

## Introduction

- ILSAC defines lubrication specifications and licensing standards to meet the needs and requirements of the automotive industry and legislative bodies.
- ILSAC GF-6 is the upcoming engine oil standard for passenger vehicles and light trucks in the United States.
- ILSAC GF-6 has been pushed back several times, but first acceptable usage is expected to be in 2020.

ILSAC GF-6 Timeline

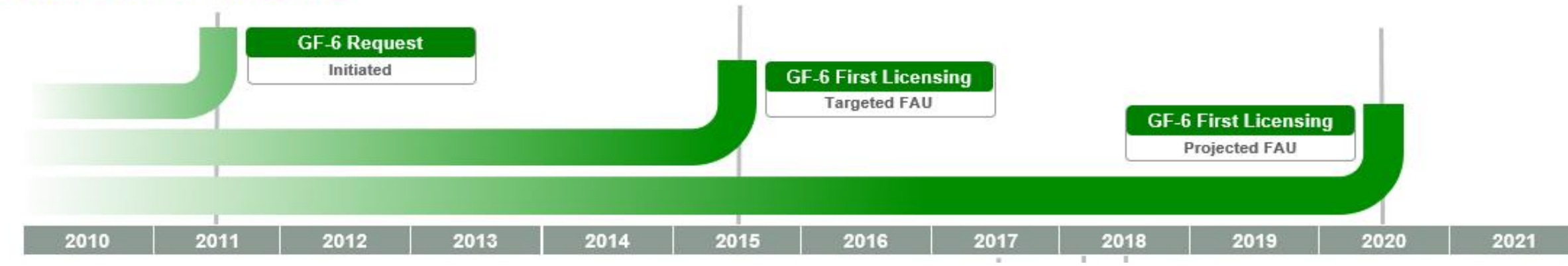


Figure Courtesy of The Lubrizol Corporation<sup>1</sup>

## The Need for ILSAC GF-6

- Corporate Average Fuel Economy (CAFE) requires passenger cars and light trucks to attain an average fuel economy of 54.5 mpg.
- Reducing greenhouse gas (GHG) emissions is a primary concern for legislators and car manufacturers.
- Lubricants tend to improve fuel economy by only up to 3%, but with light-duty vehicles producing 60% of GHG emissions from the U.S. transportation sector, there is huge GHG emission reduction potential<sup>4</sup>.
- Turbocharged/gasoline direct injection (T/GDI) engines have grown in popularity.
- Low speed pre-ignition is very common in T/GDI engines
- Piston cleanliness and particulate matter reduction for overall longevity

