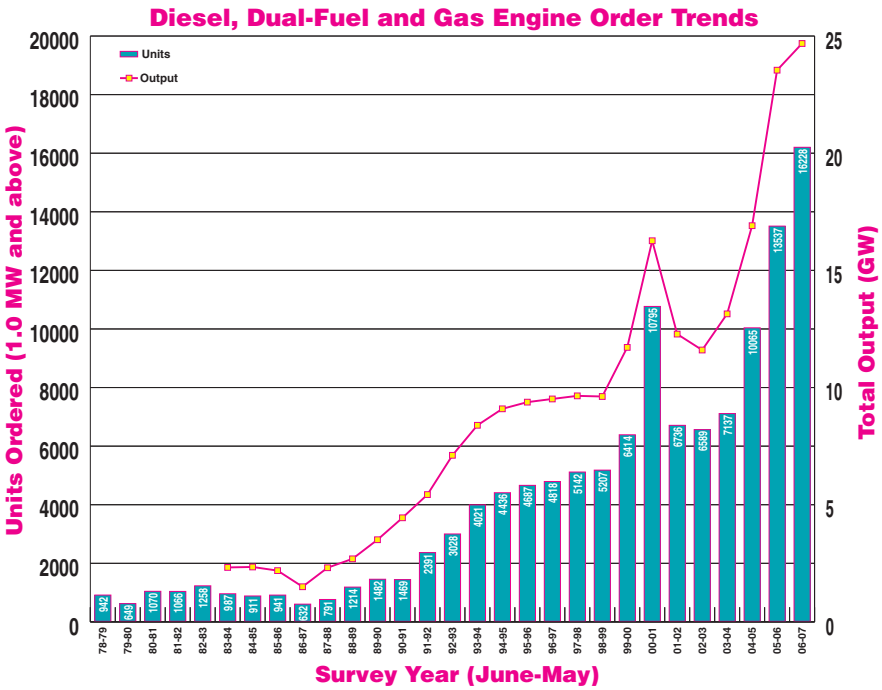
2007

31st POWER GENERATION ORDER SURVEY

DIESEL & GAS TURBINE WORLDWIDE
The Marine and Stationary Power Authority

BY MARK MCNEELY



Sounding Like a Broken Record

Reciprocating engine orders top 33 000 units, while gas turbines climb to a healthy 58 GW

Editors Note: *For the third year this annual survey reports data on a smaller category of engine output [0.5 to 1.0 MW] – the range of reciprocating engines from 500 to 1000 kW. The next higher category, therefore, technically begins at 1.01 MW. The historical (graphic) representation of reciprocating engine orders and outputs will still begin at 1.0 MW. This year's survey analysis, however, will now include this new information as we have three years of data.*

For those amongst us who don't know what a record is, it's (usually) a 12 inch vinyl disk on which one placed a stylus and music was produced via an amplifier. Or, in our case, it is another record-breaking year for the large reciprocating engine markets. North America again held a strong position in the number of engines ordered over 2006, while there were mixed results in other areas of the world. Gas turbine orders, too, made a significant gain in 2007 after posting a healthy increase last year. These are the general highlights in *Diesel & Gas Turbine Worldwide's* 31st Annual Power Generation Order Survey.

The volume of piston engines above 1.0 MW (13 772) surpassed last year's record level (13 488). The order volume for the smaller engines, 500 to 1000 kW, rose to 19 339 engines this year over last year's 17 614 units. Gas turbine engine orders (916) showed another impressive increase over last year's reported figures (831) and the aggregated output total increased by 38% from last year's level.

The geographic disposition of all of these engines continues to be global in reach.

Diesel, dual-fuel and natural gas (including the new fuel category "Liquid Biofuel") reciprocating engine orders increased modestly beyond the huge increase demonstrated in 2006. This, of course, also follows on a very active year in 2005. Of those engines greater than 500 kW, units ordered increased 6% over 2006 reports, while the total output also increased by 8%. The highlighted output category this year is 0.50 to 1.0 MW, which showed a unit order increase of 10% and an increase in output of 13%. Other output ranges that showed large increases last year were relatively flat this year. Geographically, the major regions in the world were again relatively flat by volume, with two exceptions, North America and Eastern Europe & Russia. These two regions reported increases of 1174 and 825 engines, respectively.

