

Gas Turbine World 2006 Handbook

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Cover Story

Transco gas pipeline compressor installation at Cambridge, UK powered by a Siemens SGT-400 gas turbine rated 18,000 horsepower and 36.2% efficiency.



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Combined Cycle Prices

Turnkey equipment-only scope of supply for a basic gas-fired combined cycle plant with gas turbine (generally with dry low emissions combustion), unfired multi-pressure HRSG with no bypass stack, multi-pressure condensing steam turbine, electric generators, step-up transformer, water cooled heat rejection, standard controls, starting system and plant auxiliaries. Depending on equipment scope, site specifics, geographic location, currency valuations and competitive market conditions, actual prices may vary considerably. Prices are quoted FOB the factory in 2006 US dollars.

Plant Model	Net Plant Output	Hertz	LHV Efficiency	No. Gas Turbines	Steam Turbine	Equipment Only	Price per kW
STAC 60	7.3 MW	50/60 Hz	39.6%	1xTaurus 60	1.8 MW, 1P	\$6,203,200	\$850
GPCS 80	7.9 MW	50/60 Hz	40.3%	1xM7A-01	2.6 MW	\$6,695,900	\$848
MACS70	8.5 MW	50/60 Hz	40.7%	1xMSC70	1.9 MW	\$7,046,600	\$829
STAC 70	9.5 MW	50/60 Hz	41.7%	1xTaurus 70	2.0 MW, 1P	\$7,997,300	\$842
MACS90	11.7 MW	50/60 Hz	40.6%	1xMSC90	2.8 MW	\$9,590,300	\$818
MACS100	13.3 MW	50/60 Hz	41.7%	1xMSC100	3.3 MW	\$10,762,000	\$812
UGT 10CC1	13.5 MW	50 Hz	45.8%	1xUGT10000	3.5 MW	\$11,170,000	\$827
STAC 100	13.8 MW	50/60 Hz	40.7%	1xMars 100	3.1 MW, 1P	\$11,030,000	\$799
LM1600PA	17.4 MW	50/60 Hz	46.9%	1xLM1600PA	4.6 MW	\$13,929,000	\$800
STAC 130	17.7 MW	50/60 Hz	42.7%	1xTitan 130	3.7 MW, 1P	\$14,421,000	\$815
UGT 15CC1	22.7 MW	50 Hz	45.3%	1xUGT15000	5.2 MW	\$17,759,000	\$782
L20A-1	25.0 MW	50/60 Hz	48.6%	1xL20A	8.3 MW	\$19,622,000	\$785
UGT 10CC2	27.5 MW	50 Hz	46.3%	2xUGT10000	7.5 MW	\$21,017,000	\$764
LM2500PE	30.4 MW	50/60 Hz	50.5%	1xLM2500PE	8.2 MW	\$22,684,000	\$747
FT8 PowerPac	32.9 MW	50/60 Hz	49.7%	1xFT8	8.8 MW, 2P	\$25,428,000	\$773
THM 1304-11	32.9 MW	50/60 Hz	45.5%	1xTHM 1304-11	11.4 MW, 2P	\$24,965,000	\$758
UGT 25CC1	34.7 MW	50 Hz	47.5%	1xUGT25000	8.0 MW	\$26,175,000	\$754
LM2500PK	35.4 MW	50/60 Hz	50.4%	1xLM2500PK	9.4 MW	\$26,287,000	\$742
SCC-600 1x1	36.1 MW	50/60 Hz	50.1%	1xGT10B	12.6 MW, 2P	\$26,434,000	\$732
FT8-3 PowerPac	36.6 MW	50/60 Hz	50.6%	1xFT8	10.0 MW, 2P	\$26,751,000	\$731
RB211-6562	37.7 MW	50/60 Hz	50.2%	1xRB211-6562	12.0 MW	\$27,525,000	\$730
CC105P	38.5 MW	50 Hz	41.7%	1xMS5001	13.8 MW, 2P	\$27,408,000	\$712
RB211-6762	39.8 MW	50/60 Hz	51.4%	1xRB211-6762	12.2 MW	\$29,281,000	\$736
SCC-700 1x1	41.3 MW	50/60 Hz	51.1%	1xGT10C	12.9 MW, 2P	\$30,257,000	\$733
RB211-6761	42.6 MW	50/60 Hz	52.8%	1xRB211-6761	12.6 MW	\$31,289,000	\$734
UGT 15CC2	45.8 MW	50 Hz	45.9%	2xUGT15000	10.8 MW	\$32,714,000	\$714
L20A-2	51.0 MW	50/60 Hz	49.1%	2xL20A	16.9 MW	\$36,298,000	\$712
LM6000PD	52.9 MW	50 Hz	52.3%	1xLM6000PD	11.8 MW	\$38,430,000	\$727
LM6000PC	53.5 MW	50 Hz	51.9%	1xLM6000PC	11.4 MW	\$39,427,000	\$737
CC106C	62.7 MW	50 Hz	54.0%	1xMS6001C	21.9 MW, 2P	\$45,151,000	\$720

