



# Mobile Climate Control

For a better climate



Off Road



On Road

## Our vision

**To be the leading global HVAC provider to the commercial vehicle industry**



**Bus**

Nova  
New Flyer  
Gillig  
Eldorado



**Off Road**

Volvo Construction  
Bobcat  
JLG  
Cargotec



**Utility**

Spartan  
TLD  
Demers  
Acutemp



**Military**

AM General  
GDLS  
FNSS  
Force Protection

## Leading edge engineering, testing and production dedicated to creating innovative HVAC solutions for transit

Parts Warehouse – York, PA



- Staff of > 70 engineers in Canada, USA and Sweden
- Core bus engineering group in York, Pennsylvania
- 400 Dealer Support network across North America
- In House Climate Chamber Testing - -40f to +140f
- MCC University with Full HVAC Curriculum in York, PA

MCC University Training – York, PA



Climate Control Test Chamber

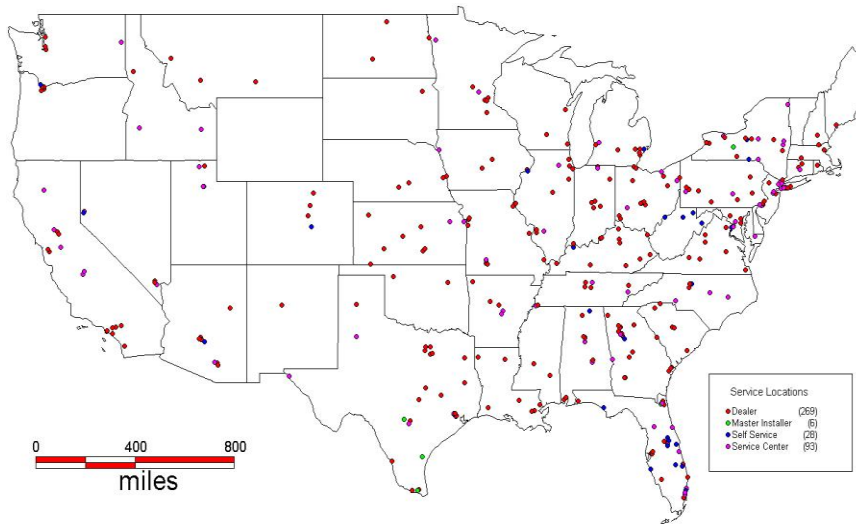


## Our Transit Customers

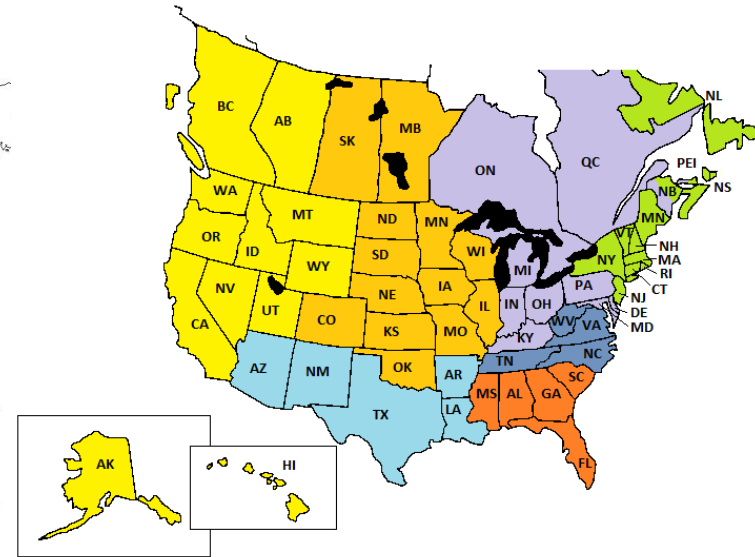


## MCC Service Support Capabilities

390 Dealer Locations Available To Provide Service Support



MCC Field Service Engineers Provide Technical Support To Bus OEM's And Transit Authorities



### Dealer Support for Pennsylvania:

- PENN Power Group

### FSE for Pennsylvania:

- Charles Merson
- Office: 717-767-3332
- Cell: 717-683 5293

## MCC Rear Mount and Roof Mount HVAC Systems

Full range of AC units optimized for R134a, light weight materials, MCHX coils, with maximum performance and reliability

### Eco353 Inline Rooftop AC



### Eco136 Parallel Rooftop AC



### Eco Xcel



### Eco RM Series



## Product Strategy – Reciprocating Compressor Options

### Full Product Portfolio:

- **Standard cylinder unloading** for capacity control = optimum fuel savings
- Globally proven designs
- Industry leading efficiency
- Wide capacity range
- Lightweight materials for weight savings
- All optimized for R134a refrigerant
- Rebuild kits available for all models



Bitzer 4 & 6 NFCY Series



Carrier/Carlyle 05G Series



Bock Semi-hermetic Reciprocating Series



Bock FKX/40/50 Series

## Split Systems

**Evaporators** EM (ducted and free blow) or IW (in wall)

**Condensers** skirt mount or roof top

### Features and Advantages:

- Smallest dimensional size in industry
- 60% reduced weight vs prior models
- Flexibility of location and capacities

## Integrated Systems

**Eco 8** (free blow) heat and cool unit

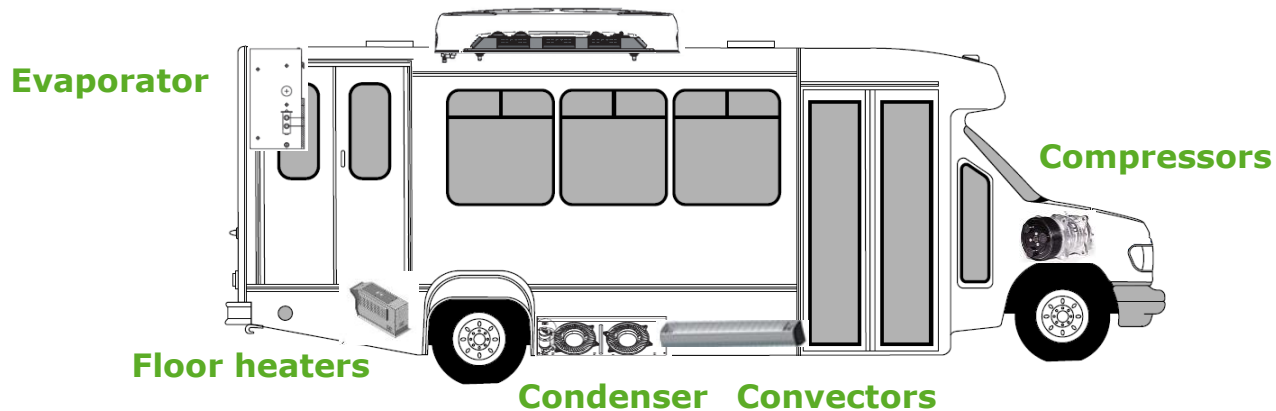
**Eco 10** (free blow) cool only unit

**Eco 12** (ducted) shuttle, cut-away, mid-full size school bus

### Features and Advantages:

- Maximum interior headroom
- Less leak potential
- Protects from corrosive elements

### Integrated Rooftop Units







# Mobile Climate Control

[www.mcc-hvac.com](http://www.mcc-hvac.com)

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# Allison Transmission Bus Model Product Features and Enhancements

John Manzi – North America Regional Sales  
Manager (East Region)



# Topics

- **Durability Improvements**
- Warranty Metrics
- Optimization Features
  - Dynamic Shift Sensing (DSS)
  - Neutral at Stop (NAS)
  - Acceleration Rate Management (ARM)
  - Auto Neutral with Park Brake
  - Fuel Economy Comparisons
  - Prognostics

# B400/500 Durability Improvements

- Other changes:**
- Sump cooling provision
  - TranSynd™ factory fill
  - All range clutch material
  - Filters, 75,000 miles