Gas turbine orders are up 10% this year to a total of 916 units, which denotes a healthy pace of growth for an industry that suffered through a significant downturn a few years ago. Gas turbine output increased by 39% over 2006 to a total of over 58 GW. Units ordered in several output categories showed positive gains this year, including 5.0 to 7.5 MW (up 37%), 60 to 120 MW (up 288%), and 180+ MW (up 60%). When taken geographically, most of the major regions of the world showed increases in gas turbine orders, with the notable increase in North America (140%).

Procedures

This survey's coverage again includes reciprocating engines starting at 500 kW. Gas turbine orders received for power generation remain rated 1.0 MW and above. This survey encompasses a one-year period from June 1, 2006, through May 31, 2007. Also shown in the data tables are the previous year's survey results for reference and comparison purposes.

As in previous years, our report on orders for marine mechanical propulsion, marine auxiliary generation and diesel-electric marine propulsion systems will be featured in our forthcoming November issue. Also, our 2nd Annual Mechanical Drive Order Survey will be featured in the December issue, as well as in the December edition of our sister publication **COMPRESSORTech**^{TWO}.

The accompanying listing of participants contributing to this worldwide

DIESEL, DUAL-FUEL & GAS ENGINE ORDERS, June 2006 – May 2007

Output Range (MW)	Units Ordered	Total Engine Output (MW)	Type of Generating Service			Fuel					Western Europe	Eastern Europe & Russia	Middle East	Far East	Southeast Asia/ Australia	Central Asia	North Africa	Central, W., E., & S. Africa	North America	Central America & Caribbean	South America
			Stand-by	Peak-ing	Contin-uous	Diesel Fuel	Heavy Fuel	Dual-Fuel	Liquid Biofuel	Nat. Gas											
0.50-1.0	19 339	13 405	12 663	1568	5108	18 026	7	1	0	1305	3467	904	2291	1938	952	2646	9	347	5161	1187	437
1.01-2.0	11 603	16 753	6349	1307	3947	9980	252	0	6	1365	3009	417	794	1648	922	795	15	94	3132	586	191
2.01-3.5	1632	3912	907	156	569	1246	9	0	8	369	364	73	68	119	112	34	0	16	778	38	30
3.51-5.0	200	791	3	0	197	109	21	0	14	56	39	20	4	43	41	13	0	6	17	10	7
5.01-7.5	111	678	13	1	97	42	11	17	4	37	22	2	9	18	18	14	3	3	14	0	8
7.51-10	149	1289	0	23	126	13	31	0	15	90	23	12	30	6	1	14	0	35	24	0	4
10.01-15	18	213	0	0	18	0	18	0	0	0	1	0	1	1	0	0	0	8	3	4	0
15.01-20	59	1044	0	0	59	0	21	23	15	0	16	18	4	0	0	1	1	9	1	8	1
20.01-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30.01 & above	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	**33 111**	**38 085**	**19 935**	**3055**	**10 121**	**29 416**	**370**	**41**	**62**	**3222**	**6941**	**1446**	**3201**	**3773**	**2046**	**3517**	**28**	**518**	**9130**	**1833**	**678**

DIESEL, DUAL-FUEL & GAS ENGINE ORDERS, June 2005 – May 2006

Output Range (MW)	Units Ordered	Total Engine Output (MW)	Type of Generating Service			Fuel				Western Europe	Eastern Europe & Russia	Middle East	Far East	Southeast Asia / Australia	Central Asia	North Africa	Central, W., E., & S. Africa	North America	Central America & Caribbean	South America
			Stand-by	Peak-ing	Contin-uous Duty	Diesel Fuel	Heavy Fuel	Dual-Fuel	Nat. Gas											
0.50-1.0	17 614	11 840	11 315	1490	4809	16 608	13	12	981	3735	312	2378	2026	1341	2163	5	344	4466	570	274
1.01 to 2.0	11 257	15 403	6298	1280	3679	9765	285	0	1207	2430	180	1016	1610	1181	616	11	182	2827	1075	129
2.01 to 3.5	1778	4226	810	155	813	1269	209	1	298	433	60	150	77	91	29	1	35	659	220	23
3.51 to 5.0	147	574	4	1	142	43	67	3	34	35	9	3	13	24	6	1	5	3	47	1
5.01 to 7.5	129	758	4	10	115	35	15	4	75	22	6	10	51	15	10	4	3	1	5	3
7.51 to 10	151	1303	0	0	151	1	70	0	80	4	58	30	4	5	11	0	4	0	34	1
10.01 to 15	14	167	2	0	12	4	10	0	0	2	0	10	0	0	0	0	0	0	2	0
15.01 to 20	60	1067	1	0	59	13	43	4	0	13	0	9	0	2	1	0	8	0	12	15
20.01 to 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30.01 & above	1	43	0	0	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0
Totals	**31 151**	**35 381**	**18 434**	**2936**	**9781**	**27 751**	**713**	**24**	**2675**	**6674**	**625**	**3608**	**3781**	**2659**	**2837**	**22**	**581**	**7956**	**1965**	**446**

