

# Historical Summary of Diesel & Gas Turbine Survey Results (through order year 2014)

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On behalf of  
EGSA Market Trends Committee*

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Electrical Generating Systems Association



# *Objectives of Analysis*

- Compile previous results from the Diesel & Gas Turbine power generation engine order survey to review historical changes – focusing on Gas versus Diesel by power range.
- Highlight North America engine orders compared to worldwide totals.
- Overlay EGSA alternator shipment survey results for North America to show trend information (through 2012).



# Format of Diesel & Gas Turbine Market Survey Results – Order Year 2014

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	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	7	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	0	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	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	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	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	0	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	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	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	0
<b>Totals</b>	<b>31 605</b>	<b>39 228</b>	<b>14 998</b>	<b>621</b>	<b>15 906</b>	<b>3</b>	<b>72</b>	<b>411</b>	<b>31 119</b>	<b>28 576</b>	<b>202</b>	<b>4</b>	<b>7</b>	<b>2816</b>	<b>4828</b>	<b>1559</b>	<b>5166</b>	<b>4287</b>	<b>3709</b>	<b>1040</b>	<b>34</b>	<b>1698</b>	<b>6295</b>	<b>763</b>	<b>2226</b>

Source: Diesel & Gas Turbine Worldwide – Power Generation Order Survey

- Survey results available at: [www.diesलगasturbine.com](http://www.diesलगasturbine.com)
- Although results are shown by power range and Duty Cycle, Engine Speed, Fuel Type and Region – only one dimension is shown at a time.
- Results are limited to this one dimensional view to protect the companies participating in the survey.



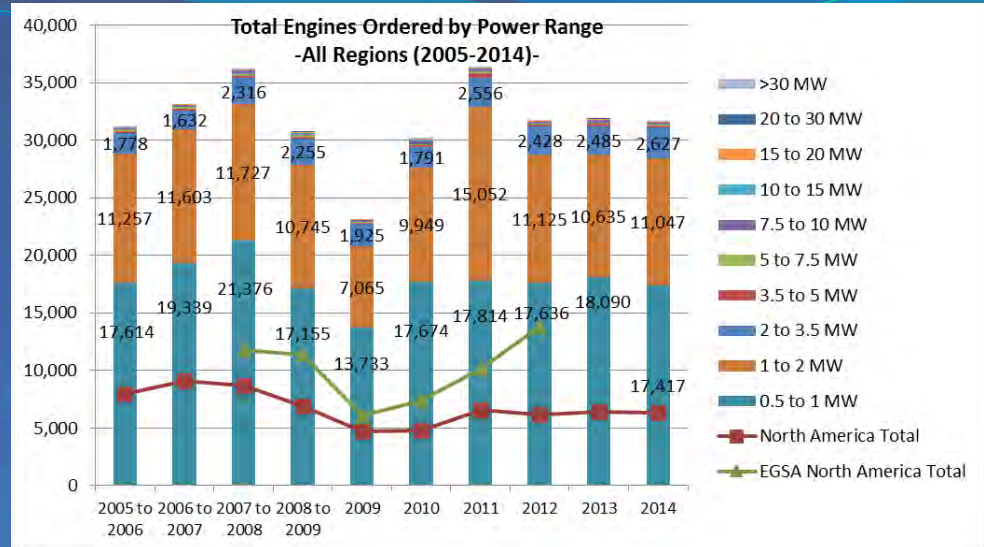
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# Worldwide Engine Orders by Power Range (2005-2014)

- Over 91% of the engine orders above 0.5 MW are concentrated in the 0.5 to 2 MW range on a yearly basis.
- North America accounts for approximately 18 – 25% of worldwide engine orders above 0.5 MW on a yearly basis.
  - Since 2011 North America has stabilized between 18-20% of worldwide demand for engines >500 kW.
- In terms of trend the orders from 2013 to 2014 were fairly **flat overall** with a slight volume shift from the lowest 0.5 to 1 MW range to the 1 to 2 MW and 2 to 3.5 MW ranges.



