

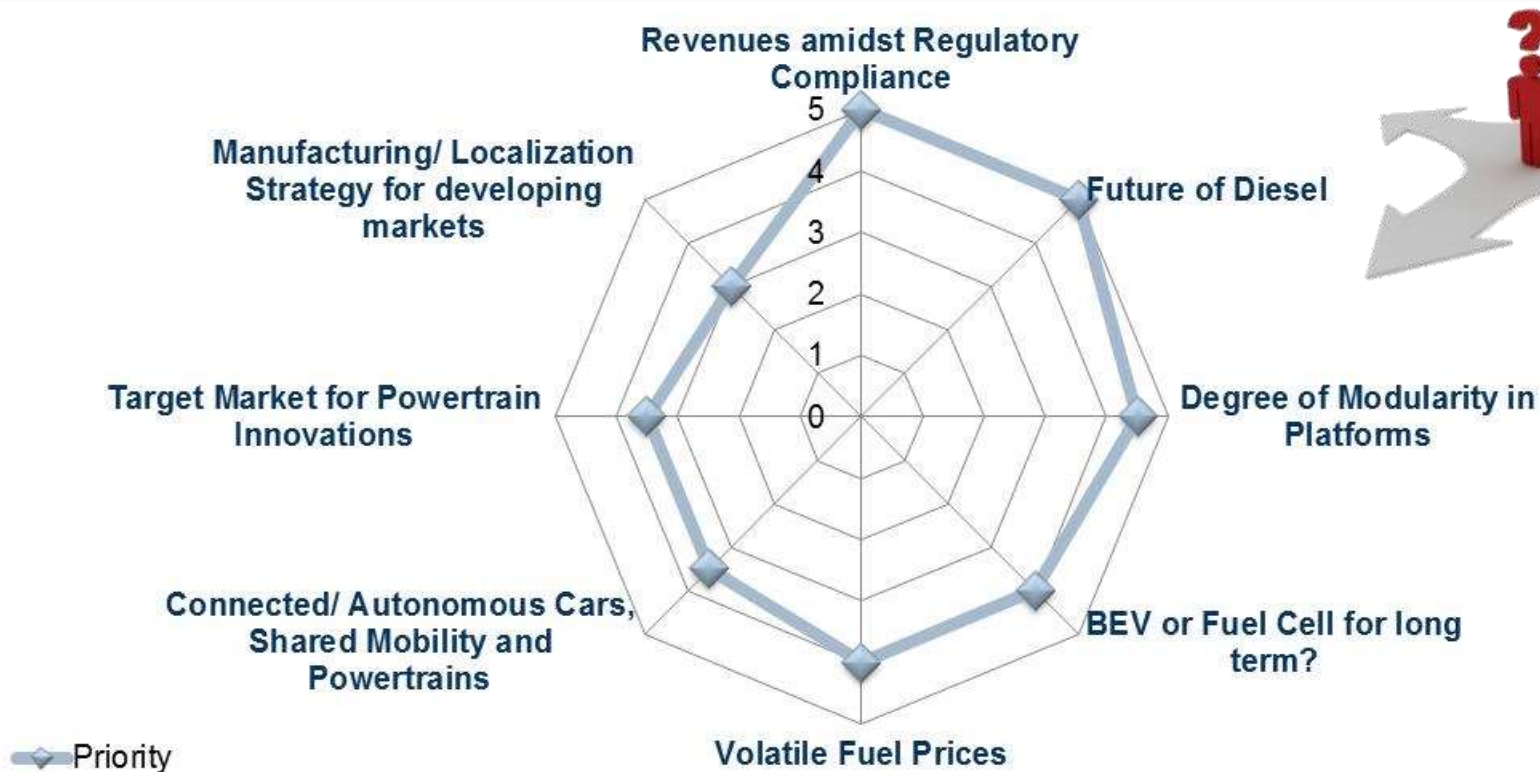
2016 Powertrain Voice of Consumer and attitudes towards diesel cars, hybrid and electric vehicles

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Franck Leveque,
Partner & Business Unit Leader,
Mobility Group

2015-2016 Powertrain Industry - Top-of-Mind Issues

Electrification strategies, survival of diesel, fuel cells, geographical divergence, and platform modularity will be the largest factors to consider in the near and long term for powertrain senior management.

