# Session 3
# How to better reflect & improve in-use Fuel Economy ?
## *Renault & On-board eco driving technologies*

**Dr Philippe Schulz**
**Expert Leader – Environment, Energy & Raw Materials**

RENAULT eco2

**GFEI Workshop - In Use Fuel Economy**
***London – July 16, 2014***

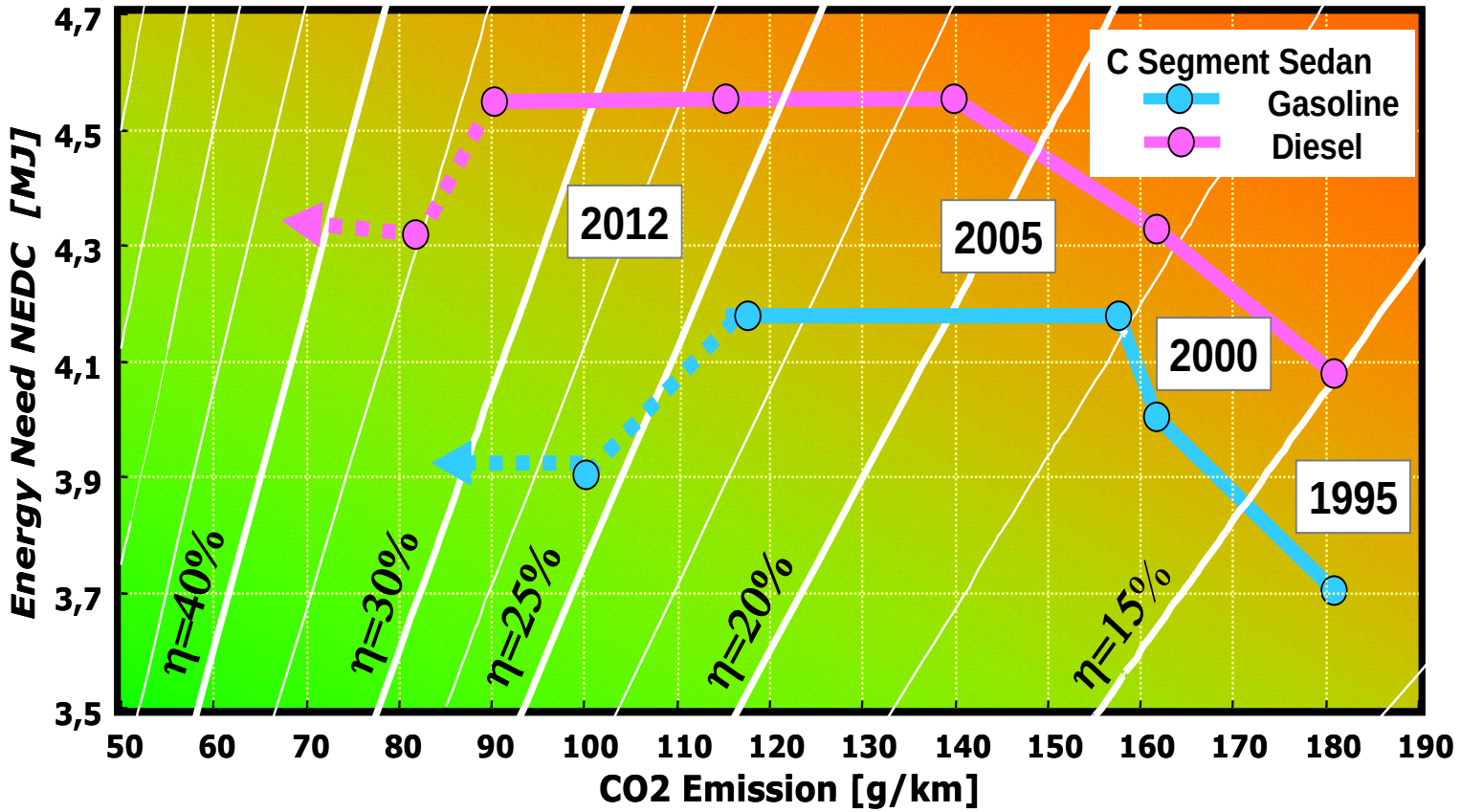
# HOW TO IMPROVE IN-USE FUEL ECONOMY

01 TECHNOLOGY ALONE WILL NOT SOLVE ALL CHALLENGES

02 HELP YOURSELF…WITH THE SUPPORT OF NEW PRODUCTS & SERVICES : DRIVINGECO2

03 CONCLUSION

# STILL A POTENTIAL TO IMPROVE THE ENERGY EFFICIENCY OF INTERNAL COMBUSTION ENGINES, BUT NOT ENDLESS….



# EUROPEAN EMISSION REGULATIONS :

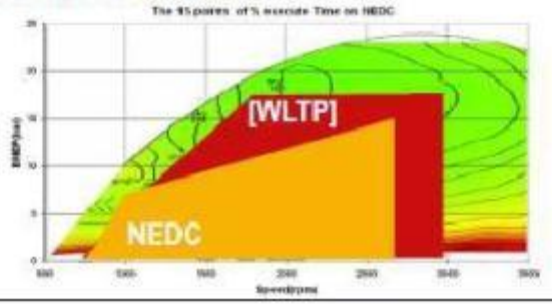
## MORE STRINGENT AND CLOSER TO REAL DRIVING CONDITIONS

### NOx + ON BOARD DIAGNOSIS

| | | EURO5 | EURO6C |
|---|---|---|---|
| NOx certification | g/km | 180 | 80 |
| OBD | Diag. number | 15 | 75 |
| | + increased frequency and reduced thresholds | | |

