

POWER

39th
GENERATION
ORDER SURVEY

Diesel & Gas Turbine
WORLDWIDE
the prime-mover magazine since 1969

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HOLD FAST

by Brent Haight

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 Mechanical Drive Order Survey (to appear in the June issue) is devoted to engine orders for mechanical drive applications including pumps, compressors, oil exploration machinery, rail and other industrial applications. The Marine Propulsion Order Survey (to appear in the

July/August issue) examines mechanical drive, auxiliary and diesel-electric marine propulsions systems.

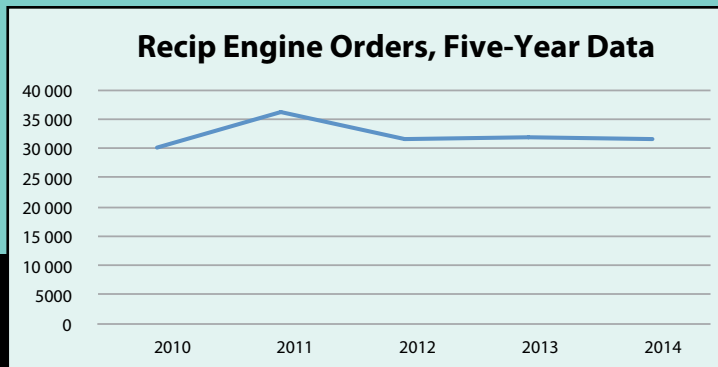
Procedures

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 utilities. 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.

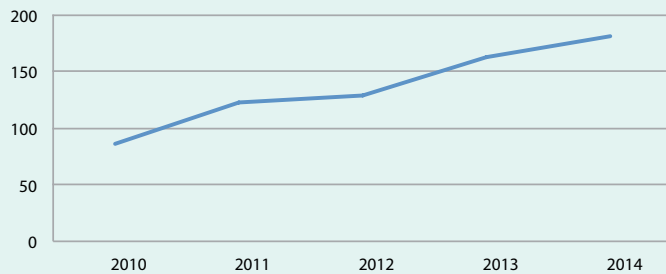
An accompanying table shows the geographic breakdown we provide OEMs,



RECIPROCATING ENGINE (DIESEL, DUAL-FUEL & GASEOUS-FUEL) POWER GENERATION ORDERS, January - December 2014

Output Range (MW)	Units Ordered	Total Engine Output (MWe)	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
			Standby	Peaking	Continuous	Below 300	300 - 600	720 - 1000	Above 1000	Diesel Fuel	Heavy Fuel	Dual Fuel	Liquid Biofuel	Natural Gas												
0.50 to 1.00	17 417	12 746	9285	226	7905	0	0	5	17 412	16 568	6	0	843	2916	914	3581	1556	1601	607	13	1315	3087	507	1320		
1.01 to 2.00	11 047	16 054	4003	259	6771	0	0	50	10 997	9577	35	0	1428	1444	496	1292	2133	1917	350	13	307	2176	166	753		
2.01 to 3.50	2627	6342	1669	124	789	0	0	86	2541	2286	57	1	283	430	75	177	572	165	36	5	65	974	51	77		
3.51 to 5.00	187	745	14	0	168	0	0	40	147	51	19	0	117	31	16	27	14	7	8	2	1	21	21	39		
5.01 to 7.50	67	296	12	0	40	0	0	67	0	45	20	0	2	1	6	17	5	10	0	0	1	4	2	21		
7.51 to 10.00	184	1687	15	12	157	0	5	163	16	38	28	0	118	0	52	46	7	9	20	0	4	30	3	13		
10.01 to 15.00	12	168	0	0	12	0	6	0	6	6	0	3	3	6	0	6	0	0	0	0	0	0	0	0		
15.01 to 20.00	60	1076	0	0	60	0	60	0	0	5	33	0	22	0	0	20	0	0	19	1	3	3	12	2		
20.01 to 30.00	3	67	0	0	3	2	1	0	0	0	3	0	0	0	0	0	0	0	0	0	2	0	0	1		
30.01 and above	1	47	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0		
Totals	31 605	39 228	14 998	621	15 906	3	72	411	31 119	28 576	202	4	7	2816	4828	1559	5166	4287	3709	1040	34	1698	6295	763	2226	

Steam Turbine Orders, Five-Year Data



highlighting the specific countries within the reported geographic regions.

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. An accompanying table identifies those companies that participated in the 2015 survey.

It is important to note, some units reported in the 2015 Power Generation Order Survey did not have complete information. In some cases OEMs chose not to provide generating service, fuel type or geography for some of their reported orders.

