Power Systems Research (PSR) is forecasting that global engine production for all fuel types will grow slowly and steadily at a compound annual growth rate (CAGR) of 1.4% up to 2019. Total horsepower delivered will grow faster as average engine output tends to increase. Growth rates will be lower than those we saw in prerecession years.

However, looking at just diesel engines, we expect a CAGR of 4.2% over the same period. We expect some shifts to alternative fuels including ethanol, natural gas and LPG, these are high in percentage terms but low in unit volume terms.

Global engine production will be around 237 million total units in 2014 and we expect the ratio of the low and higher displacement engines to remain constant to 2020.

A key driver to growth will be the implementation of emissions standards in line with local government legislation. The cost of producing an emissionized engine is decreasing as global manufacturers achieve scale, collaborate with local manufacturers and leverage their expertise into developing markets. As these technically advanced products, designed to improve fuel economy and lower carbon dioxide and nitrous oxide emissions are launched we expect to see a shift in market dynamics and continued focus on improving the total cost of ownership.

The shift to natural gas fuel is dependent on natural gas prices remaining competitive versus diesel. As a result, adoption will vary regionally. The advantage of natural gas fuel is that these engines can meet emissions regulations without the complex aftertreatment characteristic of compliant diesels.

**Global Diesel Engine Production By Fuel Type**

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>CAGR 2014-2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel</td>
<td>4.2%</td>
</tr>
<tr>
<td>Gasoline</td>
<td>0.7%</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>5.5%</td>
</tr>
<tr>
<td>LPG</td>
<td>5%</td>
</tr>
<tr>
<td>Others</td>
<td>5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1%</strong></td>
</tr>
</tbody>
</table>

*Source: Power Systems Research*
On-Highway Trucks

Looking at production of on-highway trucks above 3.5 tonnes/Class 3, PSR forecasts that the global medium and heavy truck market will grow slowly and steadily in the next five years before flattening out slightly in line with the business cycle by 2020. We predict a five-year compounded growth rate of 2.2%.

However, looking deeper into expected production by gross vehicle weight (GVW) and by region, we see interesting trends.

The biggest issues in 2014 are related to economic conditions and the high amount of inventory in China, Brazil and Eurasia (Russia, Belarus, Turkey and Ukraine).

In the medium term, the most significant production fluctuations are in the 3.5 to 6 tonne (Class 3), 6 to 10 tonnes (Class 4 and 5) and 12 to 16 tonne (Class 7) segments.

In volume terms, 3.5 to 6 tonnes (Class 3) represents 31% of total production whereas 6 to 10 tonnes (Class 4 and 5) together are only 10%. However from 2015 onwards, production of 6 to 10 tonnes is forecast to grow at a higher rate than 3.5 to 6 tonnes.

The main reason for this shift is fleet rightsizing strategies, increasing urbanization leading to hub and spoke distribution models along with improvements in product ranges in the developing economies of China, South America, India, Eurasia and Southeast Asia.

Production of 12 to 16 tonnes/Class 7 trucks had a poor performance in 2013 mainly driven by India, Japan and Korea. Prospects have brightened and will continue to improve as mining and export conditions improve.

Overall, global production has recovered from the recession of 2009. By 2020, the global truck market will total 6.25 million units compared with 3.7 million in 2009. Looking at volume growth, the variations between the mature and developing countries remain. China truck production will continue to dominate, but share will de-
Manufacturers supply 88% of global volumes. PSR believes this trend toward more consolidated engine supply will continue to 2020.

A notable trend is the adoption of natural gas engines to improve fuel economy and lower costs. Many North American fleets have moved toward greater use of natural gas engines. Adoption by other regions remains reliant on improvements in natural gas pricing and infrastructure. The U.S. is leading the way but we expect global natural gas engine production to double as other regions — Europe, Asia and Eurasia — develop appropriate infrastructure. But it should be acknowledged that this growth is from a small base and over time as constraints give way to favorable economics.

Another factor in the 16 tonnes+/ Class 8 truck segment in the next five years is the Super Truck program. This initiative, funded by the U.S. Dept. of Energy and truck and engine manufacturers, consists of vehicle and component manufacturers working together to improve fuel economy and carbon emissions.

This five-year research and development initiative’s goal is to improve fuel efficiency by 50% (30% by

To counteract increased acquisition costs (€4000 to €6000 per vehicle) there is continuing focus on improving the total cost of ownership and fuel economy.

To address these concerns, OEMs and engine and component manufacturers are working on several innovative product development solutions to reduce the weight of truck and space taken by components. Initiatives under way to improve efficiencies include:

- Engine efficiency
- Tires and wheels
- Transmissions
- Hybridization and alternative power

These initiatives impact the complete value chain of global truck whether it’s the powertrain, body, infrastructure or fleet management.

The high cost of research and development required for these initiatives has led to collaborations and some consolidation in engine supply. The market is more concentrated at the top end. The top 20 engine manu-
changes to the tractor-trailer and 20% from the engine).

Notably, Volvo and Daimler have developed and introduced automated manual transmissions (AMT), which provide a 5% improvement in fuel economy. As a result, transmission technology shifts are apparent across the mature markets.

Power Systems Research publishes a transmissions forecast. We predict that automated transmissions will grow at a compounded growth rate of 8% over the next five years.

The highest shift to AMT is in the 16 tonnes+/Class 8 segment. Today, Europe and North America represents around 76% of total AMT installation. Brazil is beginning to follow mainly due to the presence of European manufacturers.

Overall, AMTs are substituting manual transmissions at a faster pace compared to other transmission designs in both the U.S.A. and Europe. PSR studies indicate that AMT transition in the medium- and heavy-truck markets in other regions will be influenced by a favorable regulatory environment, improved cost structure (and thus pricing) and better end user awareness.

Our forecasts beyond 2020 show double-digit growth in Class 8 AMT production in Eurasia, China and the Indian subcontinent.

Like the engine production market, the supply of transmissions is also increasingly concentrated. Some OEMs are vertically integrated and produce their own AMT transmission product. Only two key component manufacturers, Eaton and ZF (includes ZF-MAN, ZF Meritor), have a significant share of the Class 8 AMT market.

We expect the global medium, heavy truck and bus production (3.5 tonnes+/Class 3+) to grow at a slow, steady pace until 2018, after which production will remain flat in line with the business cycle up to 2020. Growth by GVW class will continue to fluctuate, affected by economic conditions, regulation and innovative product platforms technologies to reduce the total cost of ownership and improve fuel economy.

The result of several collaborative initiatives between key engine, equipment, and component manufacturers will begin to bear fruit across regions. The market for engine supply and major components will continue to consolidate as manufacturers collaborate and vertically integrate to reduce R&D costs.

Overall growth may look unexciting but looking deeper by GVW class highlights the significant activity by manufacturers to develop innovative product solutions. Across the truck production value chain companies are working to comply with regional regulations, improve the total cost of ownership and improve fuel economy.

We expect the global truck market to continue to remain innovative through to 2020.