Output Range (MW)	2005 to 2006	2006 to 2007	2007 to 2008	2008 to 2009	2009	2010	2011	2012	2013	2014
0.5 to 1 MW	17,614	19,339	21,376	17,155	13,733	17,674	17,814	17,636	18,090	17,417
1 to 2 MW	11,257	11,603	11,727	10,745	7,065	9,949	15,052	11,125	10,635	11,047
2 to 3.5 MW	1,778	1,632	2,316	2,255	1,925	1,791	2,556	2,428	2,485	2,627
3.5 to 5 MW	147	200	180	111	94	149	427	129	196	187
5 to 7.5 MW	129	111	150	153	103	92	99	83	142	67
7.5 to 10 MW	151	149	284	155	129	347	279	178	179	184
10 to 15 MW	14	18	29	31	25	34	13	3	11	12
15 to 20 MW	60	59	83	82	86	64	92	113	75	60
20 to 30 MW	0	0	8	1	0	17	4	0	3	3
>30 MW	1	0	1	0	0	1	2	1	0	1
<b>Grand Total</b>	<b>31,151</b>	<b>33,111</b>	<b>36,154</b>	<b>30,688</b>	<b>23,160</b>	<b>30,118</b>	<b>36,338</b>	<b>31,696</b>	<b>31,816</b>	<b>31,605</b>
<b>North America Total</b>	<b>7,956</b>	<b>9,130</b>	<b>8,725</b>	<b>6,878</b>	<b>4,677</b>	<b>4,772</b>	<b>6,589</b>	<b>6,129</b>	<b>6,390</b>	<b>6,295</b>
<b>EGSA North America Total</b> <sup>*Note 1</sup>			11,740	11,400	6,081	7,366	10,128	<sup>*Note 1</sup> 13,838	Not Available	Not Available

**\*Note 1:** The EGSA Alternator Shipment Survey was discontinued with the latest available reporting period of Q2 2012 data. The total of 13,838 for EGSA North America in 2012 is an extrapolated value based on using Q1 & Q2 data as well as historical average estimates for Q3 & Q4 volumes as a percentage of the yearly alternator shipment total.

Source: Diesel & Gas Turbine Worldwide – Power Generation Order Survey, EGSA Quarterly Generator Shipment Survey.

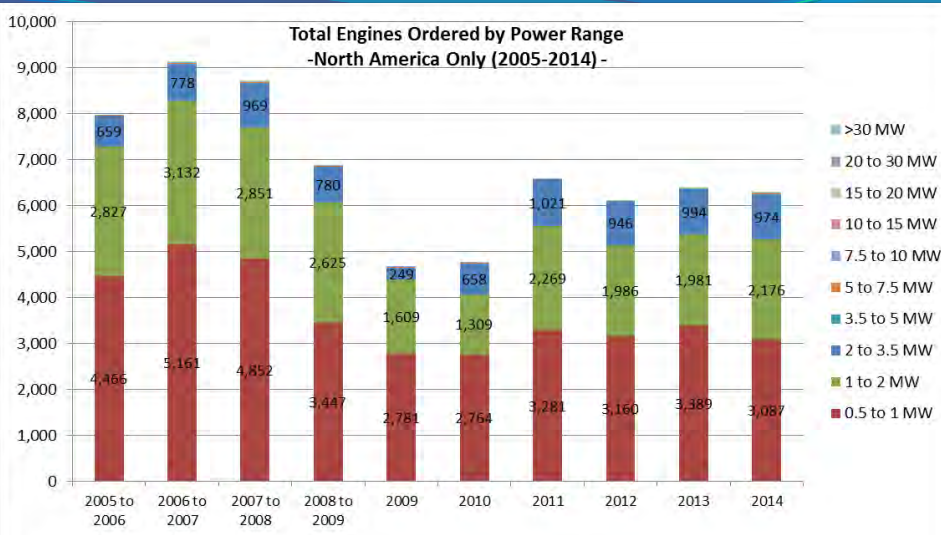


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# North America Engine Orders by Power Range (2005-2014)