DIESEL, DUAL-FUEL & GAS ENGINE SPEEDS

Output Range (MW)	June 2005 - May 2006				June 2006 - May 2007			
	Speed Range (r/min)				Speed Range (r/min)			
	under 300	300-600	720-1000	above 1000	under 300	300-600	720-1000	above 1000
0.50-1.0	0	12	34	17 568	0	5	13	19 321
1.00-2.0	0	0	324	10 933	0	0	306	11 297
2.01-3.5	0	16	222	1540	0	0	73	1559
3.51-5.0	0	7	139	1	9	0	164	27
5.01-7.5	0	4	117	8	0	3	70	38
7.51-10	0	0	151	0	0	3	146	0
10.01-15	0	14	0	0	0	18	0	0
15.01-20	1	59	0	0	1	58	0	0
20.01-30	0	0	0	0	0	0	0	0
30.01 & above	1	0	0	0	0	0	0	0
Totals	**2**	**112**	**987**	**30 050**	**10**	**87**	**772**	**32 242**

survey is much the same as in the recent past and includes those that contributed data for the 500 to 1000 kW category. In the absence of any significant changes from the 2006 survey, these 2007 survey results are comparable on a year-to-year basis for various analyses.

Recip Engines Add to Totals

Engine orders for diesel, dual fuel and natural gas engine generating systems totaled 33 111 units, a 6% increase in activity over the 31 102 units ordered the previous year. Total output – at 38 085 MW – increased roughly 8% over the 34 793 MW in 2006. Again, this year the analysis includes all engines above 500 kW.

The largest volume increase was in the smallest category, from 0.5 to 1.0 MW. This category increased by 10% to 19 339 units. Another category with a significant increase, although lower by volume because of the larger engine sizes, was 3.5 to 5.0 MW, which increased by 36% (200 units vs. 147 in 2006). Another category of high interest, the range from 2.0 to 3.5 MW, showed a slight decrease over last year, decreasing by 8% from 1778 units in 2006 to 1632 units in 2007. All of the other categories this year showed only slight movement either up or down in units ordered. It must be noted, however, that even without much in the way of dramatic increases, the volumes overall are still very high — having been set by the record-smashing 2006 survey data.

GAS TURBINE POWER GENERATION ORDERS, June 2006 – May 2007

Output Range (MW)	Units Ordered	Total Engine Output (MW)	Type of Generating Service			Fuel (Units)				Western Europe	Eastern Europe & Russia	Middle East	Far East	Southeast Asia/ Australia	Central Asia	North Africa	Central, W., E., & S. Africa	North America	Central America & Caribbean	South America
			Stand-by	Peak-ing	Contin-uous	Diesel Fuel	Heavy Fuel	Dual-Fuel	Nat. Gas											
1.01-2.0	114	158	79	0	35	50	34	2	28	0	18	3	82	6	1	0	0	4	0	0
2.01-3.5	52	134	36	0	16	25	9	5	13	0	13	0	37	0	0	0	0	0	0	2
3.51-5.0	57	226	29	0	28	14	15	6	22	1	3	0	31	4	3	2	0	12	0	1
5.01-7.5	104	602	1	0	103	1	0	43	60	12	7	5	16	24	5	1	5	17	0	12
7.51-10	14	106	0	0	14	1	0	4	9	3	0	0	6	2	1	1	0	1	0	0
10.01-15	83	1091	1	5	77	1	0	26	56	14	15	25	4	5	1	4	3	6	1	5
15.01-20	6	100	1	0	5	0	0	3	3	2	2	0	1	1	0	0	0	0	0	0
20.01-30	88	2291	0	67	21	11	0	25	52	18	8	2	3	2	6	4	7	24	8	6
30.01-60	126	5177	0	89	37	1	0	48	77	16	7	31	5	11	14	6	10	17	1	8
60.01-120	70	6287	0	57	13	0	0	42	28	1	1	44	1	1	3	0	0	17	0	2
120.01-180	103	16 203	0	63	40	9	0	49	45	5	10	48	5	9	4	4	10	8	0	0
180.01 & above	99	25 983	0	8	91	0	0	19	80	27	2	25	16	5	1	3	0	9	1	10
Totals	**916**	**58 358**	**147**	**289**	**480**	**113**	**58**	**272**	**473**	**99**	**86**	**183**	**207**	**70**	**39**	**25**	**35**	**115**	**11**	**46**

