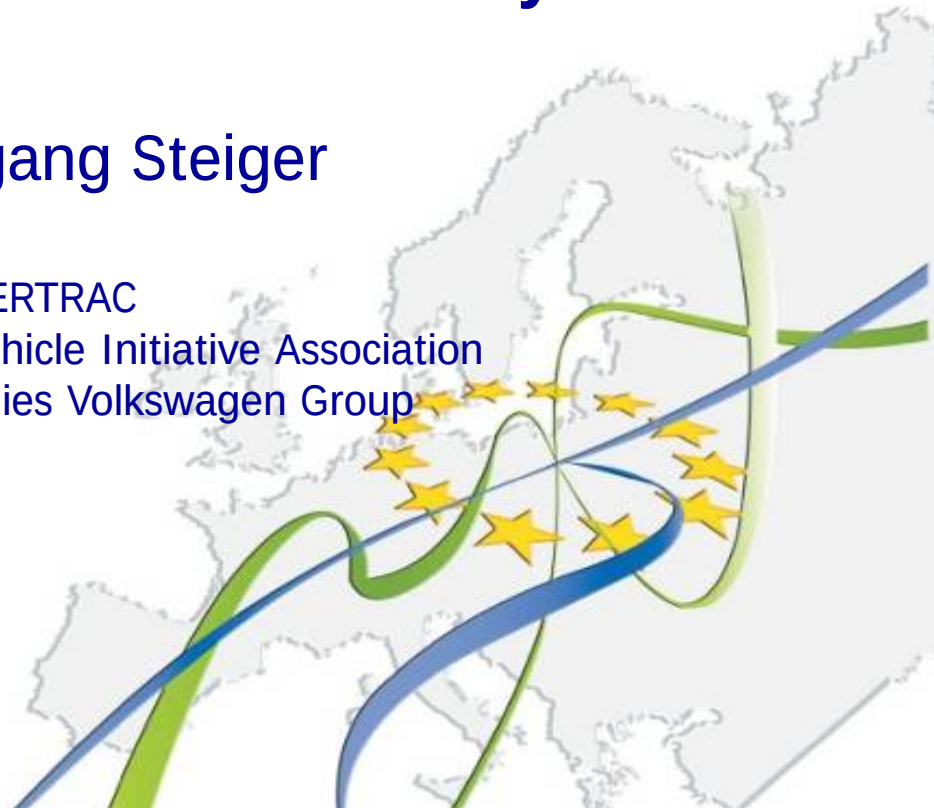
R&D for Sustainable Road Transport

European Road Transport Research Advisory Council

Prof. Dr. Wolfgang Steiger

Chairman ERTRAC
Chairman European Green Vehicle Initiative Association
Director Future Technologies Volkswagen Group



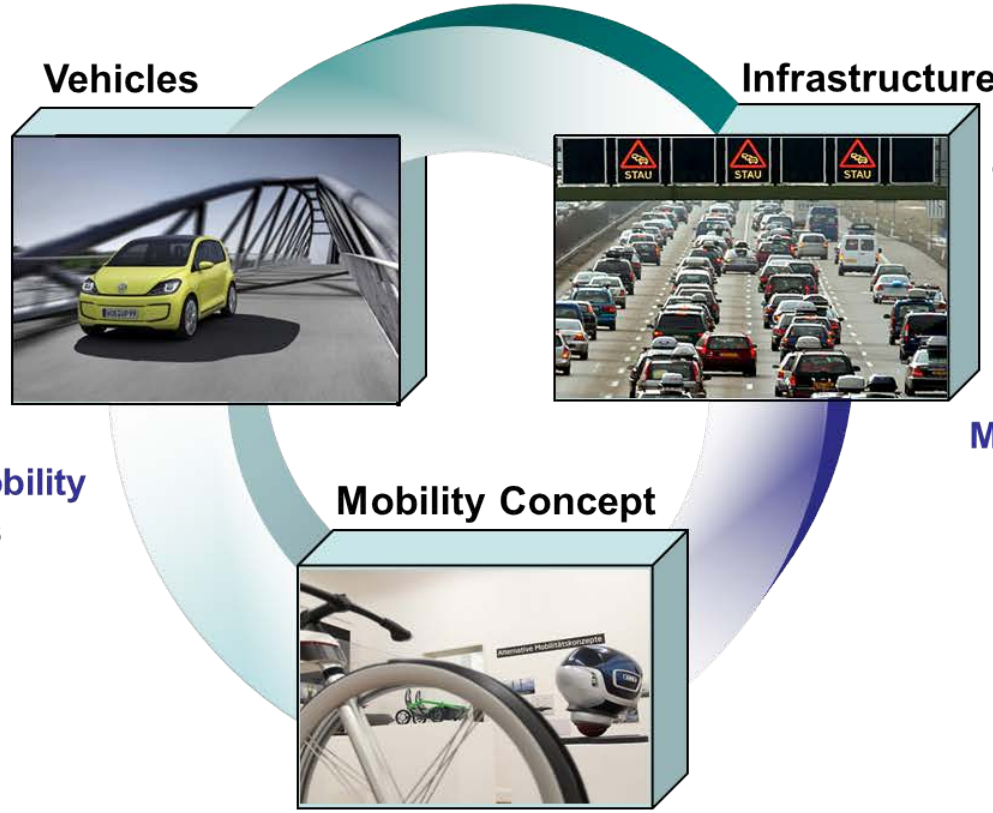
10th CONCAWE Symposium
25. February 2013
Brussels

