In the future, it will be increasingly important to include a comprehensive view of energy production and delivery in both portfolio planning and powertrain development. The choice of energy carrier and the interactions between the areas well-to-tank (production, storage, transport and distribution) and tank-to-wheel (storage and energy conversion in the vehicle) result in decisive impulses for development with respect to a sustainable reduction of CO₂ and pollutant emission. The complex competition between energy carriers thus has a significant influence on the competition of powertrain concepts. The variety of combustion engine based powertrain concepts, BEV and FCEV will presumably remain for some time to come. In this respect, renewable energies are faced with the particular challenge of continuous availability. This means that we increasingly find ourselves in a transition from a scarcity of energy resources to a limitation in energy storage capacities.

The conference will focus on three thematic blocks:
• Production, storage, transport/distribution of energy carriers
• Energy storage media in the vehicle
• The main focus will be laid on the consequences for the powertrain portfolio

Prof. Dr. h.c. Helmut List
Chairman and CEO
AVL List GmbH

Prof. Dr. Robert Fischer
Executive Vice President, Engineering and Technology Powertrain Systems, AVL List GmbH
Contents

2 Foreword
3 General Information
4 List of Speakers
6 Conference Program
10 Welcome to Graz
11 General Map of Graz
12 Welcome Reception
13 Social Program
14 About the Conference

Please see attachment for registration and hotel reservation.

Subject to modifications.

General Information

Conference Office: AVL List GmbH, Hans-List-Platz 1, A-8020 Graz
Tel.: +43 (316) 787 927
E-Mail: event@avl.com


Registration: In the Helmut-List-Halle on Thursday, June 6th, 2019

Conference Fee: € 1,190.– + 20 % tax,
Students € 110,– plus 20 % tax,
Free of charge for members of the press
Fees include proceedings, 2 lunches and snacks, social evening events

Conference Languages: German and English (simultaneous translation)

Conference Documents: An order form for additional conference documents is available online and at the registration desk.
(price: € 140.– plus 10 % tax)

Hotel Reservation: Please see the reservation form attached

Arrival: By plane: Graz-Thalerhof,
by train: Graz Main Station,
by car: see map of Graz (page 11)

Evening Program:
June 5th, 2019, 17:00 Welcome Reception in the Garden of Encounter at AVL Headquarters
June 6th 2019, 19:30 Aperitifs at the Orangerie and AVL Social Evening at the Alte Universität

Partners’ Program: Excursion to Lippizaner Stud Piber and St. Barbara Church in Bärnbach
PRESENTING AUTHORS

Prof. Dr. Robert Fischer, Executive Vice President, Engineering and Technology Powertrain Systems, AVL List GmbH

Prof. Dr. h.c. Helmut List, Chairman and CEO, AVL List GmbH

Dr. Guido Bartlok, Program Manager Hydrogen Systems / R&D, Magna Steyr Fahrzeugtechnik AG & Co. KG

Dr. Tobias Brunner, Managing Director, Hynergy GmbH

Dr. Volker Formanski, Group Leader Functional Development and Simulation Fuel Cell Systems, BMW Group

Jürgen Grimm, Head of Engineering, Engine & Drivetrain Systems Business Unit, Powertrain, CPT Group GmbH

Benedikt Heuser, Senior Project Manager, FEV Europe GmbH

Eisuke Kimura Bachelor of Precise Mech. Eng., Senior Chief Engineer, Honda R&D Co., Ltd. Automobile R&D Center

Wolfgang Langhoff, Chief Executive Officer, BP Europa SE

Dr. Tobias Lösche-ter Horst, Head of Powertrain Research, Volkswagen AG

Thiebault Paquet M.Eng., Director Powertrain, TME R&D, Toyota Motor Europe (TME)

Dr. Hermann Pengg-Bührlen, Head of Project Management e-fuels, CEO Audi e-gas Betreibergesellschaft & Audi Industriegas GmbH, Audi AG

Jürgen Rechberger, Skill Team Leader Fuel Cell, AVL List GmbH

Martin Rothbart, Senior Product Manager for Energy & Sustainability, AVL List GmbH

Dr. Paul Rübig, Member, European Parliament

Ulrich Schmalohr, Vice President of Geely Auto, President of BEV Research Institute, Zhejiang Geely Holding Group Co., Ltd., Geely Automobile Research Institute