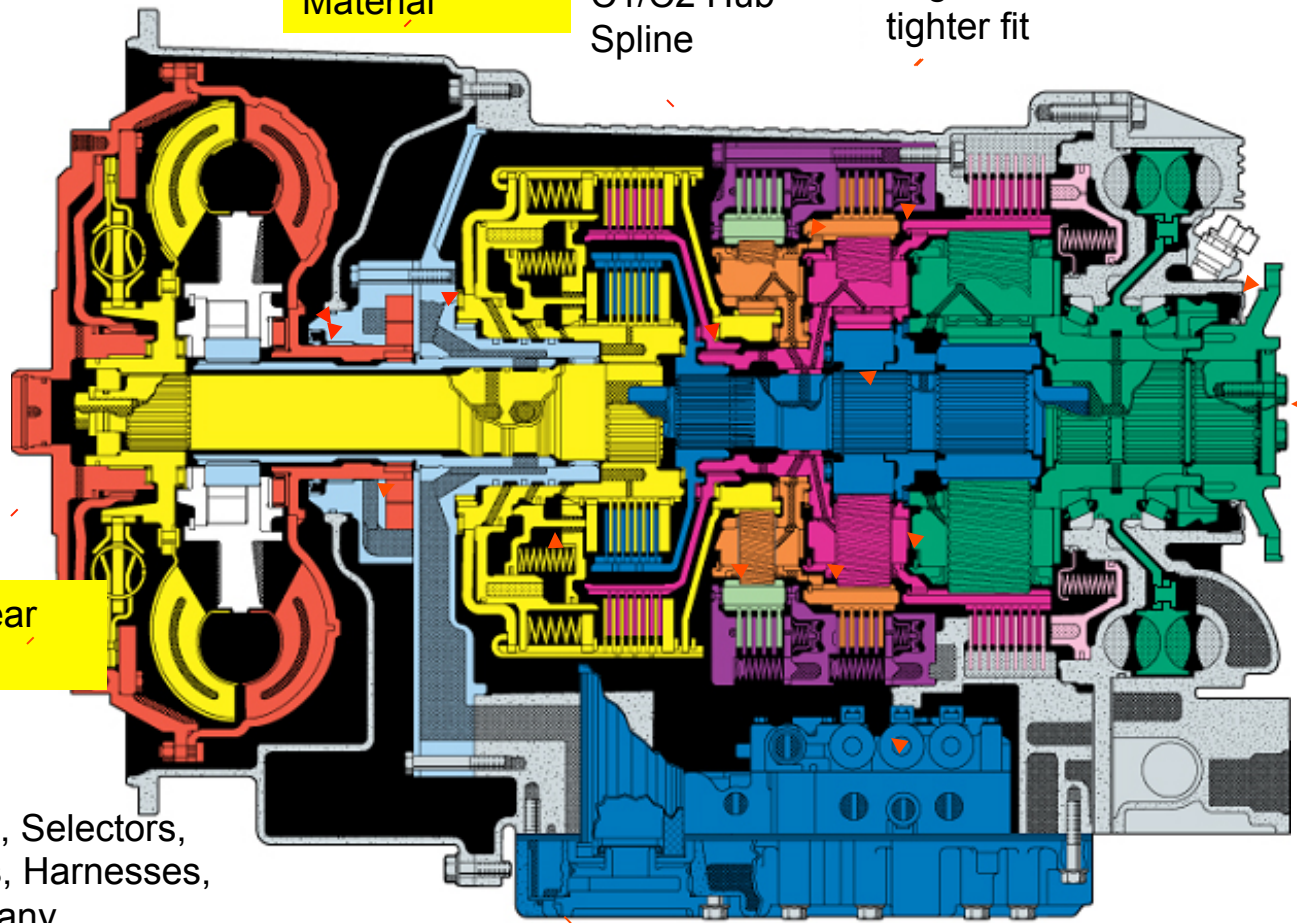
Input seal Double Lip

Input Bushing Material

Stronger C1 hub material

C1/C2 Hub Spline

P2,3 Carrier Snap Ring larger, tighter fit



Output seal with Slinger and Belleville Washer

Single Output Bolt

Hardened Main Shaft – P2 Spline wear reduction

Rotating Cl Hsg Weld

Oil Pump Gear Bushing

5<sup>th</sup> Gen TCM, Selectors, Valve Bodies, Harnesses, Software: Many improvements

P1,2,3 Index Plates tighter fit

C1/Balance Piston – Incr. tang area for ANS

Filter cover thread inserts



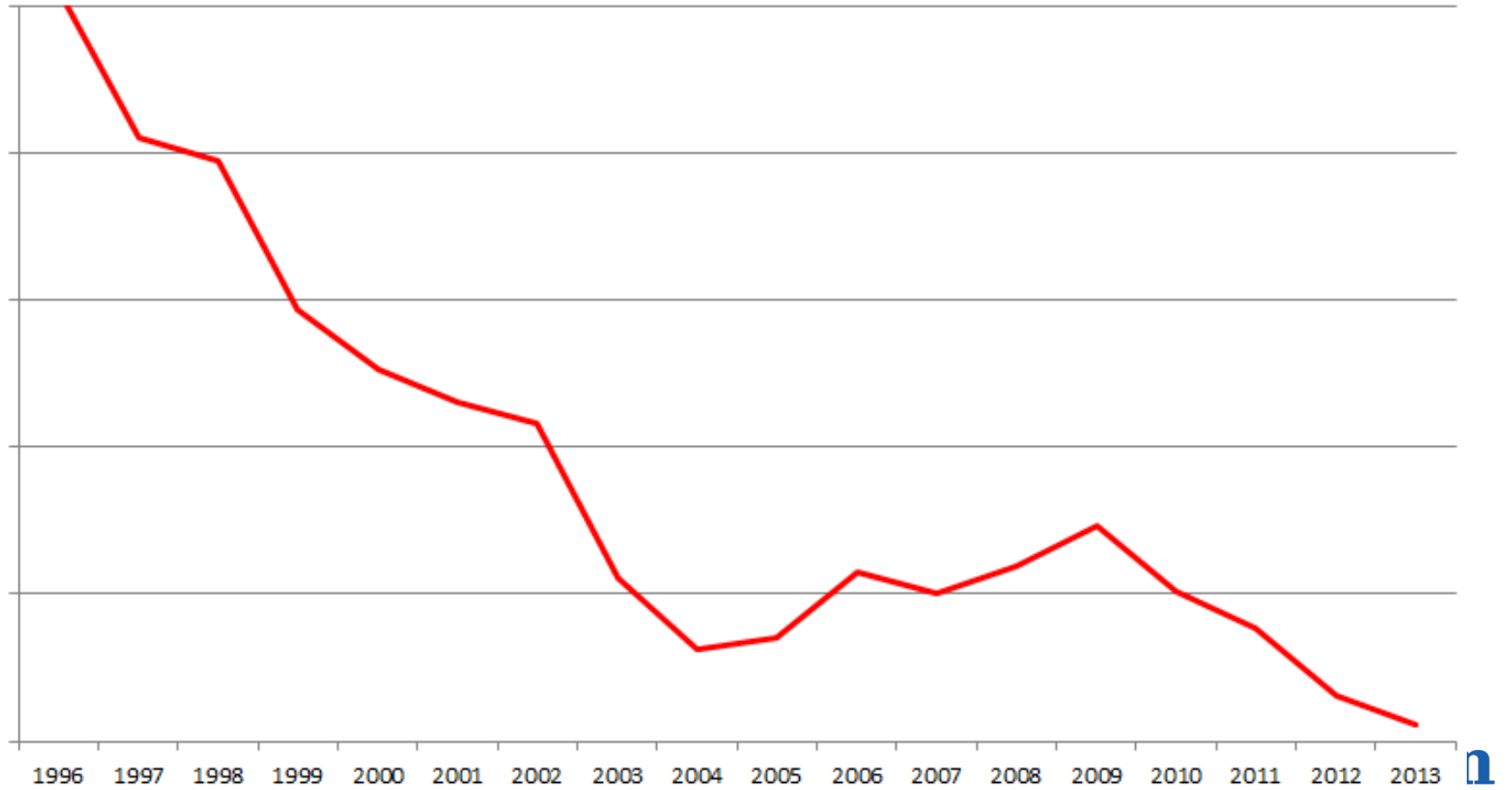
VBS Solenoids

# Topics

- Durability Improvements
- **Warranty Metrics**
- Optimization Features
  - Dynamic Shift Sensing (DSS)
  - Neutral at Stop (NAS)
  - Acceleration Rate Management (ARM)
  - Auto Neutral with Park Brake
  - Fuel Economy Comparisons
  - Prognostics
  - 5<sup>th</sup> Gen Controls

# B500(R)

## Incidents Per Thousand Vehicles (IPTV) 1996-2013



# Topics

- Durability Improvements
- Warranty Metrics
- **Optimization Features**
  - FuelSense™ Terminology
  - EcoCal
  - Dynamic Shift Sensing (DSS)
  - Neutral at Stop (NAS)
  - Acceleration Rate Management (ARM)
  - Auto Neutral with Park Brake
  - Fuel Economy Comparisons
  - Prognostics