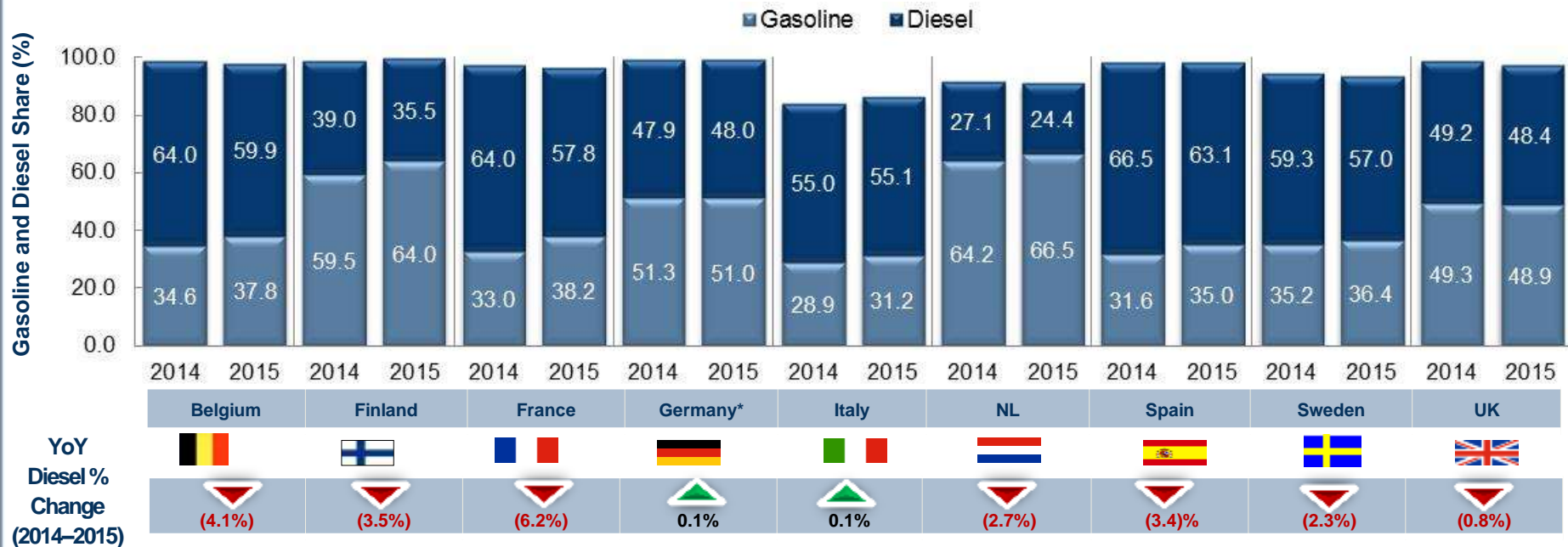


Source: Frost & Sullivan

Europe - Passenger Cars Unit Shipment Trend, Diesel vs. Gasoline

Sales of Diesel cars are expected to decline by 2% and its percentage share is likely to go down by 3% as well, in 2016.

Powertrain Market: Passenger Vehicle Sales by Country—Gasoline vs. Diesel Share, Europe, 2014–2015



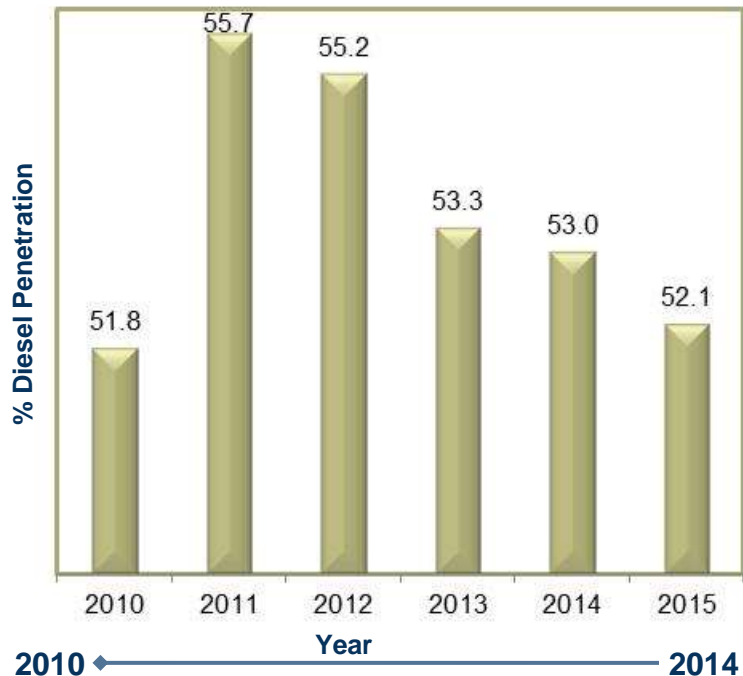
* Data only for the major countries shown, Frost estimate based on latest data available,

Source: National automotive agencies; Frost & Sullivan

Diesel Sales Outlook for Europe- Retrospection and Future

Diesel penetration in Europe towards 2020 will be influenced by a combination of factors including cost of advanced PM controlling technologies and the degree of regulatory control to be exercised over diesel cars.

