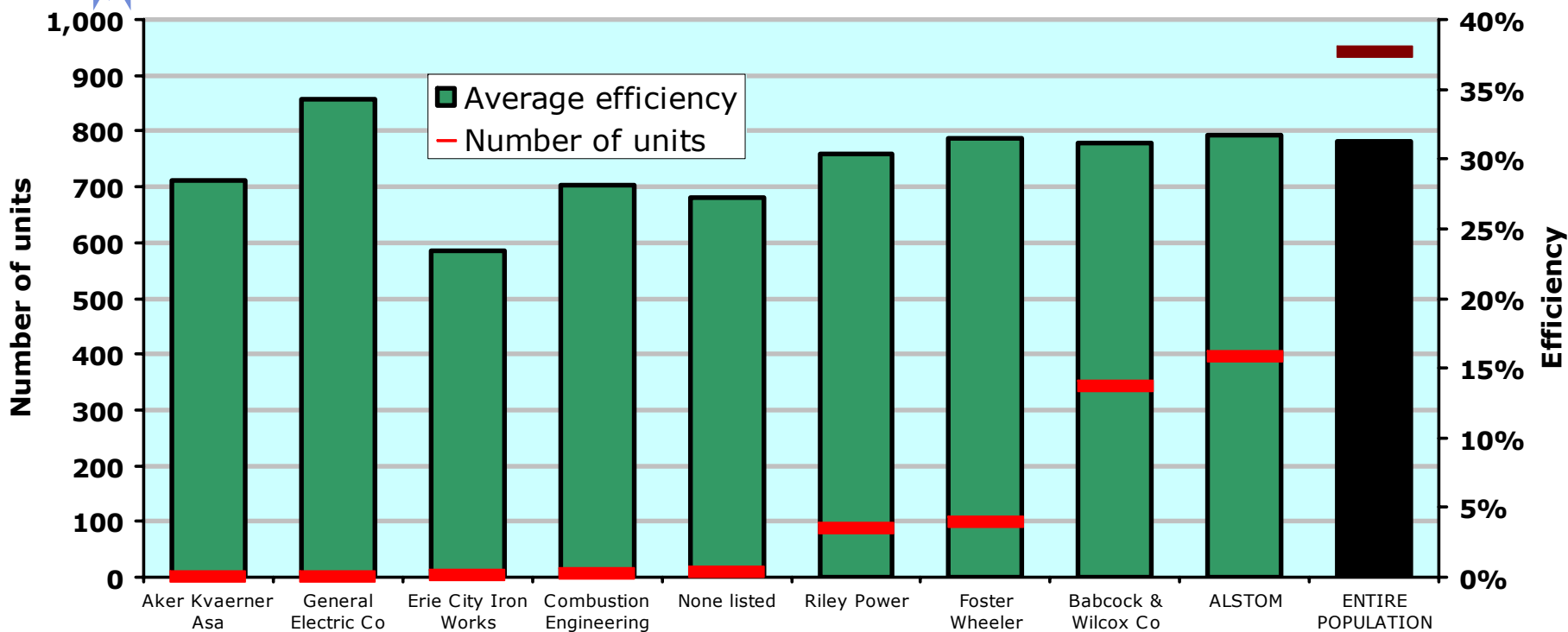
CFPP Efficiency and Elevation (2007)



Data sources: Plant efficiencies – Energy Velocity Suite, Oct 2007; Elevation - ESRI Digital Elevation Model; Temperature – Dept. of Agriculture’s National Resources Conservation Service



