

Proposal to develop a new Regulation or Recommendation on
**Determination of Powertrain Performance
of Hybrid Electric Vehicles**

Dr. Hans Holdik

Federal Ministry
of Transport and
Digital Infrastructure
GERMANY

Dongseok CHOI / Ph.D.

KATRI –
Korean Automobile Testing and
Research Institute
KOREA

Current Situation

“Uniform provisions concerning the approval of internal combustion engines or electric drive trains intended for the propulsion of motor vehicles of categories M and N with regard to the measurement of net power and the maximum 30 minutes power of electric drive trains”

**UN-
R85**

Separate determination of the power of each engine (ICE, electric motor)

No prescription, how to calculate the system power of the HEV from these results

On-board battery not included, el. power limited by electric motor only

**..and
beyond**

System power calculated as “ICE power + EM power” does not represent the real world (see e.g. KATRI-study)

HILS not validated for the light duty vehicles

Current Situation

⇒ In UN, US and Japan, there is no regulation that defines light duty hybrid system power !

Other Activities

SAE: J2908 WG

- **since March 2013:**
- **development of a standard on powertrain power rating for HEVs.**

JARI: HEV Power WG

- **since April 2014**
- **work just started 6 month ago**

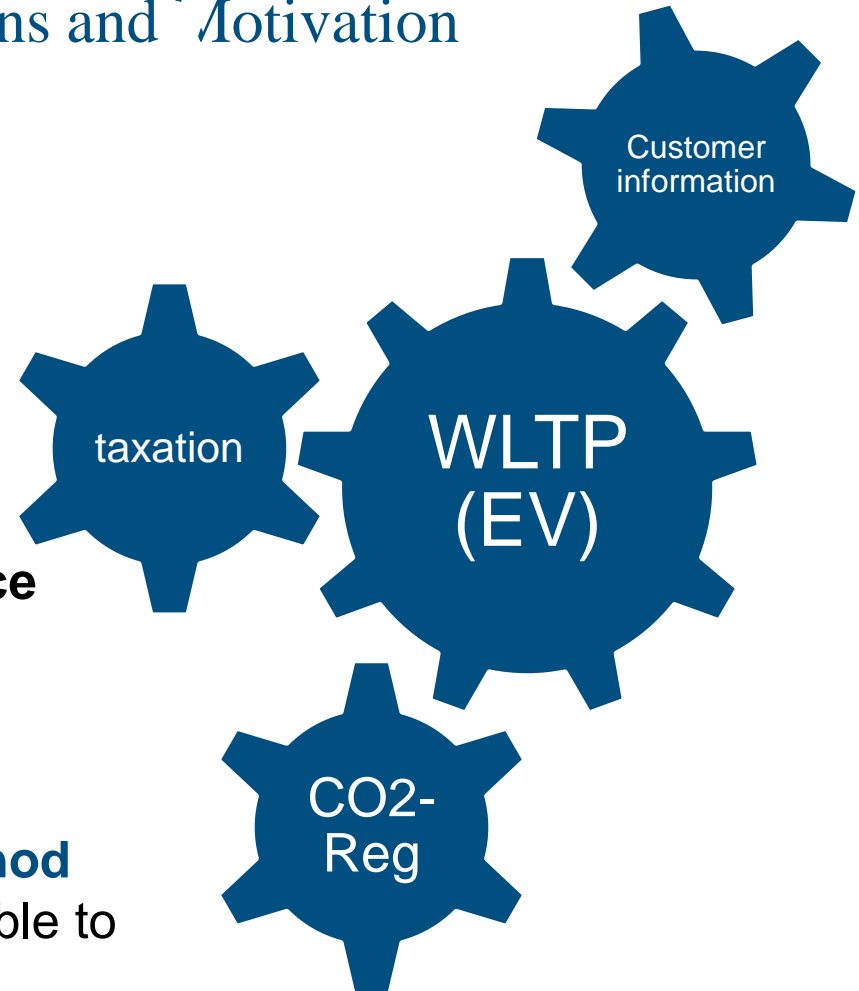
KATRI

- **since March 2010**
- **aims at classification of pc based on power output to replace a national car legislation regulation, based on engine capacity**