- The average power range distribution for North American engine orders (units basis) over the period 2005-2014 was:
  - 0.5 to 1 MW: 54%
  - 1 to 2 MW: 34%
  - 2 to 3.5 MW: 12%
- Growth over last 4 years (2011-2014) in the levels in 2-3.5 MW range to around 1000 units/year.
- 0.5 to 1 W range seems to show slight decrease in average long term levels offset by higher sustained levels in the 1 to 2 MW and 2 to 3.5 MW ranges.

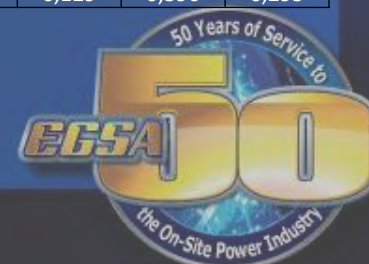


Output Range (MW)	2005 to 2006	2006 to 2007	2007 to 2008	2008 to 2009	2009	2010	2011	2012	2013	2014
0.5 to 1 MW	4,466	5,161	4,852	3,447	2,781	2,764	3,281	3,160	3,389	3,087
1 to 2 MW	2,827	3,132	2,851	2,625	1,609	1,309	2,269	1,986	1,981	2,176
2 to 3.5 MW	659	778	969	780	249	658	1,021	946	994	974
3.5 to 5 MW	3	17	4	7	5	10	9	5	10	21
5 to 7.5 MW	1	14	9	10	15	11	6	9	4	4
7.5 to 10 MW	0	24	30	9	18	20	3	1	0	30
10 to 15 MW	0	3	0	0	0	0	0	0	0	0
15 to 20 MW	0	1	10	0	0	0	0	22	12	3
20 to 30 MW	0	0	0	0	0	0	0	0	0	0
>30 MW	0	0	0	0	0	0	0	0	0	0
Grand Total	7,956	9,130	8,725	6,878	4,677	4,772	6,589	6,129	6,390	6,295

Source: Diesel & Gas Turbine Worldwide – Power Generation Order Survey



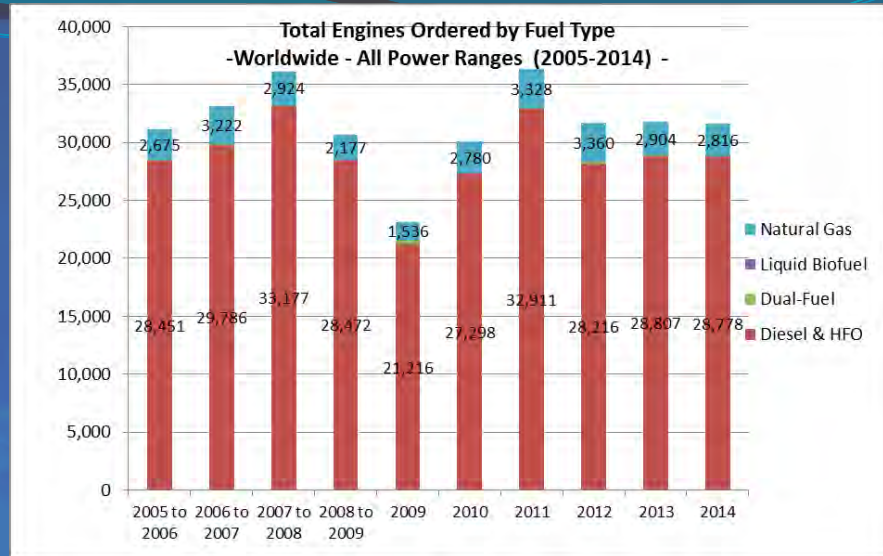
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# Worldwide Engine Orders by Fuel Type (2005-2014)

