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Cloud-Edge Machine Learning in the Swiss Energy Prosumer Pilot: Enhancing Social Acceptability

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The O-CEI project is a forward-thinking initiative aimed at addressing key challenges in the European supply chain by creating an open and cross-sector Cloud Edge DOT (CEI) continuum platform. O-CEI uses and upgrades technological innovations from previous successful projects (i.e. existing cloud technology spectrum, including meta-operating systems, cognitive cloud technologies, and decentralized swarm intelligence). It will provide a comprehensive framework in order to be integrated, deployed and validated in 8 multidimensional pilots in key strategic sectors ranging from electromobility, software-defined vehicles, logistics, smart agriculture and agri-food, smart urban environments and multiple electricity grids management. Uptake of the proposed technology will pave the way for a more sustainable and resilient CEI ecosystem, fostering a smoother transition towards a cleaner energy future.

Energy Transmission Service Operators have expressed that achieving flexibility in the energy market may quickly overburden computing infrastructures. Hence, the concept of the computing continuum as a single manageable entity, breaking the silos of edge and cloud computing has gained momentum. Thus, several cross-disciplinary actions are needed to minimize the related ecological impact (e.g., in renewable energy, social education). Being able to exploit those resources, having them cooperating in the matters of anticipation and prediction in energy lexibility is pivotal in O-CEI and in Europe.

The goal of the Swiss pilot to foster prosumers into the increasingly liberalized energy market pursuing high social acceptability, enabling them to reap new forms
of electricity production and consumption. The pilot is deployed at tree locations in Switzerland, that engage users and energy flexibility in three types of uildings: (i) urban apartments (Geneva), (ii) mixed residential/industrial (Fribourg) and (iii) ski villages (Valais). This pilot will demonstrate how innovative Smart IoT solutions (already) in place can become part of an integral (O-CEI) platform, increasing such acceptance and user engagement while deploying Smart Energy Services promoted by advanced Cloud-Edge-IoT utilities and technologies.

The three scenarios that roughly coincide with the geographic locations are presented.
Scenario 1: Flexibility applications for Distribution System Operator (DSO) or Local Energy Communities (LEC): this scenario deals with flexibility applications that enable DSOs to ensure Grid stability and LECs to optimize their consumption costs and minimize their dependence on DSOs.
Scenario 2: Optimizing Charging Costs of electric vehicles (EVs): This scenario focuses on charging stations for EVs enabling owners to optimize vehicle charging through smart contracts.
Scenario 3: Tourism scenario: this scenario is related to touristic resorts enabling hotels, restaurants and ski resorts to optimize their energy consumption.
This contribution describes the current and future machine learning required to support these three scenarios. As these scenarios involve gathering data that is potentially personal, the work is presented that ensures that the data privacy regulations of Switzerland and the EU are followed.

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