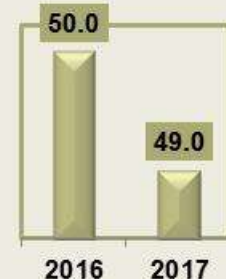
European CO2 compliance- Percentage of Diesel Penetration, Western Europe, 2010-2017



Forecast

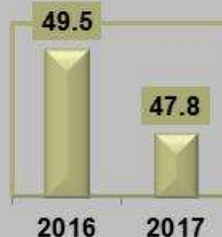
Diesel Penetration- Scenario A

Minimum Impact due to Emission scandal



Diesel Penetration- Scenario B

Diesel emission scandal snowballing into bad scenario for Diesel



Diesel Penetration- Scenario C



Note: Historical data represented is data for Western Europe. Eastern European countries are not expected to penalize diesel as much as in Western Europe. It is assumed that the relative price of diesel in comparison with gasoline will remain constant.

Source: Frost & Sullivan

Powertrain Voice of Consumer Study - Key Objectives

The objective of these consumer surveys are primarily to understand consumers perceptions and switching behaviour for different technologies/systems and features.

1

To understand **consumers' sustainability and environmental priorities** in their life and in their choice of vehicle

2

To determine consumers' **perceptions and attitudes toward different environment and sustainability factors**, and to evaluate the importance of each in determining the characteristics of the future Powertrain

3

To determine consumers' perception, concerns and attractiveness **of alternative Powertrains (hybrid and electric vehicles)** in comparison to conventional gasoline and diesel engines

4

To determine consumers' perception and concerns on **Adblue/ SCR systems on diesel cars**. Consumers attitudes and perception trends analysis on key powertrain technologies such as **transmissions and downsizing**

5

To perform a **tracking analysis of changes in consumers' attitudes**, perceptions and preferences **in comparison to the findings from 2012 and 2014** Frost & Sullivan Powertrain voice of the consumer studies.

6

To determine the impact on **consumer perception and attitude** towards **diesel engines post VW cheating scandal**



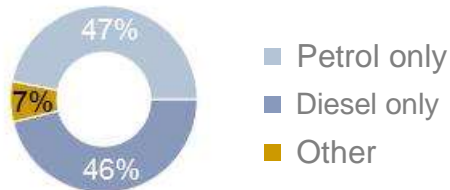
European G5 Consumer Research - Sample Size for the Survey

The sample enables robust statistical analysis per country (over 500 per country) and vehicle segment.