New Production Models

Over 30 new gas turbine designs have come onto the market over the last five years for simple cycle, combined cycle and mechanical drive projects. You can refer to Specifications reference section of the GTW Handbook for more information on design performance ratings.

Model	Rating	Heat Rate	Efficiency	Firing Temp	Intro	OEM
M1A-13X	1425 kW	14,390 Btu/kWh	23.7%	2280°F	2001	Kawasaki (nozzle)
OP-16-3A/B	1910 kW	12,730 Btu/kWh	26.8%	1832°F	2003	Opra
MT5S (RR4500)	4498 kW	10,610 Btu/kWh	32.2%	1935°F	2005	Rolls-Royce
Mercury 50.	4600 kW	8865 Btu/kWh	38.5%	2125°F	2004	Solar
GE5-2	5750 kW	10,835 Btu/kWh	31.5%	1975°F	2002	Gen Electric
Taurus 65	6300 kW	10,375 Btu/kWh	32.9%	---	2005	Solar
GTU-6P	6140 kW	13,075 Btu/kWh	26.1%	1725°F	2002	Aviadvigatel
GTE-8/MS	8000 kW	10,735 Btu/kWh	31.8%	1998°F	2002	Motor Sich
THM1304-12	11,520 kW	11,165 Btu/kWh	30.6%	1870°F	2004	MAN Turbo
GE10-2	11,690 kW	10,550 Btu/kWh	32.3%	1995°F	2004	Gen Electric
M3152K	11,825 kW	11,740 Btu/kWh	29.0%	1825°F	2004	Gen Electric
GTU-12PG-2	12,300 kW	10,470 Btu/kWh	32.6%	2085°F	2004	Aviadvigatel
THM1304-14	12,680 kW	11,000 Btu/kWh	31.0%	1895°F	2005	MAN Turbo
GTU-16PER	16,400 kW	9805 Btu/kWh	34.8%	2205°F	2004	Aviadvigatel
LM2000PS	17,610 kW	9585 Btu/kWh	35.6%	2150°F	2001	Gen Electric
L20A	17,640 kW	9950 Btu/kWh	34.3%	2280°F	2001	Kawasaki (nozzle)
GTU-25PER	24,850 kW	9030 Btu/kWh	37.8%	2320°F	2004	Aviadvigatel
FT8-3	27,970 kW	8900 Btu/kWh	38.3%	2160°F	2001	Pratt Whitney
MS5002E	29,680 kW	9570 Btu/kWh	35.7%	2055°F	2003	Gen Electric
PGT25+G4	32,760 kW	8590 Btu/kWh	39.7%	2260°F	2005	Gen Electric
LM2500+G4	33,395 kW	8755 Btu/kWh	39.0%	2260°F	2005	Gen Electric
MT30	36,000 kW	8590 Btu/kWh	39.7%	2270°F	2003	Rolls-Royce
PG6591C	42,300 kW	9410 Btu/kWh	36.3%	2420°F	2004	Gen Electric
Twin FT8-3	56,340 kW	8840 Btu/kWh	38.6%	2160°F	2001	Pratt Whitney
Trent 60	58,000 kW	8335 Btu/kWh	40.9%	---	2001	Rolls-Royce
PG6111FA	75,900 kW	9760 Btu/kWh	35.0%	2420°F	2003	Gen Electric
LMS100PA (water inj.)	98,815 kW	7570 Btu/kWh	45.1%	2550°F	2005	Gen Electric
MS7001FB	183,150 kW	9200 Btu/kWh	36.9%	2550°F	2001	Gen Electric
V94.2A (SGT5-3000E)	191,000 kW	9280 Btu/kWh	36.8%	2220°F	2003	Siemens
MS7001H	260,000 kW	8640 Btu/kWh	39.5%	2600°F	2005	Gen Electric
MS9001FB	266,700 kW	9040 Btu/kWh	37.8%	2500°F	2003	Gen Electric
MSS9001H	292,000 kW	8640 Btu/kWh	39.5%	2600°F	2001	Gen Electric
M701G2	334,000 kW	8630 Btu/kWh	39.5%	2732°F	2002	Mitsubishi (nozzle)
SGT5-8000H	340,000 kW	8705 Btu/kWh	39.2%	2600°F	2006	Siemens

