

The Digital Power Future is Now

Unlocking the vast quantities of latent Grid-Edge flexibility to support and refine distributed production, from diverse and severely intermittent sources (renewables & energy recovery) is the biggest on-going innovation to electricity markets. MPOWER, in Ireland, is the first dedicated Energy Community Utility having developed 'disturbance-neutral energy communities'. Such communities respond autonomously, i.e. with minimal or no interaction with the DSO/DNO, to disturbances from production/Storage/Flexibility hosted by that community. These local, but otherwise virtual "cellular smart-grid" communities of flexible consumers and producers (**prosumers**) create overlay '**Community Grids**' (Regulated by Contract), with minimal disruption to DSOs. Community Grids are operated by new market players such as: Community System Operators or **CSO**. They use cloud technology that implement dynamic, local markets, aggregated Regionally/Grid-wide, and integrated with advanced controls distributed to the prosumers in the Community Grid. The Limerick EU-Lighthouse City, supported by the South Dublin Smart Grid Test Bed Technology, is rolling out neighbourhoods of such Smart Energy Cells bounded within Substation Areas by digitally-automated CSO-operated Community Grids. In these neighbourhood, smart energy, cells evolution towards the long-term Cellular Smart Grid System, the ultimate Digital Energy Architecture, is in easy stages. **Maturity Level 1:** focuses on the Power Matching, in real-time (supported by the Community Grid Stabiliser – Hub with oneM2M Long Range Comms), of all new Renewable or Energy Recovery Generation by Local Consumption in real time based on Dynamic Energy (Auction) Values with surplus Energy taken up by batteries/flexible-devices being incentivised for speed of response to surplus and deficit situations. This forms the key building block of new Local Energy Markets which will become an invaluable resource for the DSO/DNO, relieving congestion and providing increasingly sophisticated (machine learning + ultraCap-driven dedicated power quality rectifiers). **Maturity Level 2** follows further investment within the Energy Community, in Flexibility Plant, into DSO-CSO integrated Smart Demand Response on an inter-cellular scale (i.e. Smart Cities and Towns) free of congestion issues. This prepares regulated Energy Communities for **Maturity Level 3:** automated Virtual Power Plant response by Dispatch and Ultra-Fast Frequency response and intelligent digital synthetic inertia.