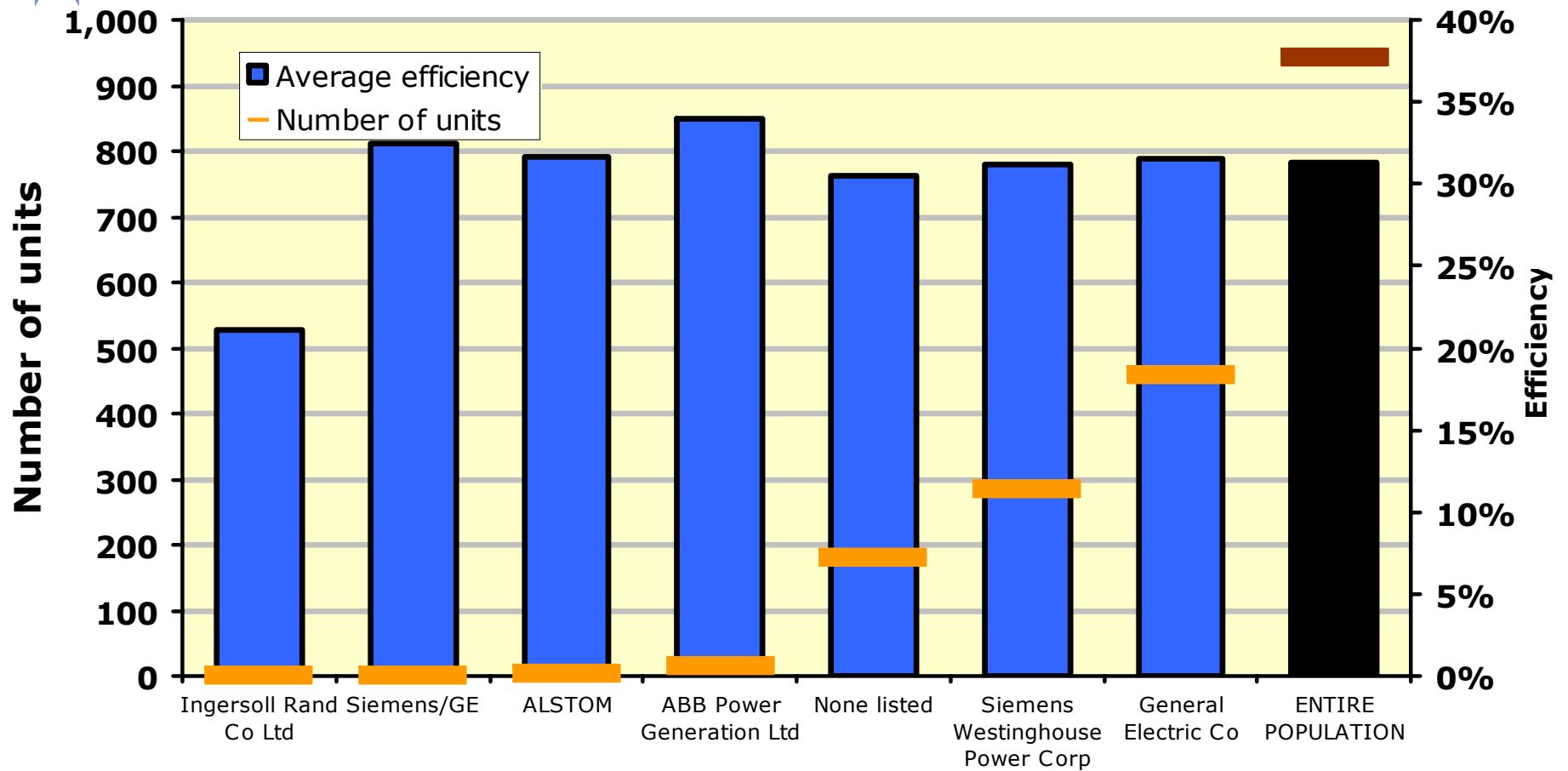
Average unit efficiency by boiler manufacturer