Combined Cycle Reference Plants

– 2006 GTW Handbook –

Model	Year	Net Plant Output	Heat Rate Btu/kWh	Net Plant Efficiency	Heat Rate kJ/kWh	Condenser Vacuum (Hg)	Gas Turbine Power	Steam Turbine Power	No. & Type Gas Turbine	Comments
Alstom (50 Hz)										
KA8C2-2	1998	165 000 kW	6783 Btu	50.3%	7156 kJ	45 mm	—	—	2 x GT8C2	dual pressure non-reheat HRSG
KA11N2-2	1993	344 800 kW	6647 Btu	51.3%	7013 kJ	45 mm	—	—	2 x GT11N2	dual pressure non-reheat HRSG
KA13E2-1	1993	252 800 kW	6458 Btu	52.8%	6813 kJ	45 mm	—	—	1 x GT13E2	dual pressure non-reheat HRSG
KA13E2-2	1993	507 400 kW	6435 Btu	53.0%	6789 kJ	45 mm	—	—	2 x GT13E2	dual pressure non-reheat HRSG
KA13E2-3	1993	763 200 kW	6417 Btu	53.2%	6770 kJ	45 mm	—	—	3 x GT13E2	dual pressure non-reheat HRSG
KA26-1	1996	424 000 kW	5850 Btu	58.3%	6172 kJ	45 mm	—	—	1 x GT26	triple pressure reheat HRSG
KA26-2	1996	850 300 kW	5835 Btu	58.5%	6156 kJ	45 mm	—	—	2 x GT26	triple pressure reheat HRSG
KA26-2 ICS	1996	857 700 kW	5785 Btu	59.0%	6103 kJ	45 mm	—	—	2 x GT26	triple pressure reheat HRSG
Alstom (60Hz)										
KA8C2-2	1998	163 500 kW	6837 Btu	49.9%	7213 kJ	45 mm	—	—	2 x GT8C2	dual pressure non-reheat HRSG
KA11N2-2	2001	348 500 kW	6582 Btu	51.8%	6944 kJ	45 mm	—	—	2 x GT11N2	dual pressure non-reheat HRSG
KA24-1	1998	278 900 kW	5978 Btu	57.0%	6307 kJ	45 mm	—	—	1 x GT24	triple pressure reheat HRSG
KA24-2	1998	560 000 kW	5955 Btu	57.3%	6282 kJ	45 mm	—	—	2 x GT24	triple pressure reheat HRSG
Ansaldo Energia (50 Hz)										
COBRA 164.3A	—	117 000 kW	6194 Btu	55.1%	6535 kJ	—	75 500 kW	43 900 kW	1 x V64.3	ISO based performance with 4/12, losses for all models
COBRA 264.3A	—	233 000 kW	6238 Btu	54.7%	6582 kJ	—	151 000 kW	86 000 kW	2 x V64.3	
COBRA 194.2	—	247 000 kW	6582 Btu	51.9%	6944 kJ	—	161 250 kW	91 000 kW	1 x V94.2	
COBRA 294.2	—	501 000 kW	6500 Btu	52.5%	6858 kJ	—	322 500 kW	188 200 kW	2 x V94.2	
COBRA 394.2	—	749 000 kW	6517 Btu	52.4%	6876 kJ	—	483 800 kW	280 300 kW	3 x V94.2	
COBRA 194.3A	—	406 000 kW	5941 Btu	57.4%	6268 kJ	—	272 400 kW	140 900 kW	1 x V94.3A	
COBRA 294.3A	—	811 000 kW	5953 Btu	57.3%	6281 kJ	—	544 800 kW	280 100 kW	2 x V94.3A	
Bharat Heavy Electricals (50 Hz)										
CC105P	1988	38 500 kW	8180 Btu	41.7%	8630 kJ	—	25 900 kW	13 800 kW	1 x MS5001	dual pressure
CC205P	1988	77 800 kW	8110 Btu	42.1%	8550 kJ	—	50 600 kW	27 200 kW	2 x MS5001	dual pressure
CC305P	1988	117 200 kW	8070 Btu	42.3%	8510 kJ	—	75 800 kW	41 400 kW	3 x MS5001	dual pressure
CC106B	1997	64 300 kW	6960 Btu	49.0%	7340 kJ	—	41 500 kW	22 866 kW	1 x MS6001B	dual pressure
CC206B	1997	130 700 kW	6350 Btu	53.7%	7320 kJ	—	81 300 kW	49 400 kW	2 x MS6001B	dual pressure