Objective, General Considerations and Motivation

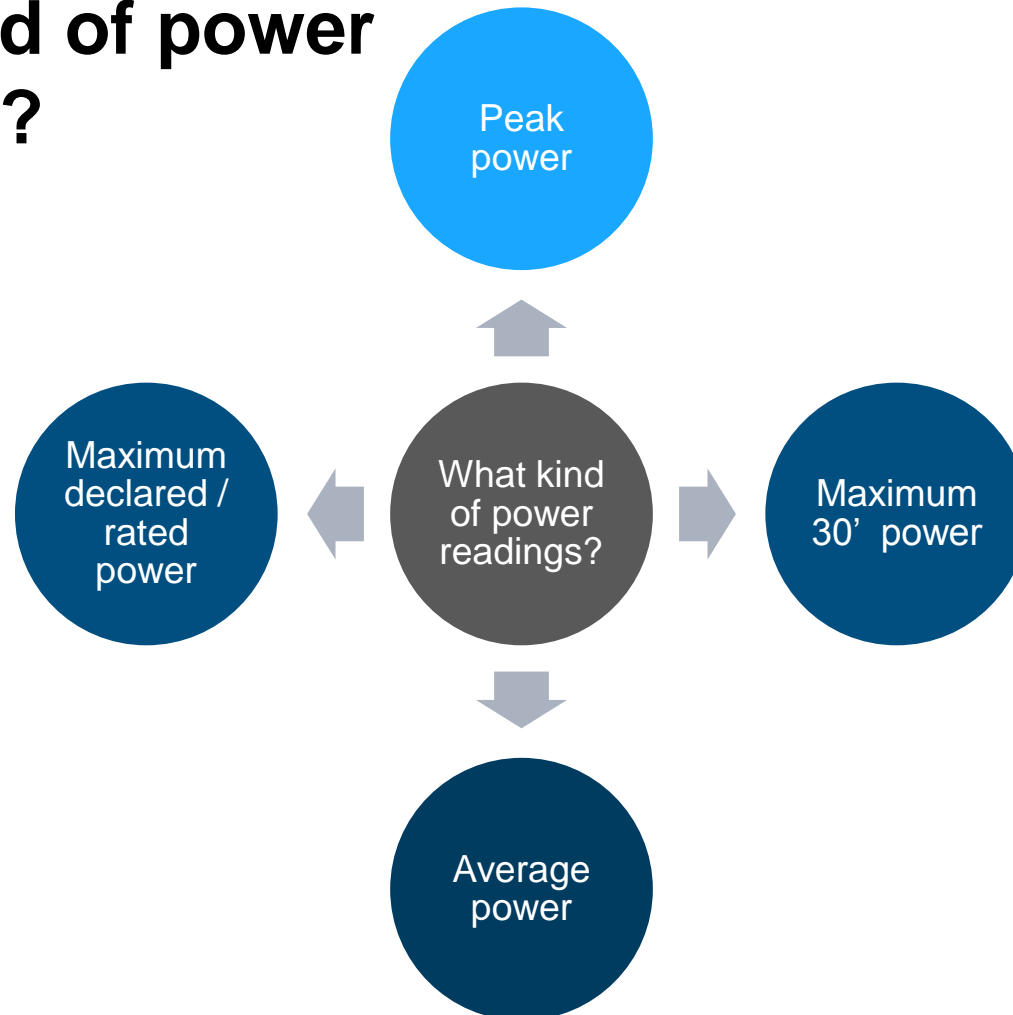
System Power of HEV - For what purposes?

- **As customer information:**
 - Maximum Declared Power
- **For taxation schemes and insurance classification**
 - based on output power
- **WLTP / Subgroup EV**
 - for application of **downscaling method** with low power vehicles that aren't able to follow the WLTC class 3
 - for application of **gear shift calculation tool**
 - Classification of **power-to-mass ratio**



Objective, General Considerations and Motivation

What kind of power readings?