# New FuelSense™ Terminology

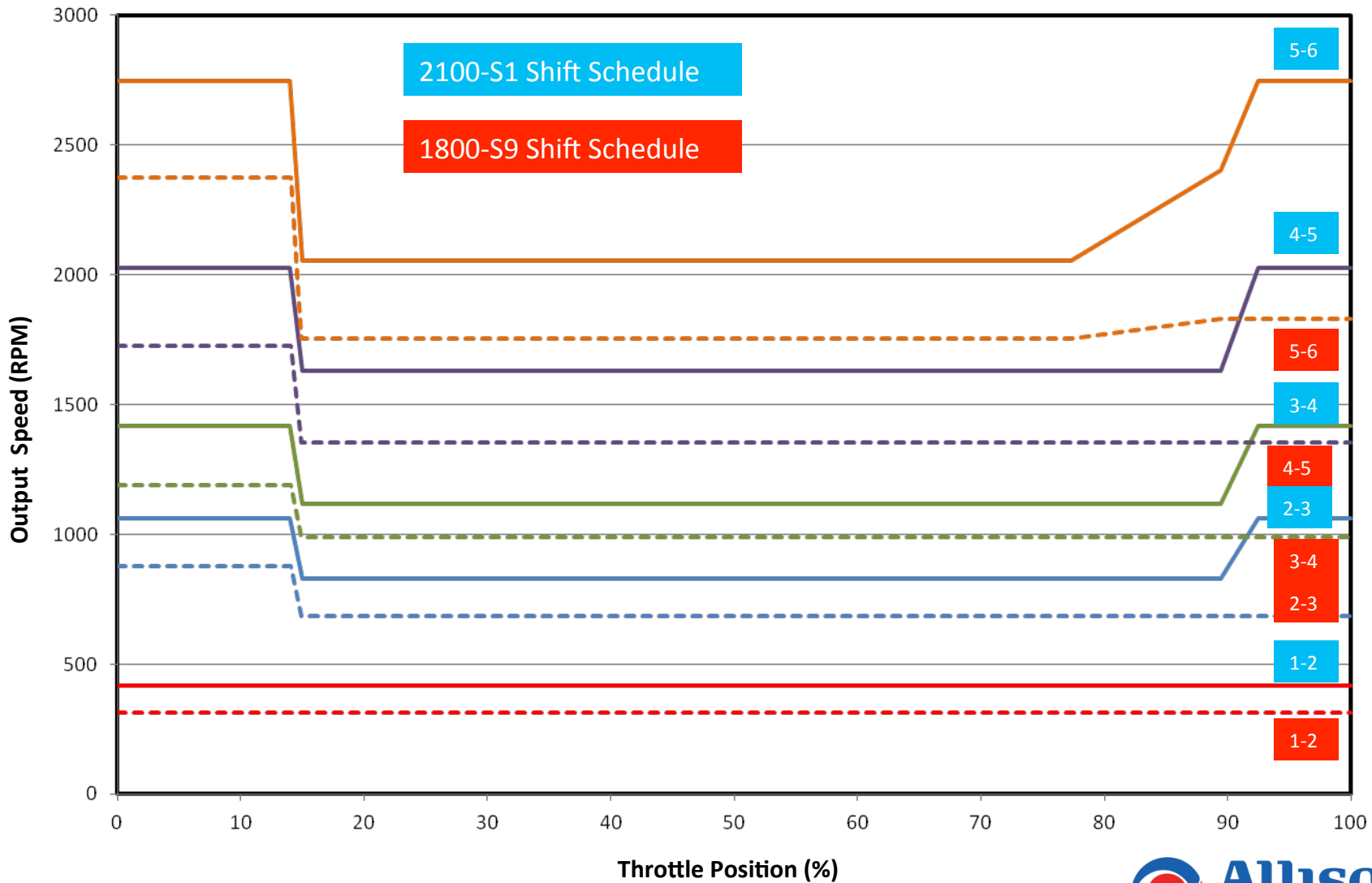
- EcoCal – formally “Economy Shift Schedules” .
- Dynamic Shift Sensing – formally “Load Based Shift Scheduling” (LBSS)
- Neutral @ Stop
  - Standard – formally “Reduced Engine Load at Stop” (RELS)
  - Premium – formally “Engine Converter Load Reduction” (ECLR)
- Acceleration Rate Management – formally “Vehicle Acceleration Control” (VAC)



# EcoCal

- Objective:
  - Lower speed shift schedules designed to keep the engine speed at or near its most optimal fuel economy operating point, and engage the lock-up clutch as soon as possible.
  - EcoCal also provides necessary performance without shift cycling

# Performance (2100-S1) / Economy (1800-S9) Shift Schedule Comparison



# Dynamic Shift Sensing

- Objective
  - Transmission controller automatically and intelligently switches between performance and economy shift schedules, based on changes in load - with a bias toward fuel economy.
  - Provides additional shift schedule – “Super Economy” Shift Schedule (SESS) - that can be activated when vehicle is in stabilized load condition.

$$\text{Lbs fuel} = \text{bsfc} * \text{HP} * \text{hours}$$

**Example:** 58,000 lb truck traveling 60 mph on a 0.25% grade (200 brake HP)

**B.S.F.C.**  
(lbs fuel / HP-hr)

“sweet spot”

mph	60	60
engine rpm	1400	1900
% throttle	70%	65%
hours	1	1
bsfc	0.334	0.37
HP	200	200
lbs fuel	66.8	74
gals fuel	9.68	10.72
mpg	<b>6.20</b>	<b>5.59</b>

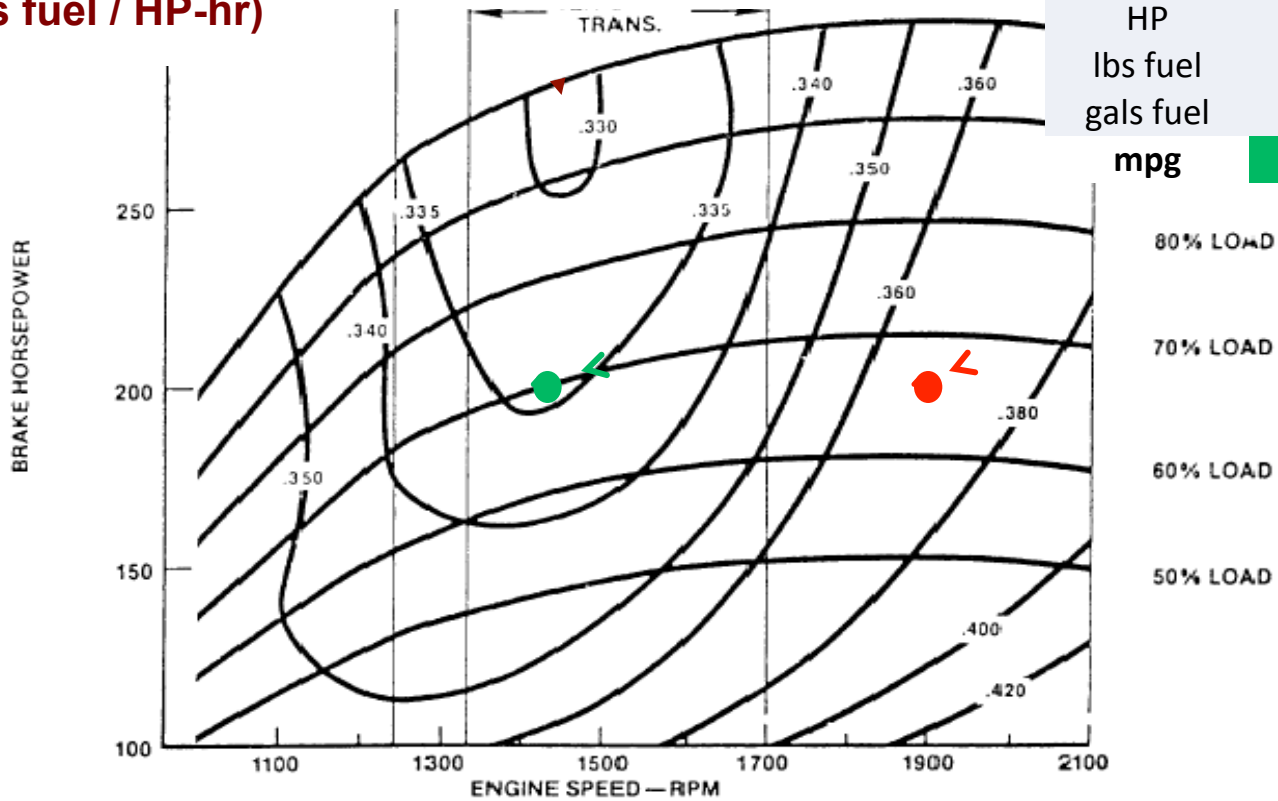


Figure 2: B.F.S.C “Fuel Map”

# Dynamic Shift Sensing

Where do the fuel economy gains come from?