### NEW PROCEDURE WLTP

CYCLE ENGINE OPERATIONS




### REAL DRIVING EMISSION

**PEMS**
**In road driving conditions**

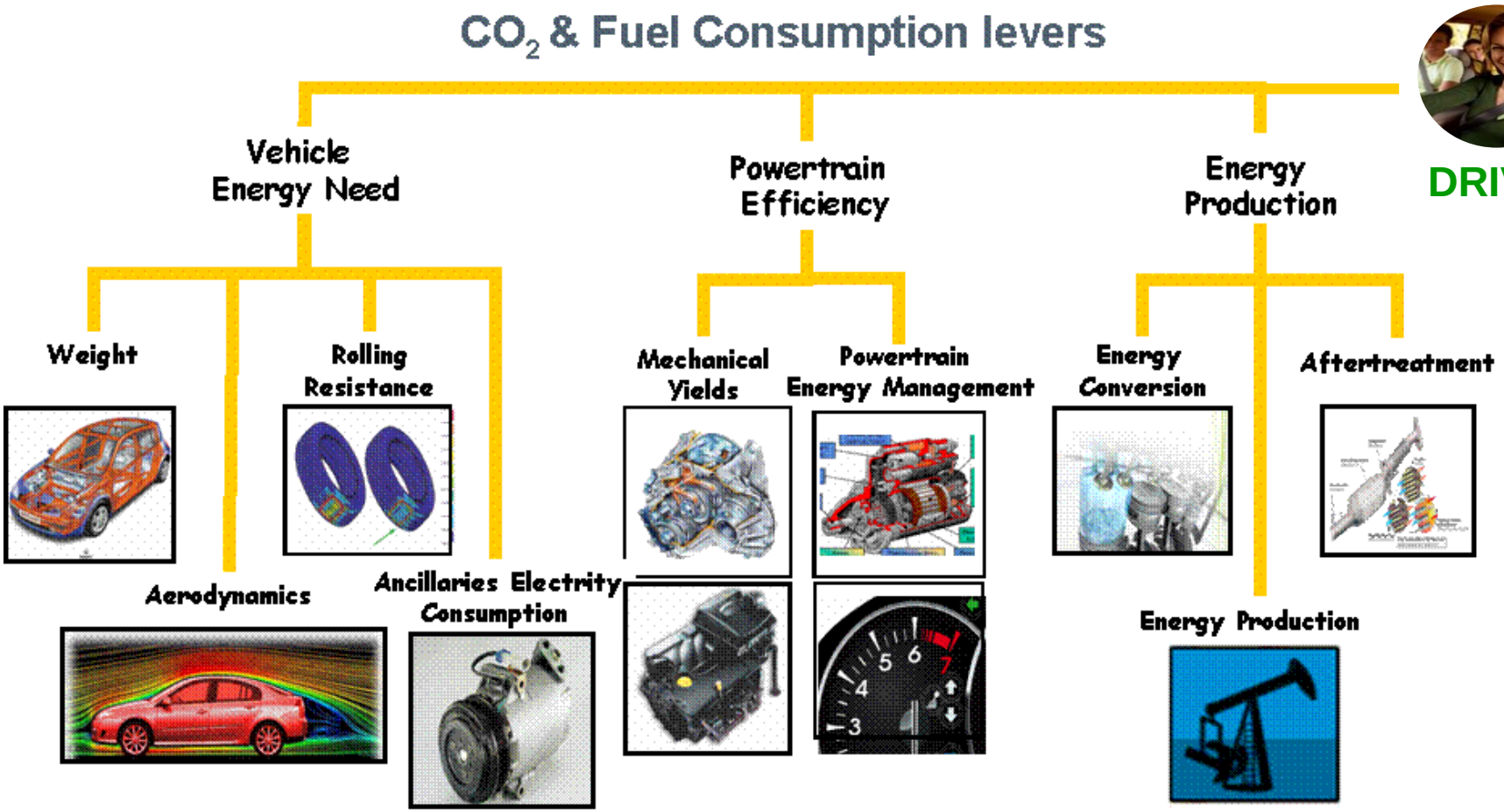
**or**

**random cycle on dyno**

### CERTIFICATION CONDITIONS

- Vehicle Inertia close to real
- AC condition
- Battery State Of Charge
- …

# MANY LEVERS TO LOWER THE $CO_2$ EMISSION AND FUEL CONSUMPTION




**NEDC : 1 $CO_2$ g/ km ≈ 10 kg** or 0,020 SCx or **8 N**ewton or **30 W**att (elec)

# HOW TO IMPROVE IN-USE FUEL ECONOMY

01 TECHNOLOGY ALONE WILL NOT SOLVE ALL CHALLENGES

02 **HELP ALSO YOURSELF…**
**WITH THE SUPPORT OF PRODUCTS & SERVICES** DRIVINGECO2

Eco-driving: Strategic, tactical, and operational decisions of the driver that influence vehicle fuel economy

Michael Sivak*, Brandon Schoettle

*University of Michigan Transportation Research Institute, 2901 Baxter Road, Ann Arbor, MI 48109-2150, USA*

Transport Policy 22 (2012) 96–99

*A good 15 % fuel reduction is easily achievable at a very low carbon abatment cost.*

# Since 2008, a dedicated in-house eco-driving programme RENAULT DRIVINGECO²

- **Objective:** Support the driver to better use his vehicle and minimize its real fuel consumption.

- DRIVINGECO² = **ECO**logical and **ECO**nomical driving

- All the means given to the driver to consume less fuel
  - Technical/non technical
  - Before, during and after driving

- Driving eco ² is made of **product** and **services**
  - **On-board : Driving style indicator, eco-mode button, gear changes indicator, trip report, eco-coaching, eco-navigation**
  - *Off-board : eco-trainings (B2B and Bt2C) and eco-challenge (B2B), particularly useful for private fleet operators*

