Status report of Part B of the November 2016 mandate for the Electric Vehicles and the Environment Informal Working Group (EVE IWG)

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1 Introduction

The EVE mandate of the November 2016 report (ECE-TRANS-WP29-2016-116e), described three main objectives for part B in the framework of the 1998 Agreement by the Electric vehicles and the Environment Informal Working Group (EVE IWG). These objectives were listed as:

1) Developing an amendment to GTR No. 15 to establish a procedure for determining the power train performance of electrified vehicles.
2) Continuation of research on the topic of battery performance and durability, with the goal of returning to AC.3 seeking authorization for relevant activities (including GTR development) once the additional research is completed and;
3) Approach the Group of Experts on Energy Efficient (GEEE) and possible the UNECE Executive Secretary, to request that they continue the work on the method of stating energy consumption with the support of the IWG on EVE.

In summary, the method of stating energy consumption work is continuing through new leadership of the GEEE with the aid of the EVE IWG as it becomes required. Progress on research of in-vehicle battery performance and durability in vehicles has went well with results pending journal publishing with other groups making presentation on related research; however, uncertainty still remains as to whether there is sufficient knowledge of the battery complexities to move forward with a GTR. From research progress, the EVE IWG has explored different approaches on how to evaluate in-vehicle battery performance and has discussed which durability requirements could apply to different vehicle architectures on air pollutants, energy consumption/CO_2 output, and range. Agreements on all aspects and areas is not certain yet due to changing chemistries and markets of in-vehicle batteries and complications to regulate all aspects. Meanwhile, progress in the development of a GTR and the validation of the procedure to determine the power train performance of electrified vehicles is undergoing and is expected to conclude by January 2019 in time to present to GRPE.

2 Battery performance and durability

2.1 Background

This section of the report, summarizes the progress to date of the EVE IWG on Battery Performance and Durability.

The previous work of EVE IWG during Part A of the current EVE mandate indicated that while sufficient knowledge and capability existed to evaluate specific electrified vehicle designs for in-vehicle battery performance and durability, it was not clear if a vehicle-level test procedure that fairly compares all types of battery chemistries and constructions, in all applications could be developed. Additionally, there was some concern among EVE members that developing a procedure prematurely may unduly influence battery design and material choice while the technology is still evolving.

Four approaches to battery durability were considered since the establishment of Part A of the mandate. These options approaches were:

A. Pursue the development of Durability Test profiles
    a. Through identification of factors known to affect battery degradation (driving cycles, temperature, charging rate, frequency, calendar time, parking time)
B. Seek to identify deterioration factors (DFs) to estimate the end of life
C. Investigate testing with aged or age-emulated battery
D. Use simulation to determine DF or expected degradation
    a. Through a simulation model that predicts the degradation resulting from the application of arbitrary lifetime usage profiles

2.2 Battery Performance and Durability and the EVE Mandate

Under the current Part B of the mandate, the EVE IWG timelines were as follows:

(a) November 2016 - June 2018: research in-vehicle battery performance and durability, develop a detailed work plan, continue consultation with the WLTP, and draft requests for relevant activities.
(b) June 2018 – Present a first draft status report on the research work and proposals for subsequent work (if appropriate) to GRPE and present informal documents on the status of research work and proposals for subsequent work (if appropriate) for review by AC.3
(c) November 2018 – Approval of the authorization to develop a GTR by AC.3 if appropriate

At the 26th EVE IWG meeting in Japan, it was decided that the timeline was to be adjusted as there was uncertainty about whether to progress with a GTR and the work on the in-vehicle battery durability and performance was still ongoing. The timeline was adjusted to provide a report in January 2019 along with the deliverable of the final GTR of the system power determination testing procedure.

2.2.1 Motivation

The primary motivation for the EVE mandate on battery performance and durability stems from the recognition that the environmental performance of electrified vehicles may be affected by degradation of the battery system over time. As stated in the Electric Vehicle Regulatory Reference Guide, loss of electric range and loss of vehicle energy efficiency are primary concerns. Both can affect not only the utility of the vehicle to the consumer, but also the environmental performance of the vehicle. Loss of environmental performance is important in particular because governmental regulatory compliance programs often credit electrified vehicles with a certain level of expected environmental benefit, which might fail to be realized over the life of the vehicle if sufficient battery degradation occurs. In addition to changes in range and energy consumption, for hybrid electric vehicles that are often equipped with both a conventional and electric powertrain, the criteria pollutants emissions from the conventional powertrain could be impacted by the degradation of the battery.

