



# CELTIC-NEXT Online Proposers Day

29th November 2018



## Pitch of the Project Proposal Power & Energy eXchange (PEX)

*Cybersecure & Faster Blockchain Communications  
Networks to Enhanced Frequency Response in Dist. Services Ops (DSO)*



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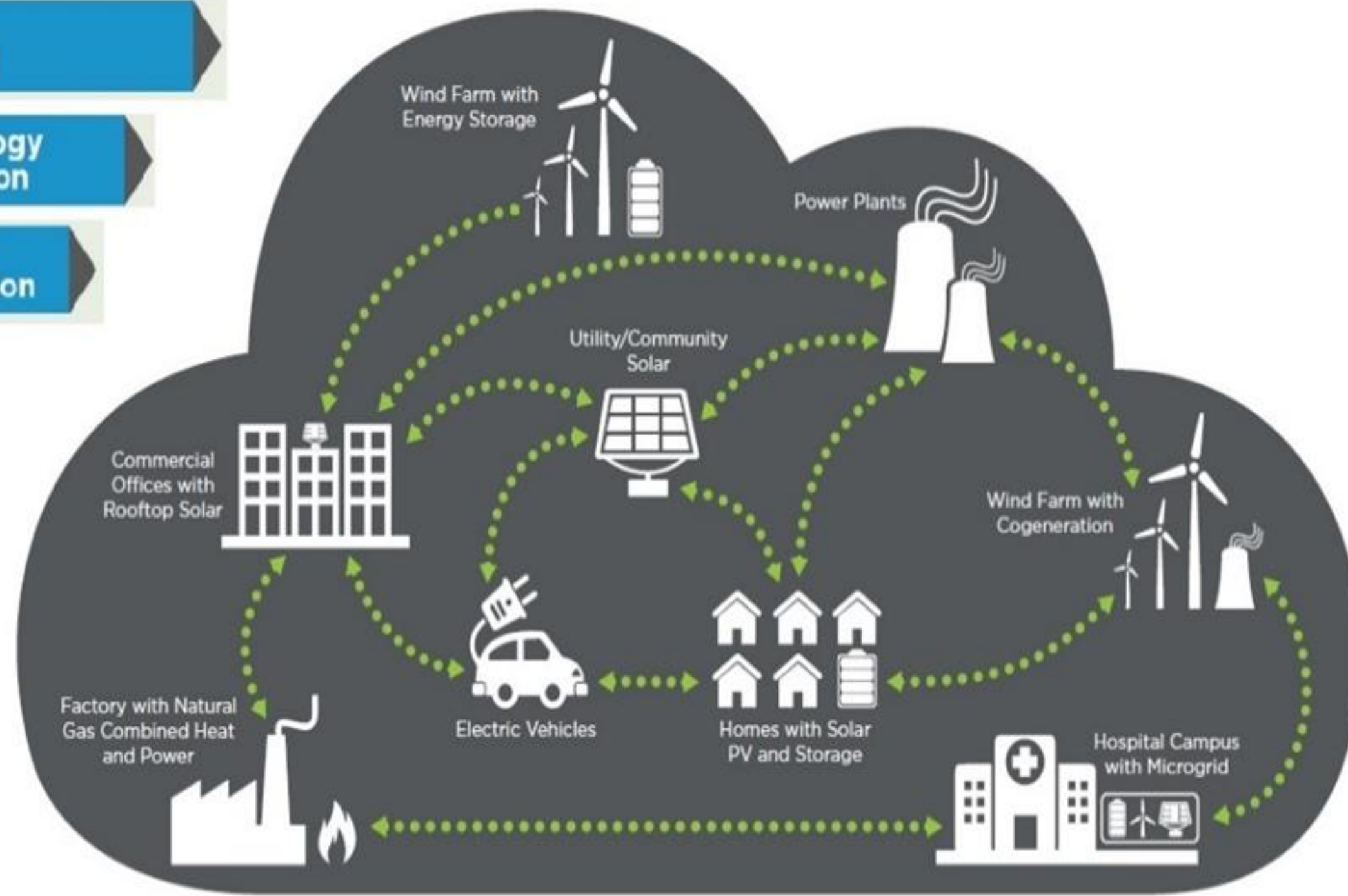
Figure 2.1 The Emerging Energy Cloud

