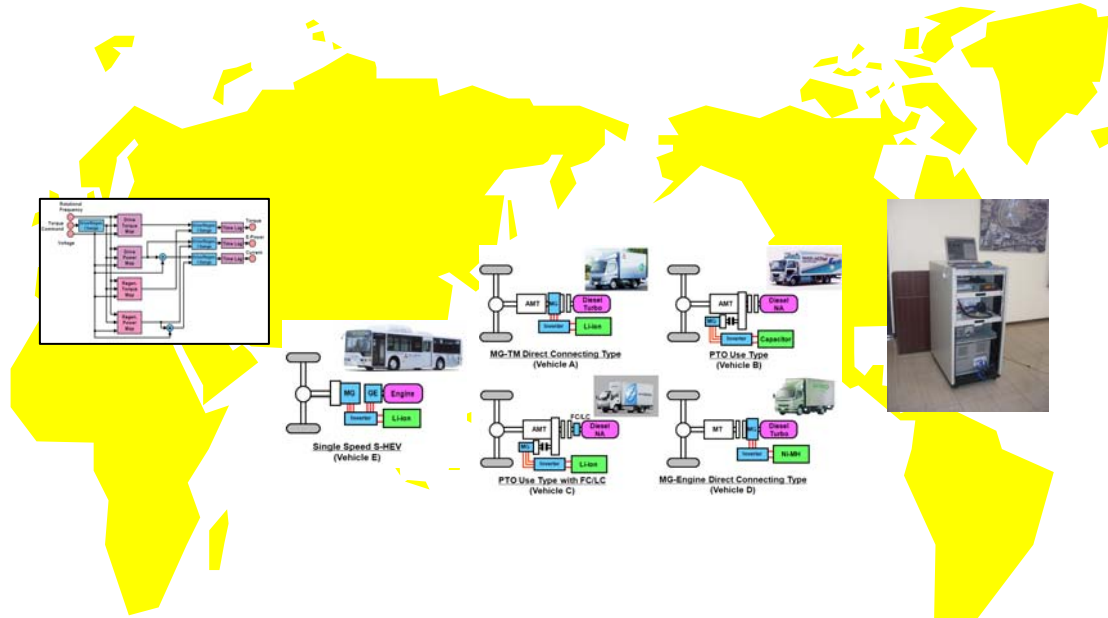




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Working Paper No. **HDH-11-07e**
(11th HDH meeting, 10 to 12 October 2012)



GRPE Informal Group on Heavy Duty Hybrids

11th HDH, Ottawa, 10 to 12 October 2012



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Summary of 10th HDH Meeting

- **The results of the 10th meeting in Geneva on 05 June 2012 are summarized, as follows:**
 - **The first part of the HDH work program (research program) has been successfully finished**
 - **Validation test program 1 on the basis of a real heavy duty hybrid software based simulation was agreed; OICA will take over budget for task 1, sponsors for tasks 2 and 3 are being looked for**
 - **The Japanese HILS method is a good basis for electric and non-electric hybrids**
 - **The three HDH test cycle options will be investigated in validation test program 1**
 - **Further consideration of JASIC alternative proposal will be done by Japan**
 - **The revised roadmap and project planning were agreed**
 - **Vehicle manufacturers are asked to submit vehicles for validation test program 2**



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Status of HDH Work Program

➤ Research program

- Work programs at TU Vienna and Chalmers University have been finished
- Work program at TU Graz has been largely finished
 - WHVC weighting factors will be submitted upon completion of EU CO2 test cycles

➤ Next steps

- Discussion on chassis dyno and powerpack testing will continue on the basis of input from ongoing programs at the Contracting Parties
- Validation test program 1 based on SILS (Software-in-the-loop simulation) has started in June 2012
 - OICA covers task 1 (serial hybrid) of 181.570 €
 - EU COM covers tasks 2 (parallel hybrid) and 3 (report & user manual) of 134.130 €
- Validation test program 2 with real HVs will start around March 2013
- Establishment of drafting group by end 2012



HDH Terms of Reference & Timing

➤ Terms of reference (GRPE-60-11)