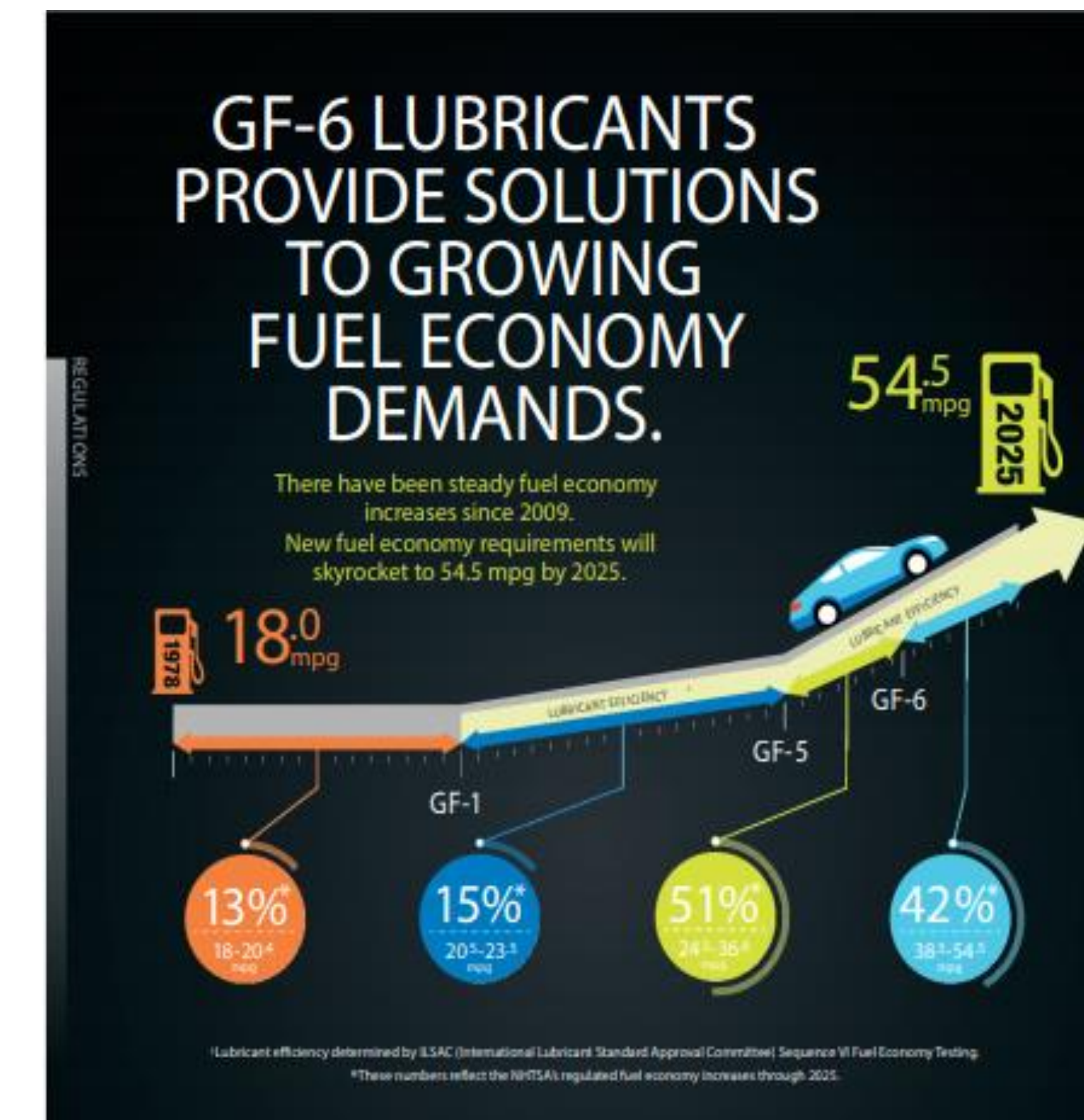


Figure Courtesy of The Lubrizol Corporation<sup>5</sup>

## ILSAC GF-6A vs GF-6B

ILSAC GF-6A OILS	ILSAC GF-6B OILS	ILSAC GF-6A OILS	ILSAC GF-6B OILS
ILSAC GF-6A	More robust than ILSAC GF-5	ILSAC GF-6B	ILSAC GF-6B
Increased durability LSPI prevention	Increased durability LSPI prevention	Viscosity	Viscosity
>2.6 mPa.s	2.3-2.6 mPa.s	Symbol	Symbol
Fuel economy and FE retention	Fuel economy and FE retention	Back serviceable	Back serviceable
Current ILSAC GF-5 grades	Fuel economy grades below SAE 0W-20	Recommended by OEMs	Recommended by OEMs

- The two subcategories are intended to cover a wide range of vehicles including future ones.

Figure Courtesy of the Infineum International Limited<sup>8</sup>

## History of ILSAC

- Prior to ILSAC's formation in 1992, engine oil standards were issued under the Tripartite System headed by the following organizations: API, SAE, and ASTM<sup>2</sup>.
- The AAMA and the JASO founded the ILSAC in 1992 to meet industry needs in a timely manner.
- Tripartite System and ILSAC merged to form the Engine Oil Licensing and Certification System (EOCLS).
- Each member of EOCLS has different functions
  - ILSAC sets minimum performance standards
  - SAE determines the needs of engine oil specifications based on automaker inputs and market trends
  - ASTM develops tests and parameters for each specification provided by SAE
  - API licenses and certifies the engine oil.

### ILSAC GF-1

The ILSAC GF-1 standard indicates the oil meets both API SH and the Energy Conserving II (EC-II) requirements. It was created in 1990 and upgraded in 1992 and became the minimum requirement for oil used in American and Japanese automobiles.

### ILSAC GF-2

ILSAC GF-2 replaced GF-1 in 1996. The oil must meet both API SJ and EC-II requirements. The GF-2 standards require 0W-30, 0W-40, 5W-20, 5W-30, 5W-40, 5W-50, 10W-30, 10W-40 and 10W-50 motor oils to meet stringent requirements for phosphorus content, low temperature operation, high temperature deposits and foam control.