Dr. Helfried Sorger, Executive Chief Engineer Base Powertrain, AVL List GmbH
Jörg Starr, Technical Project Manager, Audi AG  
Dr. Alexander Tremel, Principal Key Expert, Siemens AG, Corporate Technology  
Rajan Wadhera, President – Automotive Sector, Mahindra & Mahindra Ltd.  
Dr. Jörg Wind, Manager Energy Systems Analyses, Daimler AG  
Dr. Michael Winkler, Head of Powertrain, Hyundai Motor Europe Technical Center GmbH  
Prof. Prof. h.c. mult. Dr. Martin Winter, Scientific Leader, Forschungszentrum Jülich GmbH  
Dr. Thomas Zengerly, Chairman of the Board, Deutsche Shell Holding GmbH

CHAIRMEN

Prof. Dr. Michael Bargende, Research Institute of Automotive Engineering and Vehicle Engines Stuttgart  
Prof. Dr. Helmut Eichlseder, University of Technology Graz  
Prof. Dr. Robert Fischer, AVL List GmbH  
Prof. Dr. Bernhard Geringer, Austrian Society of Automotive Engineers  
Prof. Dr. Ferit Küçükay, University of Technology Braunschweig

PANEL DISCUSSION
Moderator: Ulrich Walter M.A.  
Prof. Dr. Robert Fischer, Executive Vice President, Engineering and Technology Powertrain Systems, AVL List GmbH  
Jürgen Grimm, Head of Engineering, Engine & Drivetrain Systems Business Unit, Powertrain, CPT Group GmbH  
Dr. Hermann Pengg-Bührlen, Head of Project Management e-fuels, CEO Audi e-gas Betreibergesellschaft & Audi Industriegas GmbH, Audi AG  
Dr. Paul Rübig, Member, European Parliament  
Ulrich Schmalohr, Vice President of Geely Auto, President of BEV Research Institute, Zhejiang Geely Holding Group Co., Ltd., Geely Automobile Research Institute  
Dr. Thomas Zengerly, Chairman of the Board, Deutsche Shell Holding GmbH
**CONFERENCE PROGRAM – WEDNESDAY, JUNE 5th, 2019**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>17:00</td>
<td><strong>Welcome Reception</strong> in the Garden of Encounter of AVL at the invitation of the Governor of the Province of Styria Hermann Schützenhöfer, <strong>Opening Address</strong> Prof. Dr. Robert Fischer at 19:00</td>
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**CONFERENCE PROGRAM – THURSDAY, JUNE 6th, 2019**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>09:00 -09:10</td>
<td><strong>Welcome Address</strong>, Prof. Dr. h.c. Helmut List, Chairman and CEO, AVL List GmbH</td>
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<tr>
<td>09:10 -09:20</td>
<td><strong>Welcome</strong>, Dr. Peter Piffl-Percevic, City Councillor, City of Graz</td>
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<td>09:20 -09:30</td>
<td><strong>Opening of the Conference</strong>, Representative of the Province of Styria</td>
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<tr>
<td>09:30 -10:00</td>
<td>Competition of Energy Carriers, Impact on the Propulsion System – The Indian Perspective Rajan Wadhera, President – Automotive Sector, Mahindra &amp; Mahindra Ltd.</td>
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<tr>
<td>10:00 -10:30</td>
<td><strong>Geely Drive with Electrification</strong> Ulrich Schmalohr, Vice President of Geely Auto, President of BEV Research Institute, Zhejiang Geely Holding Group Co., Ltd., Geely Automobile Research Institute</td>
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<tr>
<td>10:30 -11:15</td>
<td><strong>Coffee Break</strong></td>
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<tr>
<td>11:15 -11:45</td>
<td><strong>Future Mobility: What Drives Us?</strong> Dr. Tobias Lösche-ter Horst, Head of Powertrain Research, Volkswagen AG</td>
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<tr>
<td>11:45 -12:15</td>
<td><strong>Current and Future Hyundai &amp; Kia Propulsion Systems for the European Market</strong> Dr. Michael Winkler, Head of Powertrain, Hyundai Motor Europe Technical Center GmbH</td>
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<tr>
<td>12:15 -12:45</td>
<td><strong>Mobility of the Future – Advances in Technology for Energy Sector</strong> Wolfgang Langhoff, Chief Executive Officer, BP Europe SE</td>
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<tr>
<td>12:45 -14:30</td>
<td><strong>Lunch</strong></td>
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## CONFERENCE PROGRAM – THURSDAY, JUNE 6th, 2019