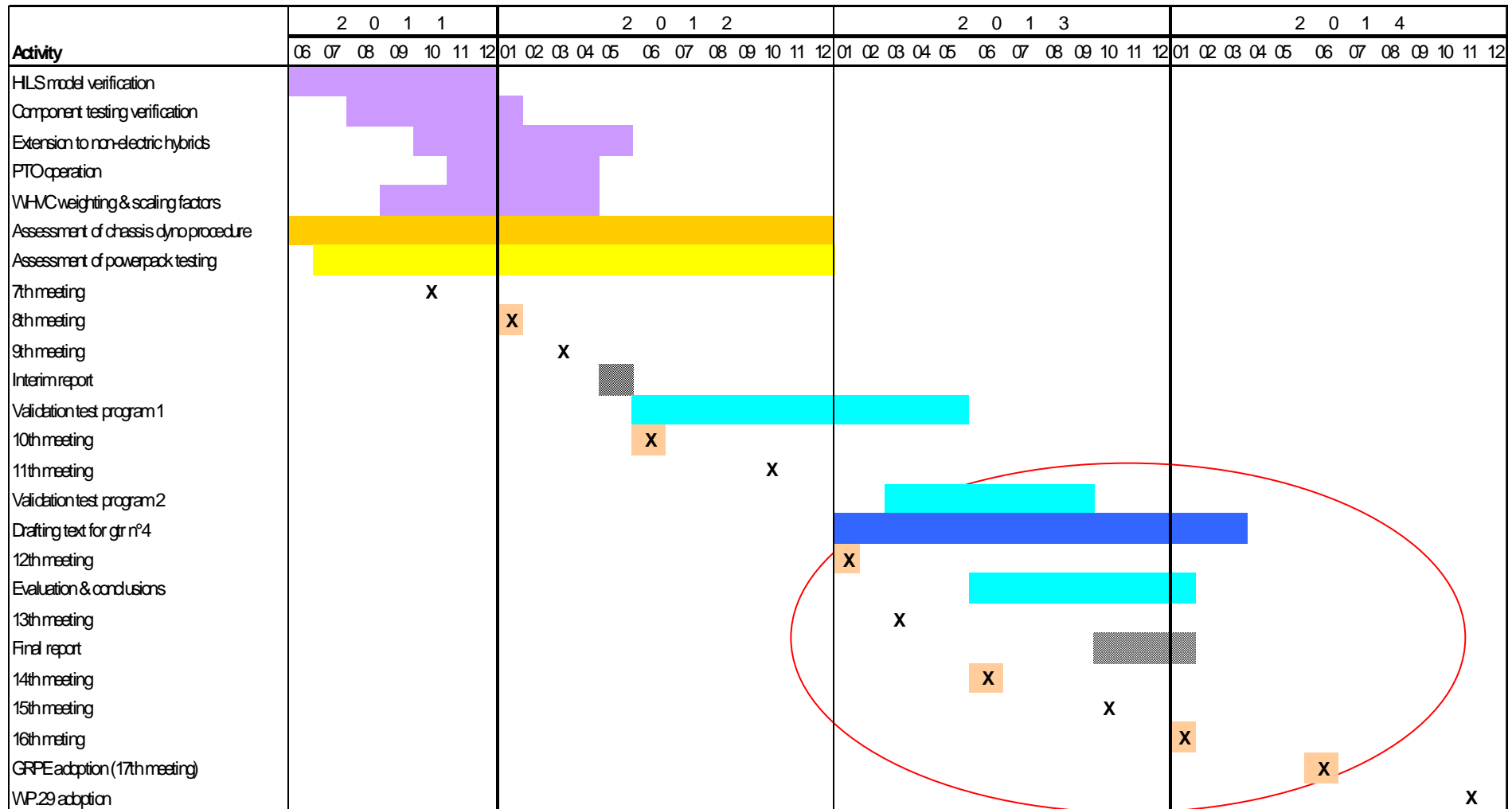
- The informal group shall submit the final report of the investigation on HILS for consideration to GRPE at its 65th session in January 2013
- The target completion date for the work of the informal group on HILS shall be the 163rd session of WP.29 in June 2014
- This target completion date and the necessity of a chassis dyno test as a second step will be reviewed by WP.29 at its 160th session in June 2013 taking into account the assessment by GRPE of the final report on HILS

