

# 35<sup>th</sup> power generation order survey

INCREASED ORDERS FOR GAS TURBINES, STEAM TURBINES AND RECIPROCATING ENGINES

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➤ Diesel & Gas Turbine Worldwide's Power Generation Order Survey is part one of three surveys designed to provide details on the markets of larger reciprocating engines, steam turbines and gas turbines used in power generation, marine propulsion and mechanical drive applications.

We divide the data into three reports in order to provide a more in-depth look at each market segment. The Power Generation Order Survey examines reciprocating engines, steam turbines and gas turbines for power generation service. The Marine Propulsion Order Survey (to appear in the June issue) examines mechanical drive, auxiliary and diesel-electric marine propulsion systems. The Mechanical Drive Order Survey (to appear in the July/August issue) is devoted to engine orders for mechanical drive applications including pumps, compressors, oil exploration machinery, rail and other industrial applications.

## Procedures

The Power Generation Order Survey includes reciprocating engines starting at 500 kW, gas turbines rated 1.0 MW and above, and steam turbines.

New orders are broken into types of generating service — standby, peaking and continuous. Manufacturers provide their own distinction between peaking and standby service; however, standby service typically refers to power generation in backup or emergency service. Peaking service is associated with power generation used in conjunction with local utili-

ties. The time that peak service operates is dependent on the condition of the local electrical grid. Continuous service typically refers to continuous power generation, stopping only for maintenance or unexpected outages.

An accompanying table identifies those companies that participated in the 2011 survey. Every effort is made to ensure that this survey is as complete and comprehensive as possible and would not have the level of detail it contains without the generous contributions of the participating companies.

## Overview

All reported driver types (gas turbines, steam turbines and reciprocating engines) showed increases in 2010, compared to orders represented in 2009.

Reciprocating engines saw a 30% rise compared to the 2010 Power

Generation Order Survey. There were 23 160 reciprocating engines reported in the 2010 survey (for 2009 reporting period). The 2011 survey recorded 30 118 orders (2010 reporting period).

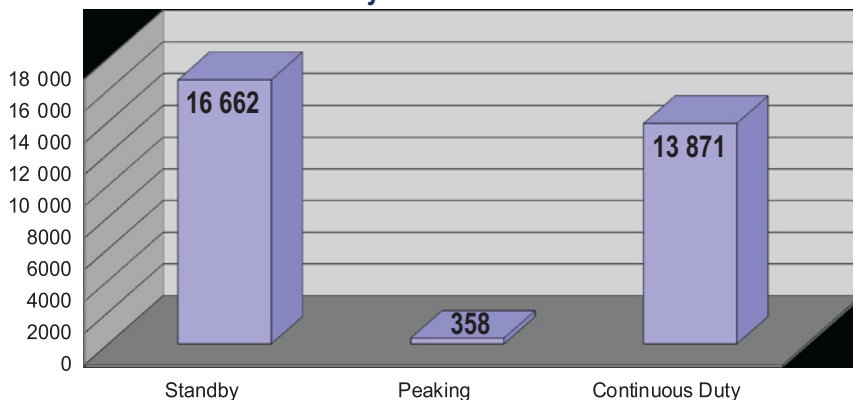
Gas turbine orders rose 31% compared to the 2010 survey. The 2011 survey accounts for 687 units ordered. The 2010 survey recorded 523 units.

Steam turbine orders increased 30%. This year's survey recorded 86 steam turbine orders. The 2010 Power Generation Order Survey recorded 66 units.

When we examine all reported driver types combined (gas turbines, steam turbines, reciprocating engines) we see an increase of 30% compared to last year's Power Generation Order Survey. The 2010 survey revealed 23 749 total power generation orders. This year's survey accounts for 30 891 units.