TODAY: ONE-WAY POWER SYSTEM



Market Demand  
Technology Innovation  
Policy & Regulation

EMERGING: THE ENERGY CLOUD



**PEX™ uses Blockchain, artificial intelligence machine learning.** disruptive operates smart contracts **in real time.**

Transactions Data ledgers is shared distributed machines (set of sensors to react to it, meter it, and bill for it instantly. Cost/transaction is near-0.

Centralised transactions are too slow, expensive, exclusive and vulnerable to attacks launched from low-cost IoE endpoint devices, without incentive to incur the cost of a security stack.

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**New Communications technologies must enable pervasive connectivity and cybersecurity to IoE: Wireless 5G, Gbps Wi-Fi, new controls, virtual beacon, and low power, long distance radio frequency**



# Organisation Profile



*TSI-eco founded in 2012 in Canada based on Telecom Services International – TSI since 1981 who developed and operated Real-Time Digital Telecom eXchanges in Canada, Australia & Europe. It leads the Canadian Electric Grid Innovators (CEGI) Consortium in 2017, experts in real-time simulation with telecom, energy, grid & microgrids, power electronics and artificial intelligence (AI).*

***Mission:*** *to develop transactive energy exchange with ultrafast communications between machines that manage the Grid to Microgrids at independent producers and Prosumers to advance renewable and cleantech for energy flexibility, improve security & resiliency of grids, reliability of prosumers and incentivize more integration in electric grid, reduce the operating costs for stakeholders.*

*Now seek European participation for integrating electrons and communications exchange flows solving global and practical solutions to the energy via the Grids.*

# IoE + 5G Project: Outcomes, Impact



*IoE transactions decentralised producers and energy grid machine2machine.*

*Blockchain to get consensus needing to fast enhance the frequency of the Grid.*

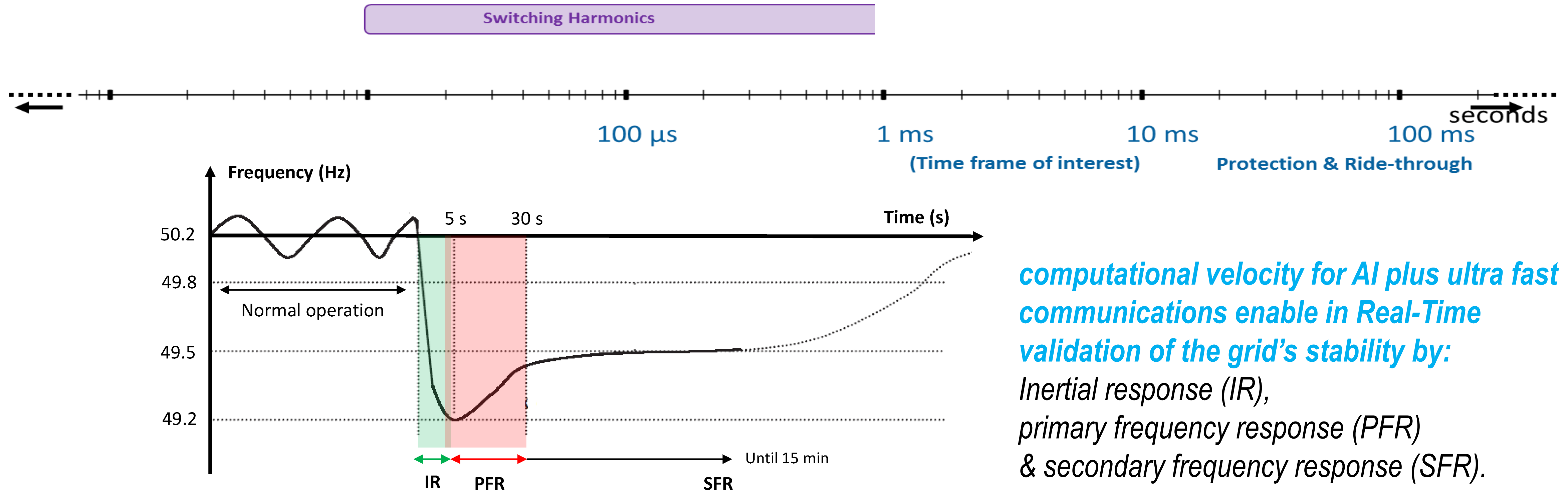
*5G Real-Time Communications for ultrafast and cybersecure deployment, lower latency, reduced latency, higher availability with no need for back-up power/site, multiple links for failure tolerance and mobility,*