➤ Timing (GRPE-60-12)

Item	Time
IG meeting (timing & budget)	10/2010
Report to GRPE	01/2011
2 years work program	
IG final report to GRPE	01/2013
GRPE adoption	01/2014
WP.29 adoption	06/2014



Updated Roadmap & Project Planning



➔ Final report to GRPE delayed to 67th session, GRPE adoption to 68th session

➔ Timing for WP.29 adoption delayed to 164th WP.29 (11/2014)



Items for 11th Meeting

- **The following items need to be decided:**
 - **Final adoption of validation test program 1**
 - ➔ will need to be largely finished before validation test program 2 starts
 - ➔ will consequently delay roadmap
 - **Proposal for component library**
 - **Method to define and to normalize the full load curve for hybrid power packs**
 - **Consideration of JASIC proposal (torque reduction factor to WHTC)**
 - **Handling of PTO operation**
 - **Discussion of overall validation scheme**
 - **Laboratories/institutes interested in HDH validation test program 2**
 - for example, powerpack testing and vehicle testing
 - **Establishment of drafting group**
 - Nomination of experts
 - **Preparation of GRPE report on chassis dyno and powerpack testing**
 - **Adoption of revised roadmap and project planning**



Comparison of HDH Methods

	WHTC (for Conv. Diesel)	Current Japanese HILS	Japanese Proposal (HV ratio)	TU GRAZ Proposal (WHDHC)	Powerpack testing
Outline	Emission test is done with the RPM/torque pattern of the engine on the basis of a standardized engine cycle	HV engine RPM/torque pattern is obtained by HILS simulation of the HV powertrain on the basis of a standardized vehicle cycle	First obtain the HV ratio by HILS using the vehicle speed of WHVC, then multiply the ratio and WHTC torque to obtain modified engine RPM/torque pattern.	Obtain HV engine RPM/torque pattern by HILS simulation using the cycle developed from the combination of WHTC power (and WHVC vehicle speed)	Emission test is done with the RPM/torque pattern of the complete powerpack
Necessity of vehicle concept	NO	YES	YES	NO	post TM: YES/NO pre TM: NO
Provisions for negative torque (recuperation)	NO	Possible to reflect the effect of HV system	Possible to reflect the effect of HV system	Defined distinctly for the powertrain; vehicle spec not considered	Included in the test; for post TM, vehicle spec may be simulated
Cold test	Mandatory	Not included, but possible Requires additional modelling	Not included, but possible Requires additional modelling	Proposed Thermal models under investigation	Possible
Current test facilities sufficient	YES	YES HILS simulator required	YES HILS simulator required	YES HILS simulator required	post TM: NO pre TM: YES
Alignment with WHTC	—	NO: simulation on WHTC is impossible	YES: WHTC test corrected for HV ratio is possible	YES: the test points are different from WHTC, but derived from WHTC	post TM: NO pre TM: YES
Remarks	—	Impossible to align with WHTC May result in unrealistic load cycles for power pack Application to series hybrid possible	WHVC load rate is not considered, but possible to modify by adding gradient condition Application to series hybrid impossible	Impossible to fully reflect the effect of HV system Similar load cycle than for conventional engines Not applicable, if electric motor and ICE drive different axles Application to series hybrid to be checked	Requires modification of test facilities in case of post TM For pre TM, impossible to fully reflect the effect of HV system



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Next Meetings

- **The next meetings are scheduled as follows:**
 - **The 12th meeting will be on 15 January 2013 in Geneva**
 - **The 13th meeting will be on 21/22 March 2013 in Borlänge, Sweden**
 - **The 14th meeting will be in June 2013 in Geneva (to be confirmed)**
 - **The 15th meeting will be in October 2013 (San Francisco, date to be confirmed)**
 - **The 16th meeting will be in January 2014 in Geneva (to be confirmed)**