Global Trends

- Demographic change and urbanization
- Global shifting and expansion of middle class
- Resource competition and global warming
- Connectivity and mobility

21. Century leading concept → Sustainability

Sustainability requires an Efficient Transport System

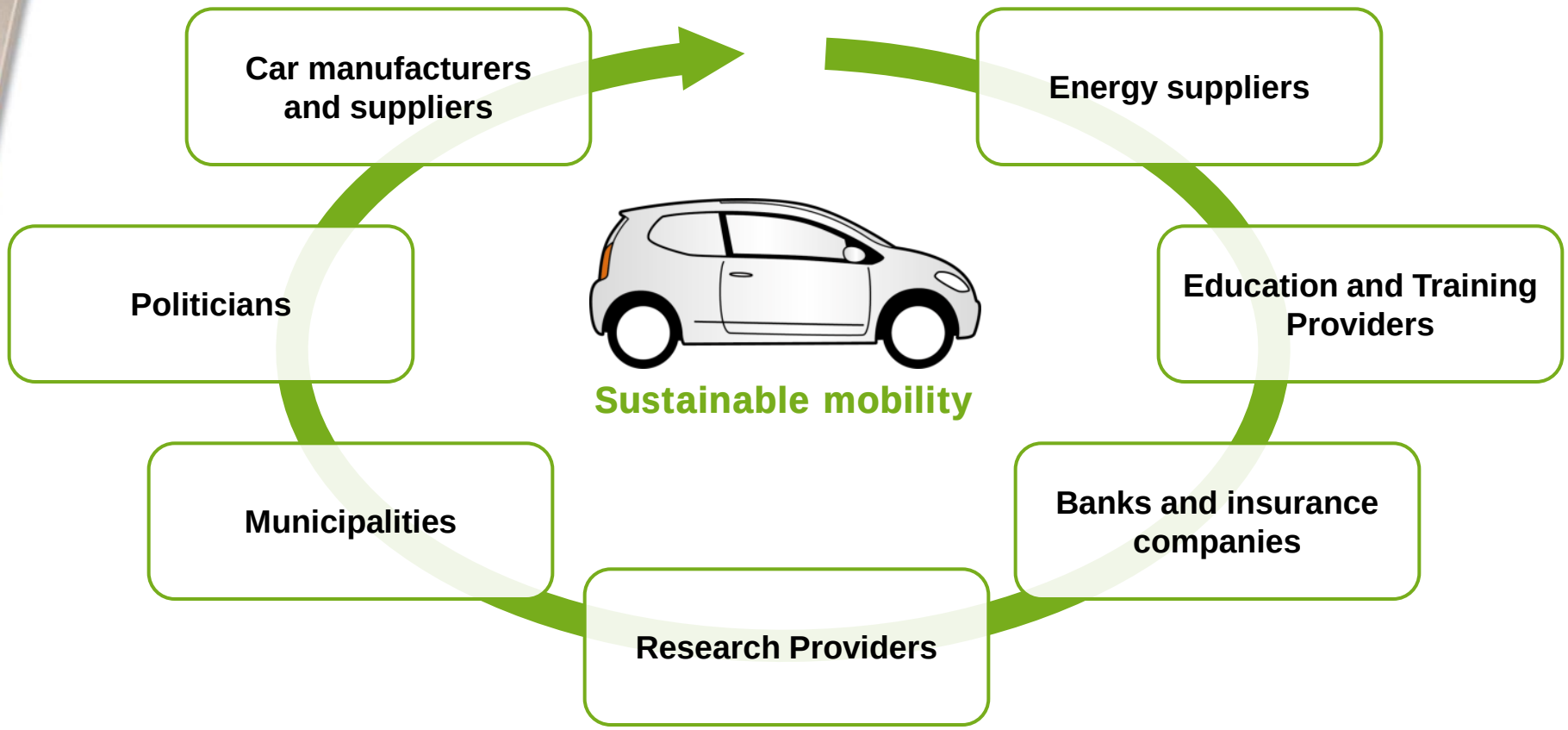


Efficient Powertrains
Electro mobility
Vehicle concepts
Assistant systems
Quiet and clean
CO2 neutral Mobility
Renewable Energies

Traffic flow improvement
Traffic flow management
Actual traffic information
Micro City
Parking space
Safety
Car to X Communication

Innovative Mobility Concepts
Short distance mobility
Micro mobility for the last mile
Seamless Mobility
Long-distance mobility