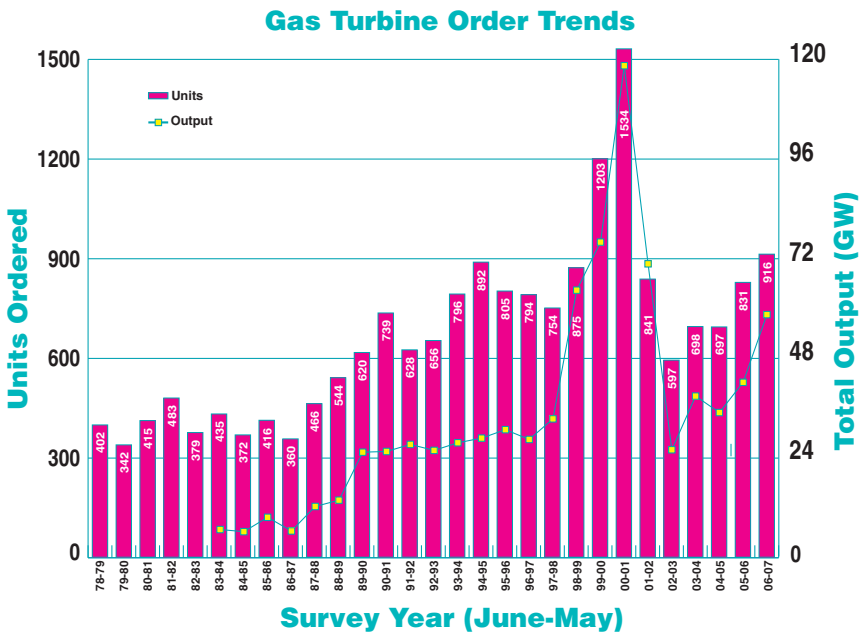
GAS TURBINE POWER GENERATION ORDERS, June 2005 – May 2006

Output Range (MW)	Units Ordered	Total Engine Output (MW)	Type of Generating Service			Fuel (Units)				Western Europe	Eastern Europe & Russia	Middle East	Far East	Southeast Asia/ Australia	Central Asia	North Africa	Central, W., E., & S. Africa	North America	Central America & Caribbean	South America
			Stand-by	Peak-ing	Contin-uous	Diesel Fuel	Heavy Fuel	Dual-Fuel	Nat. Gas											
1.01-2.0	118	162	89	0	29	46	40	11	21	4	11	0	98	0	0	2	0	1	2	0
2.01-3.5	36	96	31	0	5	16	15	4	1	0	4	0	32	0	0	0	0	0	0	0
3.51-5.0	39	161	0	0	39	3	5	8	23	10	0	0	13	1	2	1	4	4	0	4
5.01-7.5	76	443	1	1	74	2	0	40	34	7	2	3	11	14	11	0	7	12	0	9
7.51-10	34	263	0	0	34	2	0	8	24	12	3	1	10	2	1	0	1	3	0	1
10.01-15	119	1561	0	1	118	1	0	25	93	14	11	19	13	6	11	0	9	6	3	27
15.01-20	9	161	0	0	9	3	0	2	4	0	4	3	2	0	0	0	0	0	0	0
20.01-30	97	2436	4	11	82	17	1	20	59	5	24	37	14	1	0	5	4	3	0	4
30.01-60	124	4873	0	20	104	0	7	40	77	7	21	14	14	14	2	0	21	4	17	10
60.01-120	18	1567	0	2	16	2	5	2	9	4	3	5	3	0	0	0	0	1	0	2
120.01-180	99	14 395	0	16	83	0	0	31	68	4	3	31	7	5	6	1	29	9	0	4
180.01 & above	62	15 902	0	0	62	0	0	12	50	16	0	16	10	5	4	0	0	5	0	6
Totals	**831**	**42 020**	**125**	**51**	**655**	**92**	**73**	**203**	**463**	**83**	**86**	**129**	**227**	**48**	**37**	**9**	**75**	**48**	**22**	**67**