- The average split by fuel type (units basis worldwide) over the period 2005-2014:
  - Diesel & HFO: 90.9%
  - Dual Fuel: 0.3%
  - Liquid Biofuel: 0.04%
  - Natural Gas: 8.7%



Output Range (MW)	2005 to 2006	2006 to 2007	2007 to 2008	2008 to 2009	2009	2010	2011	2012	2013	2014
Diesel & HFO	28,451	29,786	33,177	28,472	21,216	27,298	32,911	28,216	28,807	28,778
Dual-Fuel	24	41	14	28	401	36	93	111	60	4
Liquid Biofuel		62	31	11	7	4	6	9	9	7
Natural Gas	2,675	3,222	2,924	2,177	1,536	2,780	3,328	3,360	2,904	2,816
Grand Total	31,150	33,111	36,146	30,688	23,160	30,118	36,338	31,696	31,780	31,605

Output Range (MW)	2005 to 2006	2006 to 2007	2007 to 2008	2008 to 2009	2009	2010	2011	2012	2013	2014
Diesel & HFO	91.3%	90.0%	91.8%	92.8%	91.6%	90.6%	90.6%	89.0%	90.6%	91.1%
Dual-Fuel	0.1%	0.1%	0.0%	0.1%	1.7%	0.1%	0.3%	0.4%	0.2%	0.0%
Liquid Biofuel	0.0%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Natural Gas	8.6%	9.7%	8.1%	7.1%	6.6%	9.2%	9.2%	10.6%	9.1%	8.9%
Grand Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Diesel & Gas Turbine Worldwide – Power Generation Order Survey



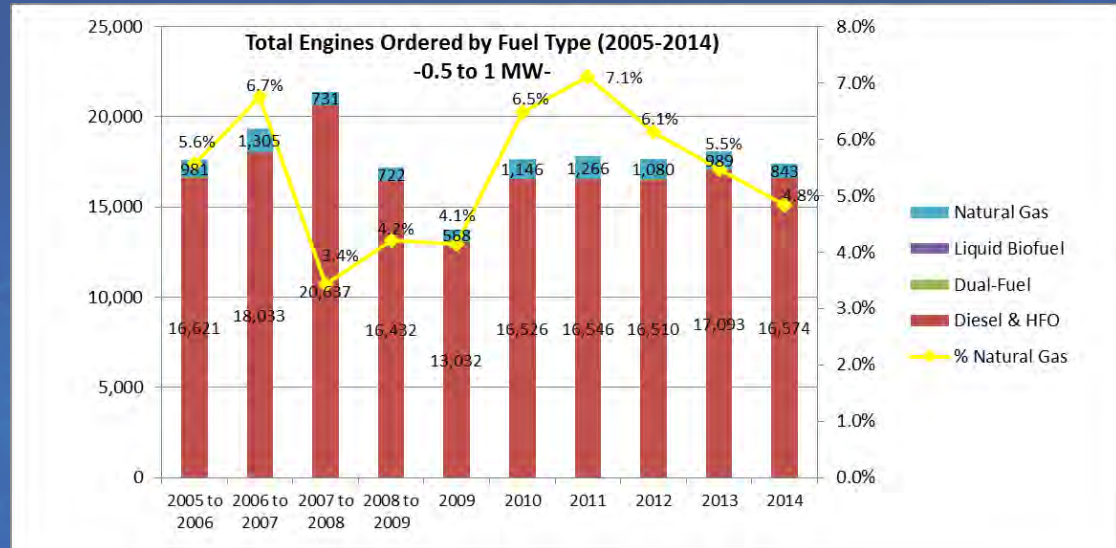
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# Worldwide Engine Orders by Fuel Type (2005-2014)

## 0.5 to 1 MW

- The 0.5 to 1 MW range is dominated by Diesel & HFO standby units with an uptick in natural gas units starting from 3-4% during the years 2007-2009 to 5-7% in 2010-2014.
- Fall from 6.1% to 4.8% of total units natural gas from 2012 to 2014 due to the large difference in relative proportion of Diesel & HFO to Natural Gas (i.e. drowning out effect).
- At the same time natural gas orders in these larger ranges have fallen off a few hundred units from 1,266 in 2011 to 843 in 2014 as there is a trend in natural gas at the higher power ranges above 1 MW.