Data source: Energy Velocity Suite, Oct 2007



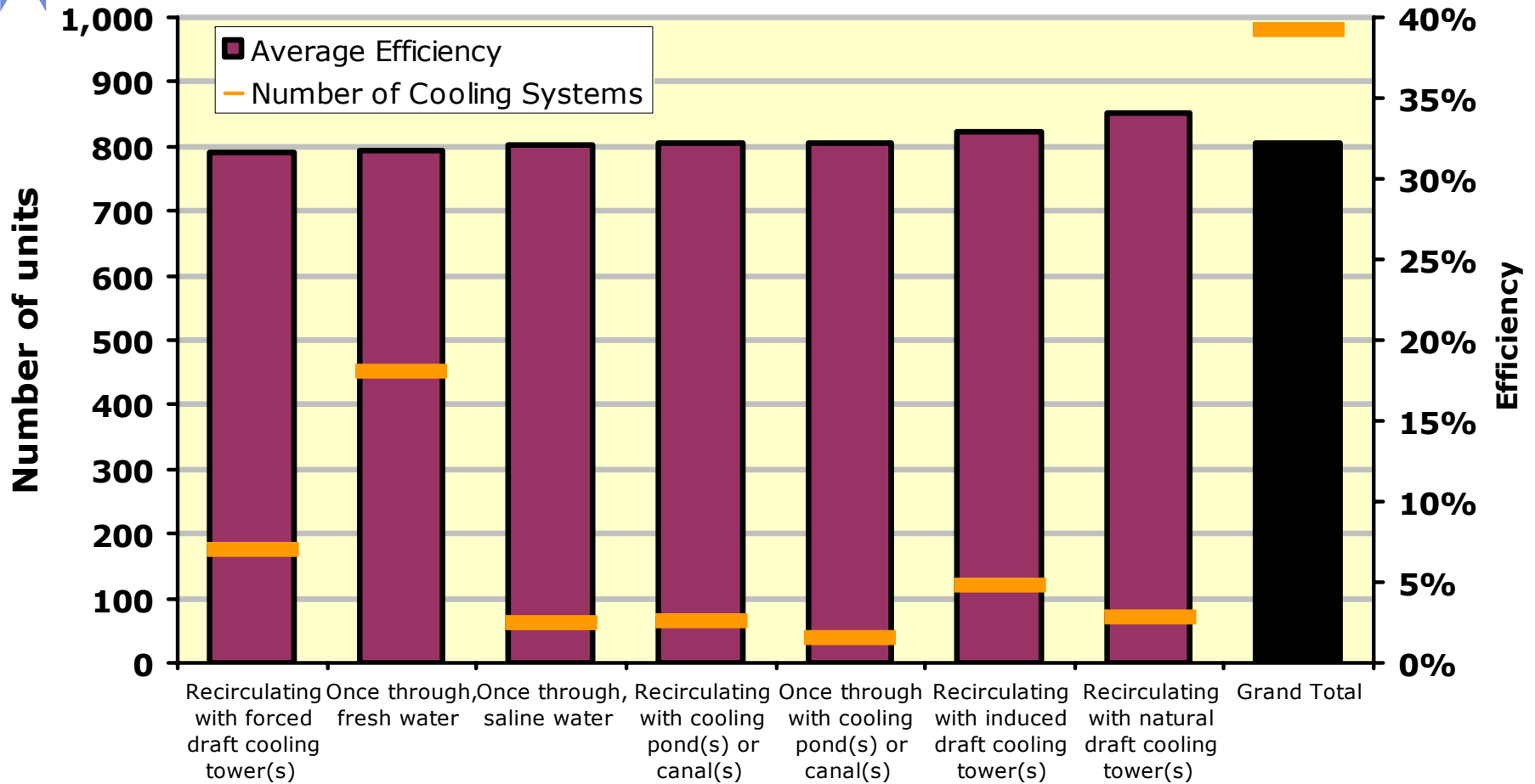
Average unit efficiency by generator manufacturer