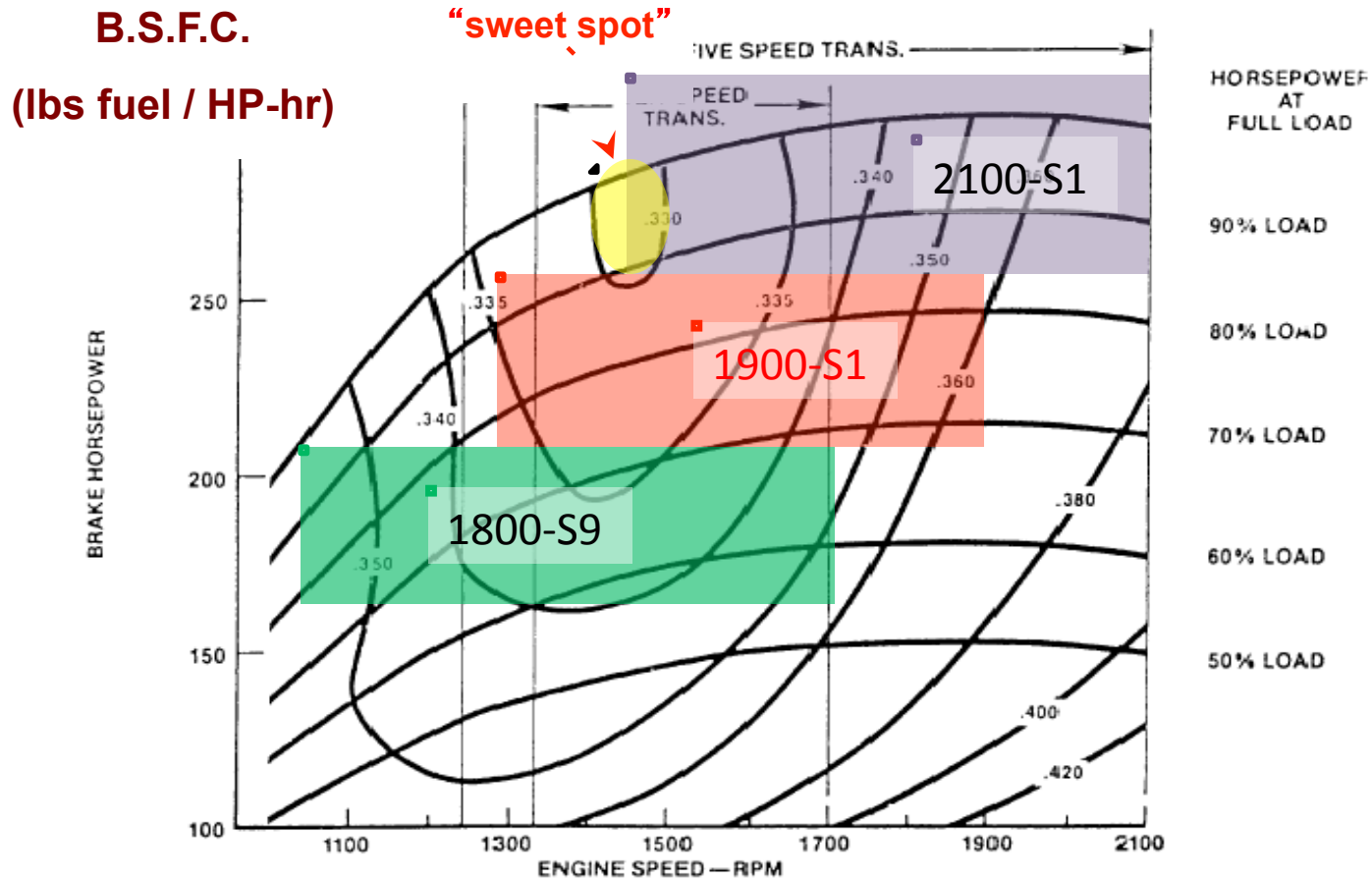


Figure 2: B.F.S.C “Fuel Map”

# How does the Dynamic Shift Sensing feature determine what shift schedule to use?

- $F = ma$  - or -  $m = F/a$
- TCM is able to calculate mass of bus based on torque messages from engine controller and acceleration rate from output speed
- A “mass breakpoint” is determined and used to compare against “real time” calculated mass/road load.
- TCM detects significant increase/decrease in mass/road load and uses appropriate shift schedule

(above “breakpoint” = Performance; otherwise stay in Economy)

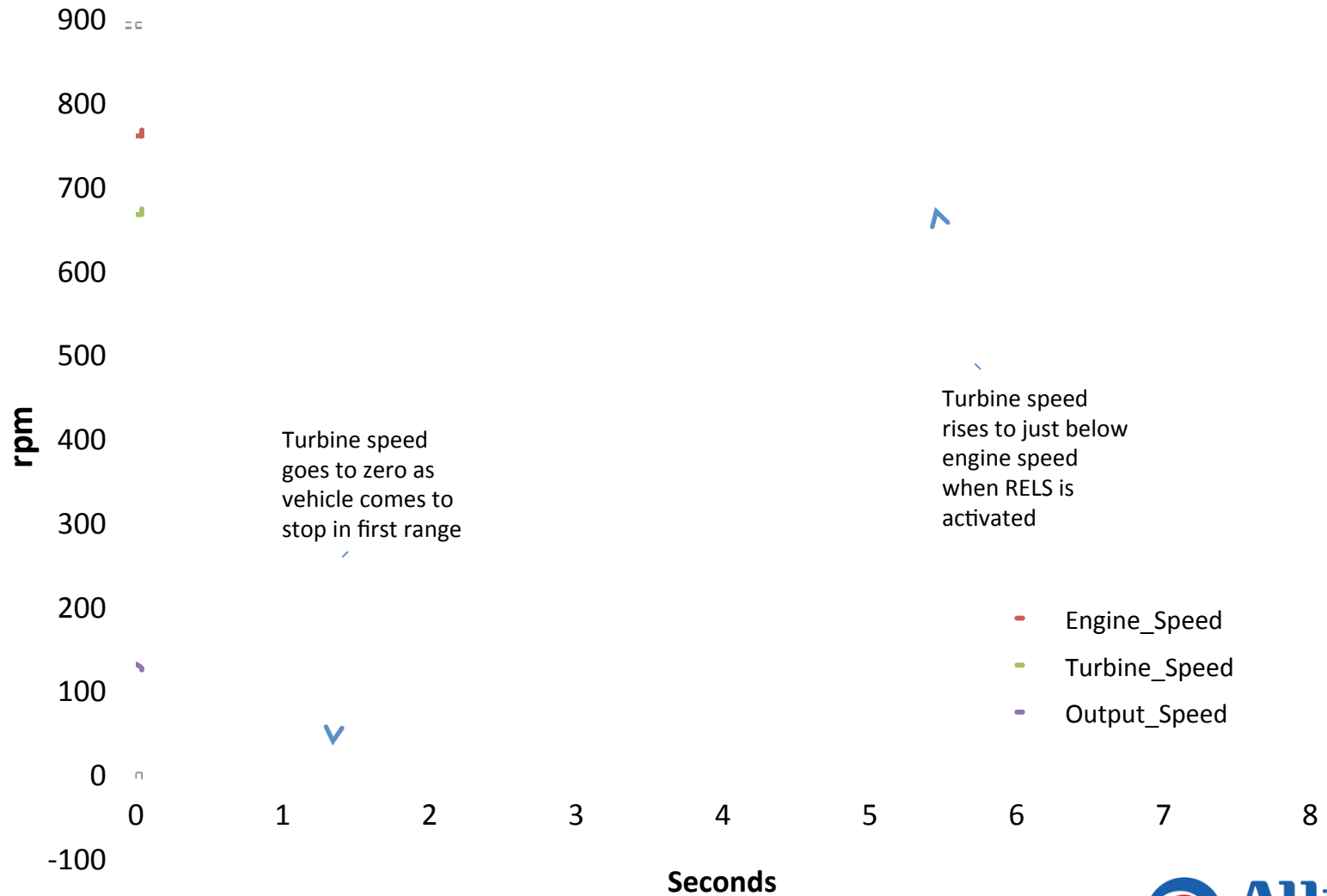


# Neutral @ Stop Features

**Objective: Transmission controller detects "drive-idle-stall" conditions based on Brake Input and varies clutch application to reduce fuel consumption and torque converter heat when vehicle is stopped in range. Two Levels of Neutral @ Stop Available**