Overview

Total orders (all reported driver types) reported in the 2015 Power Generation Order Survey (2014 data) were down only 1% compared to those reported in last year's survey (2013 data). Good news considering the current state of the global energy landscape. Low oil prices have negatively impacted myriad industries. Prime movers designated for power

generation applications are no exception. Orders began to taper near year end as oil prices continued to set new lows. More and more companies postponed projects delayed orders and adopted a "wait and see" attitude toward capital spending.

Reciprocating engine orders totaled 31 605 units, down roughly 1% from last year's count.

Gas turbine orders fell by 20% compared to last year's report. The 2015 Survey reveals 596 gas turbine orders while 710 orders were reported in the 2014 Survey.

A bright spot in the 2015 Power Generation Order Survey is that steam turbine orders rose in 2014, setting a new high-water mark for steam turbine orders reported in our annual survey. Steam turbine orders logged 181 units, an 11% increase compared to the 2014 Survey.

North America once again claimed the top geographic location for all reported driver types in 2014 with 6404 units ordered. Shale fields in the U.S. continue to be a dominating factor. China's economic woes came into play as the Far East dropped from second place last year to fourth place this year.

Top five regions revealed in the 2015 Power Generation Order Survey are: North America (20%); Middle East (16%); Western Europe (15%); Far East (14%) and Southeast Asia & Australia (12%).

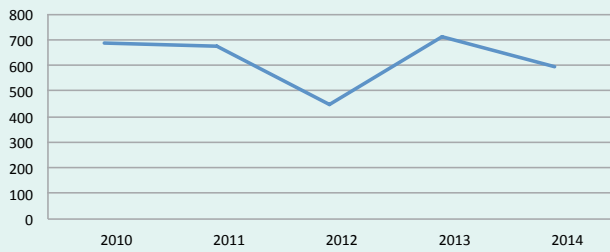
STEAM TURBINE POWER GENERATION ORDERS, January – December 2014

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
			Standby	Peaking	Continuous	Condensing	Non-Condensing	Reheat	Extraction	Induction											
0.0 to 1.00	20	12	0	0	9	0	20	0	1	0	1	0	0	1	5	0	0	1	10	1	1
1.01 to 5.00	71	139	0	0	34	2	69	0	0	0	2	0	0	0	59	0	0	2	3	5	0
5.01 to 10.00	11	90	0	0	5	10	1	0	2	0	1	2	0	0	5	1	0	0	1	1	0
10.01 to 30.00	25	535	1	0	21	17	0	0	7	0	7	0	1	6	2	3	0	0	4	2	0
30.01 to 60.00	6	289	0	0	4	6	0	0	1	0	3	0	0	0	0	1	0	0	2	0	0
60.01 to 120.00	8	722	0	0	6	6	0	4	2	0	0	0	2	2	0	0	2	0	0	1	1
120.01 to 200.00	16	2370	0	0	16	4	0	1	0	0	0	3	0	1	6	1	0	0	3	1	0
200.01 to 300.00	5	1266	0	0	5	4	0	2	0	0	0	0	2	1	0	0	0	2	0	0	0
300.01 to 500.00	11	4333	0	0	11	5	0	5	0	0	0	1	1	0	2	0	0	0	5	2	0
500.01 to 700.00	8	5306	0	0	8	0	0	0	0	0	0	0	3	1	2	0	2	0	0	0	0
700.01 to 1000.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1000.01 and above	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	181	15 062	1	0	119	54	90	12	13	0	14	6	9	12	81	6	4	5	28	13	2

Country Information For Regions/Regional Codes, D>W Annual Market Surveys

Western Europe	Luxembourg	Switzerland	Bulgaria	Poland	Middle East	Qatar
Andorra	Italy	United Kingdom	Croatia	Republic of Macedonia	Bahrain	Saudi Arabia
Austria	Ireland		Czech Republic	Romania	Cyprus	Syria
Belgium	Malta	Eastern Europe,	Estonia	Russia	Egypt	Turkey
Denmark	Netherlands	Russia & CIS	Georgia	Serbia	Iran	United Arab
Finland	Norway	Albania	Hungary	Slovak Republic	Iraq	Emirates
France	Portugal	Armenia	Kazakhstan	Tajikistan	Israel	Yemen
Germany	San Marino	Azerbaijan	Kyrgyzstan	Turkmenistan	Jordan	
Greece	Slovenia	Belarus	Latvia	Ukraine	Kuwait	
Iceland	Spain	Bosnia and	Lithuania	Uzbekistan	Lebanon	<i>Continued</i>
Liechtenstein	Sweden	Herzegovina	Moldova		Oman	<i>on page 32</i>

Gas Turbine Orders, Five-Year Data



Regardless of oil prices, politics and other “short-term” factors, the need for reliable power continues to grow. The International Energy Agency (IEA) predicts energy demand to grow by 37% through 2040 (World Energy Outlook 2014 Fact Sheet, Nov. 2014). Much of that growth will come from natural gas fired plants as nuclear continues to recover from Japan’s Fukushima disaster and ongoing retirement of coal-fired plants.