Male
n=1,481

Current Fuel Type

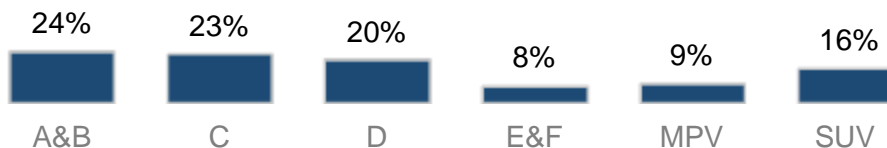


Current Fuel Type



Female
n=1,044

Current Car Segment



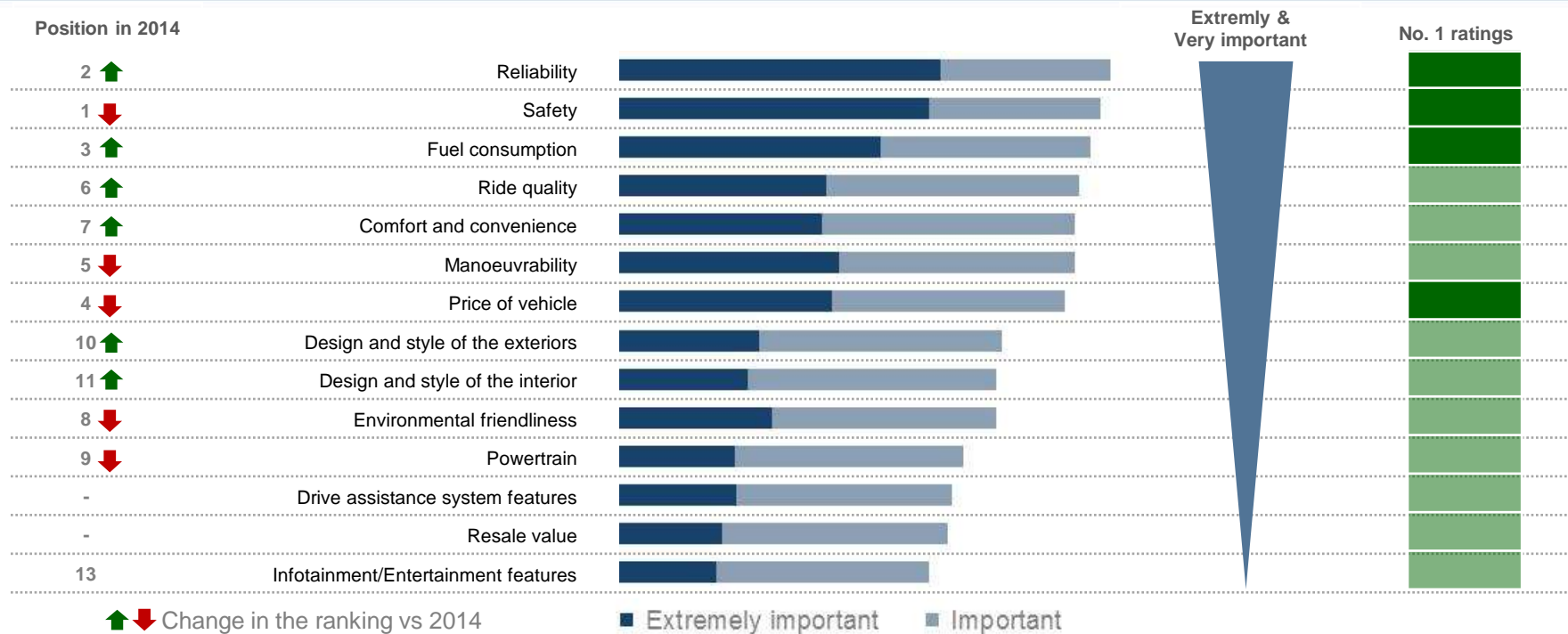
Note: Results weighted by vehicle registration for each country to provide a more representative market analysis

Base: All respondents (n=2,525).

Q10. When it comes to vehicle technologies, do you consider yourself as...?

General Criteria for Purchasing a New Vehicle

Fuel consumption is more important than environmental friendliness or powertrain. About 15% of the consumers chose price of the vehicle as No. 1 criteria for new car purchase.



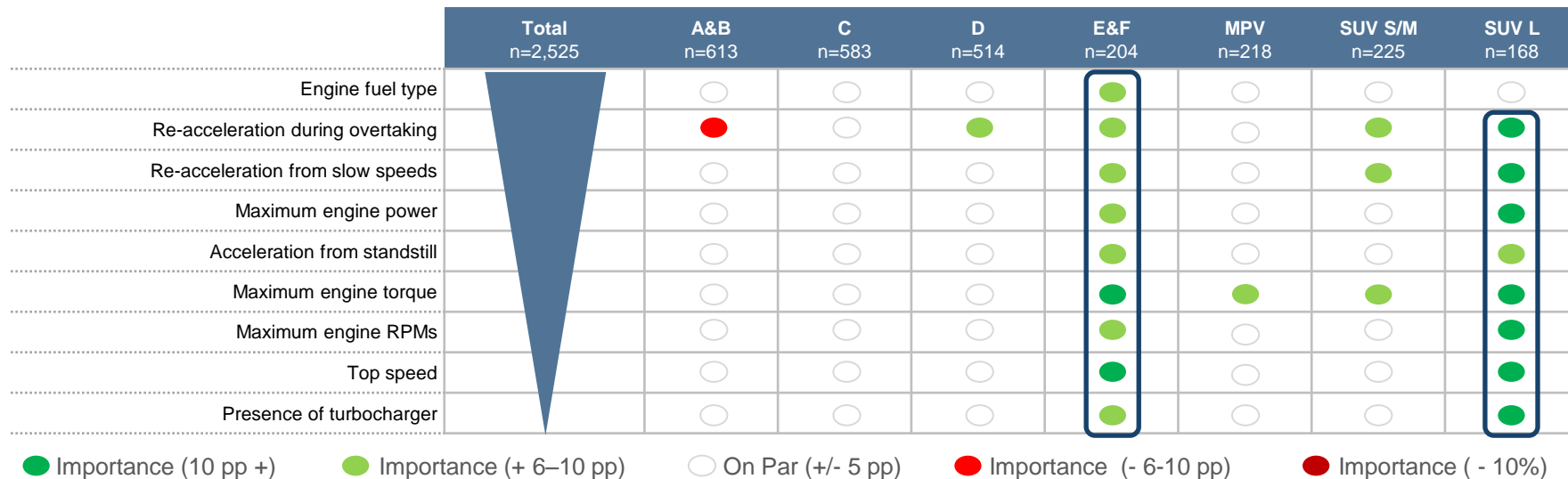
Base: All respondents (n=2,525).