## Type Of Generating Service For All Reported Driver Types

(Steam Turbine Orders, Gas Turbine Orders, Reciprocating Engine Orders)  
January – December 2010



**DIESEL, DUAL-FUEL & GAS ENGINE ORDERS, January – December 2010**

Output Range (MW)	Units Ordered	Total Engine Output (MW)	Type of Generating Service			Engine Operating Speed Ranges (r/min)				Fuel					Western Europe	Eastern Europe, Russia & CIS	Middle East	Far East	Southeast Asia, Australia	Central Asia	North Africa	Central/West. East & South Africa	North America	Central America & Caribbean	South America
			Stand-by	Peak-ing	Contin-uous	Below 300	300 to 600	720 to 1000	Above 1000	Diesel Fuel	Heavy Fuel	Dual Fuel	Liquid Biofuel	Nat. Gas											
0.5 to 1.0	17 674	13 457	9927	172	7575	0	2	2	17 670	16 524	2	2	0	1146	3585	854	2610	1331	831	3296	67	471	2764	792	1073
1.01 to 2.0	9949	14 361	5371	126	4452	4	0	301	9644	8631	284	4	2	1028	2854	408	914	1528	828	974	21	180	1309	271	662
2.01 to 3.5	1791	4501	1027	4	760	0	15	76	1700	1349	47	3	0	392	339	73	137	215	83	123	3	41	658	51	68
3.51 to 5.0	149	634	34	0	115	0	6	45	98	42	8	0	0	99	29	41	23	11	3	18	0	10	10	4	0
5.01 to 7.5	92	542	30	0	62	0	25	62	5	60	24	0	2	6	21	8	0	17	17	7	0	8	11	2	1
7.51 to 10	347	3155	136	5	206	0	182	165	0	17	234	2	0	94	1	0	58	2	0	110	0	19	20	2	135
10.01 to 15	34	439	0	0	34	0	18	16	0	2	28	4	0	0	0	0	0	0	0	16	0	2	0	10	6
15.01 to 20	64	1127	0	0	64	0	18	45	1	0	42	21	0	1	6	0	1	0	7	19	0	15	0	16	0
20.01 to 30	17	357	17	0	0	0	0	0	17	0	3	0	0	14	0	0	0	0	0	0	0	0	0	0	17
30.01 & above	1	43	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
<b>Totals</b>	<b>30 118</b>	<b>38 616</b>	<b>16 542</b>	<b>307</b>	<b>13 269</b>	<b>5</b>	<b>266</b>	<b>712</b>	<b>29 135</b>	<b>26 626</b>	<b>672</b>	<b>36</b>	<b>4</b>	<b>2780</b>	<b>6835</b>	<b>1384</b>	<b>3743</b>	<b>3104</b>	<b>1769</b>	<b>4563</b>	<b>91</b>	<b>746</b>	<b>4772</b>	<b>1149</b>	<b>1962</b>

While each driver type did show increases, this year's survey reveals a significant increase in the use of reciprocating engines in power generation service. As technologies and efficiencies improve, reciprocating engines are clearly gaining market share once owned by gas turbines. Debates are frequent as to "which is better." Each side has well-drawn arguments that won't be discussed here. Rather, in looking at the numbers, one can see that team recip is gaining ground.

Looking only at engine output from 1 to 5 MW, growth in reciprocating engine orders between the 2010 sur-

vey and 2011 survey represents about 31%. Gas turbines in the same power rating (1 to 5 MW) saw a 7% decrease in orders compared to last year.

It is important to note that exact comparisons are difficult to make due to participation differences between this year's survey and last (the events in Japan did affect survey participation this year), but the growth in reciprocating engines' market share is significant.