- **Standard (RELS) – Provides partial Neutral with output locked to help reduce roll-back**
- **Premium (ECLR) – Provides full Neutral with output locked to help reduce roll-back**

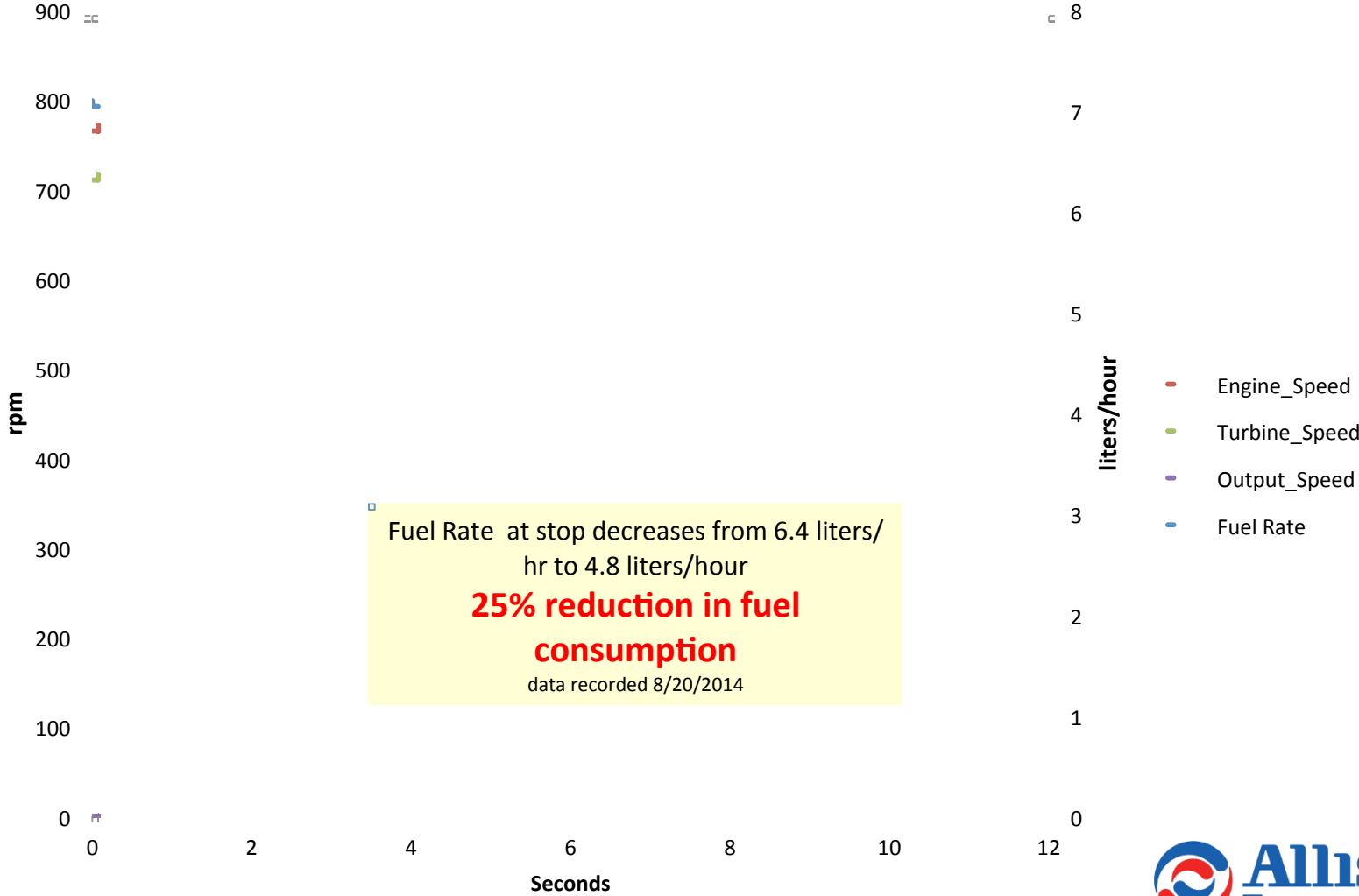
## Typical shift from 1st to Neutral @ Stop-Standard (RELS) following a stop





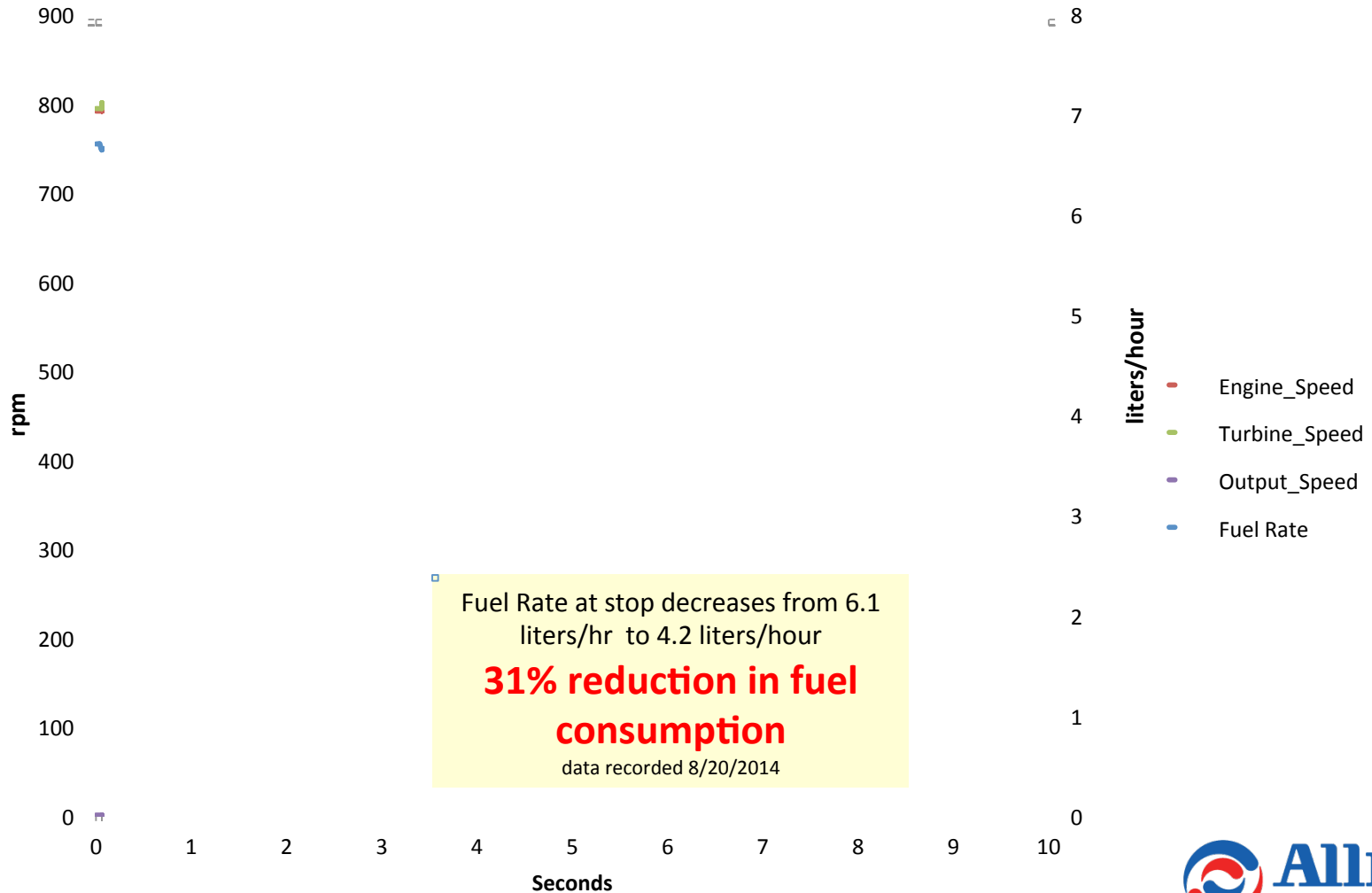
# Neutral @ Stop – Standard (RELS)