# DRIVINGECO2 ADDRESS DRIVERS BY VARIOUS WAYS

1 **Delegation *« My car is doing »***

- eco-mode

2 **Implication *« My car is teaching me »***

- eco-driving assistance
- eco-scoring, coaching, challenge

3 **Training *« A coach is teaching me »***

- embedded technologies are helping me before & after the training like a tutor

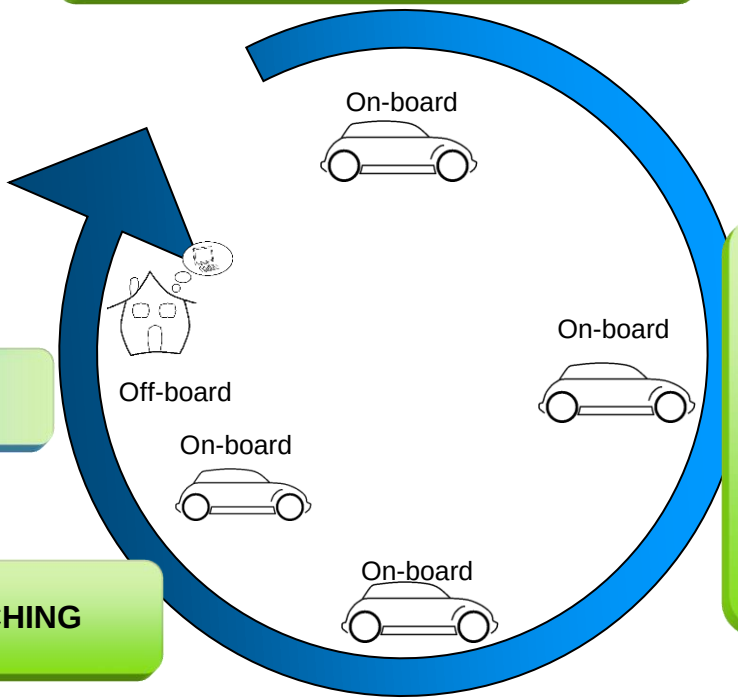
# A GLOBAL PRODUCT & SERVICES OFFER

**Service**

**Product**

**ECO-NAVIGATION**

**ECO-DRIVE TRAINING**
BtoB / BtoC




**ECO-DRIVING ASSISTANCE**

- **Driving style indicator**
- **Gear changes indcator**
- **Eco-mode button**

**ECO CHALLENGE (to come)**

**TRIP REPORT/ECO COACHING**

***Did you know about it ?***

Trip report, driving style indicator and eco-coaching allow to reduce until 25 % its consumption by an implication of the driver

# DRIVING ECO² IN THE VEHICLE

# 1 – DASHBOARD: DRIVING STYLE INDICATOR

- A bright witness on the dashboard allows to inform the driver about its real time driving style and thus to adapt its driving accordingly.

- Taken into account the vehicle speed, the management of the accelerations, the management of the decelerations and the speeds changes.

- The style of driving is permanently indicated by variation of color and luminous intensity.

Green : good economical driving

Yellow : consumption and emissions can be improved

Amber : driving is too dynamic and eco performance is low

# 2 - ECO-MODE BUTTON

This mode, actionable with a simple pressure on a button, allows fuel savings, immediate and simply by modifying the performances of the vehicle :

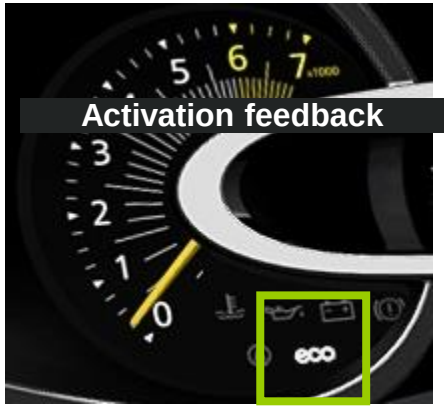
- Modification of the accelerator pedal mapping
- Reduction of engine torque
- Thermal comfort is adapted to reach smoothly desired cooling/heating (regulated A/C)