A Systems Approach - Challenge for all Stakeholders



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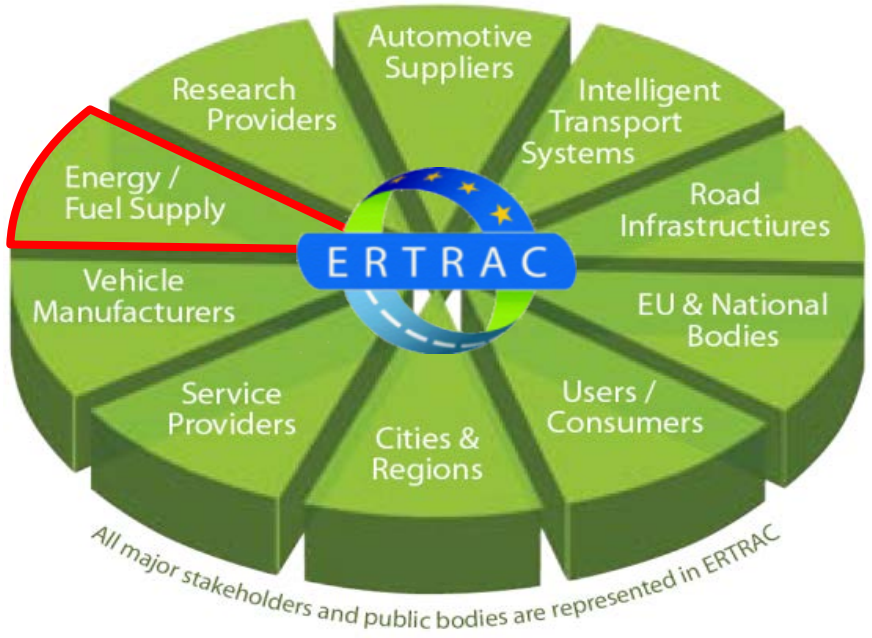
Guided by Systems Approach

Targeting Societal Challenges of Road Transport:

- Decarbonization
- Reliability
- Safety & Security
- Global Competitiveness



Need for a broad Stakeholder Group

ERTRAC SRA 2010:
setting guiding Objectives for Europe

Towards a 50% more efficient road transport system by 2030

	Indicator	Guiding Objective
Decarbonization	Energy efficiency: urban passenger transport	+80%* (pkm/kWh)
	Energy efficiency: long distance freight transport	+40%* (tkm/kWh)
	Renewables in the energy pool	Biofuels: 25% Electricity 5%
Reliability	Reliability of transport schedules	+50%*
	Urban accessibility	Preserve Improve where possible
Safety	Fatalities and severe injuries	-60%*
	Cargo lost to theft and demage	-70%*

* In 2030 versus 2010 baseline

Decarbonization in the next ten Years is mainly based on Efficiency of Conventional Powertrains …

VOLKSWAGEN AKTIENGESELLSCHAFT

BLUEMOTION

ŠKODA

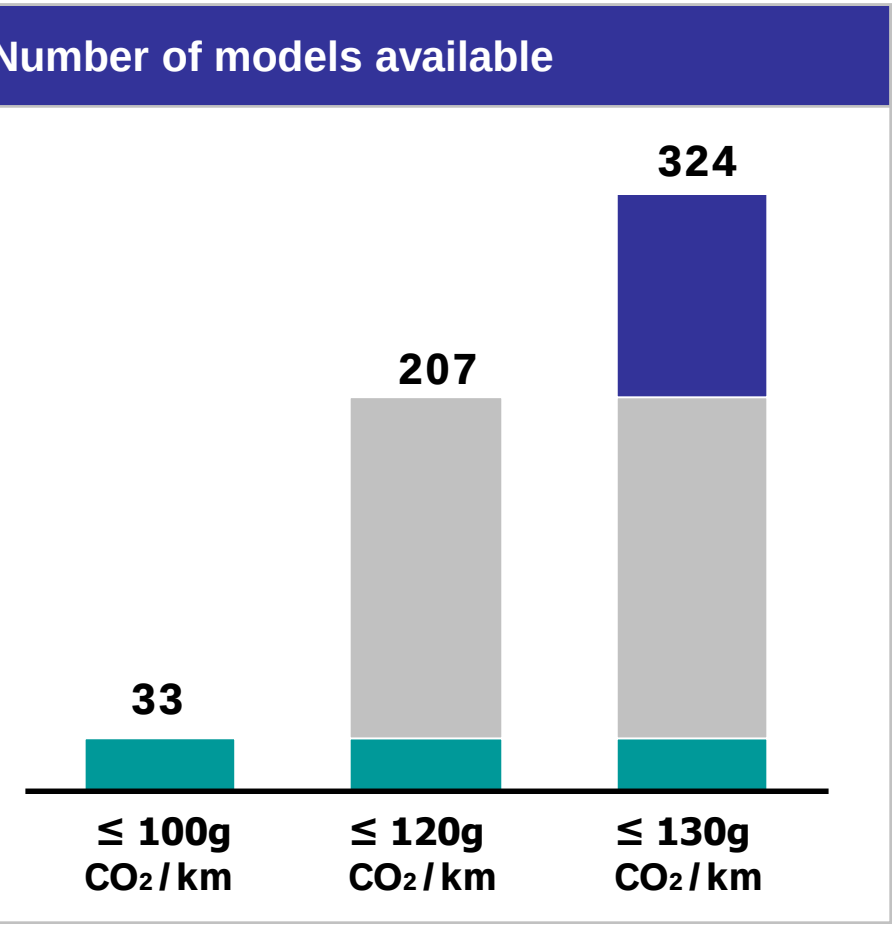
GreenLine

concept

Audi

ECOMOTIVE

SEAT



Source: Volkswagen Group (status: 18.12.2012)