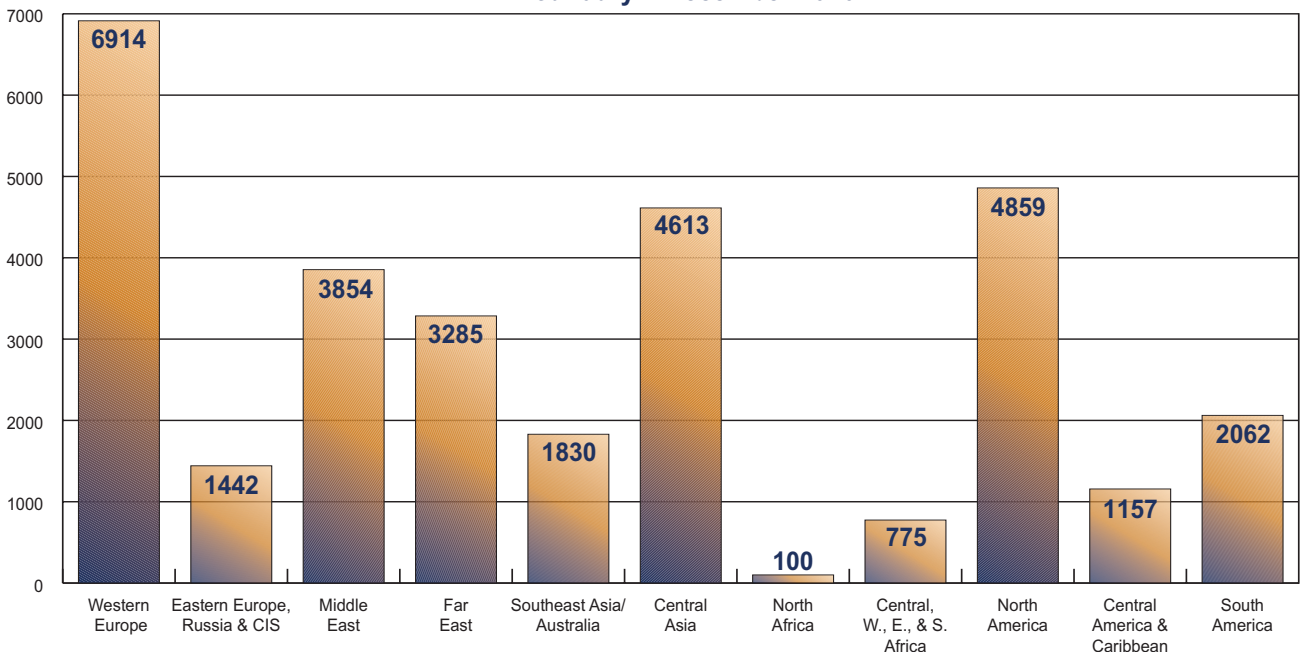
Western Europe overtook North America as the top geographic location for 2010 orders. The 2011 Power Generation Order survey revealed that 6914 units (all driver types re-

ported) were ordered in Western Europe — a 62% increase from 2010's survey. North America received 4859 orders in this year's survey — an increase of nearly 3% compared to the 2010 survey.

Top five markets revealed in the 2011 survey are: Western Europe (22%), North America (16%), Central Asia (15%), Middle East (12%) and Far East (11%).

Analysts rate the top Western Europe power markets as Germany, France, Italy, Spain and the U.K. Many Western European countries have increased investments within the power genera-

**Region Totals For All Reported Driver Types  
(Steam Turbine Orders, Gas Turbine Orders, Reciprocating Engine Orders)  
January – December 2010**