Because battery degradation is not currently subject to uniform standards, there is a desire to understand the potential for battery degradation to affect environmental performance of electrified vehicles, and to consider the need for regulations to ensure that battery durability of an electrified vehicle is sufficiently controlled to maintain the expected environmental performance for the life of the vehicle.

The IWG was therefore charged with the task of gathering information related to this topic, and to make recommendations concerning the possibility of establishing a GTR for this purpose.

2.3 Findings

At EVE 16, a literature review of factors affecting battery durability was prepared by FEV Consulting and presented to the EVE IWG. From the presentation, it was clear that the problem of establishing battery durability for representative usage scenarios, chemistries, and configurations is extremely complex.

IWG members noted the following considerations:

- The factors which affect battery durability vary among different chemistries and usage conditions, and have differing importance to environmental performance.
- Battery aging is very path dependent, making it difficult to reliably model the actual life of an in-use battery by means of a single simplified test protocol.
- Influences on durability that occur during vehicle operation are not necessarily the same as those that occur while parked. For example, a vehicle parked in a hot environment for long periods of time may experience degradation due to elevated battery temperature, while a vehicle being actively operated in the same environment may avoid degradation because the battery is being actively cooled.
- Ambient temperatures have mixed relevance to battery durability. Manufacturers have the option to actively manage the temperature of the battery itself so that actual battery cell operating temperatures are rarely the same as ambient air temperatures.
- Some members noted that any steps to predefine battery aging conditions may lead manufacturers to optimize performance for test conditions rather than for the range of actual usage likely to be experienced by customers. That is, if a test procedure is more demanding than necessary to demonstrate full useful life in the field, it might compel manufacturers to over-specify battery performance and unnecessarily increase cost; or if the test procedure is not demanding enough it may have little value in ensuring that environmental goals are met during the life of the vehicle.

The IWG also identified and discussed some quantitative approaches to predicting battery degradation that have recently been described in the literature. The IWG acknowledged research conducted by researcher Jeff Dahn at Dalhousie University, in which a technique known as high-precision coulomb counting is used to predict future degradation rates by measuring loss of charge in early cycling of battery cells.[1] The IWG also acknowledged a research initiative at Pennsylvania State University in which

[1] More information can be found here:

a formula was developed for battery degradation using inputs describing state of charge, how often the battery charges or discharges completely, operating temperature, and current. It was concluded that both methods appear to be best suited to cell-level analysis in a research environment, and so do not appear to be readily adaptable to vehicle-level testing. Also, because both methods primarily attempt to quantify the future rate of formation of solid-electrolyte interphase (SEI) on a carbon-based Li-ion anode, they presumably would not reflect other mechanisms of degradation, nor mechanisms that would apply to non-carbon anodes or non-Li-ion chemistries. Since these methods are still in research stage and still undergoing verification and development, the IWG felt that they are of limited value for application as a regulatory norm for battery durability determination.

Members of the IWG also discussed the possibility of defining durability in terms of the total amount of energy that a battery must deliver during its useful life in order to achieve the environmental performance expected in a given application. Evidence of this capability might then be established by testing the ability of a battery to deliver this energy through a series of appropriately specified charge and discharge cycles. The potential capability of such a test to deliver reliable estimates of durability for arbitrary usage cycles, chemistries and configurations were not examined. Considerable further research would be required to evaluate the applicability of this method. For example, it is not immediately clear what the appropriate test conditions would be, or how to validate the test results for vehicles of varying degree of electric propulsion as well as different usage conditions.

The following work of the EVE IWG looked at approaches to develop testing methods of vehicles or batteries. These approaches were the following:

a) Approach A:Pursue Development of Durability Test profiles
b) Approach B:Seek to identify deterioration Factors (DFs)
c) Approach C: Investigate Testing with Age or Age-emulated batteries
d) Approach D: Determine Deterioration Factors with Simulation

Approach A: Pursue Development of Durability Test profiles

The goal of approach A was to investigate the potential for the development of durability test profiles for the testing of vehicles or batteries, for use by a manufacturer to demonstrate compliance with a durability standard. The test profile could be any combination of factors known to affect battery degradation, including but not limited to factors such as: driving cycle, ambient temperature (during use and storage), internal battery temperature (related to thermal management effectiveness and driving cycle), charging rate at the charger, frequency and type of charging, calendar time, idle storage time, etc.