Data source: Energy Velocity Suite, Oct 2007



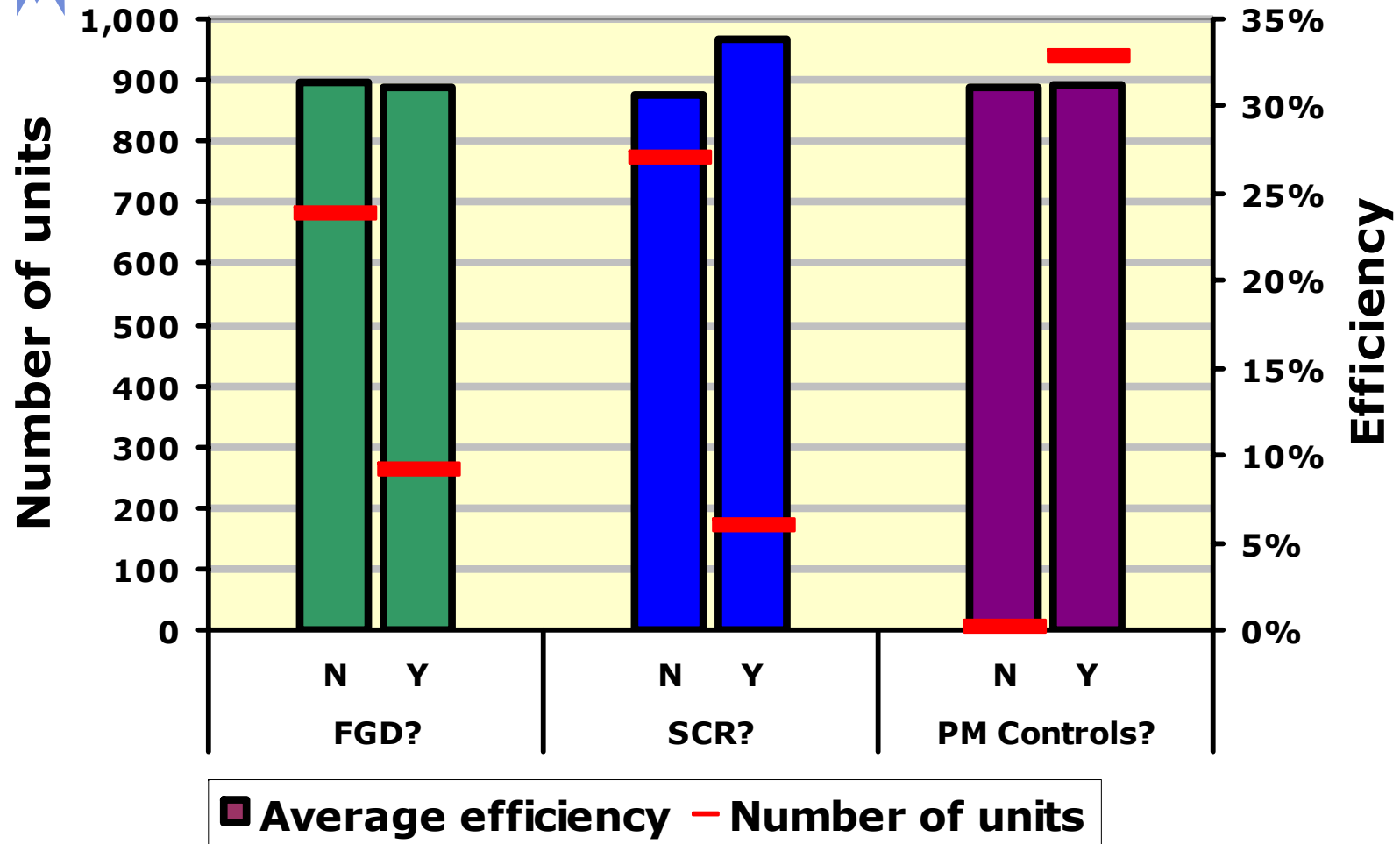
Average unit efficiency by cooling system type



Data sources: Plant efficiencies and pollution controls – Energy Velocity Suite, Oct 2007; Cooling system configurations – Energy Information Administration's 2005 form 767 data