Q11. From today's perspective, how important will the following attributes be in your decision making when it comes to buying your next car?

Q13. Which of these attributes are the most important for you?

Powertrain Related Criteria for Purchasing a New Vehicle

Buyers of E&F vehicles or large SUVs are more interested in Powertrain features.

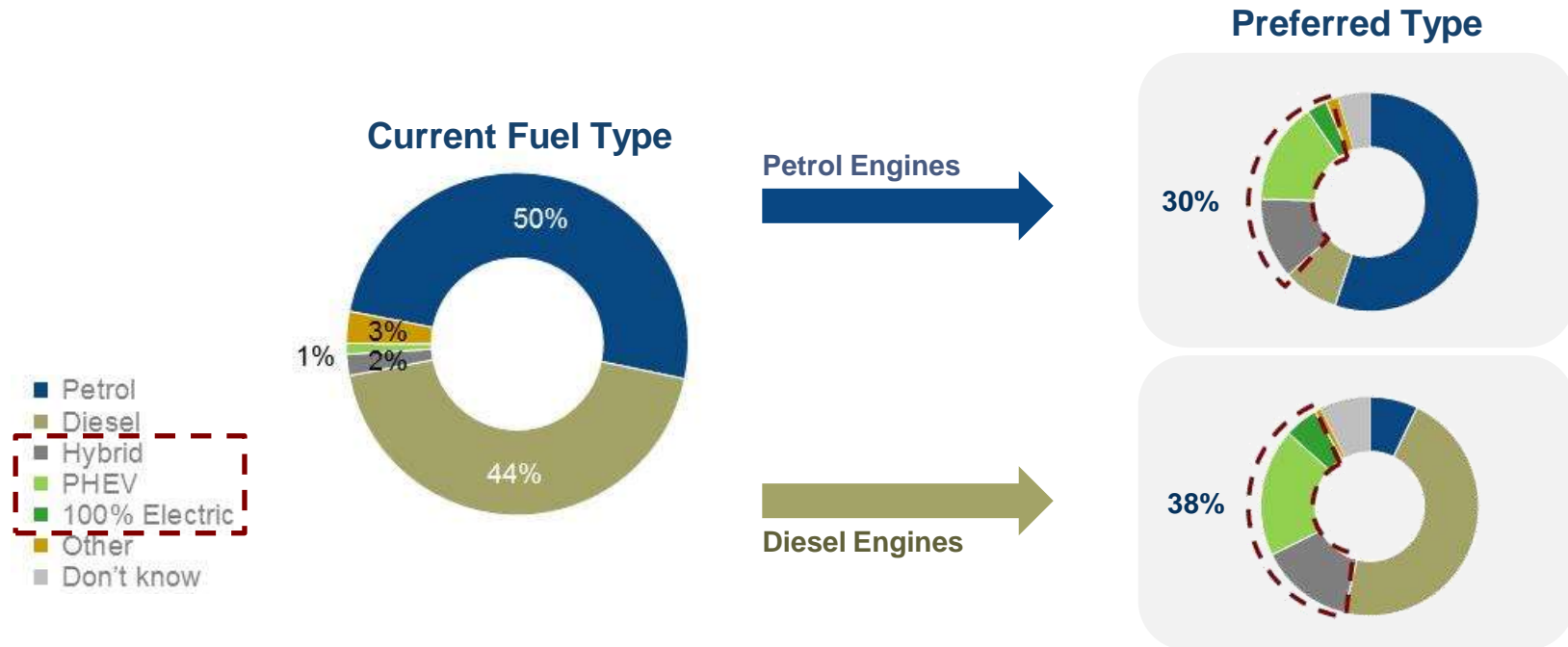


Base: All respondents (n=2,525).

Q12. Let's now focus more on technical aspects, how important will the following powertrain attributes be in your decision making when it comes to buying your next car?

Current vs Preferred Fuel Engine Type

There is a high interest in alternative fuel types especially in PHEV engines with 18% of consumers surveyed preferring PHEVs.



Base: All respondents (n=2,525).