### ILSAC GF-3

An ILSAC GF-3 oil must meet both API SL and the EC-II requirements. The GF-3 standard has more stringent parameters regarding long-term effects of the oil on the vehicle emission system, improved fuel economy and improved volatility, deposit control and viscosity performance. The standard also requires less additive degradation and reduced oil consumption rates over the service life of the oil.

### ILSAC GF-4

ILSAC GF-4 is similar to the API SM service category, but it requires an additional sequence VIB Fuel Economy Test (ASTM D6837).

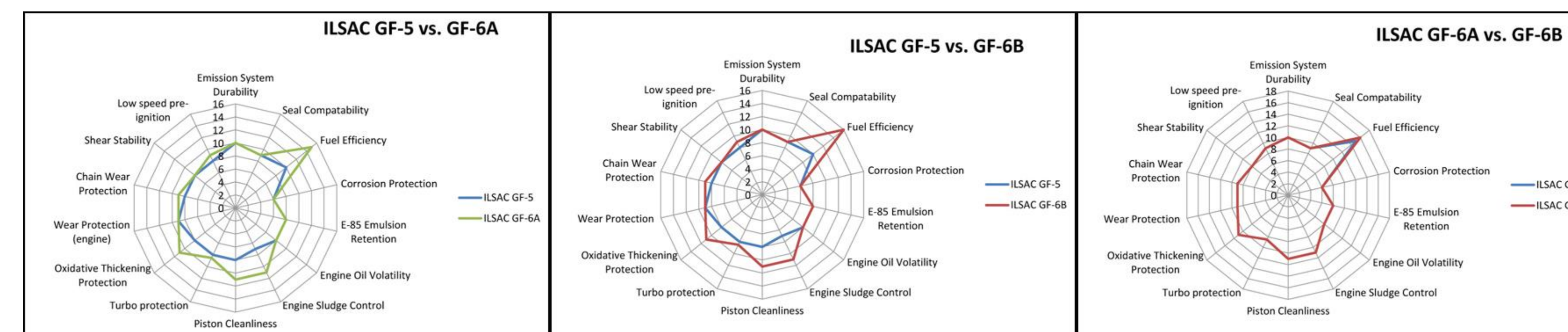
### ILSAC GF-5

Introduced in October 2010 for 2011 and older vehicles, designed to provide improved high temperature deposit protection for pistons and turbochargers, more stringent sludge control, improved fuel economy, enhanced emission control system compatibility, seal compatibility, and protection of engines operating on ethanol-containing fuels up to E85.

Figure Courtesy of the oilspecifications.org<sup>3</sup>

## ILSAC GF-6

- First standard to have two subcategories



Figures Courtesy of MOTOR Magazine<sup>6</sup>

- First standard to introduce seven new tests at once

	Test	Test focus	Test engine
Legacy test	Sequence VIII	Corrosion	CLR Test 0.7L
Replaces VID	Sequence VIE	Fuel Economy	2012 GM 3.6L PFI*
Replaces IIIG	Sequence IIIH	Oxidation & deposits	2012 FCA 3.6L PFI
Replaces IVA	Sequence IVB	Wear	2010 Toyota 1.5L PFI
Replaces VG	Sequence VH	Sludge & varnish	20xx Ford 4.6L PFI
New	Sequence VIF	Fuel Economy	2012 GM 3.6L PFI
New	LSPI	Pre-ignition	2016 Ford 2.0L GDI**
New	Chain Stretch	Wear	2016 Ford 2.0L GDI

\*Port fuel injection  
\*\* Gasoline direct injection

Figure Courtesy of the Infineum International Limited<sup>7</sup>

## Future of Lubricants

- First acceptable use of ILSAC GF-6 is expected in 2020
- New lubricants are needed for changing engine technology
- Solid-state lubricants may be an alternative to thinning engine oils

## References

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8. "Two Categories Explained." *Insight, From Infineum International Limited*, Infineum International Limited, [www.infineuminsight.com/trends/ilsac-gf-6/two-categories-explained](http://www.infineuminsight.com/trends/ilsac-gf-6/two-categories-explained).