Objective and Scope

Determination of system power of HEV (combined power of the energy converters)

Scope: **Light Duty Vehicles** (M, N1)

➤ Performance criteria:

–**Power** as a function of **Speed**

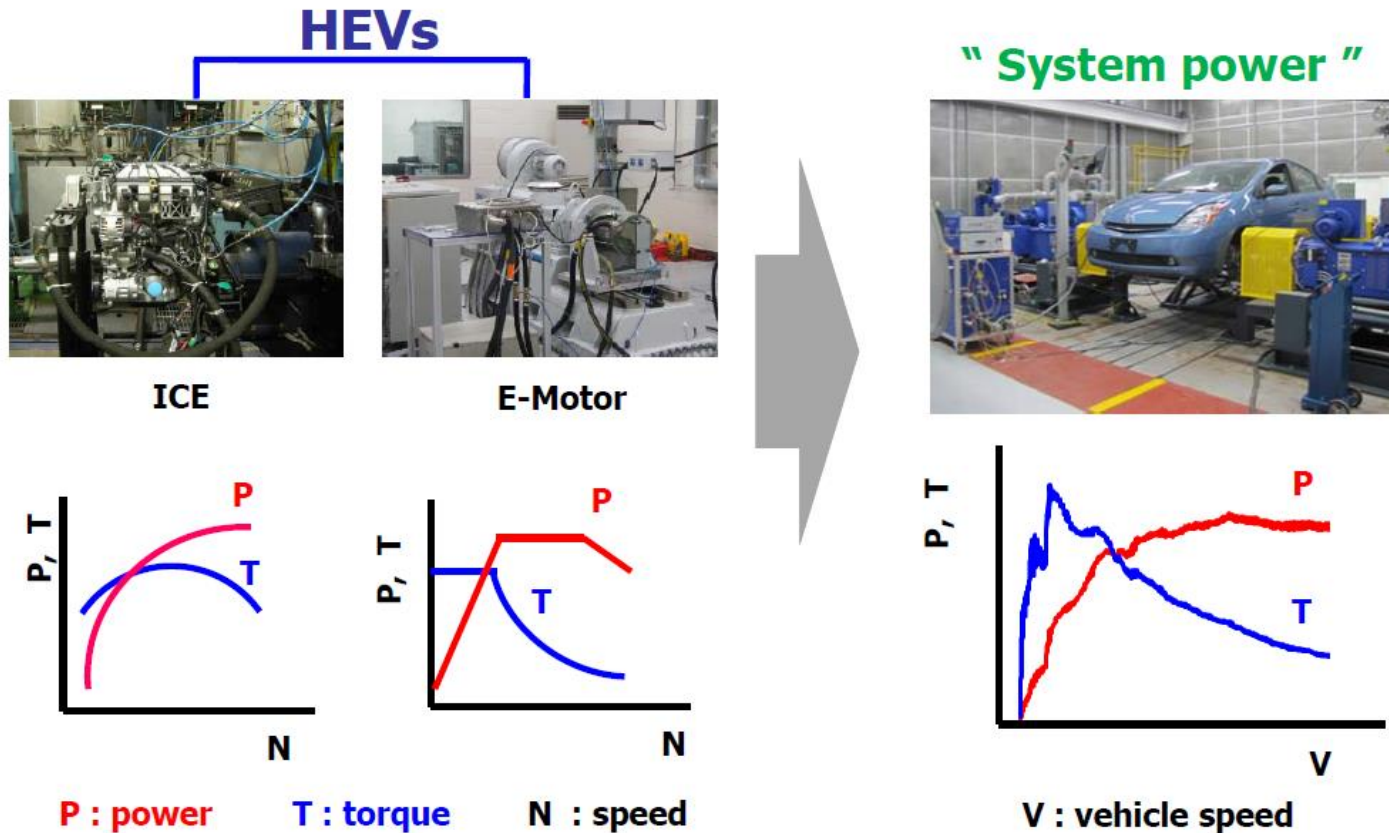
–**Torque** as a function of **Speed**

(other pc could be included at a later stage when appropriate and needed)

➤ Heavy Duty Vehicles (HDV) and L-category vehicles are currently beyond the scope and would be covered by other groups (HDH, L-EPPR) ⇒ lead to be split up accordingly

Background

“How to measure the representative power of HEVs?”