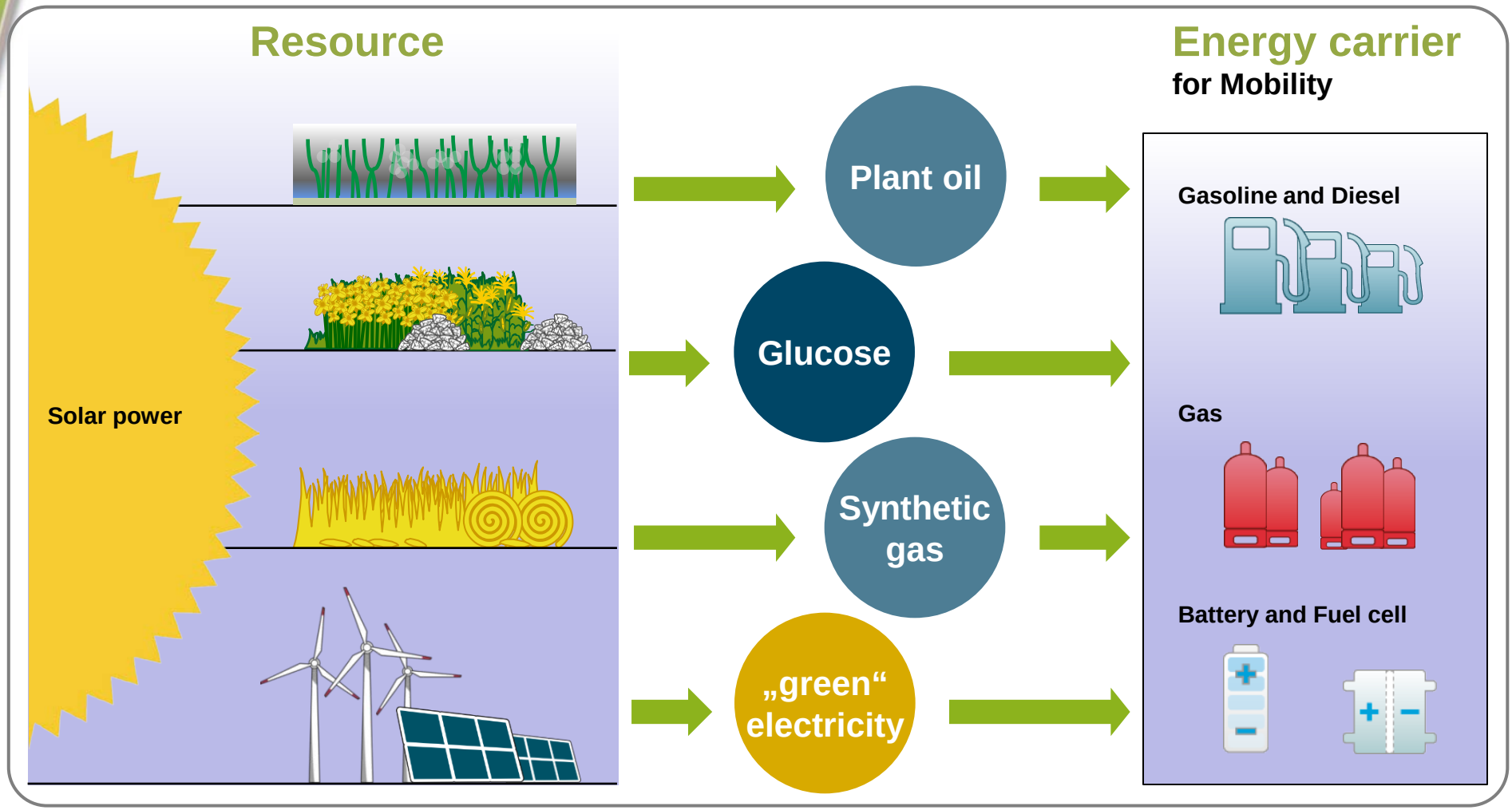
.. And Decarbonization of Fuels

1.0l R3 CNG

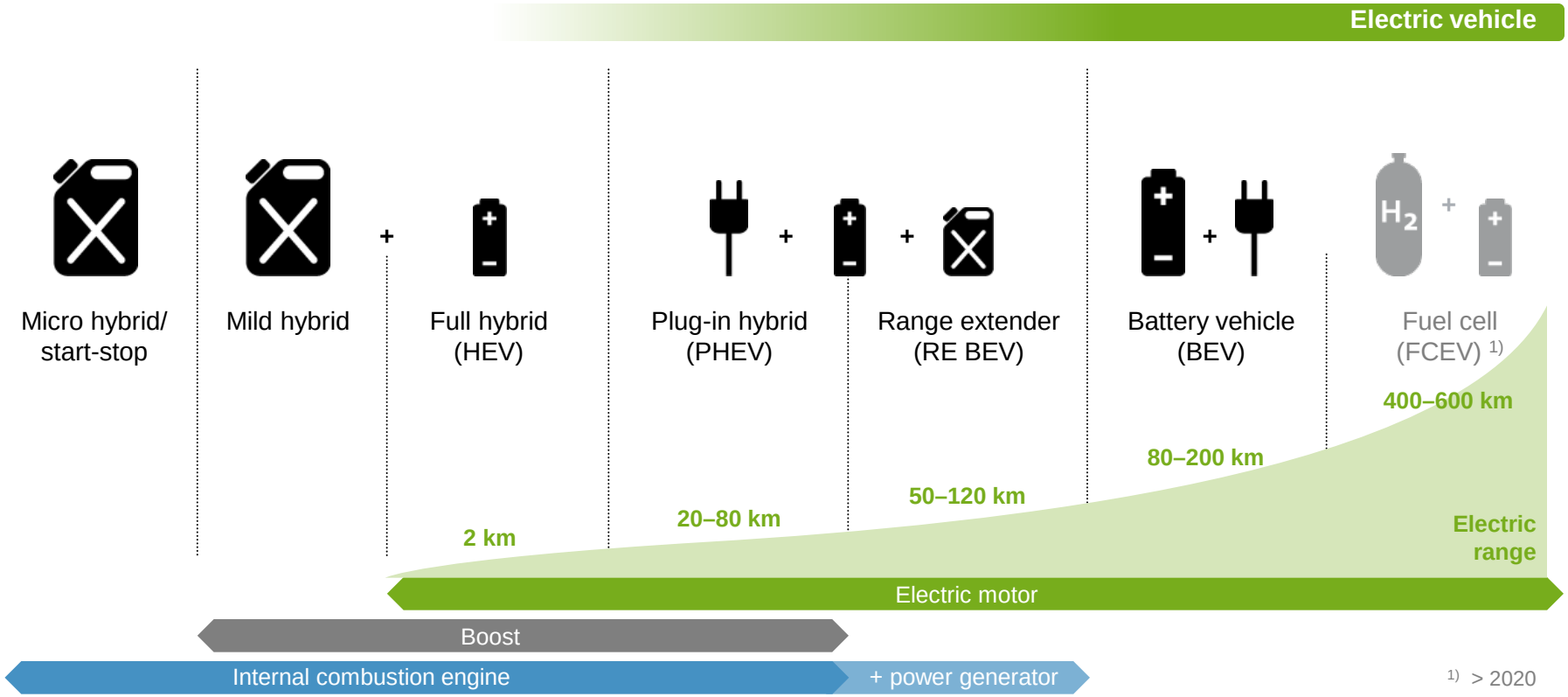
Source: Volkswagen Group

Engine:	1.0l Natural Gas Engine BlueMotion Technology, 50 kW (68 PS) „quasi“-monovalent
Transmission:	5-Gear-Manual
CNG-Consumption:	2.9kg /100 km
CO_2-Emission:	**79 g/km**
Mileage:	**CNG**: 380 km; Total: 600km
Tank Package:	2 Sub Floor-Gas-Steel Tubes (Capacity: ca.11 kg) no reduction of passenger space Tank Capacity Gasoline: 10 l
Engine Management:	same driveability in all kinds of powertrains

… and Industrialization of alternative ultra low carbon Fuels

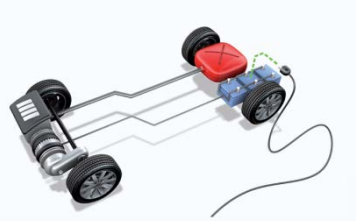


Coming Decades of Electrification of the Drive Systems



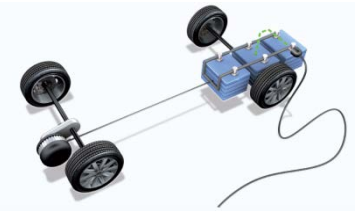
Level of Electrification: Plug-in hybrid versus battery-powered vehicle

Plug-in hybrid i.e. Golf twïnDrive



- Internal combustion engine and electric motor; mixed mode possible
- Medium-capacity battery, charged via the socket-outlet
- Regenerative braking (over medium distances the vehicle can be powered just by the electric motor)