Eco-Mode button

Driver can disconnect this eco-mode via a kick-down on the accelerator pedal

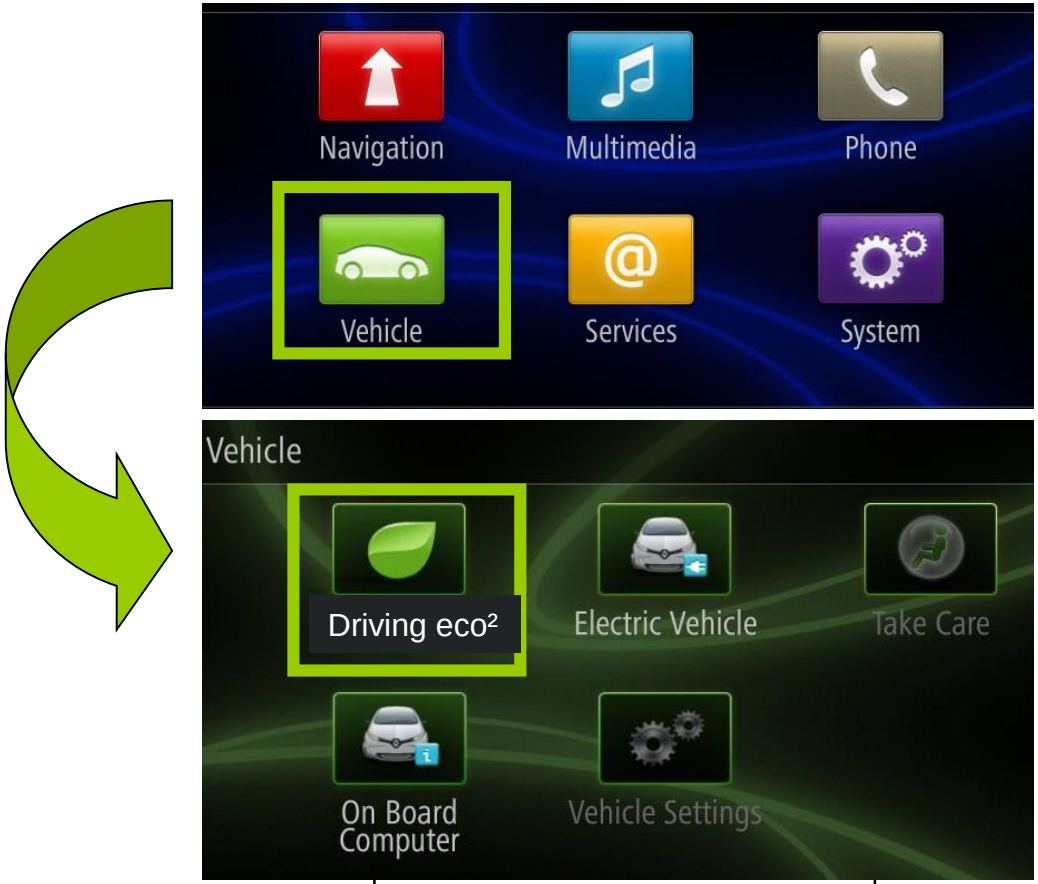

*Did you know about it?*

The eco-mode button only allows to reduce vehicle fuel consumption **up to 10 %.**

