Sustainability in the semiconductor industry with innovative technologies - Net Zero 2040 commitment

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Sustainability is crucial in the semiconductor industry due to its impact on costs, product quality, and the environment. We associate sustainable activities with reducing greenhouse gas emissions and carbon footprint, driving disruptive innovations. The Czech National Semiconductor Cluster (CNSC) strengthens the semiconductor industry with sustainability as a core part of its activities. CNSC unites academic institutions, companies, startups, and innovation centers to form a comprehensive value chain, fostering joint projects that combine industrial needs with scientific expertise. onsemi, a leading provider of intelligent sensing and power solutions, operates in the Czech Republic with Rožnov's wafer fab and raw wafer manufacturing. Celebrating 70 years since semiconductor production started in 1955 with Ge transistors, onsemi is now a leading CNSC enterprise, producing over 3 billion chips and 3 million polished and epitaxial wafers annually. onsemi is developing cutting-edge technology and products for a sustainable future, with a commitment to Net Zero by 2040.

This paper introduces two cases for SiC wafer manufacturing. SiC, with a hardness of 9.5 Mohs, presents challenges for conventional wafer slicing and lapping. onsemi pioneered laser-based wafer splitting, improving yield and reducing kerf losses, while enabling lean processing with front-side grinding and chemical-mechanical polishing. With production ramp-up, we identified excessive water consumption in SiC grinding. In collaboration with an equipment supplier, we qualified a unique deionized water unit with a closed loop, featuring effective water recycling. This approach achieves 99.5% water savings and 82% energy savings. Reducing environmental impacts while increasing competitiveness and achieving economic returns is motivating for further actions. We see attractive potential in laser processing for SiC in grinding, polishing, cleaning, and annealing, developing further opportunities within the CNSC, in cooperation with universities and HiLASE (Institute of Physics, Czech Academy of Sciences). We appreciate support from the Technology Agency of the Czech Republic awarded within project LapSiC: TQ16000033.