## Fuel Rate Reduction with Cummins ISL 280 / B400R

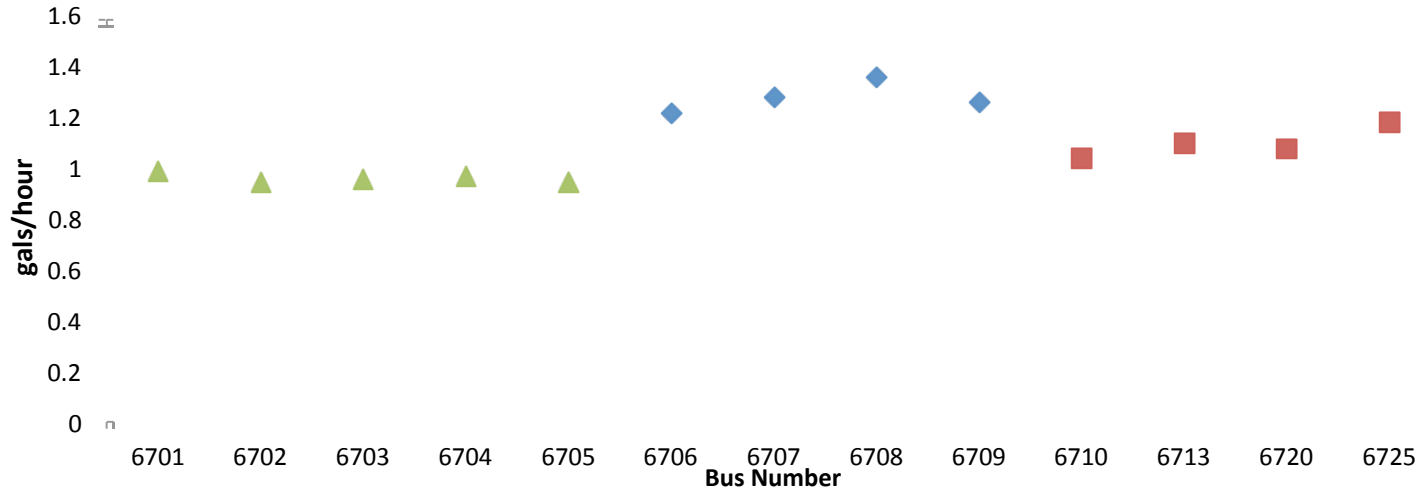


# Neutral @ Stop – Premium (ECLR)

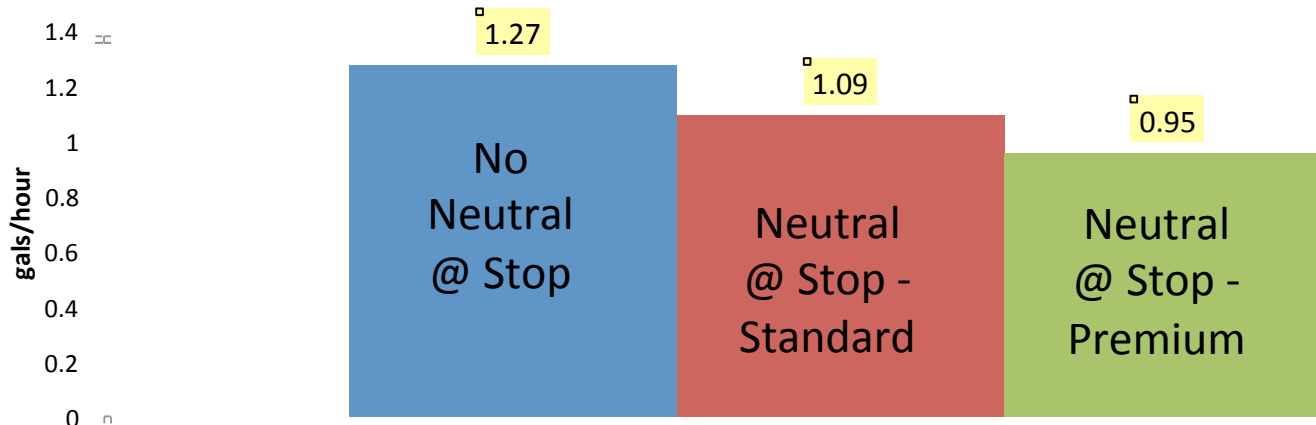
## Fuel Rate Reduction with Cummins ISL 280 / B400R