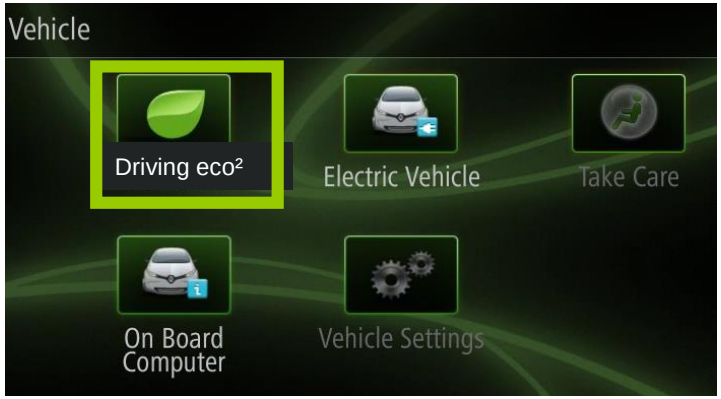


# 3 – VIEW THROUGH R-LINK, THE RENAULT NAVIGATION SYSTEM

- After his journey, the customer can view his eco-driving performance

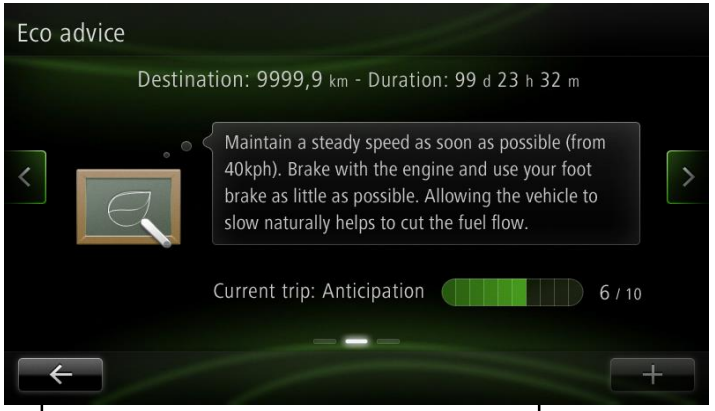


# 3 – DRIVER EDUCATION USING THE NAVIGATION SYSTEM




## TRIP