Updated Capital Investment Costs
Peaking Unit and Combined Cycle Technologies

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Overview

- Provide updated, capital investment cost estimates for dual fuel and gas-only peaking unit technologies and informational combined cycle technologies. Updates include:
  - Electrical interconnection costs were developed by Lummus
  - System deliverability upgrade (SDU) preliminary cost estimates provided by PSEG Long Island (Lummus is reviewing the SDU costs)
  - Capital investment cost estimates for the GE 7HA.02
  - Presentation of capital investment cost estimates for the gas-only F Class Frame units, with and without selective catalytic reduction (SCR) systems, in Load Zones C, F, and G
    - Without SCR, NOx emissions of other peaking unit technologies are higher than F Class Frame units (e.g. LMS100PA+ at 25 ppm with water injection and 7HA.02 at 25 ppm with dry low NOx (DLN)); therefore costs are not presented for an option without SCR for these technologies
    - Gas-only F Class Frame unit in Load Zone G (Rockland County) could not accept cap on annual NOx emissions to avoid triggering non-attainment new source review (NNSR); therefore costs are not presented for an option without SCR for this location
  - Use of preliminary after tax weighted average cost of capital (ATWACC) values developed by Analysis Group for the calculation of project financing costs (previous estimates were based on ATWACC from the last ICAP Demand Curve reset (2013 DCR)). Methodology used to estimate project financing costs was refined from preliminary results presented at April 25, 2016 ICAPWG meeting
  - Updated the escalation rate that was used to escalate certain site preparation costs from the costs used in the 2013 DCR






Overview

- The breakdown of total capital investments costs for the peaking unit technologies and informational combined cycle technologies are included in an Appendix to this presentation for the following:
  - Dual fuel designs in all Load Zones
  - Gas only designs in Load Zones C, F, and G






Updated Capital Cost Estimates, Dual Fuel

Capital Cost Estimates Dual Fuel [1, 2] (2015$ million)	K - Long Island	J - NYC	G (Dutchess)	G (Rockland)	F – Capital	C – Central
Peaking Unit Technologies						
2x0 GE LMS100PFA	$345	$337	$310	$313	$281	$292
1x0 Siemens 5000F5	$288	$277	$255	$258	$225	$237
1x0 GE 7HA.02	$549	$377	$342	$345	$310	$320
12x0 Wartsila 18V50DF	$433	$425	$386	$390	$349	$358
Combined Cycle Plants						
1x1x1 Siemens 5000F5	$883	$728	$603	$611	$541	$517
1x1x1 Siemens 8000H	$921	$768	$636	$646	$572	$544

1) Capital Investment includes Engineering, Procurement, Construction Contract, Owner's Cost, Financing Costs, Working Capital and Fuel and Non-Fuel Inventories

2) Pursuant to stakeholder requests, Lummus developed costs for the GE 7HA.02 combustion turbine configured as simple cycle combustion turbine, however, this option will not be considered eligible for peaking unit technology at this time because none are currently operational (or "in-service")

Updated Capital Cost Estimates, Dual Fuel

Capital Cost Estimates, Dual Fuel [1, 2, 3] (2015$/kW)	K - Long Island	J - NYC	G (Dutchess)	G (Rockland)	F – Capital	C – Central
Peaking Unit Technologies						
2x0 GE LMS100PA+	$1,820	$1,800	$1,650	$1,660	$1,500	$1,570
1x0 Siemens 5000F5	$1,310	$1,270	$1,170	$1,180	$1,040	$1,100
1x0 GE 7HA.02	$1,730	$1,190	$1,080	$1,090	$980	$1,020
12x0 Wartsila 18V50DF	$2,160	$2,120	$1,930	$1,950	$1,740	$1,790
Combined Cycle Plants						
1x1x1 Siemens 5000F5	$2,680	$2,220	$1,840	$1,870	$1,660	$1,570
1x1x1 Siemens 8000H	$2,390	$2,010	$1,660	$1,690	$1,500	$1,410

1) Capital Investment includes Engineering, Procurement, Construction Contract, Owner's Cost, Financing Costs, Working Capital and Fuel and Non-Fuel Inventories
2) Pursuant to stakeholder requests, Lummus developed costs for the GE 7HA.02 combustion turbine configured as simple cycle combustion turbine, however, this option will not be considered eligible for peaking unit technology at this time because none are currently operational (or "in-service")
3) The $/kW cost is based on the degraded ICAP output

Updated Capital Cost Estimates, Gas-Only

Capital Cost Estimates, Gas Only [1, 2] (2015$ million)	G (Dutchess)	G (Rockland)	F – Capital	C – Central
Peaking Unit Technologies				
2x0 GE LMS100PA+	$297	$300	$268	$280
1x0 Siemens 5000F5 – with SCR	$236	$238	$209	$220
1x0 Siemens 5000F5 – without SCR	$210	Note 3	$184	$196
1x0 GE 7HA.02	$305	$308	$274	$285
12x0 Wartsila 18V50SG	$356	$359	$319	$332
Combined Cycle Plants				
1x1x1 Siemens 5000F5	$580	$588	$518	$494
1x1x1 Siemens 8000H	$612	$621	$548	$521

1) Capital Investment includes Engineering, Procurement, Construction Contract, Owner's Cost, Financing Costs, Working Capital and Fuel and Non-Fuel Inventories. Cost estimates for gas only GE LMS100PA+, GE 7HA.02 and Wartsila 18V50SG include SCR for all Load Zones.

2) Pursuant to stakeholder requests, Lummus developed costs for the GE 7HA.02 combustion turbine configured as a simple cycle combustion turbine, however, this option will not be considered eligible for peaking unit technology at this time because none are currently operational (or "in-service")

3) SCR required in Load Zone G (Rockland) due to low (25 tons/year) non-attainment major source threshold.

Updated Capital Cost Estimates, Gas-Only

Capital Cost Estimates, Gas Only [1, 2, 4] (2015$/kW)	G (Dutchess)	G (Rockland)	F – Capital	C – Central
Peaking Unit Technologies				
2x0 GE LMS100PA+	$1,580	$1,600	$1,440	$1,500
1x0 Siemens 5000F5 – with SCR	$1,080	$1,090	$960	$1,020
1x0 Siemens 5000F5 – without SCR	$960	Note 3	$850	$910
1x0 GE 7HA.02	$960	$970	$870	$910
12x0 Wartsila 18V50SG	$1,780	$1,790	$1,590	$1,660
Combined Cycle Plants				
1x1x1 Siemens 5000F5	$1,770	$1,800	$1,590	$1,500
1x1x1 Siemens 8000H	$1,600	$1,620	$1,440	$1,350

1) Capital Investment includes Engineering, Procurement, Construction Contract, Owner's Cost, Financing Costs, Working Capital and Fuel and Non-Fuel Inventories. Cost estimates for gas only GE LMS100PA+, GE 7HA.02 and Wartsila 18V50SG include SCR for all Load Zones.

2) Pursuant to stakeholder requests, Lummus developed costs for the GE 7HA.02 combustion turbine configured as a simple cycle combustion turbine, however, this option will not be considered eligible for peaking unit technology at this time because none are currently operational (or "in-service")

3) SCR required in Load Zone G (Rockland) due to low (25 tons/year) non-attainment major source threshold.

4) The $/kW cost is based on the degraded ICAP output

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