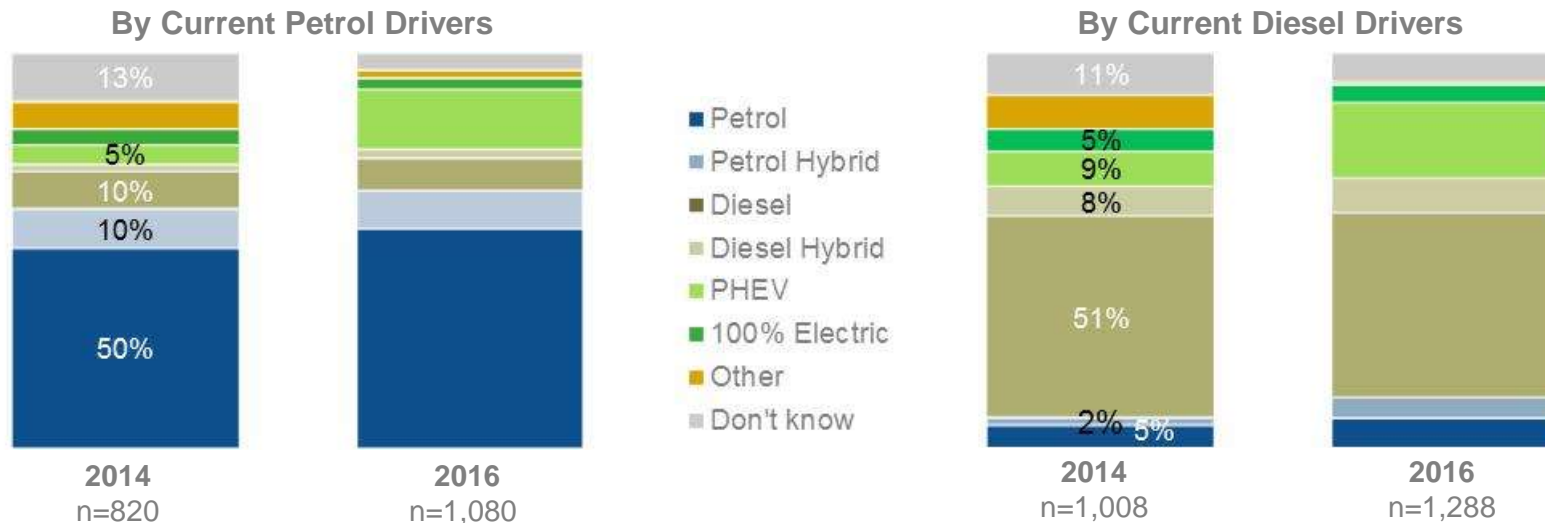
Q2. What type of fuel/engine do you have in your main vehicle?

Q25. What would be your most preferred fuel/engine type in relation to your next vehicle?

Current versus Preferred Fuel Engine Type

The interest in a diesel engine declined by 4% from 2014 and main beneficiary was PHEV engine.

Preferred Type of Powertrain for Next Vehicle – Trend 2014-2016



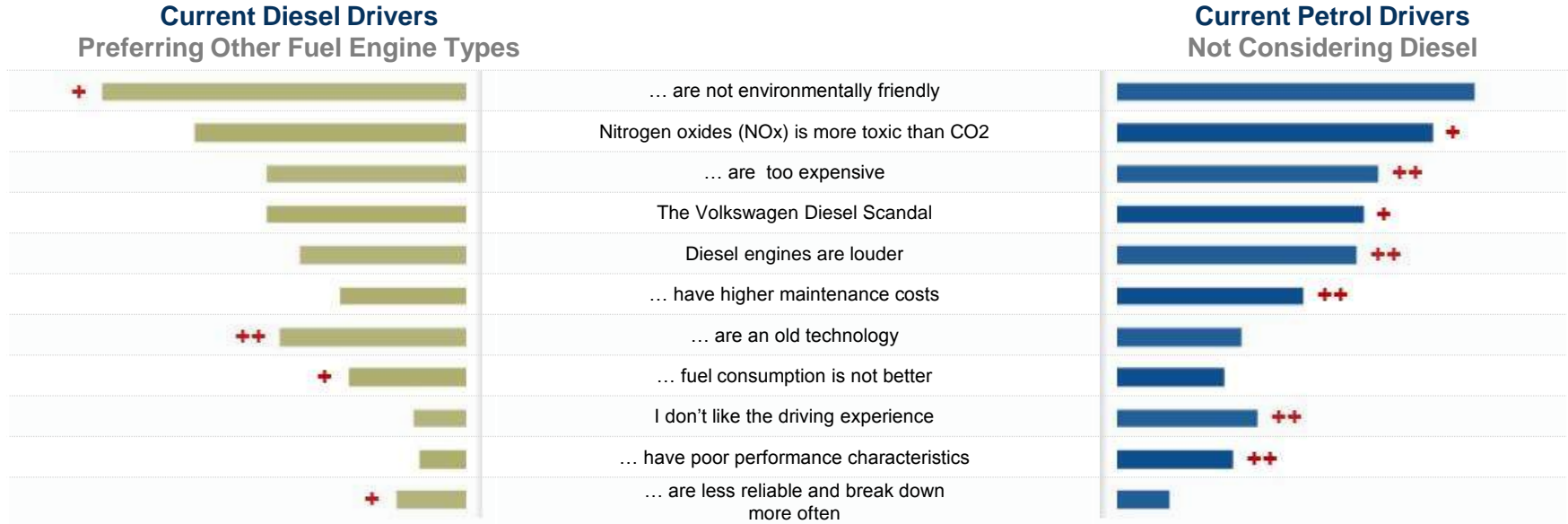
Base: All respondents (n=2,525).