This approach could likely be feasible if:

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http://www.dal.ca/diff/dahn/research/adv_diagnostics/hpc_additive_studies.html

(a) There exists one or more accelerated test profiles applicable to a vehicle or a battery that would effectively and fairly predict degradation over a specified useful life (kilometers and years).
(b) The test profile must be possible for a manufacturer to complete within a reasonable amount of time (e.g. 1 year or less).
(c) The test profile should not disadvantage chemistries that work well in real-world use, but respond poorly to accelerated testing. That is, the transformation from a test outcome to a predicted degradation must either be the same for all chemistries and designs, or must be identified uniquely for each chemistry and design.

At EVE 22, members from JRC agreed to develop a proposal of what a potential battery durability test profile under this approach might look like.

Approach B: Seek to identify deterioration Factors (DFs)

This approach would work to identify default DFs for use in vehicle certification, most likely by observing vehicles in use, and also considering the need to uphold environmental performance. In this approach, vehicles could be tested for environmental performance at or near their beginning-of-life and environmental performance at the end-of-life would be estimated by applying a default DF to represent expected degradation at EOL. A manufacturer could petition for the use of a different DF upon presentation of evidence to support it.

To identify a DF, they could be developed by observing vehicles in use, to identify the DF's they achieve during useful life in the hands of average customers, with the assumption that customer satisfaction and reliability is upheld and that environmental performance is maintained.

Approach C: Investigate Testing with Age or Age-emulated batteries

Approach C, investigates the possibility of a test protocol that involves testing a vehicle that has been configured to act like a deteriorated vehicle (by means of a special test mode that activates software changes, or a special test configuration involving specific hardware changes).

One approach that was discussed was the possibility of testing a vehicle with an aged battery. Procuring a properly aged battery would be a difficulty. While the ideal aged battery would be one that has been used for the full useful life in the hands of a typical customer (e.g. 240,000 km in 15 years), this is obviously not practical, meaning that alternatives must be considered to emulate such an ideally aged battery.

This approach could likely be feasible if:

a) For testing with an aged battery approach, a suitable/aging test profile (perhaps a result of Approach A) would need to be developed to age the battery
b) Feasibility requirements under approach A also apply

c) For a hardware or software-emulated aging approach, a set of default DFs (as suggested in approach B would also be needed to define the operating limits of the age-emulation

Approach D: Determine DF by Simulation

This approach considered the development of a battery simulation model that is sufficiently detailed to predict the degradation that would result from the application of arbitrary lifetime usage profiles. This would then be used to determine default DFs for various vehicle types and applications. This would be an alternative to Approach B, where DFs would be developed from empirical data. The model would likely be a very low-level model capable of using inputs such as battery chemistry, cell design, BMS, thermal management capabilities, etc. and predict degradation that would result from application of a test profile.

This approach could likely be feasible if:

a) It must be possible to develop such a model with the resources available to EVE.
b) (The model must be applicable to a wide variety of chemistries and designs likely to be used by manufacturers going forward.
c) The DFs thus derived by this analytical method should be possible to validate by comparison to empirical field or test data.

2.3.1 Points of Agreement

With regard to any of the approaches (A through D), it was identified that different types of electrified vehicles would likely present different requirements and may therefore be best suited to different approaches. Environmental goals, durability requirements, and implications of degradation are likely to differ substantially among different types of vehicles.

EVE22 it was discussed that as a minimum requirement going forward, the IWG should populate the following matrix by identifying which cells in the matrix represent a WLTP objective for regulation.

The following matrix (Figure 1) shows Environmental goals on the horizontal, and vehicle types on the vertical.

	Air pollutants	CO_2/ Energy Consumption	Range
HEV			
PHEV			
PEV			

Figure 1. Matrix of environmental goals and vehicle types

This matrix has been further developed since EVE 22 into the following.