Efficiency and emission control equipment

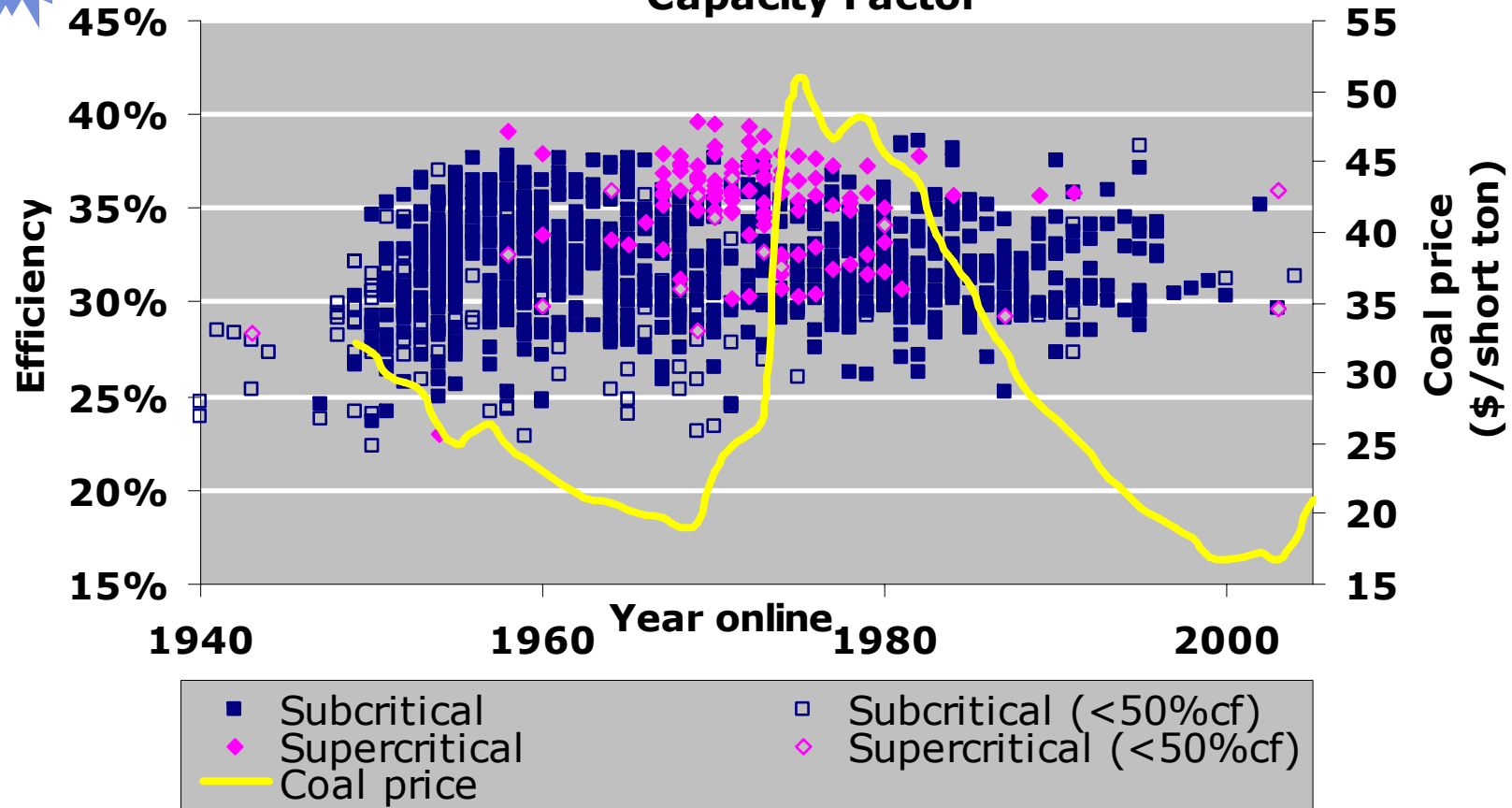


Data sources: Plant efficiencies and pollution controls – Energy Velocity Suite, Oct 2007; Cooling system configurations – Energy Information Administration's 2005 form 767 data

Cheap coal, combined with decisions to sacrifice efficiency for reliability contributed to lack of supercritical plants and lower-than-expected efficiencies in the past 20 years



CFPP Efficiency and Year Online by Steam Cycle Type and Capacity Factor



Data source: Energy Velocity Suite, Oct 2007; Coal prices, Energy Information Administration, Annual Energy Review
 Prices are in chained (2000) dollars, calculated by using gross domestic product implicit price deflators

<http://www.eia.doe.gov/emeu/aer/coal.html>.