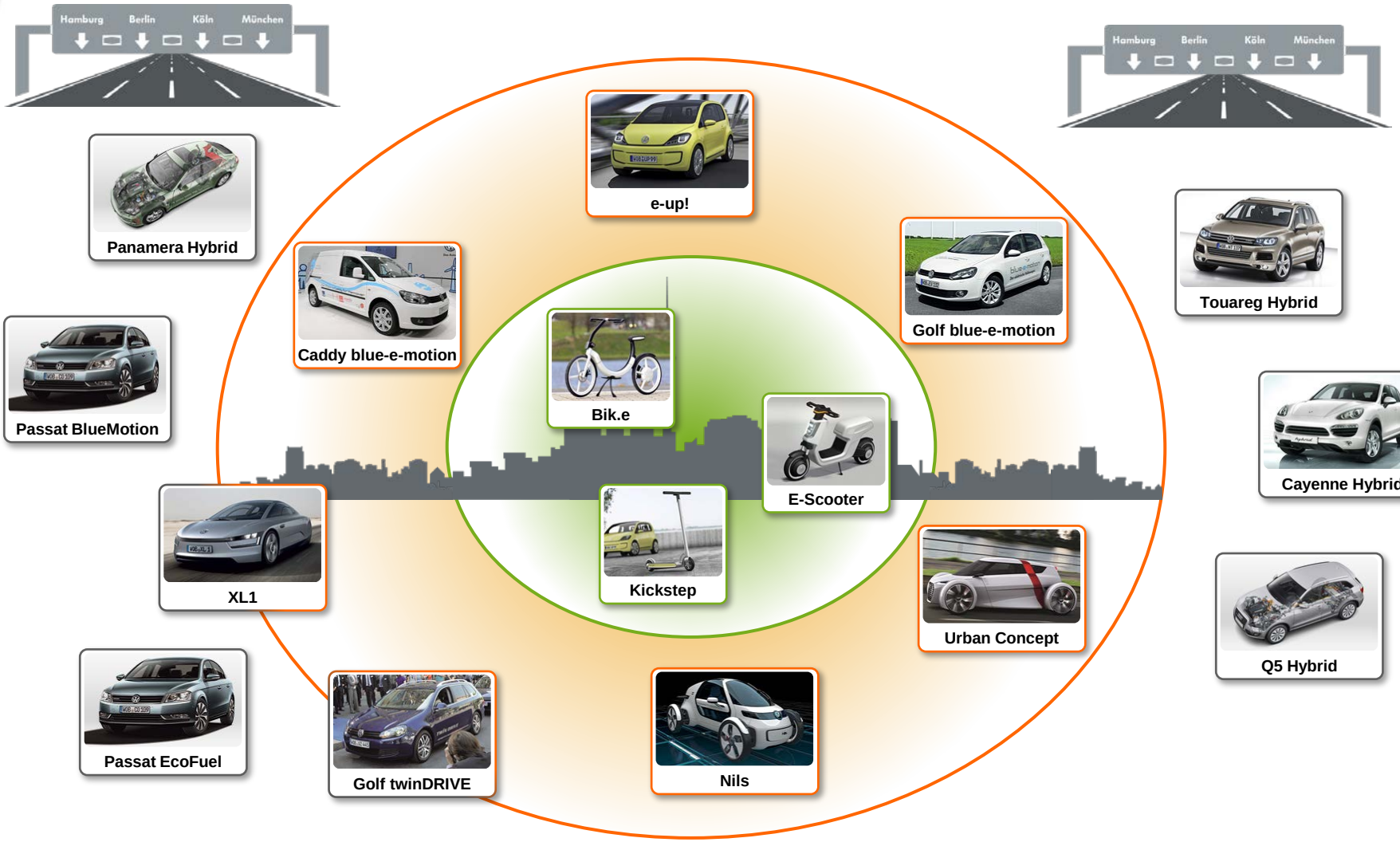
Battery-powered vehicle i.e. Golf blue-e-motion



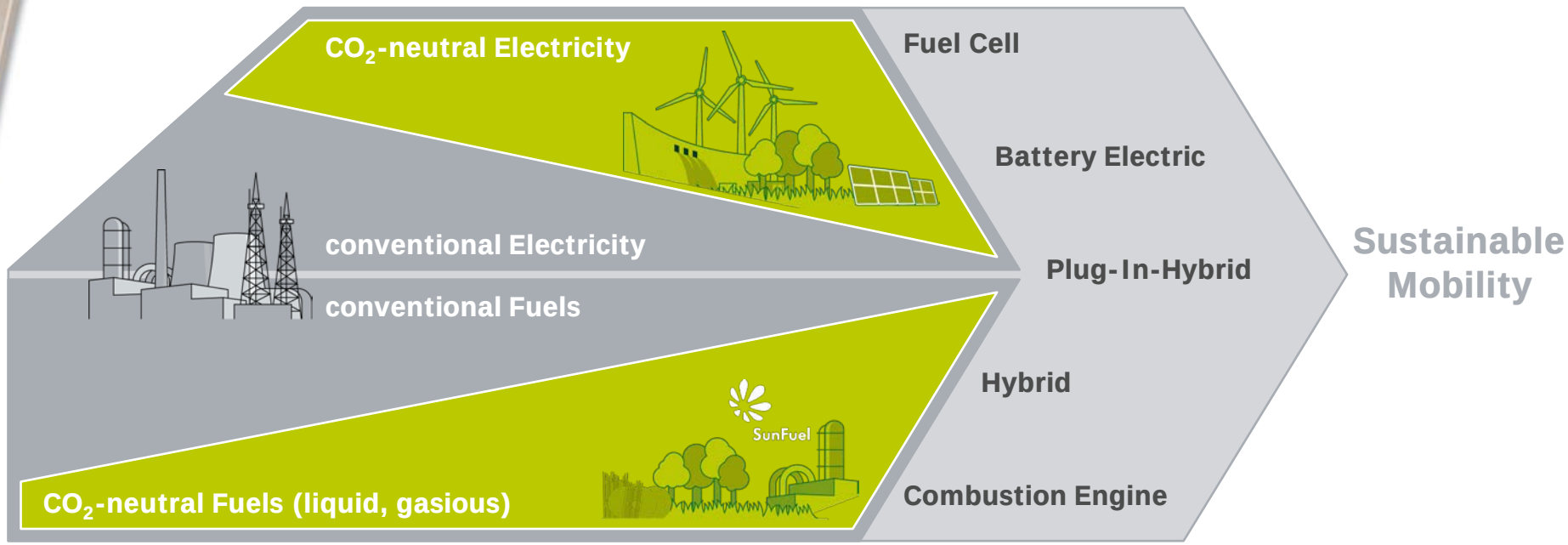
- Electric motor
- Battery is charged via the socket-outlet
- Regenerative braking
- Powered just by electricity