### Idle Fuel Rate by Bus #



### Average Idle Fuel Rate



8/20/2014

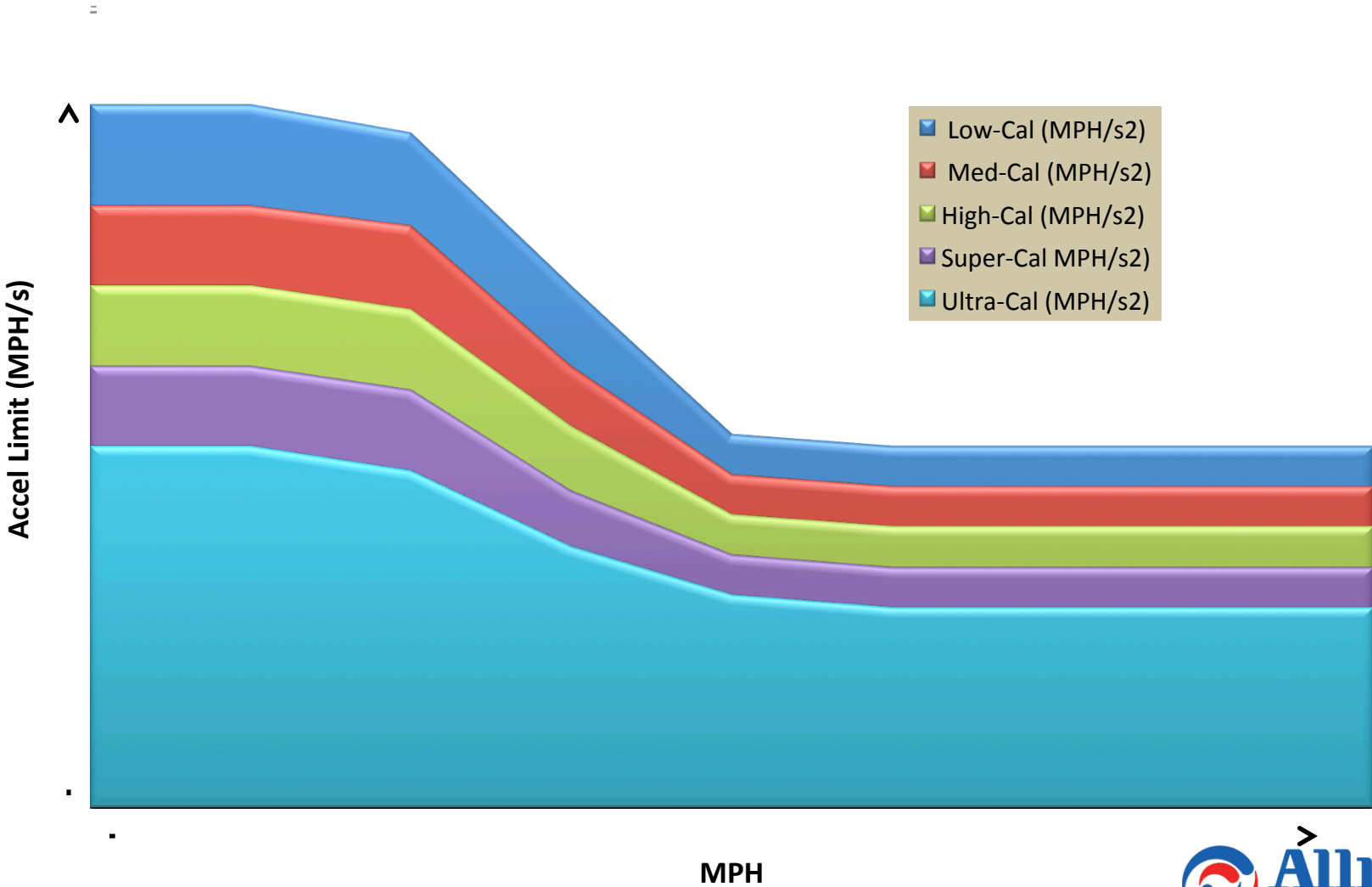


# Acceleration Rate Management

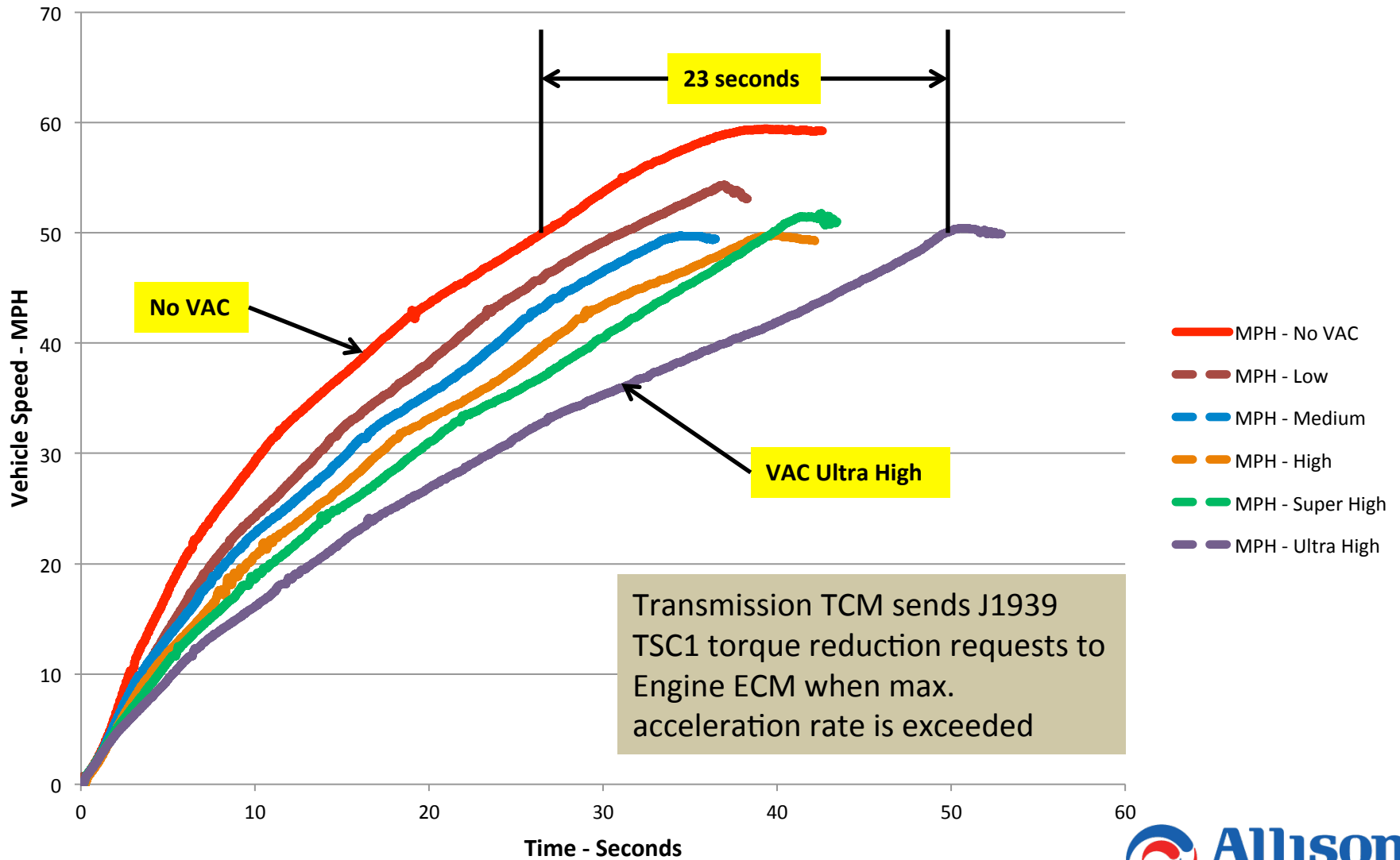
**Objective: Limit vehicle acceleration to a maximum value by cutting torque from engine when acceleration rate is exceeded**

# Gen 5 Acceleration Rate Mgmt Rates

## Accel Limit (MPH/s) vs Speed (MPH)



# Comparison of Acceleration Rate Mgmt Levels at W.O.T



# Park Brake Auto-Neutral

**Objective: Reduce fuel consumption and transmission heat by automatically shifting transmission to neutral when park brake is applied**

# Park Brake Auto-Neutral

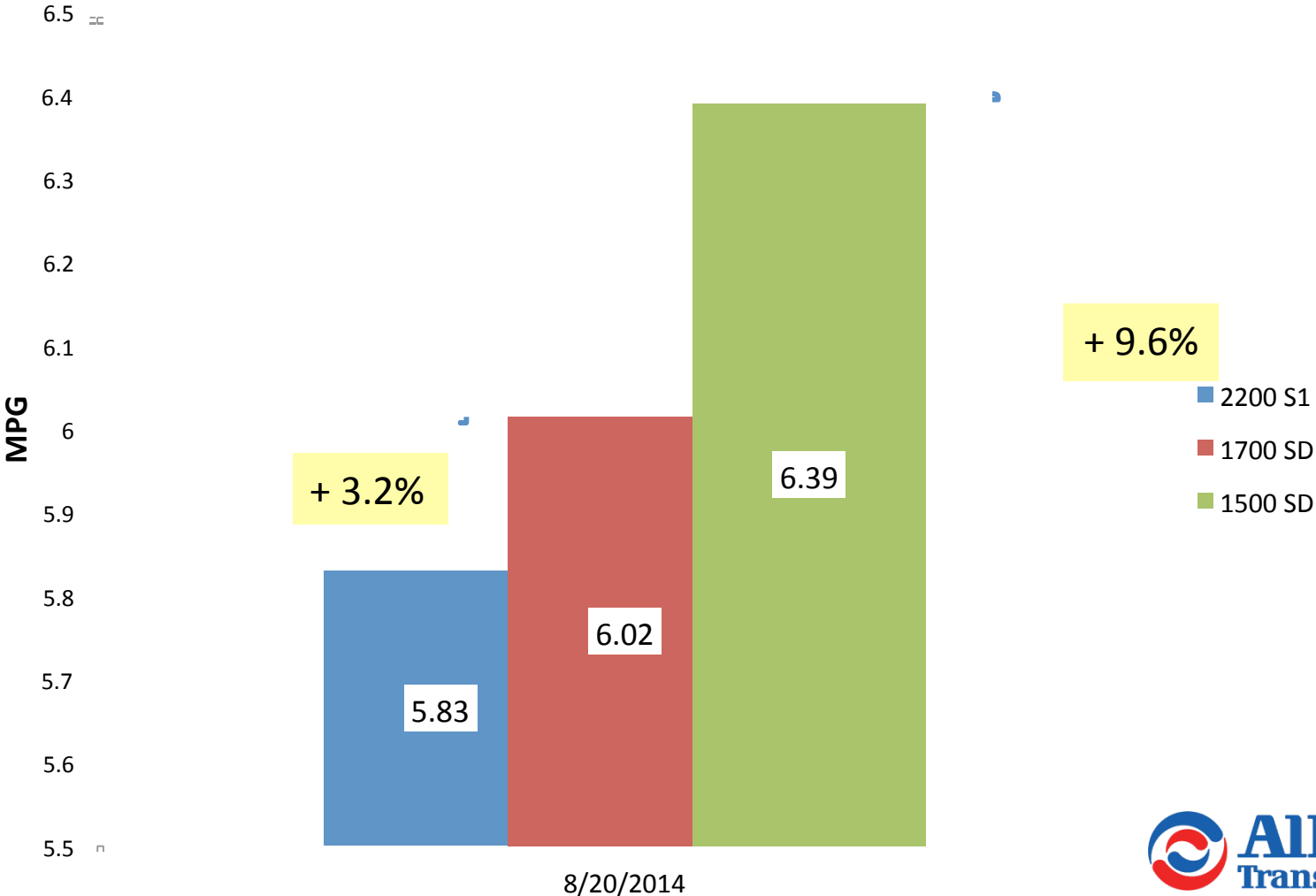
- Vehicle which is left in Drive when parked will:
  - burn more fuel than vehicle left in Neutral (Approximately 50% fuel savings in Neutral vs. Drive)
  - elevate oil temperature in torque converter and sump
- Feature will automatically shift transmission to Neutral when park brake is applied
- Operator must manually re-select range