In the type of generating service area, all three types of service — standby, peaking and continuous — increased in volume over 2006 levels. For all output categories above 500 kW, standby service increased by 8% (19 935 vs. 18 434 in 2006), peaking service units increased by 4% (3055 vs. 2936 units in 2006), while continuous-duty machines rose by 3.5% (10 121 vs. 9781 units in 2006). As in previous surveys, the bulk of the engines ordered above 3.5 MW were destined for continuous-duty operation. Engine orders by speed range changed slightly this year, with a 22% decrease (772 vs. 987 units in 2006) in the range from 720 to 1000 r/min. This was somewhat offset by a 7% increase (32 242 vs. 30 050 units in 2006) in the highest speed range above 1000 r/min. It also follows previous trends that almost all of the higher speed units were in the smaller output ranges from 500 kW to 3.5 MW.

With regard to fuels, it continues to be noteworthy to look at the number of natural gas engine orders. Overall, natural gas engine orders increased over 20%, from 2675 in 2006 to 3222 in 2007. Also noteworthy is a 33% increase in natural gas engines in the 500 to 1000 kW range. Overall, this natural gas engine order increase is certainly in higher proportion than the increase in engine volume for the year, making it significant. Also, there is a new fuel category of **Liquid Biofuels** this year to help better reflect the small, but growing use of renewable fuels to power large internal combustion engines. The Liquid Biofuels category, which premiered with 62 engines, does not include biogas engines. Biogas engines still remain under the natural gas fuel category. Finally, there was a decrease of 48% (370 vs. 713 units in 2006) in the number of heavy fuel engines reported.

In analyzing the geographic location for orders, just about all of the major regions saw slight increases over last year, although there were some decreases as well. Three regions had fairly high increases, including



Eastern Europe & Russia (131%), Central Asia (24%) and North America (15%). This year's only slight decreases in major regions were in Southeast Asia/Australia (-23%), the Middle East (-11%) and Central America (-7%). Engine orders for the Far East, which includes China, Japan and South Korea, remained almost even with last year (3773 vs. 3781 units in 2006). Western Europe, another high-volume region, rose 4% (6941 vs. 6674 units in 2006).

Given the geographically dispersed nature of the engines reported, it is difficult to pinpoint one single indicator driving demand. Two leading indicators for this activity, it would seem, are the continued high worldwide demand for both raw materials and energy resources. Other factors — including stronger global economies in general, specific regional infrastructure development, data centers and natural disasters (and preparedness) — continue to feed demand.

Gas Turbines Retain Momentum

Gas turbine orders continue to grow at a healthy rate, doubling the year-to-year growth in output from the past two years. Units ordered reached 916 in 2007, a 10% increase over last year's 831 units. Total output increased much more, however, rising 39% to 58 358 MW. This represents a significant increase in orders for higher output machines. This output increase brings the industry closer to the first major jump in orders (64 000 MW) back in the 1998/99 timeframe.

With regard to the individual output categories, the results were mostly positive. One remarkable surge in orders was in the 60 to 120 MW category, which increased in units ordered by 290% (70 vs. 18 units in 2006). Another significant increase, which accounts for much of the overall increase in output as well, occurred in the largest 180+ MW category. Units ordered increased by 60% and the output soared from 15 902 MW in 2006 to 25 983 MW in 2007, an output increase of 63%. In the smaller output ranges, it was the 5.0 to 7.5 MW category that saw the largest increase (37%), going from 76 units in 2006 to 104 units in 2007. Two decreases to note were in the 10 to 15 MW range (-30%) and the 20 to 30 MW range (-9%). The remaining output ranges were virtually unchanged.

When taken together, the highest output gas turbines — 60 MW and above — increased in units ordered by 52% this year. This increase bodes well not only for the four manufacturers of the largest gas turbines, but the entire high value supply chain that feeds into that manufacturing network.

When analyzing the gas turbine orders by geographic location, the results reflected an equal number of increases and decreases. North America's increase was the highest at 140% (115 vs. 48 units in 2006). This increase was accounted for by rising orders in the 20 to 120 MW categories. Another high-volume region was the Middle East, which saw its orders increase by 42% (183 vs. 129 units in 2006). Southeast Asia/ Australia also saw orders increase by 46% (70 vs. 48 units in 2006). There were three regions that showed decreases this year and they include Central/ Southern Africa (-53%), Central America (-50%) and South America (-31%). It should also be noted that Western Europe, another fairly high-volume region, increased by 19%. Other regions remained somewhat stable.

