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LOCAL TRANSACTIVE ENERGY MARKETS TO SUPPORT THE ENERGY TRANSITION

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Chaire de recherche d'Hydro-Québec: Gestion transactionnelle de la demande résidentielle en puissance et en énergie.

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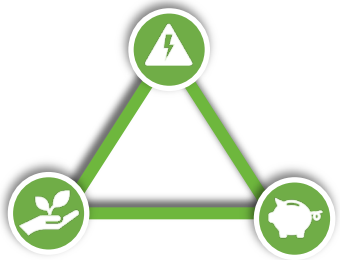
Energy Transition

Energy security



Environmental sustainability

Energy equity

Opportunities:

- ✓ Decarbonisation
- ✓ Customer engagement
- ✓ Decentralization
- ✓ Sharing Economies
- ✓ Digitalization
- ✓ Deregulation

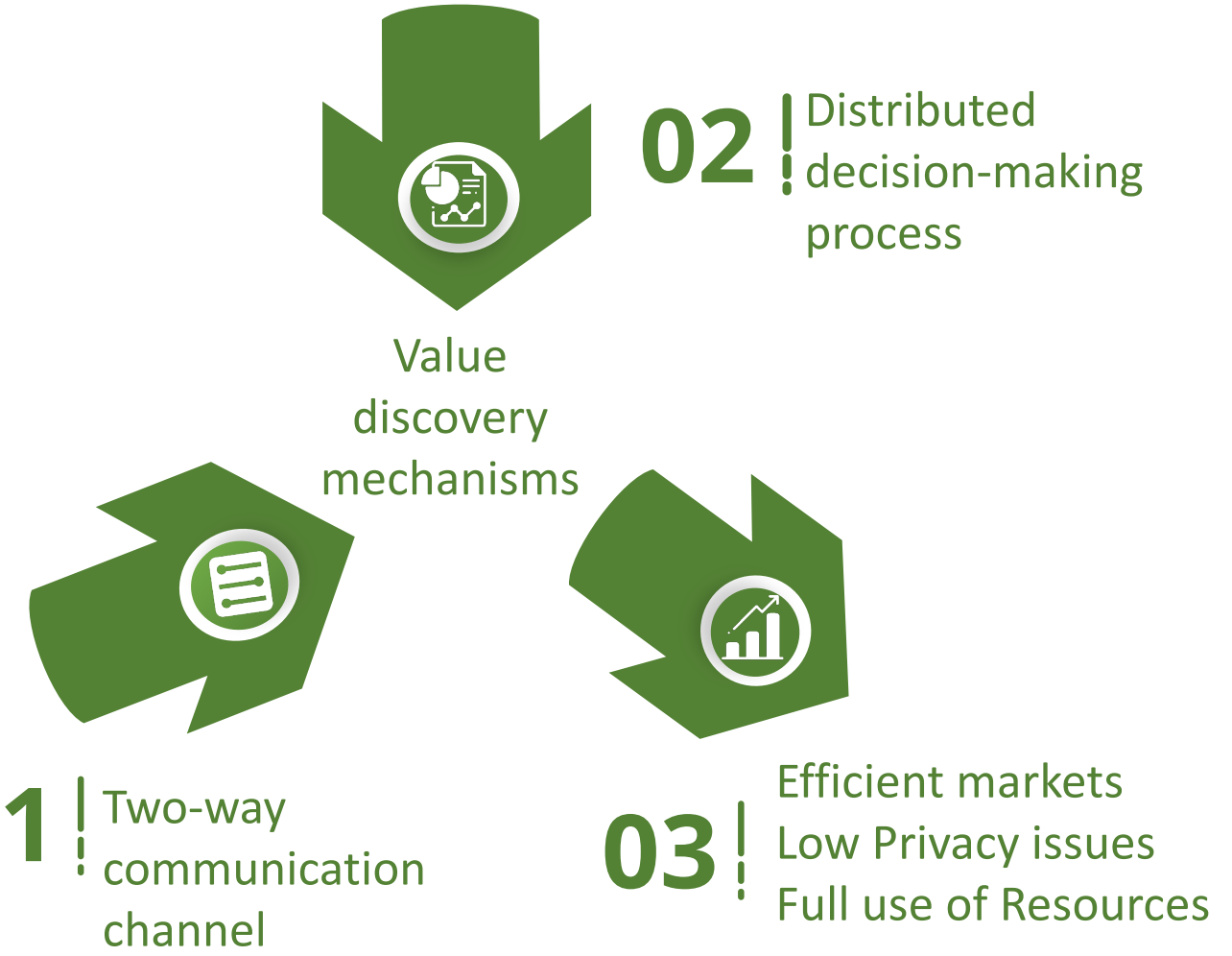
Challenges for power systems:

- × Incorporate intermittent and variable resources
- × Keep resilience and reliability constraints
- × Deal with low inertia systems
- × Coordinate local and wholesale markets
- × Create value for end-users

Source: World Energy Council. (2021). World Energy Trilemma Index 2021. https://www.worldenergy.org/publications/

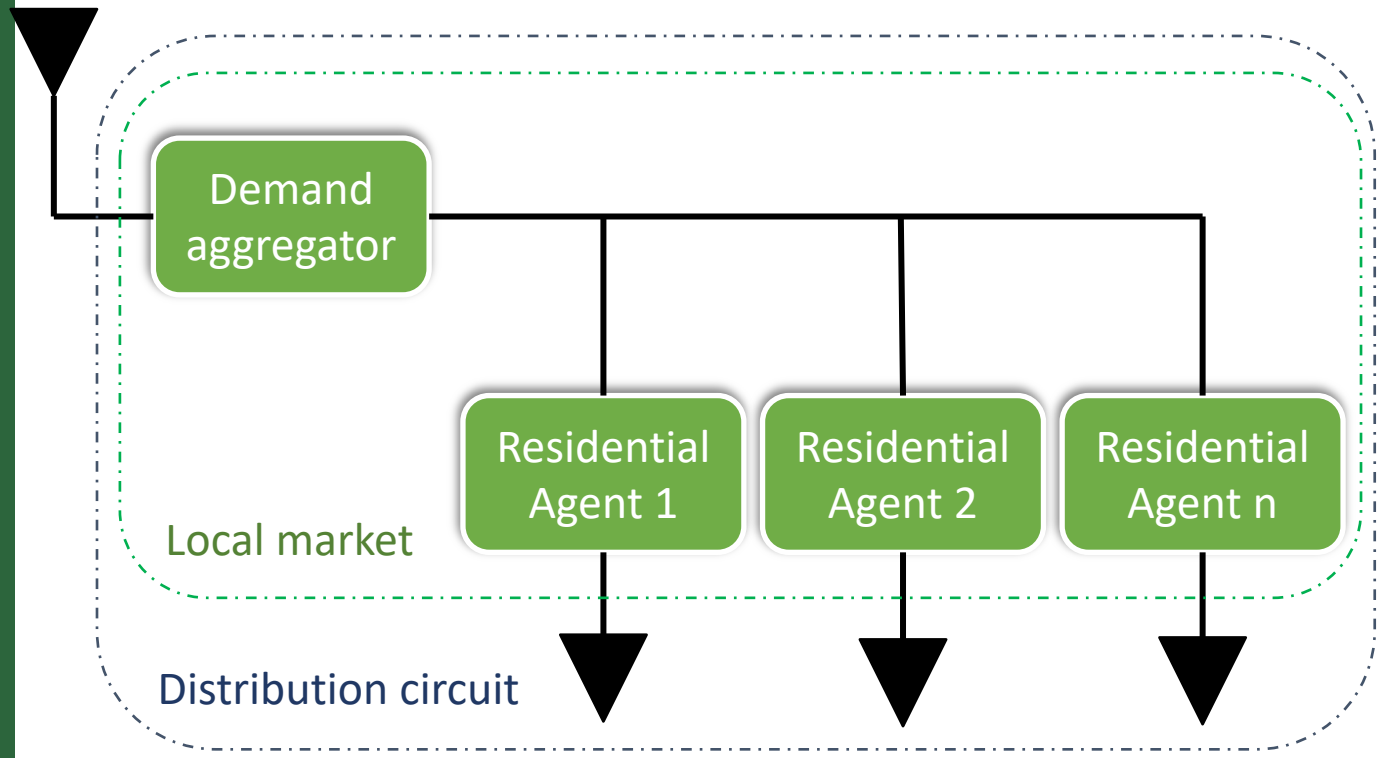
Transactive Energy (TE)