**GAS TURBINE POWER GENERATION ORDERS, January – December 2010**

Output Range (MW)	Units Ordered	Total Engine Output (MWe)	Type of Generating Service			Fuel (Units)				Western Europe	Eastern Europe, Russia & CIS	Middle East	Far East	Southeast Asia & Australia	Central Asia	North Africa	Central/West, East & South Africa	North America	Central America & Caribbean	South America
			Stand-by	Peak-ing	Contin-uous	Diesel Fuel	Heavy Fuel	Dual Fuel	Nat. Gas											
1.0 to 2.0	80	100	61	0	19	28	33	2	17	3	6	0	64	1	0	0	4	2	0	0
2.01 to 3.5	40	114	29	1	10	10	20	6	4	0	2	2	31	2	0	0	2	1	0	0
3.51 to 5.0	64	272	30	0	34	11	17	15	21	8	1	4	32	4	0	0	0	11	0	4
5.01 to 7.5	88	509	0	0	88	0	0	29	59	17	8	4	7	10	2	0	0	32	0	8
7.51 to 10	50	403	0	0	50	1	0	15	34	2	9	19	0	7	6	0	3	1	0	3
10.01 to 15	131	1849	0	2	129	0	0	76	55	7	10	4	8	19	6	0	4	6	2	65
15.01 to 20	4	64	0	0	4	0	0	4	0	0	4	0	0	0	0	0	0	0	0	0
20.01 to 30	13	503	0	1	12	0	0	2	11	1	1	2	1	0	6	0	2	0	0	0
30.01 to 60	49	1843	0	0	49	0	0	16	33	9	5	7	0	10	4	0	5	2	0	7
60.01 to 120	39	3320	0	8	31	0	4	17	18	0	3	17	8	3	5	0	0	1	0	2
120.01 to 180	65	9061	0	36	29	2	10	4	49	0	0	30	12	1	2	7	7	0	6	0
180.01 & above	64	14 916	0	2	62	6	0	21	37	5	2	11	5	0	16	0	0	16	0	9
<b>Totals</b>	<b>687</b>	<b>32 954</b>	<b>120</b>	<b>50</b>	<b>517</b>	<b>58</b>	<b>84</b>	<b>207</b>	<b>338</b>	<b>52</b>	<b>51</b>	<b>100</b>	<b>168</b>	<b>57</b>	<b>47</b>	<b>7</b>	<b>27</b>	<b>72</b>	<b>8</b>	<b>98</b>

**STEAM TURBINE POWER GENERATION ORDERS, January – December 2010**

Output Range (MW)	Units Ordered	Total Engine Output (MWe)	Type of Generating Service			Steam Turbine Types					Western Europe	Eastern Europe, Russia & CIS	Middle East	Far East	Southeast Asia & Australia	Central Asia	North Africa	Central/West, East & South Africa	North America	Central America & Caribbean	South America
			Stand-by	Peak-ing	Contin-uous	Condensing	Non-Condensing	Reheat	Extraction	Inclination											
0.0 to 1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.01 to 5.0	17	47	0	0	17	7	10	0	1	1	6	0	0	3	0	0	0	1	6	0	1
5.01 to 10	17	131	0	0	17	11	6	0	6	1	5	2	0	5	1	0	2	1	1	0	0
10.01 to 30	23	398	0	1	22	19	4	0	16	1	11	1	2	2	0	0	0	0	7	0	0
30.01 to 60	6	281	0	0	6	5	0	1	2	1	3	2	0	0	0	0	0	1	0	0	
60.01 to 120	2	143	0	0	2	2	0	0	0	1	1	0	0	0	1	0	0	0	0	0	
120.01 to 200	2	260	0	0	2	1	1	0	0	0	0	2	0	0	0	0	0	0	0	0	
200.01 to 300	3	875	0	0	3	3	0	0	0	0	0	0	1	1	0	0	0	0	0	1	
300.01 to 500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
500.01 to 700	12	6137	0	0	12	12	0	6	0	0	1	0	6	0	2	3	0	0	0	0	
700.01 to 1000	2	1740	0	0	2	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	
1000.01 & above	2	2800	0	0	2	2	0	2	0	0	0	0	2	0	0	0	0	0	0	0	
<b>Totals</b>	<b>86</b>	<b>12 812</b>	<b>0</b>	<b>1</b>	<b>85</b>	<b>64</b>	<b>21</b>	<b>9</b>	<b>25</b>	<b>5</b>	<b>27</b>	<b>7</b>	<b>11</b>	<b>13</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>15</b>	<b>0</b>	<b>2</b>

tion sector in order to accommodate increased demands. Transmission and distribution networks throughout Western Europe are currently undergoing considerable upgrades, which likely contributed to the bump to the number-one geographic location this year.

With the global recession waning, analysts predict demand to rise within all sectors (industrial, residential, commercial).