MOLIT
Ministry of Land,
Infrastructure and Transport



Korea Automobile Testing & Research Institute

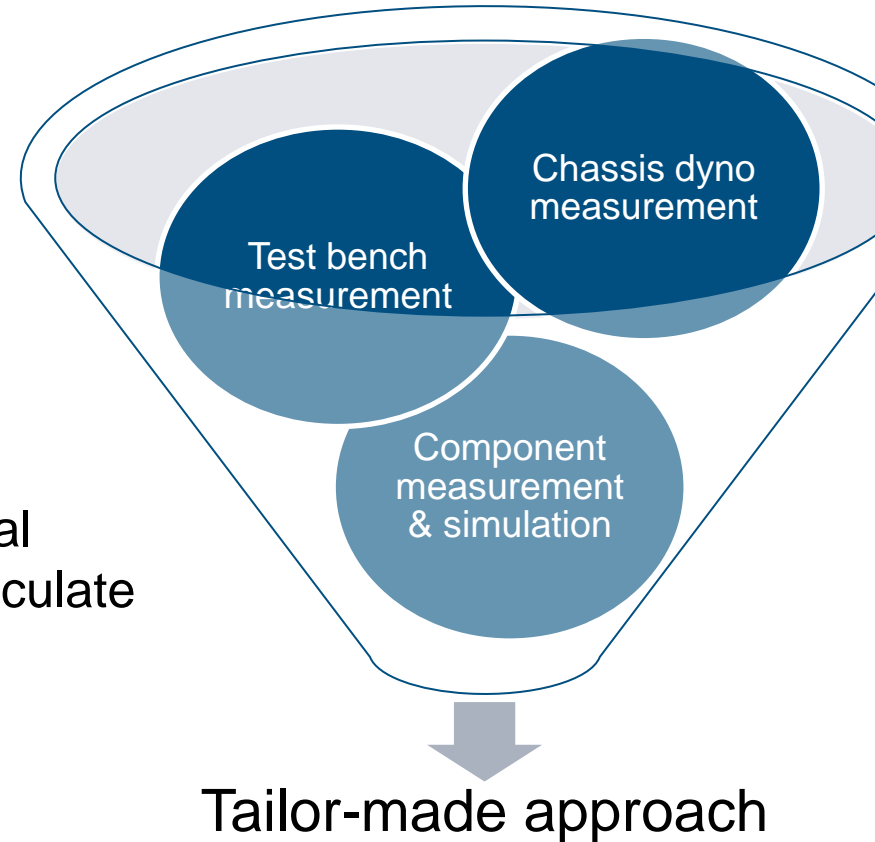
Development Approach – Technical Aspects

Several options for a technical procedure:

- Measure the complete vehicle
- Measure system power directly
- Measure the power of the individual components of the system and calculate system power

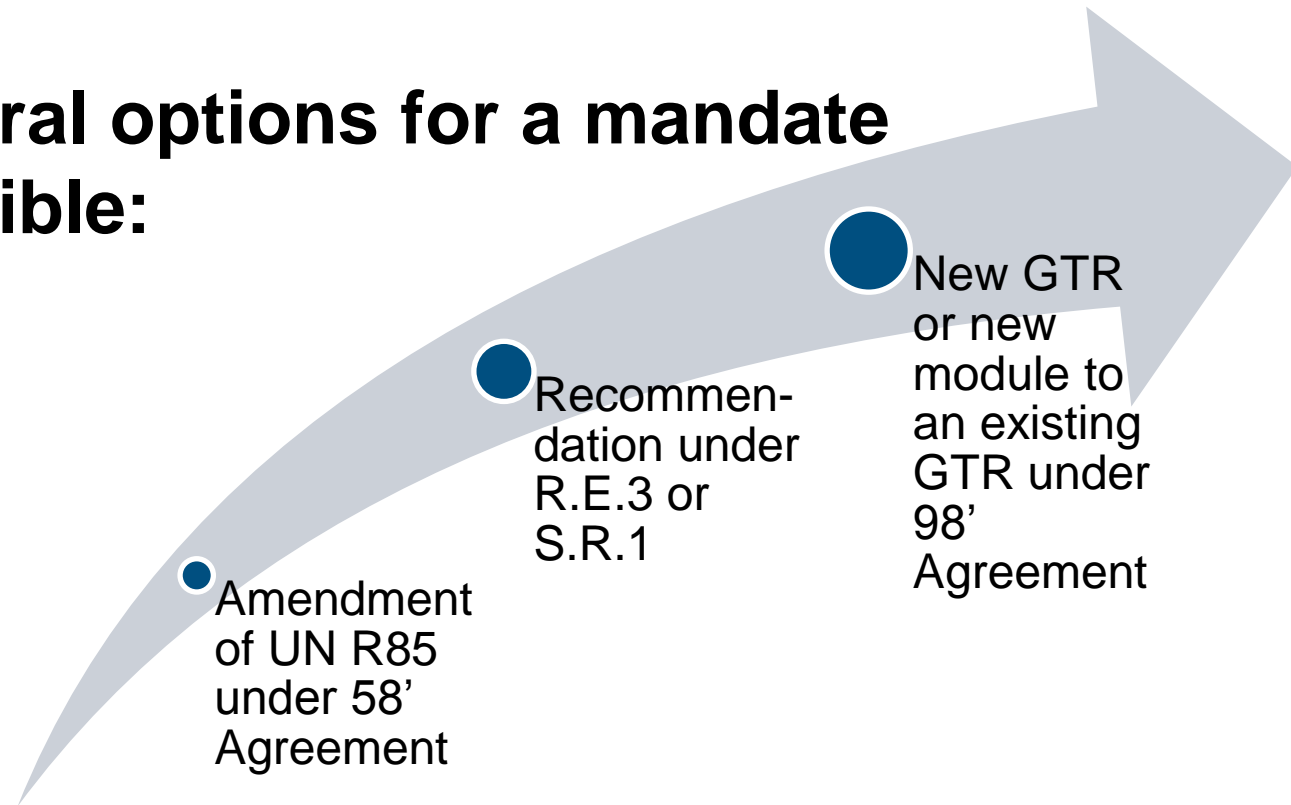
Decision criteria:

- feasibility, robustness
- data quality: reproducibility, repeatability, validation
- expense



Development Approach – Organizational Aspects

Several options for a mandate possible:



Decision criteria:

- interested contracting parties
- level of harmonization
- acceptable timeline

Conclusion

- **UNECE WP.29 is an appropriate platform to develop a **harmonized** measurement procedure [and GTR] for determination of system power of HEV vehicles.**
- **It is an appropriate timing to start the discussion under WP.29**
- **Aim at a maximum harmonization level of the test procedure (but: without performance requirements)**

Proposed tentative work plan (M, N1 vehicles)

Step i

- Report on
- **strategic political questions:** need for technical information on best/worst case or representative case?
- **technical questions:** to be answered in detail including information, which resources will be needed therefor

Deliverables

- Status Report,
- Document for GRPE

Step ii

- Development of the Road Map
- **What? Where? When?**
- Development of the Road Map by delegates from the Contracting Parties and stakeholders

Deliverables

- Agreement of the content of the road map
- Determination of Technical Sponsor,
- Chair and Secretary of the IWG,
- Mandate document for endorsement by AC.3 **(Milestone)**

Proposed tentative work plan (M, N1 vehicles)

Step iii

- **Technical Research Phase**
- Experimental and/or simulation work (if any) in order to develop a new harmonized procedure.
- consideration and weighing up of different technical procedures (e.g. complete vehicle measurement, unit measurement, component measurement)

Deliverables

- Decision on technical approach
- Technical report
- draft GTR / Recommendation / Amendment

Step iv

- **Validation Phase**
- preparation, test items, procedure test vehicles, validation new test procedure, application

Deliverables

- Technical Validation report, GTR / Rec. / Amend.

Proposed tentative work plan (M, N1 vehicles)

Step i)

Report on

- strategic political questions: need for technical information on best/worst case or representative case?
- technical questions: to be answered in detail including information, which resources will be needed therefor

Deliverables:

- status report,
- informal document for GRPE

Step ii)

Development of the road map (what?, where?, when?) by delegates from the Contracting Parties and stakeholders.