Perhaps the story to be told for this year's increases is in the type of service. Peaking units jumped an extraordinary 466% over last year, tallying 289 units this year while only recording 51 units in 2006. Most of these units — as it would be expected — were in the mid to high output ranges from 20 to 180 MW. The other two service categories, standby and continuous duty, reflected an increase and decrease, respectively, of 18% and -27%. With regard to type of fuel, the most interesting category this year is the dual-fuel machines, which increased by 34%, from 203 units in 2006 to 272 units in 2007.

Power Generation Trends

These order surveys try to convey an accurate count of engines destined for power generating applications. It is important to note that the gas compression industry continues on a healthy order pace, which adds to the gas turbine and gas engine manufacturers' total order volumes.

Reciprocating engine orders no doubt remain healthy — especially in several key markets including marine propulsion, power generation, mechanical drivers and rail traction.

This year's remarkable, record-setting

power generation order figures for piston engines — on top of last year's outstanding increases — reflect broad increases in both diesel and natural gas fuels, peaking and continuous service, as well as ample dispersal throughout the major geographic regions. It is particularly interesting to note the increases in reciprocating engine orders in Eastern Europe & Russia, as well as North America. Central Asia's 24% increase is also noteworthy. Moreover, the 20% growth in natural gas engines, always a high interest area, reflects continued demand for applications with either traditional oilfield gas or biogas.

Last year's 42 000 MW in gas turbine orders would have seemed to be a more "normal level" for the industry, but this year's 16 000 MW increase in orders requires a new definition of normal level. Growth in North America, the Middle East and Southeast Asia seemed to have been fueled, at least in part, by demand for peaking service machines. The 466% increase in peaking service gas turbines this year is truly astounding, however, the continuous-duty machines also more or less kept pace with last year's numbers. LNG production continues to gear up in the major natural gas centers of the world, as has the production of LNG carriers, all of which helps to increase the supply of natural gas worldwide. And while there has been quibbling and posturing over natural gas pipeline projects in some regions, overall the world's gas infrastructure continues to expand.

Predicting 2008's order figures is a daunting task, but worldwide the engine manufacturers are saying their order books are full, so it should be expected that next year's order data will be positive as well. Again, absent any major geopolitical upheaval(s) in the coming year, it would not be surprising to see engine orders in all categories to continue to reflect robustness in worldwide demand for power.

Once more, our most sincere thanks go to all of the engine manufacturers who invested time and energy to participate in this survey. We deeply appreciate the support of the engine industry and are grateful that power generation buying influences and customers throughout the world continue to find this annual power generation survey useful and informative.

Electronic versions of past surveys are available on our website at: www.dieselgasturbine.com.

Diesel, Dual-Fuel and Gas Engine Manufacturers Participating and Reporting Orders in this Power Generation Survey

- BEZ Motory
- Caterpillar Engine Div. (including Caterpillar Motoren)
- Cummins Engine
- Deutz Power Systems
- Electro-Motive Diesel
- GE Jenbacher
- GE Transportation
- Hyundai
- Isotta Fraschini
- MAN B&W Diesel Group (including MAN B&W Ltd., Copenhagen, Holeby, Augsburg and licensee Navantia, Spain)
- MTU Friedrichshafen (including Detroit Diesel)
- Mitsubishi Heavy Industries
- Niigata Power Systems
- PervomayskDieselMash
- Rolls-Royce Bergen
- Wärtsilä
- Waukesha Engine, Dresser, Inc.
- Yanmar Diesel Engine

Gas Turbine Manufacturers Participating and Reporting Orders in this Power Generation Survey

- ALSTOM Power
- Ansaldo Energia
- Aviadvigatel
- Daihatsu Diesel Mfg.
- GE Energy (including GE Oil & Gas)
- Hitachi Ltd.
- Kawasaki Heavy Industries
- MAN Turbo
- Mitsubishi Heavy Industries
- NPO Saturn
- Niigata Power Systems
- OPRA
- Power Machines
- Pratt & Whitney Power Systems
- Rolls-Royce Energy
- Siemens Power Generation
- Solar Turbines
- Yanmar
- Zorya-Mashproekt