Source: Volkswagen Group

Mobility Requirements
- urban Areas and long Distances



Decarbonization
Coexistence of Powertrain Technologies and Energies

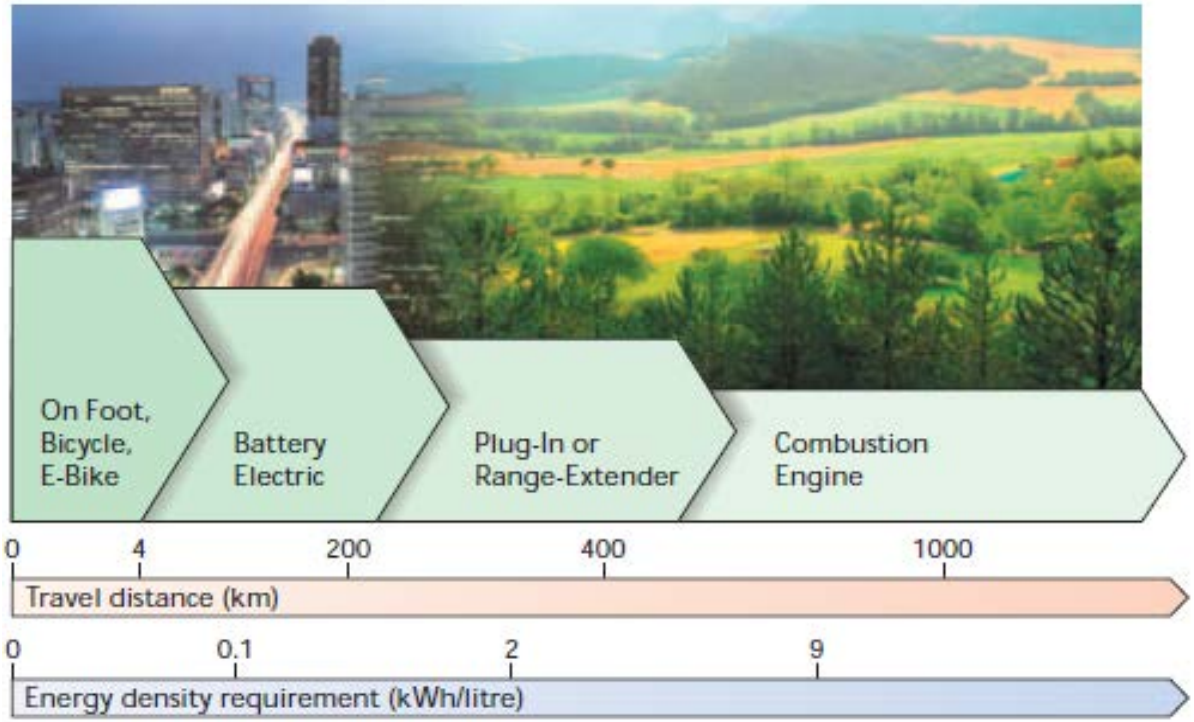


Source: Volkswagen Group

Decarbonization **+ Reliability**

- **Improve reliability of transport schedules**
- **Preserve and improve urban accessibility**