The Energy Information Administration (EIA) predicts that world net electricity generation will increase by 87%, from 18.8 trillion kilowatt hours in 2007 to 25.0 trillion kilowatt hours in 2020 and 35.2 trillion kilowatt hours in 2035. Although the recession slowed the rate of growth in electricity demand in 2008 and 2009, the EIA predicts that growth will return to pre-recession rates by 2015.

Good news for the manufacturers of

gas turbines, steam turbines and reciprocating engines destined for power generation service.

**Diesel, Dual-Fuel and Gas Engine Orders**

The number of diesel, dual-fuel and gas engines ordered during 2010 totaled 30 118, a 30% increase from last year's survey. The majority of the orders (59%) were in the power range of 500 kW to 1 MW, followed by the 1.01 to 2.00 MW power range at 33%. This data mirrors the 2010 Power Generation Survey results, which showed 500 kW to 1 MW with 59% and 1.01 to 2.00 MW with 30%.

Standby power once again dominated the type of generating service, with 55% of the orders being designated this way. Continuous duty represented 44%, while peaking service saw a drastic drop, representing only

1% of the orders reported. Last year peaking service accounted for 24% of the reciprocating engine orders.

Engine operating speeds above 1000 r/min comprised 97% of the total units ordered in 2010. Diesel fuel engines represented 88% of all engines ordered. Natural gas-powered engines rose from 6% in the 2010 survey to 9% this year. Dual-fuel fell to less than 1% this year. Dual-fuel accounted for almost 2% of the total engines last year.

Top geographic markets for diesel, dual-fuel and gas engines were Western Europe (23%), North America (16%), Central Asia (15%) and Middle East (12%).

**Gas Turbine Orders**

Gas turbine orders totaled 687 units, up 31% from last year's survey. There were more orders for larger gas turbines

## Country Information for Regions/Regional Codes *D&GTW* Annual Market Surveys

<b>Western Europe (Without Eastern Europe)</b>	Azerbaijan	Iraq	Laos	<b>Central, West, East &amp; South Africa</b>	Mauritania	Costa Rica
Andorra	Belarus	Israel	Malaysia	Angola	Mauritius	Cuba
Austria	Bosnia and Herzegovina	Jordan	Marshall Islands	Benin	Mozambique	Dominica
Belgium	Bulgaria	Kuwait	Micronesia	Botswana	Namibia	Domin. Republic
Denmark	Croatia	Lebanon	Palau	Burkina Faso	Niger	El Salvador
Finland	Czech Republic	Oman	Papua New Guinea	Burundi	Nigeria	Guatemala
France	Estonia	Qatar	Philippines	Cameroon	Rwanda	Haiti
Germany	Georgia	Saudi Arabia	Samoa	Cape Verde	Senegal	Honduras
Greece	Hungary	Syria	Singapore	Cent. African Rep.	Seychelles	Jamaica
Iceland	Kazakhstan	Turkey	Solomon Islands	Chad	Sierra Leone	Mexico
Liechtenstein	Kyrgyzstan	United Arab Emirates	Tahiti	Comoros	Somalia	Nicaragua
Luxembourg	Latvia	Yemen	Tonga	Congo	South Africa	Panama
Italy	Lithuania	<b>Far East</b>	Thailand	Cote d'Ivoire	Sudan	Puerto Rico
Ireland	Moldova	China	Tuvalu	Djibouti	Swaziland	Virgin Islands
Netherlands	Poland	Hong Kong	Vanuatu	Equatorial Guinea	Tanzania	West Indies
Malta	Republic of Macedonia	Japan	Vietnam	Eritrea	Togo	<b>South America</b>
Norway	Romania	Mongolia	<b>Central Asia</b>	Ethiopia	Uganda	Argentina
Portugal	Russia	North Korea	Afghanistan	Gabon	Zaire	Bolivia
San Marino	Serbia	South Korea	Bangladesh	Gambia	Zambia	Brazil
Slovenia	Slovak Republic	Taiwan	India	Ghana	Zimbabwe	Chile
Spain	Tajikistan	<b>Southeast Asia &amp; Australia</b>	Maldives Islands	Guinea	<b>North America</b>	Colombia
Sweden	Turkmenistan	Australia	Nepal	Guinea Bissau	Canada	Ecuador
Switzerland	Ukraine	Brunei	Pakistan	Ivory Coast	U.S.A.	Guyana
United Kingdom	Uzbekistan	Burma	Sri Lanka	Kenya	<b>Central America &amp; Caribbean</b>	Paraguay
<b>Eastern Europe, Russia &amp; CIS</b>	<b>Middle East</b>	Cambodia	<b>North Africa</b>	Lesotho	Bahamas	Peru
Albania	Bahrain	Fiji Islands	Algeria	Liberia	Bermuda	Surinam
Armenia	Cyprus	Indonesia	Libya	Madagascar	Belize	Uruguay
	Egypt	Kiribati	Morocco	Malawi		Venezuela
	Iran		Tunisia	Mali		

