

Combined Cycle Modeling

Unit Level	
Min run time	8 hours
Min down time	8 hours
Start cost	\$2,000

Schedule Level			
Item	Configuration 1	Configuration 2	Configuration 3
Minimum MW	130	260	400
Maximum MW	230	490	750
Segment 1 incr. rate	\$33	\$31	\$32
Segment 2 incr. rate	\$35	\$33	\$33
Segment 3 incr. rate	\$37	\$36	\$35
No Load	\$3,700	\$5,700	\$7,700
CT Start Price	\$6,000	\$6,000	\$6,000
Configuration Start Price	\$8,000	\$14,000	\$20,000
Ramp Rate	1 MW/min	3 MW/min	5 MW/min
CT Min Run	4 Hours	4 Hours	4 Hours
CT Min Down	4 Hours	4 Hours	4 Hours
CT Start Notify	30 Minutes	30 Minutes	30 Minutes
Regulating Min	150	270	425
Regulating Max	210	480	720
Regulation Range	5 MW/5 min.	15 MW/5 min.	25 MW/5 min.

The items included in the table above are not meant to be inclusive of all the items needed to specify a unit's operation. They are used to illustrate the operating options of a Combined Cycle unit. The facility has the ability to operate with any of the above configurations. It also has the ability to move from one configuration to another.

If we think in terms of weekly operation, a logical operating schedule might start on Monday with Configuration 2 (2 GT and a steam turbine start with and included start cost of \$14,000) and then move to schedule 3 (1 GT start for an additional cost of \$6,000) for the evening peak. It is likely that there will be a move to Schedule 1 for the overnight and then to Schedule 2 or 3 for Morning pickup (either 1 or 2 more GT starts for an additional cost of \$6,000 or \$12,000). It should be noted that even though there is an additional start cost each time a GT is started, there is an offsetting improvement in the heat rate of the system. Also, no-load cost, or the cost to maintain the unit at minimum output is not multiples of the other configurations (if you modeled Configuration 3 as 3 configuration 1's the unit commitment software and BPCG calculation would treat the total no-load as \$5,100 instead of \$7,700).

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The commitment and dispatch of the unit needs to recognize that the unit costs vary based upon operating configuration and that the unit can change from one operating configuration to another by turning a GT on or off.

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