Foreseen PECTA Tasks for the new term 2024 to 2029:

Policy research and policy tools

- ***Fine-tuning promising policy measures for selected appliances & equipment:*** The results of Task D of the first PECTA term are the step-stone to build analysis for more specific policy measures, broken down for concrete appliances & equipment. This shall be developed in the second term, considering options for different policy measures such as codes of conduct, tighter MEPS among others. As result a Policy Guide for expediting WBG technology into the market shall be prepared, distinguishing different appliances & equipment.
- ***Improving EU regulation on PV converters:*** At the moment the EU is on the way to define Ecodesign requirements for PV modules and inverters, pursuant to the Directive 2009/125/EC of the European Parliament and the Council. In the current version of the requirements, the efficiency of a PV converter is defined. These requirements though should be more specific and precise, since so far, the topology - whether the converter is a DC-AC or a DC-DC-AC converter - has not been considered. Furthermore, the proposed requirements explicitly exclude the converters with possibility to connect to storage or with integrated storage. Sharpening these requirements might lead to a better overall efficiency of new PV converters. To sharpen these, it is necessary to analyse the different topologies of PV converters, quantify the highest possible energy efficiency in support of a more precise and detailed regulation. This type of analysis and research work will be undertaken in the second term of PECTA, and may serve as input for next revisions of EU regulation.
- ***Identify possible policy approaches for WBG based efficiency improvement for motors and motor systems:*** The potential of energy efficiency from using WBG in variable speed drives (VFD) and motor systems (like pumps and fans) is still rather unknown. Switzerland has launched a specific project targeting WBG in pumps during 2022, which will serve as input for further investigation in a follow up activity of PECTA. Additionally, a measurement activity with a motor application based on each, Si and SiC will help evaluate the energy use estimation and performance of WBG. The measurement results shall be used as ground information to compare with requirements in existing (EU) regulations in the motor systems area. This work will be carried out with a close interaction between PECTA and 4E EMSA (as EMSA primarily focuses on motor and motor systems).
- ***Efficiency measurement standards:*** For adopting regulation measures it is indispensable to have standardized and reproducible measurement specifications, to properly define the energy efficiency performance, the losses and a possible efficiency classification of WBG semiconductor modules and devices. At present, these topics are not the focus of standardization bodies like JEDEC or IEC. Based on the results of PECTA´s Task E in the first term, it is expected that the efficiency measurement standards definition can be started. The ultimate goal is to have approved efficiency and performance standards for WBG modules and devices. These standards would allow the characterization and comparison of WBG modules and devices, in an internationally accepted and technically robust manner. These uses of such standardized measurements should lead to an international basis for declarations of the efficiency of WBG based semiconductors.

Policy supporting activities (analysis, investigations, measurement)

- ***Revision and update of the Application Readiness Maps -ARMs:*** An update of the ARMs, based on the available version at the end of the 1st term (spring 2024), shall be further elaborated in the second term. It is expected that new semiconductor materials are used, and that results of new research work will boost the development of WBG based power electronics. The PECTA community should be informed and advised on the impact of new development on WBG power electronics and devices. Application engineers have to be informed about emerging appliances and equipment, so that they can confidently adopt WBG technology in their designs. Advising policy makers and experts – based on robust and reliable information – is therefore important and necessary.

- ***GHG emissions and sustainable use of resources:*** Efficiency improvements and using less electricity leads to reductions in GHG emissions. Additionally, the resource efficient use of materials is also an issue that goes hand in hand with GHG reductions; which is a a priority of EU in relation to the sustainable use of resources and the promotion of circular economy strategies. One relevant advantage of WBG is its high-power density compared to Silicon based devices. However, it is still an open question how the power density of WBG would impact on material, weight, volume of devices, and which impacts will be quantified in terms of GHG emissions along the life cycle of the applications (especially for the production, use and end of life phases).

  Therefore, the Life Cycle Assessment (LCA) work from the 1st PECTA term will be extended towards a quantification of the GHG emissions alongside the production, usage and disposal of WBG in comparison to Si-based devices. In particular, specific appliances/equipment, such as power supplies or PV converters shall be further investigated.

- ***E-vehicle chargers:*** At the moment, the majority of e-vehicle charging stations (wall boxes) installed in private households do not have power electronics, as they are AC chargers and the converter of AC to DC is located on the e-vehicle. In the near future there is a tendency, on one hand, to have the DC conversion in the wall box instead of on board. This means that, power electronics will be installed in the wall boxes. On the other hand, bi-directional charging will become more common, which also means using power electronics in the wall box. WBG technology can play an important role in this type of charging equipment, to make it more efficient. The future development of charging stations (domestic and commercial) should be closely tracked, to evaluate the conditions and timing of possible regulatory measures.

- ***Measurement of particular appliances and equipment:*** For further proofing the higher efficiency of WBG-based appliances and equipment, and to get reliable information, it is helpful to measure the efficiency of particular devices. Based on the experience of Task F and Task E in the 1st term of PECTA, individual measurements of different WBG modules and devices will be conducted in the second term. Selected appliances and equipment like Wall box with DC-DC and bi-directional capability, HVACR equipment with variable speed drives, and uninterruptable power supplies (UPS) are in the scope. Additional appliances and equipment – if required – could be considered for measurements.

- ***Use cases / product reliability:*** Different appliances and equipment (especially SiC based) are already available on the market and operating "in the field". It would be very beneficial to collect and analyse concrete appliances/equipment data on the market as well as investigate the process of market introduction and the obstacles faced by manufacturers (if any). This is useful to understand the market mechanisms, to identify the major hurdles and challenges before and after market entrance, and to evaluate the measures and actions that supported the successful market entrance and "survival" of such applications. Reliability of the products, and particular the embedded power electronic, is one of the challenges that manufacturers face once a product is on the market.

  PECTA shall collect field data of market products with WBG power electronics, to better understand the reliability of SiC and GaN devices. A cooperation with manufacturers and ECPE shall be beneficial.

Industrial coordination and cooperation

- ***Technology drivers / trend-setter:*** At the moment electric vehicles (EVs) are the major technology driving the development and adoption of WBG technology. The development in this particular application is therefore very important, and PECTA shall carefully observe this technology development process, to gain insights and learnings that could be relevant for other appliances/equipment under the scope of PECTA (namely end-use equipment). PECTA shall thoroughly observe the WBG related activities in the E-mobility area, learn about the rapid progress, and use this knowledge and learnings for expediting WBG appliances/equipment in other markets. It is as well foreseen to initiate an active interaction and communication with ECPE and particular industries about this subject.

  According to the actual situation, the "IEA Hybrid and Electric Vehicles TCP" (HEV TCP) does not carry out specific work in the area of WBG for HEVs. Still the work of PECTA might be of interest for the HEV TCP, and as such it is suggested to initiate a communication with this TCP for information exchange, and to identify other trends in coming-future.