**Chairman: Prof. Dr. Helmut Eichlseder, University of Technology Graz**

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<tr>
<th>Time</th>
<th>Session</th>
<th>Speaker/Presenter</th>
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<tr>
<td>14:30 (s. t.) - 15:00</td>
<td>Electricity-based Fuels&lt;br&gt;Dr. Alexander Tremel, Corporate Technology, Principal Key Expert, Siemens AG</td>
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<tr>
<td>15:00 - 15:30</td>
<td>CEP Hydrogen Mobility in Germany&lt;br&gt;Jörg Starr, Technical Project Manager, Audi AG</td>
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<tr>
<td>15:30 - 16:00</td>
<td>Hydrogen Storage in the Vehicle&lt;br&gt;Dr. Guido Bartlok, Program Manager Hydrogen Systems / R&amp;D, Magna Steyr Fahrzeugtechnik AG &amp; Co. KG</td>
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<tr>
<td>16:00 - 16:45</td>
<td>Coffee Break</td>
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**Chairman: Prof. Dr. Michael Bargende, Research Institute of Automotive Engineering and Vehicle Engines Stuttgart**

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<th>Session</th>
<th>Speaker/Presenter</th>
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<tbody>
<tr>
<td>16:45 - 17:15</td>
<td>Fuel Cell Drivetrains and Hydrogen as Part of Future Mobility&lt;br&gt;Dr. Jörg Wind, Manager Energy Systems Analysis, Daimler AG</td>
<td></td>
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<tr>
<td>17:15 - 17:45</td>
<td>The ICE in the World of Energy Carrier Diversity – Modular or Dedicated?&lt;br&gt;Dr. Helfried Sorger, Executive Chief Engineer Base Powertrain, AVL List GmbH</td>
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<tr>
<td>17:45 - 18:15</td>
<td>The Use of Multiple Energy Carriers – Key for Toyota’s Electrification Strategy towards CO₂ Reduction&lt;br&gt;Thiebault Paquet M.Eng., Director Powertrain, TME R&amp;D, Toyota Motor Europe (TME)</td>
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<tr>
<td>19:30</td>
<td>Evening Event:&lt;br&gt;Aperitifs at the Orangerie at the invitation of the Mayor of Graz, Siegfried Nagl, followed by an evening walk to the AVL Social Evening at the Alte Universität Graz</td>
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## CONFERENCE PROGRAM – FRIDAY, JUNE 7th, 2019

**Chairman:** Prof. Dr. Ferit Küçükay, University of Technology Braunschweig

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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<tr>
<td>08:30 - 09:00</td>
<td>Hydrogen – Energy Carrier and Fuel of the Future or Perpetual Great White Hope?</td>
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<td>Dr. Tobias Brunner, Managing Director, Hynergy GmbH</td>
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<td>09:00 - 09:30</td>
<td>Future of Sustainable Mobility: Honda's Approach to Reduce GHG Emission</td>
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<td>Eisuke Kimura Bachelor of Precise Mech. Eng., Senior Chief Engineer, Honda R&amp;D Co., Ltd. Automobile R&amp;D Center</td>
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<tr>
<td>09:30 - 10:00</td>
<td>Development of BMW Fuel Cell Propulsion Systems</td>
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<td>Dr. Volker Formanski, Group Leader Functional Development and Simulation Fuel Cell Systems, BMW Group</td>
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<tr>
<td>10:00 - 10:30</td>
<td>Economical and Sustainable Powertrain Technologies</td>
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<td>Dr. Hermann Pengg-Bührlen, Head of Project Management e-fuels, CEO Audi e-gas Betreibergesellschaft &amp; Audi Industriegas GmbH, Audi AG</td>
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<tr>
<td>10:30 - 11:00</td>
<td>Coffee Break</td>
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<tr>
<td>11:00 - 11:30</td>
<td>Battery Cell Technologies for Automotive Applications: State-of-the-art and Possible Future</td>
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<td></td>
<td>Prof. Prof. h.c. mult. Dr. Martin Winter, Scientific Leader, Forschungszentrum Jülich GmbH</td>
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<tr>
<td>11:30 - 12:00</td>
<td>Closed Carbon Cycle Mobility – Pathways towards a CO₂ Neutral Mobility</td>
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<td>Benedikt Heuser, Senior Project Manager, FEV Europe GmbH</td>
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<tr>
<td>12:00 - 12:30</td>
<td>E-fuels – Efficient Chemical Storage of Seasonal Intermittency Energy</td>
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<td>Jürgen Rechberger, Skill Team Leader Fuel Cell, AVL List GmbH</td>
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<td></td>
<td>Martin Rothbart, Senior Product Manager for Energy &amp; Sustainability, AVL List GmbH</td>
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<tr>
<td>12:30 - 14:00</td>
<td>Lunch</td>
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# CONFERENCE PROGRAM – FRIDAY, JUNE 7th, 2019