Output Range (MW)	2005 to 2006	2006 to 2007	2007 to 2008	2008 to 2009	2009	2010	2011	2012	2013	2014
Diesel & HFO	16,621	18,033	20,637	16,432	13,032	16,526	16,546	16,510	17,093	16,574
Dual-Fuel	12	1	0	1	133	2	2	46	6	0
Liquid Biofuel		0	0	0	0	0	0	0	0	0
Natural Gas	981	1,305	731	722	568	1,146	1,266	1,080	989	843
Grand Total	17,614	19,339	21,368	17,155	13,733	17,674	17,814	17,636	18,088	17,417
% Natural Gas	5.6%	6.7%	3.4%	4.2%	4.1%	6.5%	7.1%	6.1%	5.5%	4.8%

Source: Diesel & Gas Turbine Worldwide – Power Generation Order Survey



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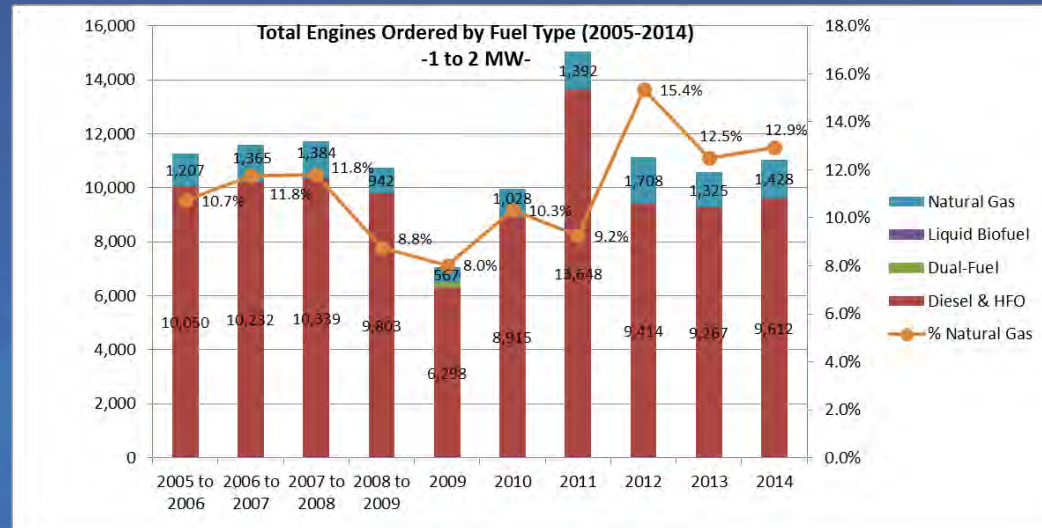




# Worldwide Engine Orders by Fuel Type (2005-2014)

## 1 to 2 MW

- The 1 to 2 MW range has shown the most significant growth of all power ranges in recent years – both in Diesel and Natural Gas.
- In the 1 to 2 MW there is a relatively greater proportion of natural gas units due to use in cogeneration and prime/continuous applications (10-12% per year).
- We would expect this upward trend towards natural gas to strengthen in future years as it becomes a more attractive and viable fuel option globally.
- Although total units in the 1 to 2 MW range decreased slightly during the previous 2 years since a high of 15,052 in 2011 the units in this range have seemed to level off at 11,000 units per year.