North America Orders

January 2003 through December 2005

Buyer & Site	Type	Gas Turbine No. & Model	Unit ISO Rating	OEM	Fuel	Remarks
CANADA						
Aker Maritime Kiewit-Husky Energy						
White Rose Field	simple cycle	3xRB211	30 MW	Rolls-Royce	NG	FPSO
ExxonMobil Canada Production-Sable Tier II platform						
Nova Scotia	gas comp	1xRB211 6562 DLE	39,600 hp	Rolls-Royce	NG	Offshore platform
GenPower New York-Hudson Energy Project						
Goldsboro, Nova Scotia	comb cycle	3xMS7001FA	171.5 MW	Gen Electric	NG	Power gen
Nexen/Opti Canada-Long Lake oil sands						
Ft. McMurray, Alberta	simple cycle	2xMS7001FA	172 MW	Gen Electric	SG, NG	Cogeneration
Orenda Magellan Aerospace						
Mississauga, Ontario	simple cycle	1xUGT-2500	2.7 MW	Zorya-Mash	Biomass	Industrial cogen
Pearson Airport/SNC-Lavalin						
Toronto, Ontario	comb cycle	2xLM6000	45 MW	GE Aero	NG	Cogeneration
TransCanada/Grandview Cogeneration						
St. John, New Brunswick	simple cycle	2xLM6000PD	45 MW	GE Aero	NG	Cogeneration
MEXICO						
Calpine Corp./Mitsui						
Valladolid	comb cycle	2xMS7001FA	171.5 MW	Gen Electric	NG	Power gen
Electricidad Sol de Tuxpan (Mitsubishi, Kyushu Electric) - Tuxpan 5						
Tuxpan, Veracruz State	comb cycle	2xM501F	185.4 MW	Mitsubishi	NG	IPP
Iberdrola Eneregia Tamazunchale						
Tamazunchale, San Luis Potosi State	comb cycle	4xMS7001FA	171.5 MW	Gen Electric	NG	Power gen
Iberdrola-La Laguna II						
Durango	comb cycle	2xMS7001FA	171.5 MW	Gen Electric	NG	Power gen
Techint/El Paso/ Pemex/ Gasoducto de Tamaulipas						
San Fernando Pipeline, Tamaulipas State	gas comp	6xGE 10	15,675 hp	GE Oil & Gas	NG	Compressor stations
UNITED STATES						
Alstom Power						
St. Louis, Missouri	gas comp	1xTornado	7.6 MW	Siemens	NG	—
Ameren Union Electric-Venice Power Plant						
Venice, Illinois	simple cycle	2xW501F	198.3 MW	Siemens	NG	—