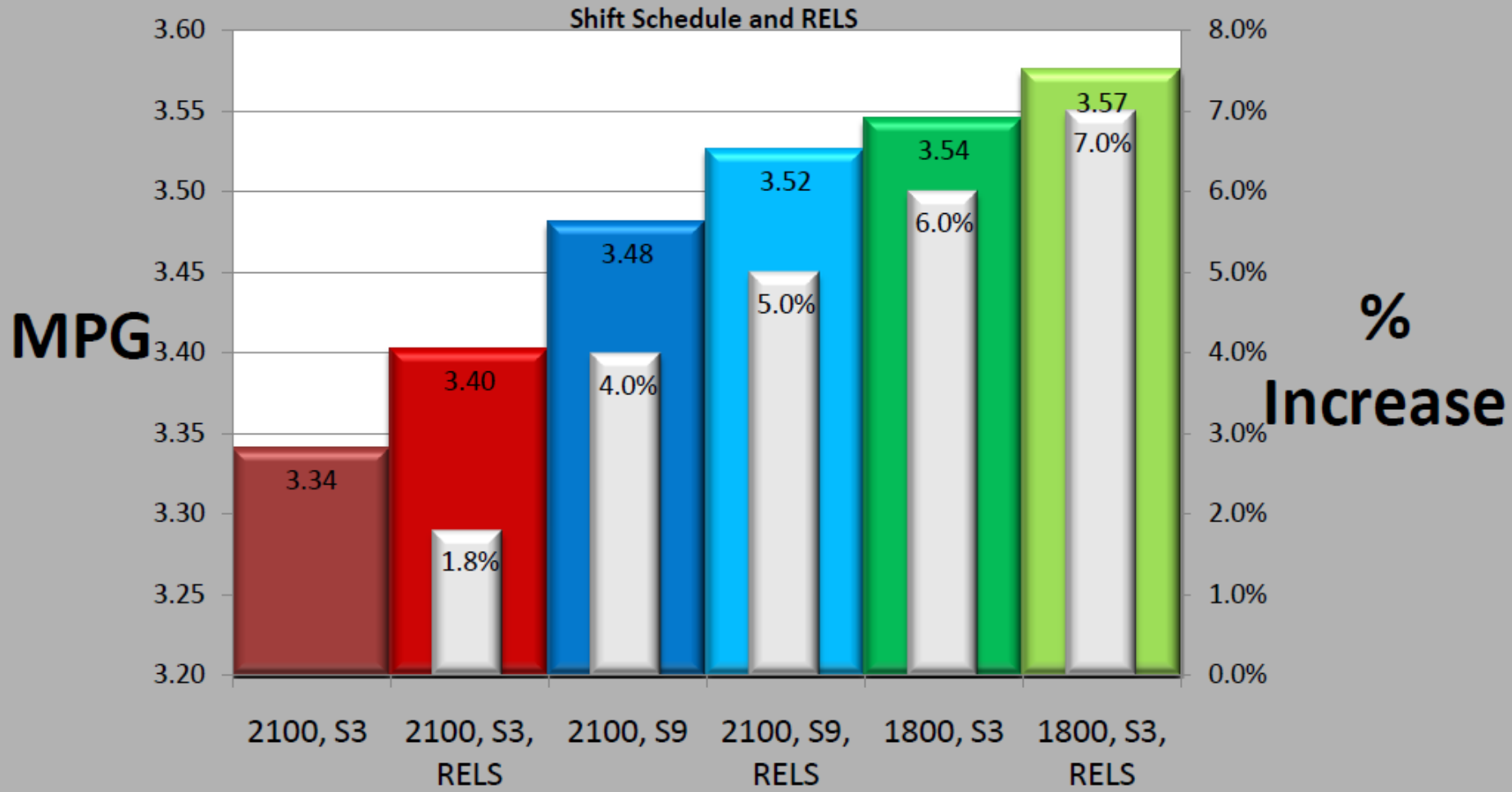


# Fuel Economy Comparisons

# St Louis Metro - Overall Avg MPG by calibration Cummins ECM Data



# Phoenix Transit - MPG & % Increase 5/18/09 - 11/5/09



# Prognostics

A close-up photograph of a vehicle's instrument cluster. The central focus is a small, rectangular digital display with a green LED screen showing the number '6r1'. To the right of the display is a black rectangular button with the text 'MONITOR' written vertically in white. Below the display is a larger, square button with the word 'MODE' in white. Further down and to the left are two more buttons: one with the letter 'N' and another with a plus sign '+'. The background is a dark, textured surface, likely the dashboard or instrument panel.

## Prognostic features

- Oil Life Monitor
- Transmission Health Monitor
- Filter Life Monitor

# Prognostics Oil Life Monitor



- Function Description
  - Operating parameters such as operating time, output revolutions, shift density, retarder usage, etc. are monitored and fluid life is adjusted accordingly. Output is displayed as a percent of fluid life remaining from 100% to 0%
- Triggering Event
  - % life remaining reaches an Allison cal set value (expect 1-2%)
- Service Indicator
  - When maintenance is required, at key on, the light will come on steady and remain on steady for 2 minutes after DRIVE has been selected
- Failure to perform maintenance and reset after a cal defined period will result in diagnostic code being set and the CHECK TRANS light being lit.

# Prognostics Trans Health Monitor

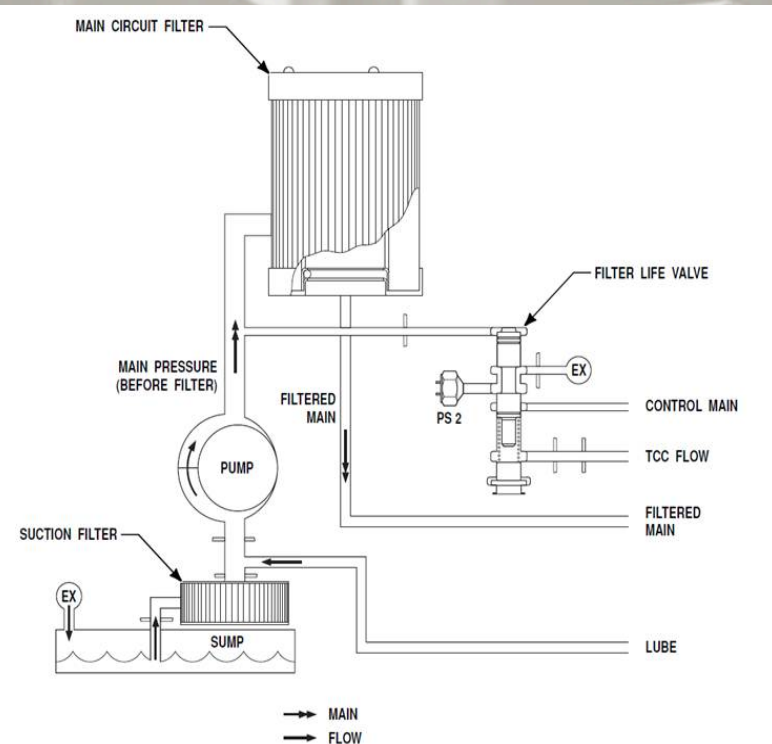


TRANSHEALTH  
OK

- Function Description
  - Monitors C1 through C5 clutches and evaluates remaining useful life through changes in calculated running clearance.
- Triggering event
  - The change in calculated running clearance reaches an Allison cal set value (expect ~10% life remaining) –OR– value exceeds a max value
- Service Indicator
  - At key on, light will come on steady and remain on steady at all times
- Manual reset possible only through service tool
- Failure to perform maintenance after a cal defined number of warnings will result in a diagnostic code being set and the CHECK TRANS light being lit.

# Prognostics

## Filter Life Monitor



- Function Description
  - Use a delta-p switch to evaluate pressure change across the main filter. Function does not operate below 40 deg C sump temperature
- Triggering event
  - Filter delta pressure reaches 25psi
- Service Indicator
  - At key on, light will flash and remain flashing for 2 minutes after DRIVE has been selected

- **Reset possible via service tool**
- **Failure to perform maintenance after a cal defined number of warnings will result in a diagnostic code being set and the CHECK TRANS light being lit**