Output Range (MW)	2005 to 2006	2006 to 2007	2007 to 2008	2008 to 2009	2009	2010	2011	2012	2013	2014
Diesel & HFO	10,050	10,232	10,339	9,803	6,298	8,915	13,648	9,414	9,267	9,612
Dual-Fuel	0	0	0	0	200	4	6	0	0	0
Liquid Biofuel		6	4	0	0	2	6	3	4	7
Natural Gas	1,207	1,365	1,384	942	567	1,028	1,392	1,708	1,325	1,428
Grand Total	11,257	11,603	11,727	10,745	7,065	9,949	15,052	11,125	10,596	11,047
% Natural Gas	10.7%	11.8%	11.8%	8.8%	8.0%	10.3%	9.2%	15.4%	12.5%	12.9%

Source: Diesel & Gas Turbine Worldwide – Power Generation Order Survey



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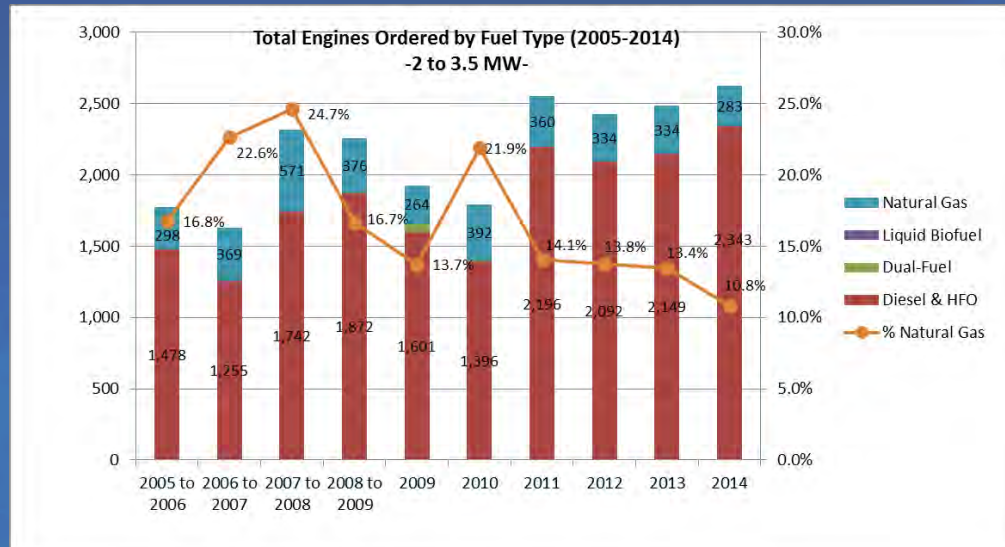




# Worldwide Engine Orders by Fuel Type (2005-2014)

## 2 to 3.5 MW

- In the 2 to 3.5 MW range there are more natural gas units considered for larger utility and peaking projects.
- The penetration of natural gas units is more dependent on the region and the stability of the natural gas supply.
- Noticeable increase in Diesel & HFO orders in 2011-2014 above 2,000 units per year.
- While 2-3.5 MW range decreased from 334 to 283 in Natural Gas in order year 2014:
  - the 1-2 MW range increased from 1,325 to 1,428 units.
  - the 3.5-5mw range increased from 83 to 117 units from 2013 to 2014



Output Range (MW)	2005 to 2006	2006 to 2007	2007 to 2008	2008 to 2009	2009	2010	2011	2012	2013	2014
Diesel & HFO	1,478	1,255	1,742	1,872	1,601	1,396	2,196	2,092	2,149	2,343
Dual-Fuel	1	0	0	4	57	3	0	0	0	1
Liquid Biofuel		8	3	3	3	0	0	2	1	0
Natural Gas	298	369	571	376	264	392	360	334	334	283
Grand Total	1,777	1,632	2,316	2,255	1,925	1,791	2,556	2,428	2,484	2,627
% Natural Gas	16.8%	22.6%	24.7%	16.7%	13.7%	21.9%	14.1%	13.8%	13.4%	10.8%

Source: Diesel & Gas Turbine Worldwide – Power Generation Order Survey



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