Section 5

Products and Services

Industry Suppliers and Contacts153

Directory of suppliers to the industry listed alphabetically (by company) with mailing addresses, names of personal contacts, phone and fax numbers, e-mail addresses and websites

Power Systems Suppliers202

Search index to identify primary suppliers (OEMs and licensed packagers) in product categories of prime interest to power plant application engineers, owner operators and EPCs such as gas turbines, steam turbines, electric generators, gensets, compressors and HRSGs

Auxiliary Operating Equipment204

Search index to identify suppliers for the operational side of power plant installations of prime interest to project engineers and owner operators such as air intake filters and silencers, turbine inlet cooling systems, fuel forwarding and treatment skids, on-line compressor washing, onsite data monitoring and diagnostics

Engineering and Onsite Support207

Search index to identify operating plant product and service suppliers of prime interest to owner operators for onsite support such as plant engineering and construction, software systems, operation and maintenance, field service trouble shooting and repairs, retrofit upgrades

Overhaul Parts and Services.211

Search index to identify third-party suppliers of replacement parts and services of prime interest to plant owner operators for scheduled and unscheduled overhaul and rebuild of gas turbines, compressors and steam turbines including upgrades, refurbishment or replacement of blades and vanes, machinery control systems, new coatings

Section 5.1

Industry Suppliers and Contacts

Directory of suppliers to the industry listed alphabetically (by company) with mailing addresses, names of personal contacts, phone and fax numbers, e-mail addresses and websites

AAF International

Power and Industrial
Bassington Lane
Cramlington
Northumberland NE23 8AF
England, UK
Tel: 44-1670-566164
Fax: 44-1670-566162
Dave Carroll, Global Sales Manager
dcarroll@aafgb.com
www.aafintl.com

Aalborg Engineering A/S

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Denmark
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Fax: 45-96-31-39-51
Gas Turbine Marketing Manager
ae@aalborg-engineering.dk
www.aalborg-engineering.com

Aalborg Industries A/S

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Denmark
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Fax: 45-98-10-13-30
Vice President
aal@aalborg-industries.com
www.aalborg-industries.com

AAR Power Services

148 Industrial Park Drive
Frankfort NY 13340 USA
Tel: 315-731-3702
Fax: 315-731-3737
Director Sales Operations
www.aarcop.com

Accttech

151 Tandem Drive
Greer SC 29650 USA
Tel: 864-848-1602
Fax: 864-848-1604
Gil Dean, President
info@accttech.com
www.accttech.com

Ace Precision Machining

977 Blue Ribbon Circle NW
Oconomowoc WI 53066 USA
Tel: 262-252-4003
Fax: 262-252-4974
Francis Fitzsenry
sales@aceprecision.com
www.aceprecision.com

Acraline Turbine

PO Box 417
Tipton OH 46072 USA
Tel: 765-675-8841
Fax: 765-675-6150
Gas Turbine Marketing Manager
www.acraline.com

Adhesive Services

PO Box 40907
Houston TX 77240 USA
Tel: 713-896-0526
Fax: 713-896-1003
President
www.adhesiveservices.com

Advance Filtration Concepts

4625 District Blvd
Vernon CA 90058 USA
Tel: 323-277-0288
Fax: 323-277-0285
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tmoyer@advfiltration.com
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