Q2. What type of fuel/engine do you have in your main vehicle?

Q25. What would be your most preferred fuel/engine type in relation to your next vehicle?

Main Reasons Against Diesel Engines

% of diesel drivers preferring to switching to other fuel engine type is because they think diesel cars are not environmental friendly.



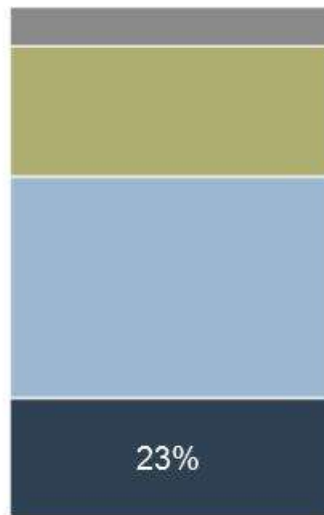
Base: Respondents not likely to purchase a Diesel vehicle next (n=957).

Q2. What type of fuel/engine do you have in your main vehicle?

Q26. You said Diesel is not your preferred fuel type for your next vehicle. What are the reasons you are going to choose a different type?

Electric Vehicle Design Expectations

Consumers do not expect major changes in design of an Electric vehicle. Over 40% consumers expect Electric Vehicle to have a similar but with specific details for the type of vehicle.



Total
n=602

Expected Design of Electric Vehicle

It does not matter to me

A completely different design to conventional petrol and diesel vehicles

A similar design to conventional vehicles, but with some Electric Vehicle specifics detailed changes

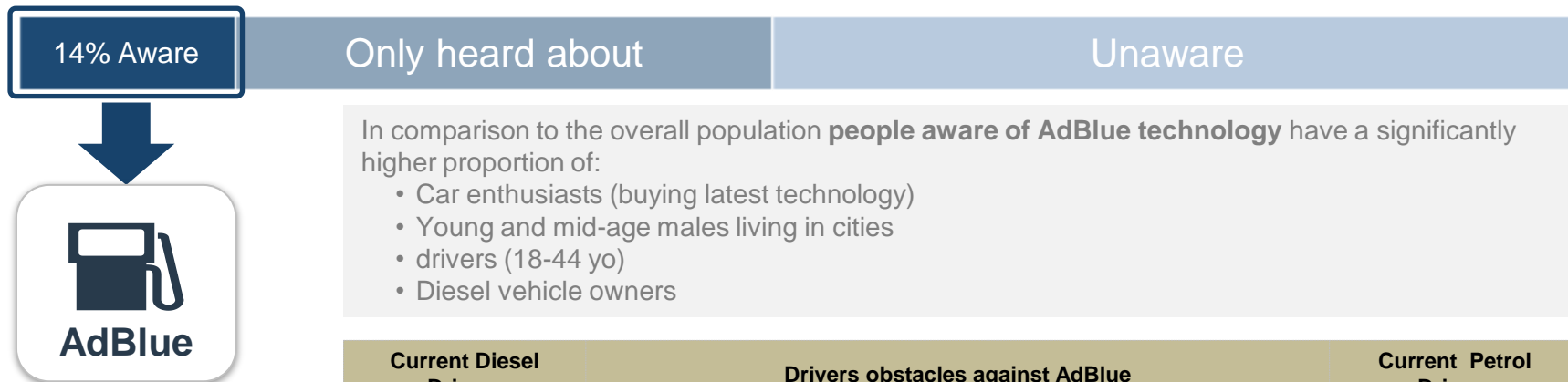
The same design as conventional petrol and diesel vehicles

Base: Respondents considering 100% electric vehicle for the next vehicle purchase (n=602).