Chairman: Prof. Dr. Bernhard Geringer, Austrian Society of Automotive Engineers

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<th>Time</th>
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<tr>
<td>14:00 (s. t.) - 14:30</td>
<td><strong>Unlimited Clean Mobility: Towards Efficient &amp; Zero Impact Emission Vehicles</strong>&lt;br&gt;Jürgen Grimm, Head of Engineering, Engine &amp; Drivetrain Systems Business Unit, Powertrain, CPT Group GmbH</td>
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<tr>
<td>14:30 - 15:00</td>
<td><strong>Fuel Options for Sustainable Mobility</strong>&lt;br&gt;Dr. Thomas Zengerly, Chairman of the Board, Deutsche Shell Holding GmbH</td>
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<td>15:00 - 15:30</td>
<td><strong>Coffee Break</strong></td>
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<tr>
<td>15:30 - 16:45</td>
<td><strong>Panel Discussion, Moderator: Ulrich Walter M.A., Members (in alphabetical order):</strong></td>
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<td></td>
<td>Prof. Dr. Robert Fischer, Executive Vice President, Engineering and Technology Powertrain Systems, AVL List GmbH</td>
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<td>Jürgen Grimm, Head of Engineering, Engine &amp; Drivetrain Systems Business Unit, Powertrain, CPT Group GmbH</td>
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<td>Dr. Hermann Pengg-Bührlen, Head of Project Management e-fuels, CEO Audi e-gas Betreibergesellschaft &amp; Audi Industriegas GmbH, Audi AG</td>
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<td>Dr. Paul Rübig, Member, European Parliament</td>
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<td>Ulrich Schmalohr, Vice President of Geely Auto, President of BEV Research Institute, Zhejiang Geely Holding Group Co., Ltd., Geely Automobile Research Institute</td>
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<td>Dr. Thomas Zengerly, Chairman of the Board, Deutsche Shell Holding GmbH</td>
</tr>
<tr>
<td>16:45 - 17:00</td>
<td><strong>Closing Remarks</strong>&lt;br&gt;Prof. Dr. Robert Fischer, Conference and Session Chairman, AVL List GmbH</td>
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</table>
Since the Middle Ages, a town has been growing around the Schlossberg hill of which its inhabitants can be proud. In fact, it was the unique ensemble of architectural styles spanning from Gothic, Baroque, Renaissance, Art Nouveau to modernity that made UNESCO add Graz to its World Cultural Heritage list. Graz is also full of contrasts. This is particularly true of its cultural life. Contemporary art and architecture enrich the cultural scene as much as the classical culture: opera, theatre and festival of classical music. In 2003, Graz was an acclaimed Cultural Capital of Europe. The striking art centre “friendly alien” and the Island in the Mur were only two of the many great achievements of this year of celebration.

It is now official knowledge, what Graz people have known forever – Graz is a capital of culinary pleasures! The Styrian products and the region’s specialities, particularly the outstanding wines and the dark pumpkin seed oil, are the main carriers of this culinary identity. The Mediterranean ambience is all over: in picturesque beer gardens, on rustic farmers’ markets, in narrow alleys, on lively squares and in dreamy courtyards.
Hotel:
1. Hotel Daniel
2. Hotel Weitzer, Hotel Wiesler
3. Best Western Plus Amedia
4. Mercure Graz City
5. Hotel Bokan
6. Hotel Ibis
7. Hotel Feichtinger
8. Lendhotel

Taxi:
Tel.: +43 (316) 28 01
Tel.: +43 (316) 878
Tel.: +43 (316) 889

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Tel.: +43 (316) 889
WEDNESDAY, JUNE 5th, 2019

WELCOME RECEPTION IN THE GARDEN OF ENCOUNTER AT AVL HEADQUARTERS

As part of the 31st International AVL Conference “Engine & Environment”, the welcome reception on the eve of the conference will once again be one of the highlights. In 2019, you will have the opportunity to make your first contacts in the Garden of Encounter at AVL Headquarters. In addition to a culinary and musical accompaniment, you can take a look behind the scenes here. On guided tours through AVL, you will learn more about important technological developments. So, look forward to a fascinating, exciting and innovative start of the conference.

