PhD Curricula - Blockchain and Distributed Ledger Technology

Curriculum 7: **Climate, energy and mobility**

The curriculum on blockchain for climate, energy and mobility focuses on the key strategic orientations of the latest H2020 work programme. The objective is to provide blockchain technology and smart contracts for promoting an open, strategic, and distributed approach in the energy value chains.

Many climate programs have been established over the years. However, the intrinsic multi-lateral and international approach brings many difficulties in linking the political commitment to the technical involvement and contribution, for example, in reducing greenhouse gas emissions. First, the curriculum will study the contribution of blockchain to transparency, traceability, and trust in environment-related programs. Then it will focus on accelerating and steering the digital and green transitions through human-centred approaches and innovations. Creating more resilient, inclusive, and democratic European energy systems will prepare them to respond better to threats and disasters. Distributed energy resources (DERs) call for distributed data collection and management (smart meters, production plans, prosumers). Removing the information asymmetry between DSO, TSO, and citizens will empower them to act in the green and digital transitions.

This curriculum will study distributed methodologies to strengthen the digitally-enabled circular, climate-neutral and sustainable economy through the technical management of energy networks, the aggregation of production in virtual power plants, the management of networks for energy distribution, and the creation and management of energy communities. Attestation and validation of methodologies of energy production will distinguish the cases of green and environmental-friendly production from the traditional ones, especially for blue, green and grey hydrogen. The use of the blockchain will be applied to breakthrough business models and programs in the energy sector and energy mobility (Demand-Response, Vehicle to Grid, energy communities, certification of self-consumption, etc.). Additionally, tracking and tracing batteries for electric mobility, including managing the logic for monitoring their health status, enable such batteries to be used in second-life applications: when they are not good anymore for traction, they still maintain most of their capacity. The application-level challenges described above will be faced with innovative theoretical approaches for guaranteeing privacy (e.g. joining Secure Multiparty Computation to blockchain), security (blockchain and Attribute-based Encryption), and wide adoption (studying the relation between natural language contracts of the energy sector and smart contracts).

Keywords:

- Energy value chains
- Environment
- Disaster monitoring and management
- Resilient and inclusive energy systems
- Environmental data management
- Circular Economy
- Energy communities
- Sustainable mobility
- Battery traceability
- Smart Contracts