Q29. Do you expect 100% Electric Vehicles to have...

People Aware of AdBlue Profile

14% of respondents overall declares familiarity with AdBlue/SCR. Most of these people are very interested in latest car technology.



In comparison to the overall population **people aware of AdBlue technology** have a significantly higher proportion of:

- Car enthusiasts (buying latest technology)
- Young and mid-age males living in cities
- drivers (18-44 yo)
- Diesel vehicle owners

Current Diesel Drivers	Drivers obstacles against AdBlue	Current Petrol Drivers
+++	It is too expensive	+++
++	It is inconvenient, because of the need for manual refilling	++
+	I don't believe it is significantly more environmentally friendly	+
+	I am afraid it is unreliable and may cause engine break down	+
+	I don't really need it	+
+	I am afraid it may negatively affect the performance of the vehicle	+

+++ Very strong

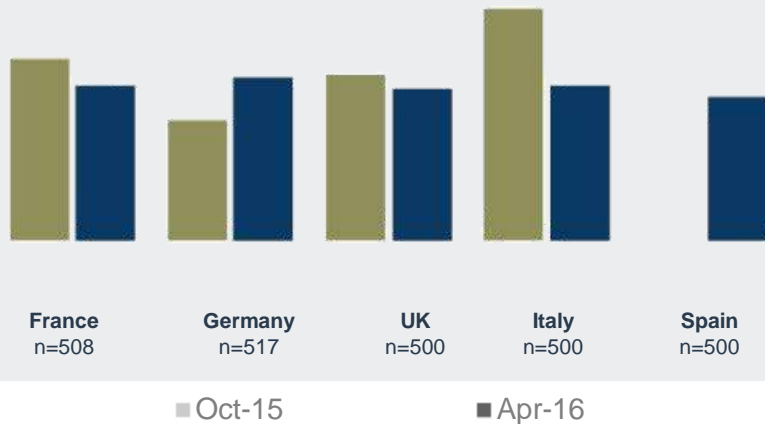
++ Strong

+ Medium

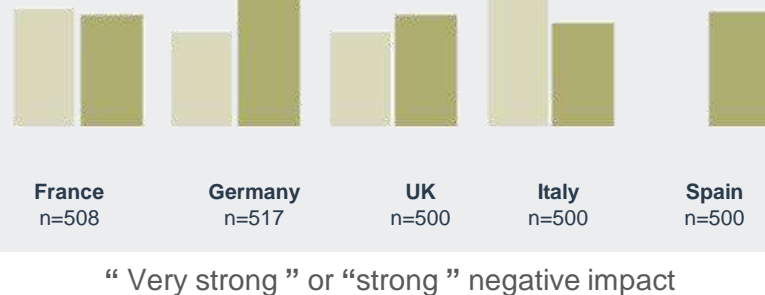
Impact on Volkswagen Brand - Trend

In Germany customers are more concerned about the scandal than in October 2015 shortly after the news, where the impact is weakening in rest of the countries.

Impact of Scandal on Volkswagen Brand 2015-2016



Impact of Scandal on Perception of Diesel 2015 - 2016



Base: All respondents (n=2,525).

Q54. Has your perception of the Volkswagen brand been impacted by this Diesel emission data manipulation?

Q55. Has your perception of diesel engines been impacted by Volkswagen manipulating emission test data?

Key Conclusions

Consumers are showing a growing interest towards alternative fuel vehicle and fuel efficient technologies

Purchasing Criteria

- Reliability & Fuel Efficiency rising in importance
- Re-acceleration in A&B

Interest in PHEV

- 15% of petrol drivers
- 19% diesel drivers

Diesel Perception

- 4% decline in interest
- PHEV biggest beneficiary

Key Conclusions

Electric Vehicle Design

- 25% Completely New
- Over 40% Specific Features

Emission Scandal

- 40% “very strongly or strongly” impacted
- Impact growing stronger in Germany

Thank You for Your Attention - Questions & Answers

Future of Mobility Video



Watch our latest Video on the Future of Mobility, filmed live at Frost & Sullivan's Annual Mobility Workshop

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Franck Leveque

Partner & Business Unit Leader

Mobility Group EIA

Direct: +49 (0) 69 770 3321

Mobile: +49 (0) 151 2767 0824

Franck.leveque@frost.com



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