17:00 Welcome Reception
SOCIAL PROGRAM

THURSDAY, JUNE 6th, 2019

PARTNERS’ PROGRAM
In the rolling hills of western Styria is the idyllic place Piber. Surrounded by lush meadows and green forests opens up the home of Europe’s oldest cultural horse breed in front of a fantastic backdrop. As the only state stud in Austria Piber has the task to breed those Lipizzaner stallions, which appear in the world-famous Spanish Riding School in Vienna. After the guided tour and a lunch in the Café Caballero, the St. Barbara Church designed by Friedensreich Hundertwasser will be visited.

Meeting point: 09:00 Helmut-List-Halle
Expected End: 17:00
With sufficient demand: June 7th, 2019, 3-hour Graz sightseeing tour

SOCIAL EVENING

Orangerie
The classicist building, built in 1842 in the middle of Graz Castle Garden, originally served to overwinter tropical plants. Already in the 19th century the Orangerie, supplemented with temporary event tents, was also used for parties and balls.

Alte Universität Graz
The Graz University was founded in the time when the Jesuits shaped the spiritual, religious and cultural life in Graz. With the adaptation of the Alte Universität Graz, a model example for the revitalization of a historically valuable building fabric has emerged, which is of outstanding importance precisely because of its location in the ensemble of the city crown of Graz.

19:30 Aperitifs at the Orangerie followed by an evening walk to the AVL Social Evening at the Alte Universität Graz

© SHS / Lippizanergestüt Piber GöR; Pfarre Bärnbach / Josef Traussnigg
ABSTRACT THE CONFERENCE

Over the next few years, the automotive industry will undergo the probably most radical change in all of its over one hundred years of history. The simultaneous reduction of greenhouse gases to limit global warming and the far-reaching avoidance of pollutant emissions to improve local air quality require a clear extension of the portfolio of both powertrain technologies and energy sources.

In order to ensure that the required measures are sustainable, the problem of emissions has to be regarded from a holistic point of view whereby considerations include energy production and supply chains together with the total lifecycle of the vehicle from production to recycling.

While US will include CO₂ emissions from electricity generation to obtain a more comprehensive evaluation of traffic-related emissions, the legislation in Europe and China continues to be focused just on tank-to-wheel. Although this nominally results in a significant reduction in traffic-related tank-to-wheel CO₂ emissions, the technology portfolio is probably not optimized for a quick reduction of the lifecycle CO₂ emissions that are relevant for global warming.

Sustainable CO₂ solutions not only require a more differentiated selection of energy carriers, they need in particular a comprehensive consideration of the complex interactions between emissions from vehicle manufacturing and recycling on the one hand, and emissions from the production, storage, transport and distribution of energy (well-to-tank) as well as the storage and conversion of energy in the vehicle (tank-to-wheel) on the other hand.

To enable an efficient use of renewable wind and solar sources, the storage of energy to compensate the temporal offset between energy demand and energy generation has become a central issue. One possible solution is the storage of energy in chemical form. In this case, hydrogen and synthetic fuels are relevant future paths to achieve defossilization, i.e. to remove the dependency on fossil energy sources. Whether, at the end of the day, one of the various paths becomes the preferred solution or whether all energy paths will coexist along with their appropriate powertrain forms, will depend on a large number of different factors. They include available production quantities, costs, infrastructure and end-user acceptance. Even
AVL is the world’s largest independent company for the development of powertrains (engines, transmissions, e-motors, batteries and control systems) for passenger cars, commercial vehicles and industrial applications, as well as for instrumentation and test systems, with activities ranging from concept through to series development. Building on insights gained from its own research, AVL serves a global customer base by developing drive systems of all sizes and designs and integrating these into overall systems.

AVL LIST GMBH

AVL founded the “Engine & Environment” conference as an independent platform in 1988 with the goal of promoting interdisciplinary discussion of the crucial questions concerning engine and vehicle technology in a broad social context including environmental and energy-related issues. At that time it was not possible to predict the degree to which, within just three decades, the engine and the environment would be connected with each other. The original goal of this conference has remained the same of course, but the content has been significantly extended.

regional differences in resource availability, along with the legislative and political climate, will be decisive. This creates a highly competitive environment, not just between energy carriers, but also between the corresponding powertrain systems. This is an extremely complex task which must consider extensive changes throughout the entire energy supply chain environment as well as unexpected technical and political impacts.
The "Engine & Environment" App keeps you up-to-date with everything to do with the conference, featuring information on speakers and presentations and the latest conference news. The app is an indispensable multimedia companion. Download the newly designed app now onto your smartphone or tablet.

Features:
- quick-and-easy registration
- overview of the speakers and topics
- agenda updates
- sharing function
- multimedia conference review

Scan the QR Code to access the "Engine and Environment" App.