Table 1. Draft Matrix of views

	Air Pollutant	CO_2/Energy Consumption	Range

HEV	• **Draft EU Position:** [5 year] or [100,000 km] must meet applicable standards (draft EU position)
	• **EVE Group View:** some consideration at WLTP & other areas for higher threshold (EVE Group view)
	• **EVE Group View:** View that WLTP durability requirement for ICE and HEV should be the same (EVE Group view)
	• **Draft Japan Positon:**
	  • Tested after 80,000 km running at type approval in Japan
	  • Japan needs scientific data when discussing the influence of battery durability
		• **Draft EU Position:** Max [+10%] from certified values for 100,000 km or 5 years
		• **EVE Group View:** some consideration at WLTP & other areas for higher threshold
		• **EVE Group View:** HEV CO_2 emission durability lifetime should always be the same as air pollutant durability lifetime
		• **Draft Japan Position**: to determine with discussion under EVE IWG collaborating with WLTP SG-EV
			X

PHEV	• **EVE Group view:** PHEV should always have same air pollutant durability lifetime requirement as HEV (EVE Group view)
	Draft Japan Position:
	  • Tested after 80,000 km running at type approval in Japan
	  • Japan needs scientific data when discussing
		• **EVE Group View:** PHEV should always have same CO_2 emission durability lifetime requirement as HEV
		• **Draft EU View**: greater than 90% charge depleting values within [5 years] or [100,000 km]
		• **Draft Japan View**: to determine with discussion under EVE IWG collaborating with WLTP SG-EV
			Equivalent all-electric range (measured amount of mileage that is powered by electricity in the battery on WLTP cycle) … definition to come from WLTP
			• **Draft EU View:**
			  ○ Guarantee customer durability
			  ○ Set comparable conditions to evaluate overall vehicle performance (draft EU view)

PEV	the influence of battery durability		• **EVE Group View:** • Want to ensure minimum number of ICE km displaced by all electric operation • Seems to be most important range durability aspect ***All-electric range (Range before first ICE start)*** • **EU Group View**: some concern about requiring durability for this value, since some manufacturers have ICE operate in certain conditions regardless of battery condition (i.e. above 80 km/h)
	X	• **Draft EU position** is that this criteria is not needed • **EVE Group View:** ○ Only reason to establish energy consumption requirement for PEV is if there will be an associated requirement to assess/include upstream emissions	• **Draft EU Position** - greater than [90%] certified range for [5 years] or [100,000 km] (draft EU position) • **EVE Group View** ○ PEV should always have same range durability lifetime requirement as durability requirement for other architectures ○ Consider longer durability requirement for PEV range (i.e. [80% or 70%] at 150,000 km or 200,000 km; 8 or 10 years;) ○ consider defining durability requirement as a function of base range, perhaps within a threshold (i.e. [80 km to 350 km] base range) • **Draft Japan Position:** ○ to determine with discussion under EVE

			IWG collaborating with WLTP SG EV

However, it is noted that official consensus views are not fully agreed upon yet.

2.3.2 Discussion Items

Following the creation of these matrices, consensus views were developed.

HEV – Air Pollutants

On the Hybrid Electric Vehicles (HEV), for air pollutant durability requirements, there was a consensus view with that of the EU, in that the durability should be 160,000km for air pollutants for HEVs and PHEVs (the same as conventional vehicles) and that there should be a 100,000 km check via in-service conformity protocol (still under development).

HEV – CO_2 / Energy Consumption

Views on CO2 and energy consumption are that there should not be a limit as it does not make sense to require a manufacturer to be responsible for a certain target. However; despite there being no set limit on CO2 or energy consumption value for these vehicles, it could be checked by type approval authority during in-service conformity so some requirement should be in place.

PHEV – Air Pollutant

The general consensus view for plug-in hybrid is that same as those for hybrid electric vehicles. There is also an additional view that PHEVs should be tested after running 80,000 km at type approval.

PHEV – Range

There were no consensus views on this topic yet but a number of simplified views were mentioned with pros and cons mentioned of each. They are the following:

Table 2: PHEV Range Views

Simplified view	Pros	Cons
Range of PHEV shown to have correlation with how frequently vehicle is plugged in	Minimum all-electric range increased likelihood vehicle will be plugged in	Manufacturers can't control how frequently consumers choose to plug in
Customers make PHEV purchase decisions at least partly on all-electric range, and this is a good case where customer-manufacturer relationship/warranty can manage this concern	Manufacturers currently need to make sure they meet customer expectations, and need is not clear	

Consider splitting requirements for blended PHEV vs range extended PHEV	Vehicles are used differently and buyers normally have different consideration when buying	This makes the topic of EV durability even more complicated, and we're already far from consensus on this
How to correlate degree of hybridization and consider that the way a PHEV is used is likely to change over the life of the vehicle	Longer durability requirements likely to increase use of EV range and reduce ICE operation	EV vs ICE operation will be difficult to measure and is not something manufacturer can control

PEV – CO_2/Energy consumption

There are no consensus views on this topic yet, but one simplified view thus fare is that more energy consumed by the plug-in electric vehicle (PEV) means that there might be greater upstream emissions so a standard of some kind should be set. Pros to setting a standard of this kind would limit environmental impacts of upstream emissions. Cons would be that upstream emissions are out of the control of manufacturers, and therefore not appropriate to be considered as part of a durability requirement.