REPORT

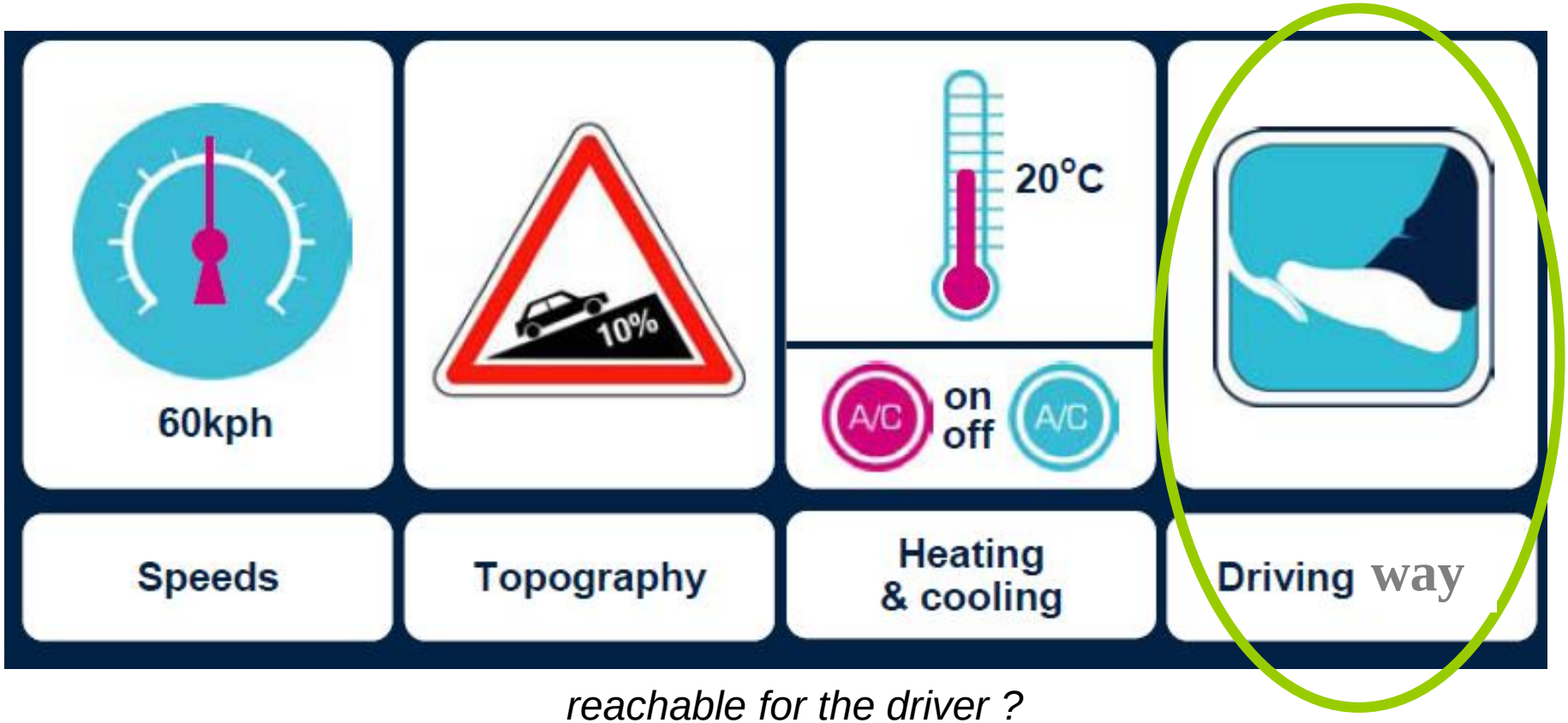

## ECO COACHING



# 3 - ECO NAVIGATION

- This feature, integrated into the navigation system allows the driver to take the lowest fuel consuming trip for a given route and indicate the speed limit authorized on the section.

