

Economic Dispatch Problem

Let's start building an economic dispatch model for a test power system!

Electricity Generation Sources

In your GAMS model you can include the following electricity generation technologies:

- Nuclear (steam turbine)
- Coal (steam turbine)
- Gas (steam turbine)
- Gas (combined cycle)
- Gas (gas turbine)
- Wind (utility-scale)
- Solar (utility-scale)
- Solar (distributed)

Nuclear (steam turbine)

- Very expensive start-up costs.
- Very slow ramp rates.
- It can't provide operating reserves.
- Usually always online (unless in maintenance) and they generate at their maximum capacity.

Property/ Unit	Nuclear01
Maximum Generation Capacity (MW)	1,200
Minimum Generation Capacity (MW)	1,050
Upward & Downward Ramping Limit (MW/hour)	100
Average Heat Rate (MMBTU/MWh)	10.50
Startup Cost (\$)	562,000
VO&M Cost (\$/MWh)	2.18

Coal (steam turbine)

- Expensive start-up costs.
- Slow ramp rates.
- It can provide operating reserves.
- Limited start-ups and cycling.

Property/ Unit	Coal01	Coal02
Maximum Generation Capacity (MW)	574	845
Minimum Generation Capacity (MW)	173	462
Upward & Downward Ramping Limit (MW/hour)	103	151
Base Heat Rate (MMBTU/hour)	373	361
Marginal Heat Rate (MMBTU/MWh)	10.9	9.5
Startup Cost (\$)	53,000	79,000
VO&M Cost (\$/MWh)	4.54	4.54

Gas (steam turbine)

- Expensive start-up costs.
- Slow ramp rates.
- It can provide operating reserves.
- Limited start-ups and cycling.

Property/ Unit	GasST01	GasST02
Maximum Generation Capacity (MW)	237	531
Minimum Generation Capacity (MW)	48	94
Upward & Downward Ramping Limit (MW/hour)	55	123
Base Heat Rate (MMBTU/hour)	195	496
Marginal Heat Rate (MMBTU/MWh)	9.5	9.9
Startup Cost (\$)	22,000	49,000
VO&M Cost (\$/MWh)	4.54	4.54

Gas (combined cycle)

- High start-up costs.
- Medium ramp rates.
- It can provide operating reserves.
- Infrequent start-ups and cycling.

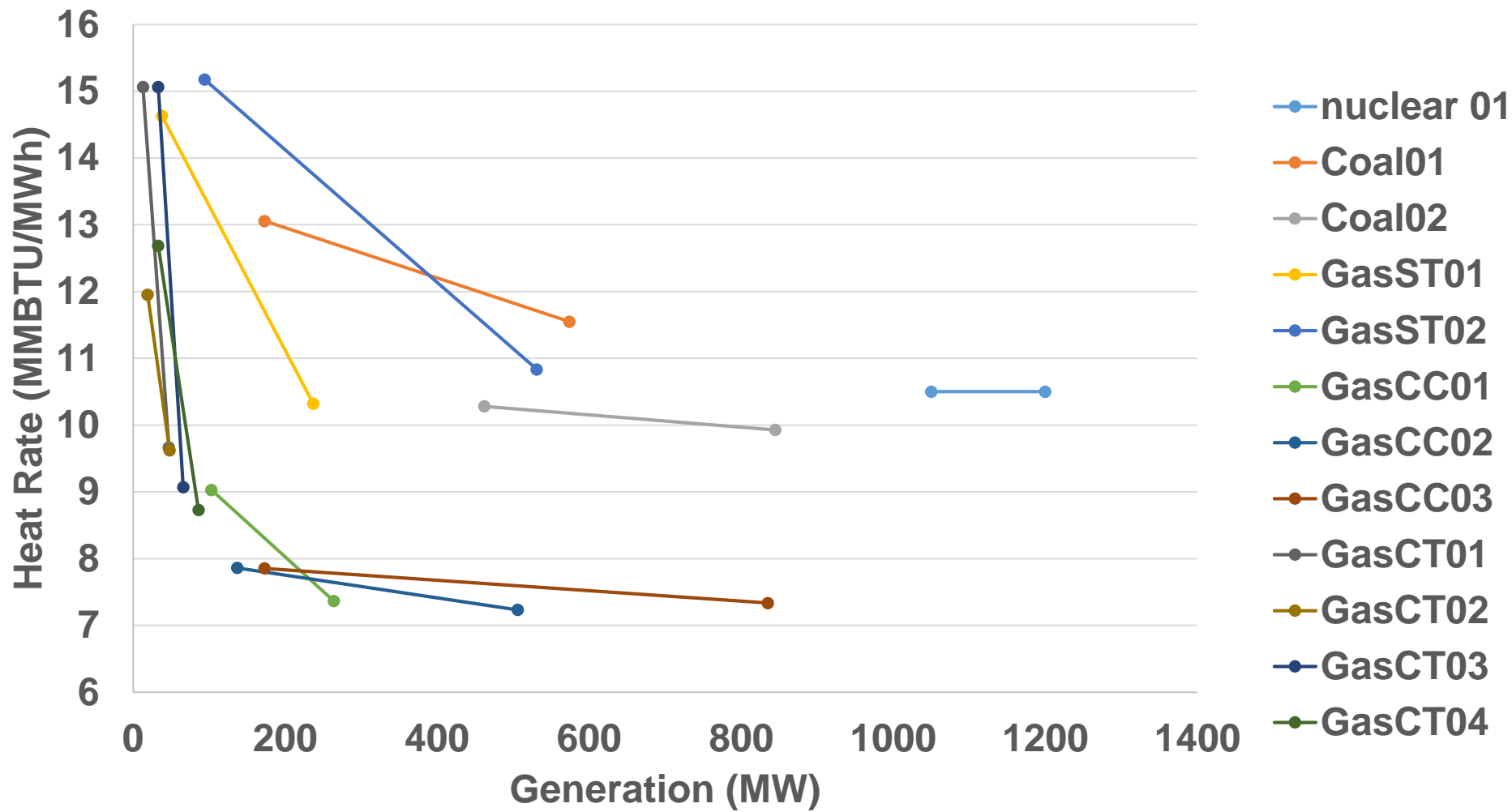
Property/ Unit	GasCC01	GasCC02	GasCC03
Maximum Generation Capacity (MW)	264	506	835
Minimum Generation Capacity (MW)	103	137	173
Upward & Downward Ramping Limit (MW/hour)	84	161	265
Base Heat Rate (MMBTU/hour)	281	118	113
Marginal Heat Rate (MMBTU/MWh)	6.3	7.0	7.2
Startup Cost (\$)	25,000	47,000	78,000
VO&M Cost (\$/MWh)	3.66	3.66	3.66

Gas (gas turbine)

- Low start-up costs.
- Fast ramp rates.
- It can provide operating reserves.
- Frequent start-ups and cycling.

Property/ Unit	GasGT01	GasGT02	GasGT03	GasGT04
Maximum Generation Capacity (MW)	47	48	66	86
Minimum Generation Capacity (MW)	13	19	33	33
Upward & Downward Ramping Limit (MW/hour)	16	16	23	29
Base Heat Rate (MMBTU/hour)	97	77	144	181
Marginal Heat Rate (MMBTU/MWh)	7.6	7.9	10.7	7.2
Startup Cost (\$)	1,100	1,120	1,550	2,000
VO&M Cost (\$/MWh)	15.7	15.7	15.7	15.7

Heat Rate Curves



Fuel Prices

Fuel	Price (\$/MMBTU)
Uranium	0.65
Coal	2.21
Gas	3.26