*Transactional energy eXchanges: Smart Contracts: power (MW), energy (MWh), carbon credit certificates*

## **Benefits:**

- *Transparently price for Power & Energy service*
- *Cost-effectively deploy non-emitting generators in microgrids*
- *Load Serving Entities, Independent Producers and Prosumers to trade energy-as-a-service*
- *cybersecurity*
- *resiliency of the electric grids,*
- *Cost reductions for electric consumers and operators,*
- *Incentives to reduce greenhouse gas (GHG).*





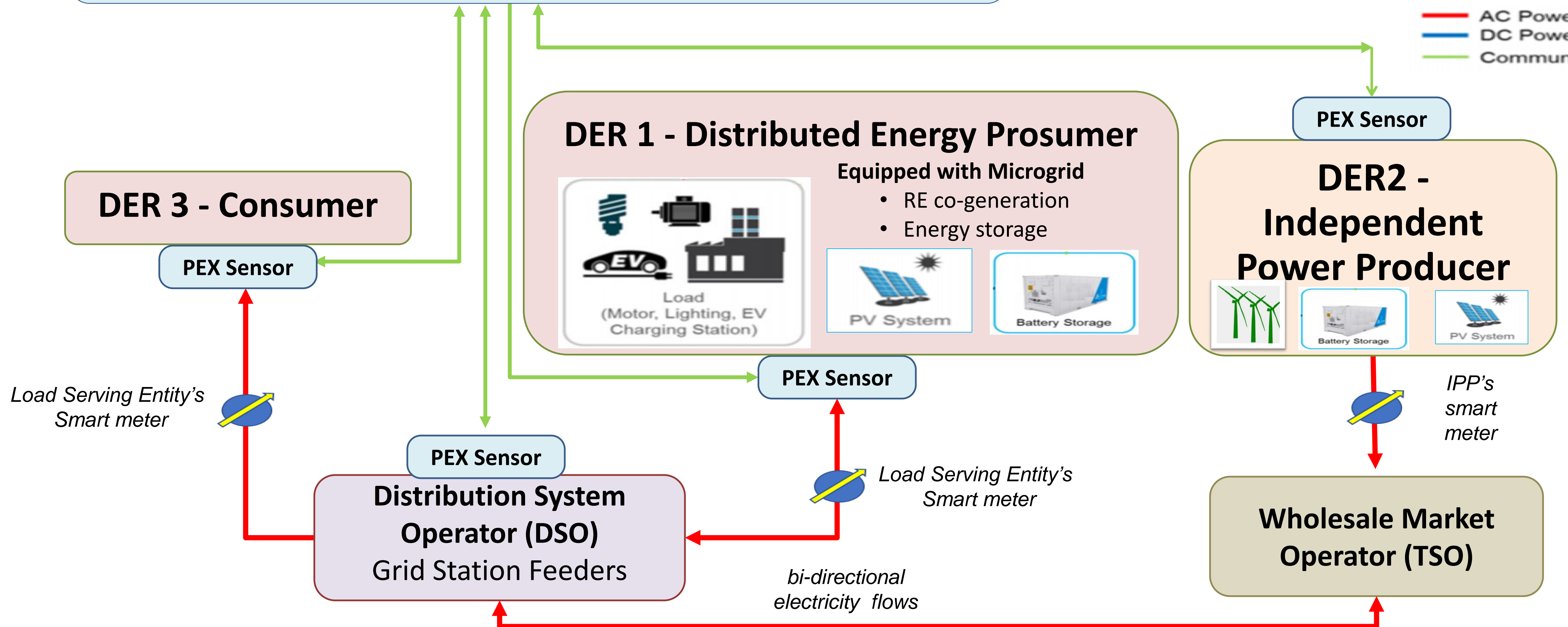
## PEX MUST:

- 1) Dispatch power capacity to each local grid as required to correct the frequency excursion events (FEE)?
- 2) DER can auto-detect FEE, post a smart contract to sell an enhanced frequency response (EFR) for 1-30 secs.
- 3) Distributed Service Operators (DSO) & Wholesale Grid Operators' machines buy Smart contract by consensus.
- 4) Compensate DER for exporting capacity avoiding brownout/blackout events?
- 5) Control amplitude/duration of DER's reverse power flows.

## PEX Trading/ Routing/ Settlement Platform

with a more fluid digital currency: **PowerCoin™** to BUY/SELL smart contracts using artificial intelligence (AI) technologies for Distributed energy resource (DER).  
Blockchain gets Consensus to trade between all affected stakeholders in real-time.

— AC Power  
— DC Power  
— Communication



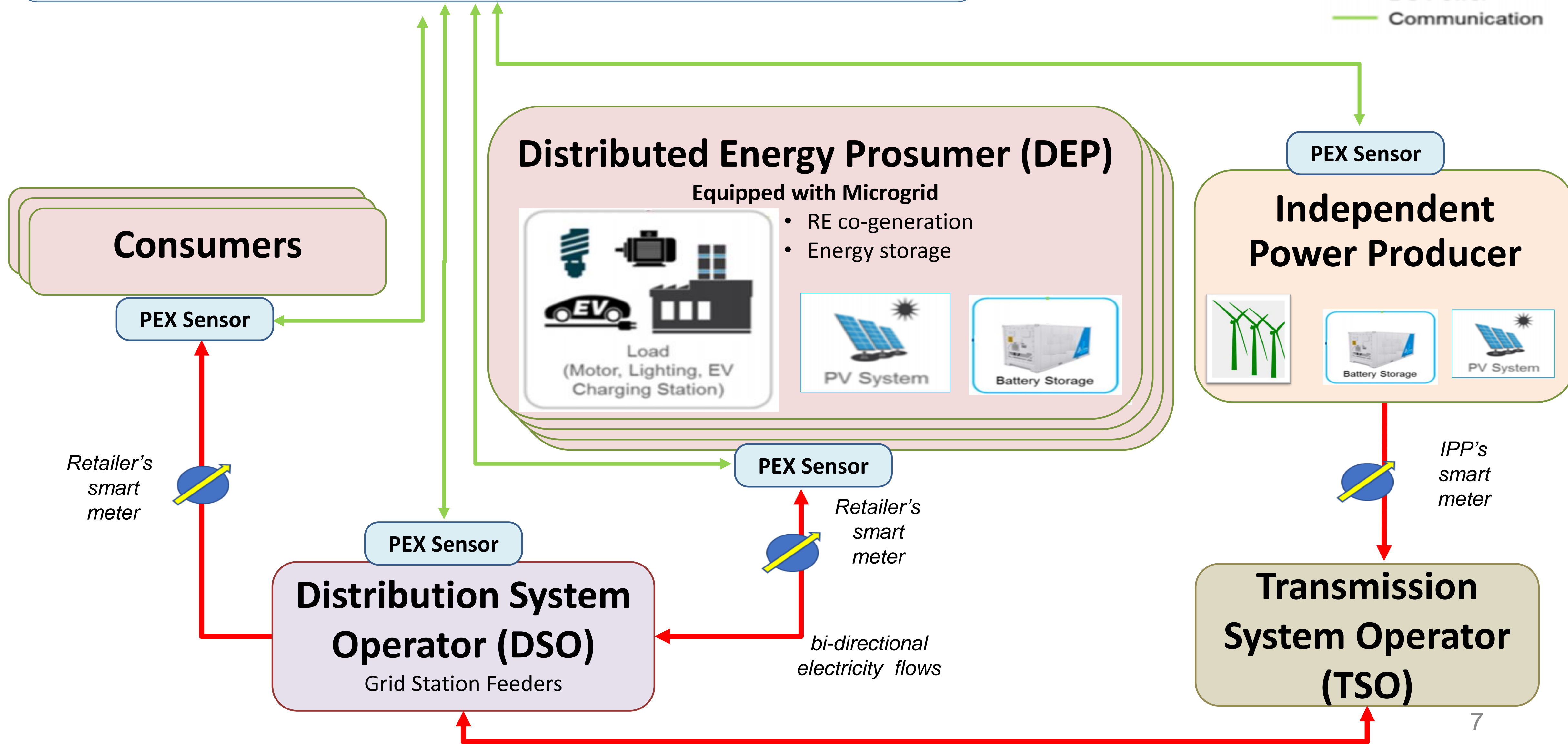
# PROJECT3: PEX for Multi Microgrids, DSOs, TSOs, IPPs