Deliverables:

- Agreement of the content of the road map
- Determination of Technical Sponsor,
- Chair and Secretary of the IWG,
- Mandate document for endorsement by AC.3 (**Milestone**)

Proposed tentative work plan (M, N1 vehicles)

Step iii)

Technical research phase

Experimental and/or simulation work (if any) in order to develop a new harmonized procedure. Consideration and weighing up of different technical procedures (e.g. complete vehicle measurement, unit measurement, component measurement)

Deliverables:

- Decision on technical approach
- Technical report
- draft GTR / Recommendation / Amendment

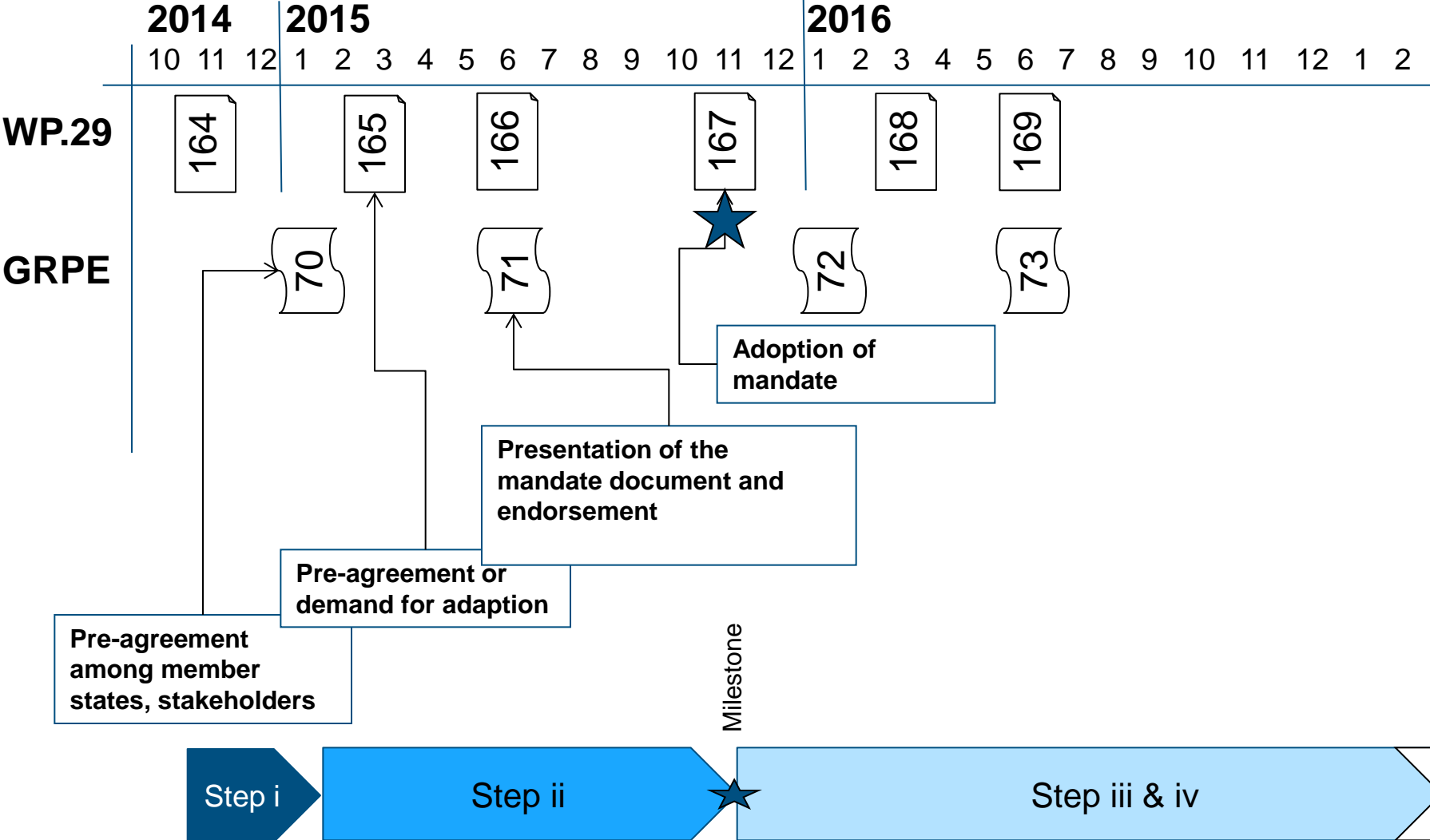
Step iv)

Validation phase: preparation, test items, procedure test vehicles, validation new test procedure, application

Deliverables:

- Technical Validation report

Proposed Timeline for Mandate



Thank you for your attention!

Federal Ministry of Transport
and Digital Infrastructure

Invalidenstraße 44
D-10115 Berlin

www.bmvi.de