

IEEE Blockchain-Enabled Transactive Energy (BCTE) Design Considerations

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Panel Session: Trading Electricity with Blockchain Systems
August 31, 2022, 4pm Paris time



IEEE BCTE Objectives

- **Overall Objective:** Create a common foundational understanding of blockchain-enabled transactive energy (BCTE) that enables global collaboration among regional groups to develop and launch innovative projects and initiatives.

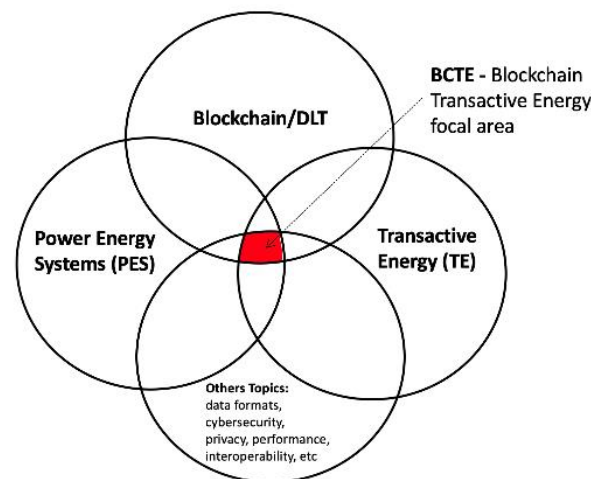
- **Specific Objectives:**
 - Elaborate the basic framework and principles for use of blockchain technology in power and energy domain in the emerging participatory grid, with a view to the most promising global Transactive Energy use cases which can be advanced toward broader commercialization using blockchain technology.
 - Identify use case demonstration projects and techno-political analyses covering the legislative and regulatory issues associated with instantiations of blockchain technology
 - Provide a cohesive structure that can align and grow worldwide local group contribution, which will be continuously refined and distributed through formal IEEE education and certification mechanisms.

Considerations in BCTE Design

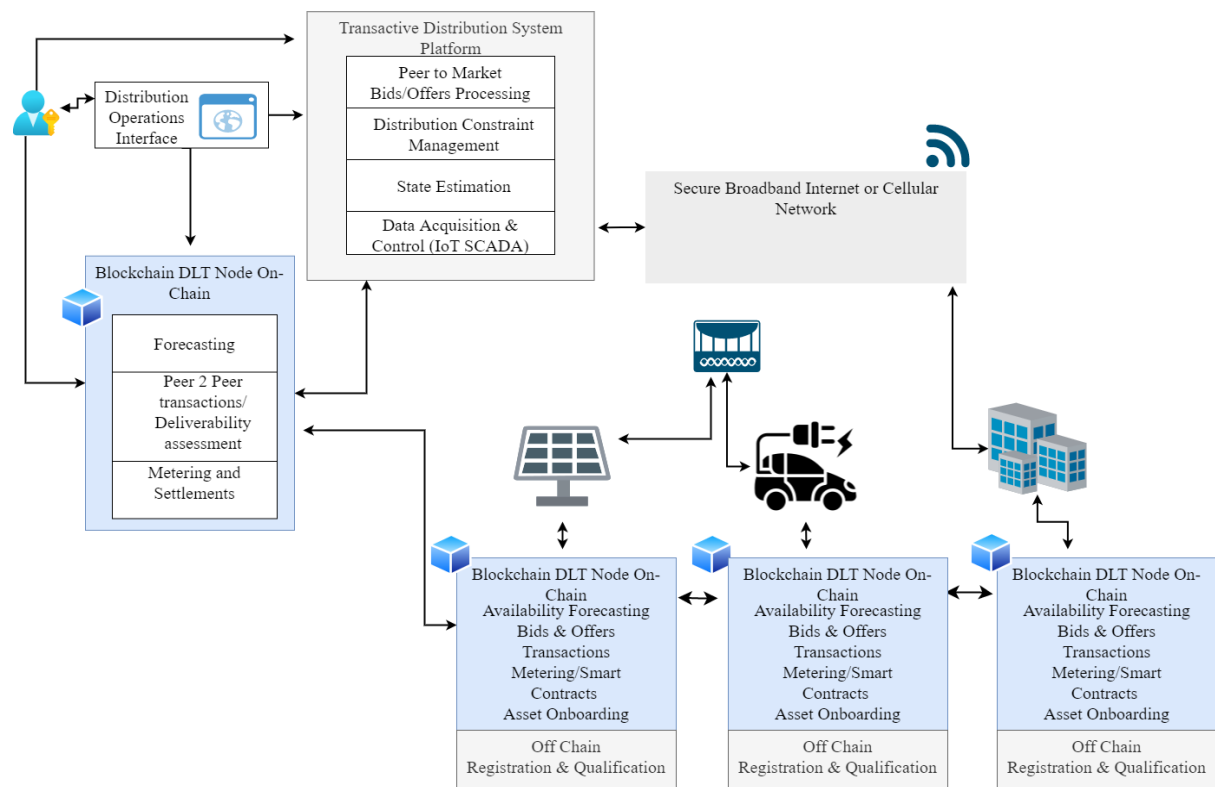
- Support peer-to-peer and peer-to-market transactions
- Support financial and physical transactions
- Support local and system-wide market transactions
- Support bid-based resolution of competing transactions deliverability vis a vis network constrained injections and/or withdrawals
- Prevent unintended impacts on the grid and third parties
- Support benefit allocation based on value generation
- Support grid use cost allocation based on grid operation cost causation

Areas of Standardization for BCTE

- BCTE is a common framework for blockchain usage, implementation, and interaction in blockchain transactive energy with different modules and intersection points with other technologies.
- The following are the main functional areas where BCTE requires standardization:
 - Data formats
 - Consensus algorithms
 - Governance models
 - Cybersecurity
 - Smart contracts framework
 - Reference framework
 - Interoperability



Application Example



Source: "Standardization of the Distributed Ledger Technology Cybersecurity Stack for Power and Energy Applications"; "Sri Nikhil Gupta Gouriseti, Umit Cali, Kim-Kwang Raymond Choo, Elizabeth Escobar, Christopher Gorog, Annabelle Lee, Claudio Lima, Michael Mylrea, Marco Pasetti, Farrokh Rahimi, Ramesh Reddi, and Abubakar Sadi Sani; **Sustainable Energy, Grids and Networks; Vol 28, December 2021.**

Concluding Remarks

- The electric industry landscape is changing due to decreasing cost and increasing penetration of renewable and distributed energy resources
- Prosumers (including Smart Buildings, microgrids, and other DER operators) are increasingly demanding to become active energy market participants
- Conventional electric grid processes, procedures, and tools are inadequate to meet the prosumer economic incentives while targeting the grid operator reliability objectives
- Blockchain-enabled transactive energy (BCTE) systems can fill in the gap to the benefit of the prosumers, consumers, and grid operators
- IEEE BCTE initiative provides the framework, architectural, and platform requirements for BCTE systems

Questions?

Thank You!
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