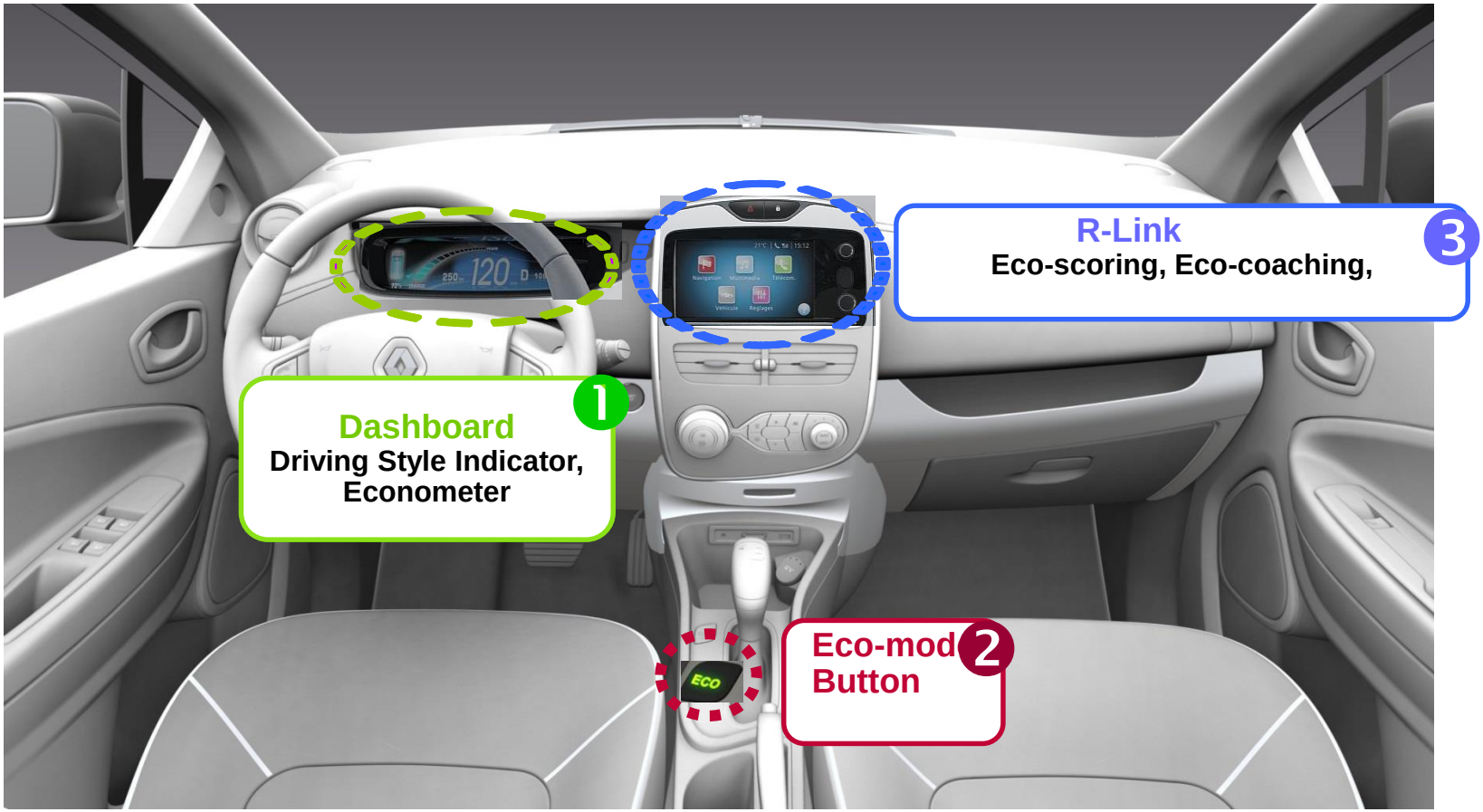
# ECO DRIVING : A STRONG LEVER TO INCREASE EV DRIVING RANGE




*reachable for the driver ?*

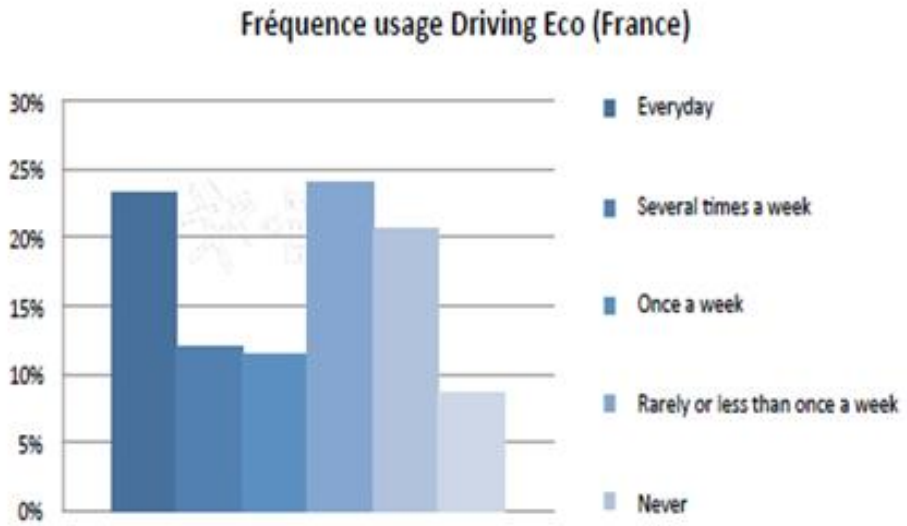
| Speeds | Topography | Heating & cooling | Driving way |
|---|---|---|---|
| **Partially** | **No** | **Partially** | **Fully** |

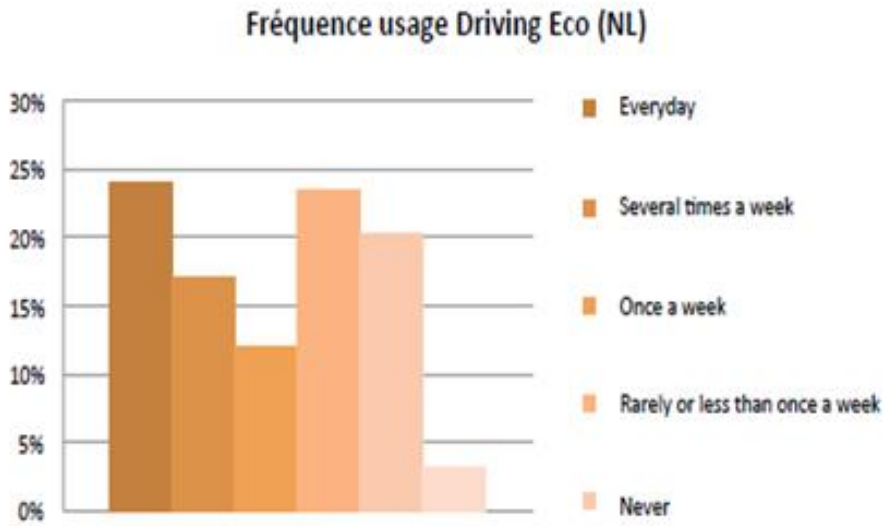
# DRIVING ECO² IN RENAULT ZOE ELECTRIC VEHICLE



# DRIVINGECO² CUSTOMER FEEDBACK ?

- **Survey in France & Netherland (Q4 2013)**




The idea of the Driving Eco 2 functions are widely appreciated: at last, something that is directly related to the driving, and the gamification aspect makes it fun and easy to use. It is even more appreciated by the Zoe owners who find it almost indispensable.

Several respondents would like to be able to share their scores with other R-link owners.

# SOME TAKEAWAYS

- Whatever the powertrain and the fuel, whatever the market, whatever the driving conditions, closing the gap between homologated and in-use fuel consumption values will need to reinforce driver education & empowerment
- This potential is still widely open. New embedded technologies and off-board services are introduced by almost all OEMs.
- Broad customer acceptance
- Not only for mature markets….