BUY/SELL orders between all with Blockchain smart contracts

Digital Currency: PowerCoins™

## Multi Microgrids Model under load

— AC Power  
— DC Power  
— Communication





## Develop Grid to Microgrid Test Bench with AI for Ultra Fast IoE **Communications**

- *Real-time simulator of electrical ultrafast networks and electrical equipment of various manufacturing partners, allowing testing of local equipment controllers (faster algorithms) intelligent controllers for IoE transactions, power management and stability control of power grids.*
- *control algorithms with "Deep Learning" methods or other artificial intelligence algorithms.*
- *simulator makes it possible to train the machine learning algorithms, allowing multiple scenarios, with learning which ensures a high reliability of the solution offered before its implementation on site.*
- *also test algorithms and behavior of the solution offered in critical scenarios such as network faults, provide a complete proof of concept and make the necessary adjustments for the integration of the technos in the network.*



# Partners



*Existing **Canadian Electric Grid Innovators (CEGI) Consortium** with large Canadian partners covering all the Grid's technologies.*

*Involved partners: TSI-eco, Opal RT, Blinkless, ETS, UWaterloo, SNC Lavalin, Erarge, Greeneum, Afcon, Région-Capital*

*Involved countries: Canada, Sweden, France, Israel and Turkey*

*Looking for partners (Eurogia 2020 & Celtic-Plus) clusters for joint development of Enhanced Frequency Response & Demand Response services and Cybersecure capabilities to implement Blockchain & AI in the PEX-5G*

- Grid's resiliency, Prosumer's reliability, Demand Response, Peak Shaving,*
- Familiarity with Intermittency BrownOut/BlackOut facts in their grid.*
- Partners: Grid suppliers IPP, ISO/TSO, EPEX Spot Market and DSOs.***
- 5G real-time communication and simulation*
- Partners: 5G vendors, operators and developers.***
- AI Developers within 5G, machine2machine and Blockchain Smart Contracts*
- Investors*

# Contact Info



CELTIC-NEXT

Next Generation Telecommunications

*For more information and for interest to participate please contact TSI Services Management Inc. (TSI-eco)*



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