in 2010 — 19% of gas turbines reported in this survey were rated 10.01 to 15.00 MW. In 2009, 21% of total gas turbines ordered were rated 1.0 to 2.0 MW.

Fuel type was dominated by natural gas (49%). Dual-fuel represented 30% of all gas turbines reported, followed by heavy fuel (12%) and diesel fuel (8%).

The Far East received the majority of orders (24%) followed by the Middle East (15%) and South America (14%).

### Steam Turbines

Steam turbine orders totaled 86 units (an increase of 30% compared to last year), with 27% falling into the 10.1 to 30.00 MW output range.

Only one unit was classed as peaking service, with all others designated continuous duty.

The majority of steam turbines were classified for condensing.

Western Europe received 35% of the steam turbines ordered in 2010, followed by North America (19%) and the Far East (17%).

### Annual Surveys

On behalf of *Diesel & Gas Turbine Worldwide*, thank you to all contributors for your continued participation in this annual survey process. It is our hope that the three surveys combined will provide an accurate snapshot of the entire large engine landscape, with fine-tuned detail provided for three market segments through each individual report — power generation, marine propulsion and mechanical drive. Electronic

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

- Caterpillar Inc.
- Caterpillar Power Generation Systems
- Cummins Power Generation
- Electro-Motive Diesel Inc.
- Fairbanks Morse Engine
- GE Energy - Jenbacher Gas Engines
- GE Energy - Waukesha Gas Engines
- GE Transportation
- Guascor Power S.A.U.
- Hyundai Heavy Industries Co. Ltd.
- Kawasaki Heavy Industries Ltd.
- MAN Diesel & Turbo (including SEMT Pielsctick & license-built engines)
- Mitsubishi Heavy Industries Ltd.
- MWM
- Niigata Power Systems Co. Ltd.
- PervomaiskDieselMash (PDM)
- Rolls-Royce
- RUMO
- Sakr Power Systems S.A.L.
- Tognum AG / MTU Friedrichshafen
- Wärtsilä Corp.

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

- Energomash Business Group
- GE Energy
- Hitachi Ltd.
- Kawasaki Heavy Industries Ltd.
- MAN Diesel & Turbo
- Niigata Power Systems Co. Ltd.
- NPO Saturn
- Opra Turbines
- Rolls-Royce
- Siemens AG
- Solar Turbines Inc.
- Vericor Power Systems LLC
- Zorya-Machproekt

#### Steam Turbine Manufacturers Participating and Reporting Orders in this Power Generation Survey

- Doosan Heavy Industries
- Dresser-Rand
- GE Energy
- GE Oil & Gas
- Hitachi Ltd.
- MAN Diesel & Turbo
- Power Machines

versions of past surveys are available at our website: [www.diesलगasturbine.com](http://www.diesलगasturbine.com). Questions, comments and suggestions should be directed to [bhaight@dieselpub.com](mailto:bhaight@dieselpub.com).