While renewables are gaining traction thanks to advances in technology and affordability, cases like California’s record-setting drought and its dramatic loss of hydroelectric power remind us that we will never live in a renewable-only world (apologies to the green movement).

Time is the constant tell. Just how much the energy industry has been impacted by low oil prices and current economic and political challenges around the globe will be revealed in next year’s order survey. Without a doubt, 2015 will prove to be a pivotal “moment” in prime-mover history.

Diesel, Dual-Fuel And Gas Engine Orders

The number of diesel, dual-fuel and natural gas engines ordered in 2014 totaled 31 605, a decrease of 1% compared to last year’s survey. The majority of orders (55%) were once again in the power range of 500 kW to 1 MW, followed by 1.01 to 2.00 MW range (35%).

The 2015 Survey reveals 50% of the orders received were destined for continuous duty, followed by standby service at 47%. Peaking service represented roughly 2% of the orders.

Engine operating speeds above 1000 r/min comprised 98% of the total units ordered in 2014.

Diesel fuel continued its domination as preferred fuel for reciprocating engines in power generation applications, claiming 90% of the reported engines fuel type. Natural gas represented roughly 9%.

Top geographic locations for diesel, dual-fuel and gas engines were North America (20%), Middle East (16%), Western Europe (15%); Far East (13%) and Southeast Asia & Australia (12%).

The U.S. shale boom continued to keep North America atop the geographic destination list for reciprocating engines.

The Far East’s drop to fourth place from second place last year can be attributed to declines in China’s power output as its economy continues to struggle.

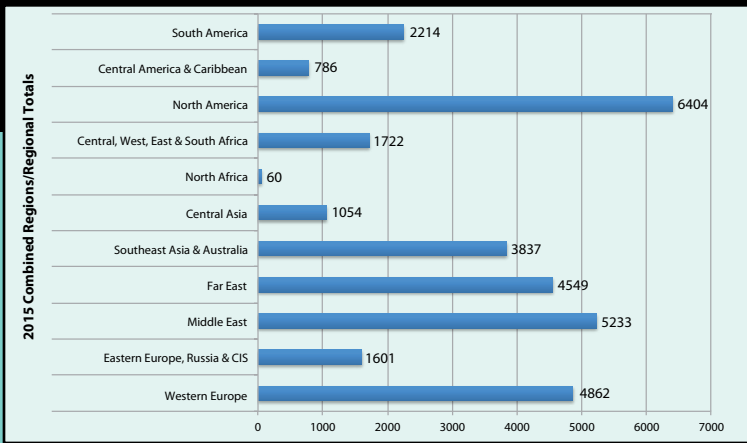
GAS TURBINE POWER GENERATION ORDERS, January – December 2014

Output Range (MW)	Units Ordered	Total Engine Output (MWe)	Type Of Generating Service			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
			Standby	Peaking	Continuous	Diesel Fuel	Heavy Fuel	Dual Fuel	Natural Gas											
1.00 to 2.00	104	140	88	0	16	23	55	10	16	7	0	0	90	2	0	0	0	5	0	0
2.01 to 3.50	38	104	36	0	2	18	10	8	2	0	0	0	36	0	0	1	0	1	0	0
3.51 to 5.00	53	220	43	0	10	19	22	4	8	0	0	0	43	2	0	0	1	7	0	0
5.01 to 7.50	69	423	5	0	64	7	0	14	48	5	21	6	16	5	0	1	0	13	1	1
7.51 to 10.00	36	291	0	0	34	0	0	16	20	2	4	2	2	9	0	3	8	5	0	1
10.01 to 15.00	14	175	0	0	8	1	0	2	11	0	0	0	3	3	0	0	2	3	2	1
15.01 to 20.00	39	609	0	0	39	0	0	9	30	3	7	5	4	2	3	3	5	7	0	0
20.01 to 30.00	10	239	0	0	10	0	0	0	10	0	0	3	1	0	0	0	0	1	4	1
30.01 to 60.00	52	2322	0	0	23	0	0	20	32	3	0	7	13	18	0	5	0	3	0	3
60.01 to 120.00	10	804	0	0	10	0	0	3	7	0	1	2	2	2	0	0	0	2	0	1
120.01 to 180.00	42	5890	0	0	38	0	12	4	26	0	0	18	10	0	3	4	3	2	1	1
180.01 and above	102	27 992	0	11	60	4	6	14	78	0	3	15	30	4	2	5	0	32	2	7
Totals	569	39 209	172	11	314	72	105	104	288	20	36	58	250	47	8	22	19	81	10	16