Diversity of Mobility Needs



Diversity of Mobility Solutions

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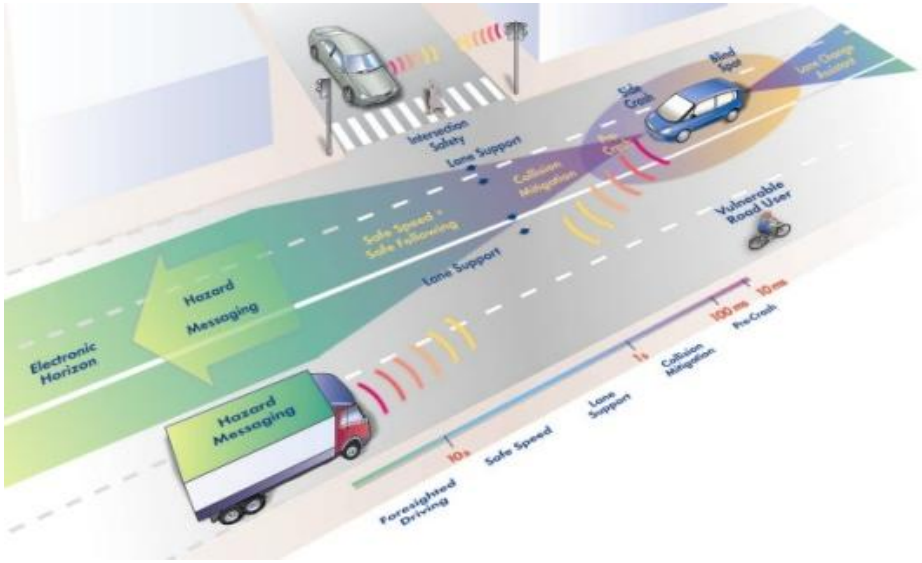
Decarbonization + Reliability **+ Safety & Security**

- **Reduce fatalities <u>and</u> severe injuries**
- **Reduce cargo lost to theft and damage**

All these challenges request to take a system approach:

- **Vehicle**
- **Infrastructure**
- **Services**
- **Energy & Resources**

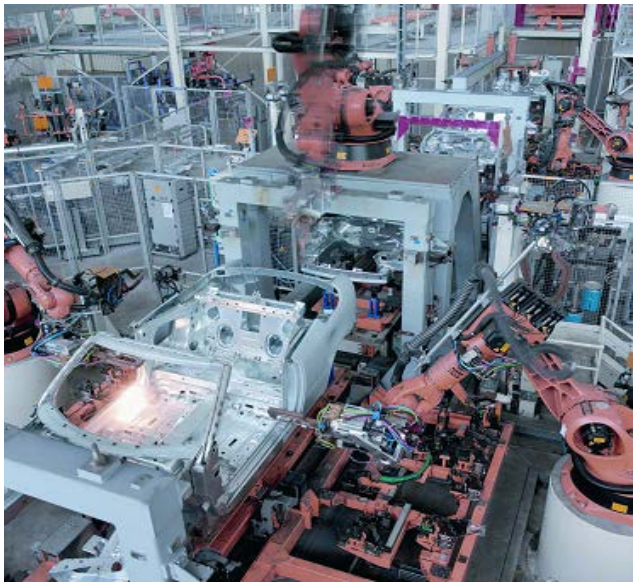


Global Competitiveness

- **Improve Global Competitiveness by targeting Societal Challenges**
- **R&D as the main tool to keep or reach global competitiveness**

Results:

- **Leadership in energy efficiency**
- **Sustainable Growth**
- **Green Jobs**
- **Europe 2020 Strategy**



ERTRAC SRA 2010
A decisive Moment for Action by Europe

EUROPEAN ROAD TRANSPORT RESEARCH ADVISORY COUNCIL

Implementing the SRA through Research and Innovation Roadmaps

System approach and coverage of the whole Innovation chain – Towards the deployment of innovative technologies

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Guided by Systems Approach

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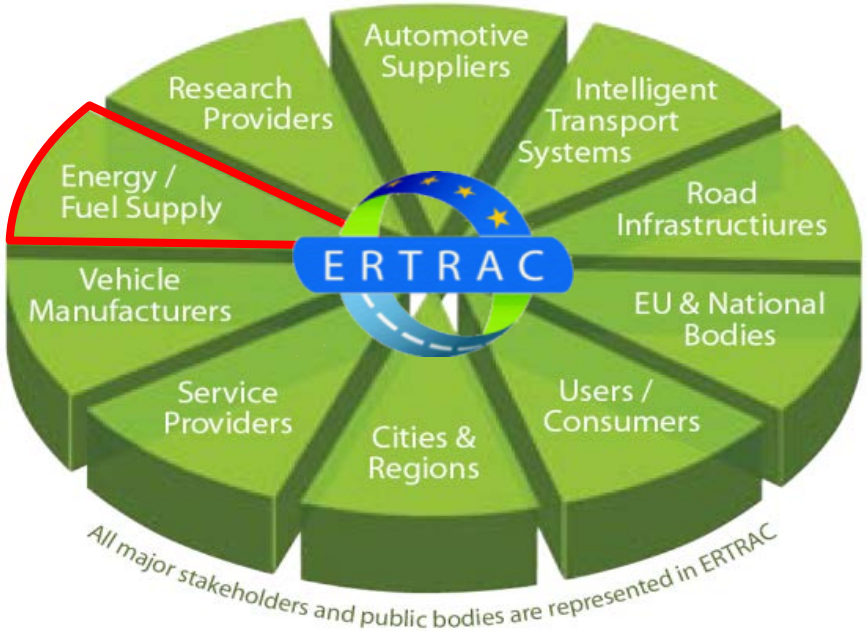
CONCAWE is:

- ✓ One of the most important elements in our stakeholder group
- ✓ A contributor from the beginning
- ✓ Very active as chair of our working group “Energy and Environment”



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Thank you for your Attention