PEV - Range

There were some consideration that PEVs should have the same durability lifetime as for other categories, however under the current technology it would be technically impossible. There is also another consideration of defining the durability requirement as a function of base range with a threshold; however this would be inappropriate to have a specific criteria due to factors affecting durability performance.

3.0 GTR development of power determination of vehicle systems

3.1 Background

The work of EVE IWG during Part A of the current EVE mandate indicated that sufficient knowledge and capability existed to develop a suitable procedure for determining powertrain performance of electrified vehicles. Since this time a procedure for determining powertrain performance was requested by the WLTP IWG and the EVE IWG sought authorization by AC.3 to develop an amendment to GTR No. 15 to establish a procedure for determining the powertrain performance of electrified vehicles. The plan for this work was established as:

I. Consideration of the concepts:
- Reference Method – Chassis dyno testing and calculation
- Candidate Method – Component testing and calculation

II. Consideration of the open points
- Load Collectives and Maximum Power
- Reference Method => Chassis Dyno Testing with completed vehicle and calculation to determine System Power

- • Candidate Method => Component Testing and calculation to determine System Power
- • Customer Information and other information with added value

III. Determination of work plan with task list and including allocation of work load

IV. Proof of concepts: Studies with different types of HEVs including. series HEV, REX and PEVs

V. Test, refine / improve and validation of the method(s)

VI. Drafting of the gtr

VII. Proposal for a draft amendment to GTR No. 15

VIII. Approval at GRPE, voting at WP.29 AC.3

3.2 Determining the powertrain performance and the EVE Mandate

The Electric Vehicles and the Environment (EVE) Informal Working Group is mandated by the WP.29 and has been formed to examine environmental issues related to all types of road vehicles (motorcycles, passenger cars, light, medium and heavy-duty vehicles) with electrical propulsion, including pure electric vehicles (PEVs), hybrid electric vehicles (HEVs) and plug-in hybrids (PHEVs). Over the course if its first mandate, the group developed the "EV Regulatory Reference Guide" for environmentally-related EV requirements, which was officially published on 28 August 2014. In addition to the identified regulatory gaps listed in Chapter 5 of the Guide, the group was tasked with conducting additional research and analysis related to a regulatory requirement to determine the system power of electrified vehicles. The WLTP IWG recently also found that this topic warranted further investigation, however, could not be tackled by that group due to the limitations of their mandate and resources.

Currently, a clear demand for an improved power determination procedure comes from the members of the WLTP IWG. The subgroup "Electrified Vehicles" is in need of a total system power specification for the purposes of classification and downscaling.

System power ratings are also useful for other purposes. Among others, it may serve as customer technical information, may be used by regulators (as basis for taxation programs) or by insurance providers (as a classifier for determining premiums).

3.3 Findings

At EVE-22, the EVE members agreed that the ISO method presented the best option as a basis for development of a test procedure by the EVE IWG. This method is very similar to the SAE's "Method 1" mentioned previously. It shows good verifiability, and as a measure of vehicle performance it is comparable to ICE rated power, which makes comparisons between ICE ratings from conventional vehicles and maximum HEV system power ratings relatively straightforward. However, validation of the ability of the method to effectively serve the purposes of WLTP as envisioned will be necessary.

It was also discussed whether the ISO method should either be incorporated by reference (as of a certain date), or should it be incorporated as text. At the time of this writing, the current draft of the ISO method has not been provided to EVE and so cannot be referred to or reviewed for this version of the draft technical report. The ISO method is expected to be published in the November 2017 time frame.

The ISO method includes two variations (referred to informally as the German method and the Japan method). There was some debate as to whether the GTR should select a single method, or provide a choice between the two variations. It was generally decided that having two methods would be acceptable (as long as the results are the same given the correct inputs), because it provides the opportunity to choose the method that best fits the data or equipment that are available, or the powertrain architecture being tested.

While the methods are believed at this time to deliver equivalent results, this remains to be investigated in more detail. It could be said that both methods include some uncertainty in that both methods call for certain information to be estimated or assumed. The German method relies on an estimated gear efficiency, while the Japan method requires an assumed electrical component efficiency.