Country Information For Regions/Regional Codes, D>W Annual Market Surveys

Far East	Southeast Asia & Australia	Malaysia	Thailand	Pakistan	Central, West, East & South Africa	Chad
China	Australia	Marshall Islands	Tuvalu	Sri Lanka	Angola	Comoros
Hong Kong	Brunei	Micronesia	Vanuatu		Benin	Congo
Japan	Burma	Palau	Vietnam	North Africa	Botswana	Cote d’Ivoire
Mongolia	Cambodia	Papua New Guinea		Algeria	Burkina Faso	Djibouti
North Korea	Fiji Islands	Philippines	Central Asia	Libya	Burundi	Equatorial Guinea
South Korea	Indonesia	Samoa	Afghanistan	Morocco	Cameroon	Eritrea
Taiwan	Kiribati	Singapore	Bangladesh	Tunisia	Cape Verde	Ethiopia
	Laos	Solomon Islands	India		Ken. African Rep.	Gabon
		Tahiti	Maldives Islands			Gambia
		Tonga	Nepal			

39th POWER generation order survey



Steam Turbines

Steam turbine orders totaled 181 units in the 2015 Survey, an increase of 11% compared to last year. Units rated 1.01 to 5.00 MW saw the most demand, accounting for 39% of all steam turbine orders. Southeast Asia & Australia was the top geographic location (46%), followed by North America (15%) and Far East (8%).

Gas Turbines

Gas turbine orders reported in the 2015 Survey totaled 569 units, down nearly 20% compared to last year. Gas turbines rated 1.00 to 2.00 MW saw the most activity, accounting for 18% of the orders.

Natural gas was the dominant fuel type (51%), followed by heavy fuel (19%), dual fuel (18%) and diesel fuel (13%).

The Far East was the top geographic location for gas turbine orders (44%). North America claimed the number two spot (14%), followed by the Middle East (10%).

China's need for clean power continues despite its economic slowdown. Beijing, where pollution averaged more than twice China's national standard last year, announced plans to close the last of its four major coal-fired power plants. The facilities will be replaced by four gas-fired stations with capacity to supply 2.6 times more electricity than the coal plants.

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, mechanical drive and marine propulsion. Electronic versions of past surveys are available at our website: www.diesलगasturbine.com. Questions, comments and suggestions should be directed to bhaight@diesलगasturbine.com.

Power Generation Order Survey Participants

Diesel, Dual-Fuel And Gas Engine Manufacturers

- Caterpillar Inc. (includes MWM, Mak and FGWilson Power Gen brands)
- Cummins Power Generation
- Dresser-Rand Guascor Engines and Gensets
- Fairbanks Morse
- GE Power & Water
- Hyundai Heavy Industries, Engine and Machinery Division
- MAN Diesel & Turbo SE (including license-built engines)
- Mitsubishi Heavy Industries Ltd.
- Niigata Power Systems Co. Ltd.
- Rolls-Royce Power Systems AG
- Wärtsilä Corp.
- Yanmar Co. Ltd.

Gas Turbine Manufacturers

- Ansaldo Energia S.p.A.
- GE Oil & Gas
- GE Power & Water
- Kawasaki Heavy Industries Ltd.
- MAN Diesel & Turbo SE
- Mitsubishi Hitachi Power Systems Ltd.
- Motor Sich
- Niigata Power Systems Co. Ltd.
- OPRA Turbines
- Power Machines
- Siemens AG
- Solar Turbines Inc.
- Vericor Power Systems
- Zorya-Machproekt

Steam Turbine Manufacturers

- Ansaldo Energia S.p.A.
- Dresser-Rand Co.
- Elliott Group
- Fincantieri S.p.A. - Marine Systems and Components Business Unit
- GE Oil & Gas
- GE Power & Water
- MAN Diesel & Turbo SE
- Mitsubishi Heavy Industries Compressor Corp.
- Mitsubishi Hitachi Power Systems Ltd.
- Power Machines

Country Information For Regions/Regional Codes, D>W Annual Market Surveys

Ghana	Mauritania	Somalia	North America	Cuba	Panama	Colombia
Guinea	Mauritius	South Africa	Canada	Dominica	Puerto Rico	Ecuador
Guinea Bissau	Mozambique	Sudan	U.S.A.	Domin. Republic	Virgin Islands	Guyana
Ivory Coast	Namibia	Swaziland		El Salvador	West Indies	Paraguay
Kenya	Niger	Tanzania	Central America & Caribbean	Guatemala		Peru
Lesotho	Nigeria	Togo	Bahamas	Haiti	South America	Suriname
Liberia	Rwanda	Uganda	Bermuda	Honduras	Argentina	Uruguay
Madagascar	Senegal	Zaire	Belize	Jamaica	Bolivia	Venezuela
Malawi	Seychelles	Zambia	Costa Rica	Mexico	Brazil	
Mali	Sierra Leone	Zimbabwe		Nicaragua	Chile	