It was also recognized that the state of charge (SOC) of the REESS could affect measured power. After technical discussions with experts from the WLTP –IWG Subgroup EV, the members of the EVE IWG agreed on the concept to determine the maximum HEV system power with REESS fully charged.

Another step to be taken is the validation of ISO test results, after review of the selected method(s). Several contracting parties volunteered to assist with such testing, including ECCC (Canada), Joint Research Centre (JRC), EPA, and possibly NTSEL, and Korea.

At EVE 22, the co-chair from Japan requested that EVE leadership take on the task of drafting the GTR, with initial priority placed on the reference method over the candidate method.

Accordingly, a drafting group was formed to begin writing the technical report.

It was also suggested that at some point in the near future, a parallel effort should also be undertaken to further develop the candidate method by means of testing at laboratories of the contracting parties, but at this time this is considered a secondary goal.

4 Method of stating energy consumption

4.1 Background and EVE Mandate

The EVE mandate on the method of stating energy consumption stems form the recognition that a common method which can be used to state and compare the energy used by vehicles (i.e. MPG, L/100km, or kWH/100km, etc.) is an important environmental issue. Advanced EVs represent a promising opportunity to reduce overall energy consumption and, by using electricity, EV's are potentially able to displace petroleum-based fuels. EV sales are expected to see rapid growth in the future, in part because of increasingly stringent regional CO_2 regulations. However, the development of electric vehicles will lead to displaced emissions from the vehicle to electricity grids; depending on the GHG accounting methods used, the influences of electric vehicles on a region's emissions profile may be underestimated if only emissions in transportation are considered. A standardized method for calculating and stating life-cycle energy consumption and the associated GHG emissions for electrified vehicles is recommended for consideration. Specifically, this method should consider the upstream emissions of vehicle energy.

Accounting for upstream emissions related to electrified vehicles being operated in all electric modes was identified in the Guide (OR-1855-EVE-TRANS-WP29-2014-81e-Proposal for an Electric Vehicle Regulatory Reference Guide) as an important environmental performance metric for electric vehicles. This topic of upstream emissions, an important environmental consideration, requires knowledge from both vehicle industry and energy industry. The GRPE mandate focuses on vehicle level performance. The upstream emissions are closely related to fields of energy, and experts from corresponding areas are preferred.

The current EVE mandate as outline the following for the timelines on the work of method of stating energy consumption:

Method of stating energy consumption:

(i) November 2016: Approval to approach the Group of Experts on Energy Efficiency (GEEE), and possibly UNECE Executive Secretary about continuing work on the method of stating energy consumption;

(ii) November 2016 - June 2018: EVE supports work of GEEE or another group on method of stating energy consumption as needed;

(iii) June 2018:

a. Report status of work on method of stating energy consumption to GRPE;

b. Report status of work on method of stating energy consumption to AC.3.

At the EVE 27 meeting with GRPE, it was decided that the final report on the status of work on the method of stating energy consumption would be presented in January 2019 along with the status on the in-vehicle battery durability and progress of the GTR for the determination of system power.

4.2 Findings

The EVE IWG developed a Microsoft Excel based model to evaluate the energy consumption of electrified vehicles during Part A of the EVE mandate. Although the EVE IWG feels this model would be suitable for the information-sharing purposes outlined in Part A of the EVE mandate, the current model is best used to make one-off evaluations of the energy consumption of a specific vehicle with a user-defined mix of source electricity.

The group noted that upstream emissions are considered as part of vehicle GHG regulations in the U.S. and Canada, but all agreed that the upstream emissions are outside the control of a vehicle manufacturer and would vary from country to country.

The Group of Experts on Energy Efficiency (GEEE) considers both regulatory and policy dialogue to address financial, technical and policy barriers to improve energy efficiency on sharing experiences and best practices in the field of energy efficiency, which is a broader mandate than the EVE IWG.
In order to better formulate the method, the EVE IWG approached the GEEE to request that they continue the work on the method of stating energy consumption. The EVE IWG feels that the GEEE may be a suitable home for this work due to their explicit focus on these types of issues. As noted in their mandate – " Group of Experts focuses on sharing experience and best practices in the field of energy efficiency in the United Economic Commission for Europe (ECE) region".

It was agreed upon by the GEEE that they would takeover and continue the work on the method of stating energy consumption research and developed excel model with support of the EVE IWG as needed.