"A system of economic and control mechanisms that allows the dynamic balance of supply and demand across the entire electrical infrastructure using value as a key operational parameter."*



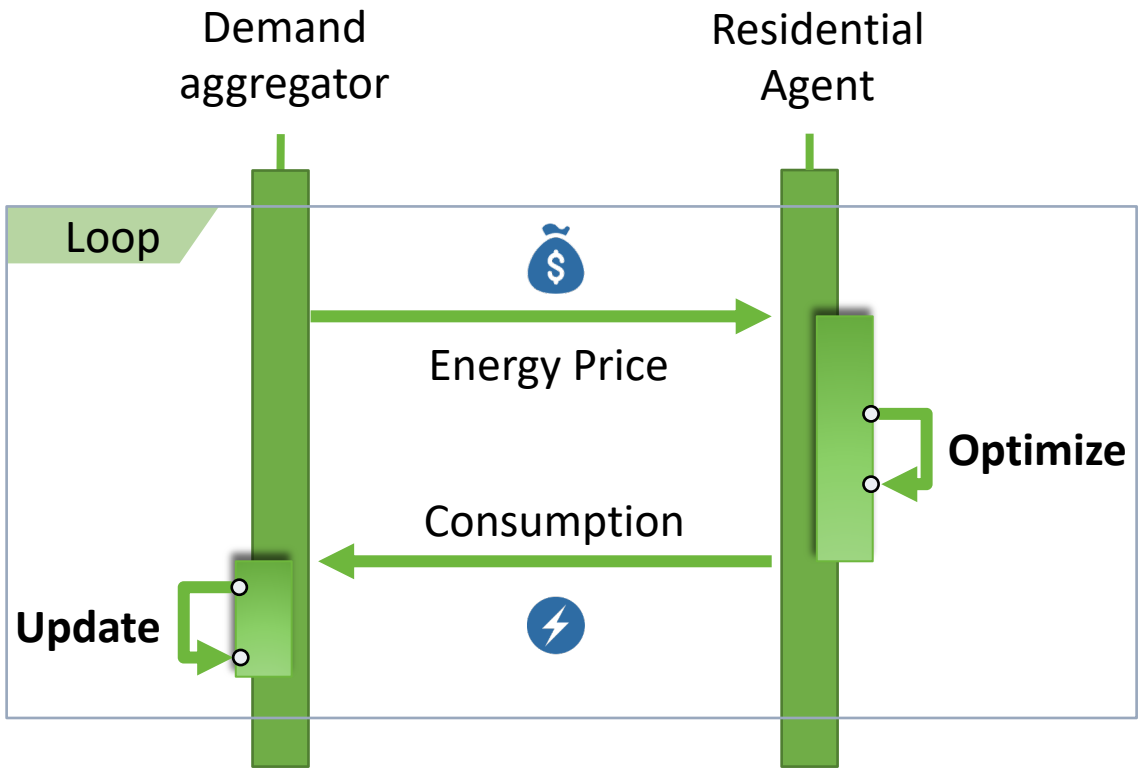
*GridWise Architecture Council, & GWAC. (2019). GridWise Transactive Energy Framework., 1.1, 1–23. https://doi.org/PNNL-22946

Local Forward TE market

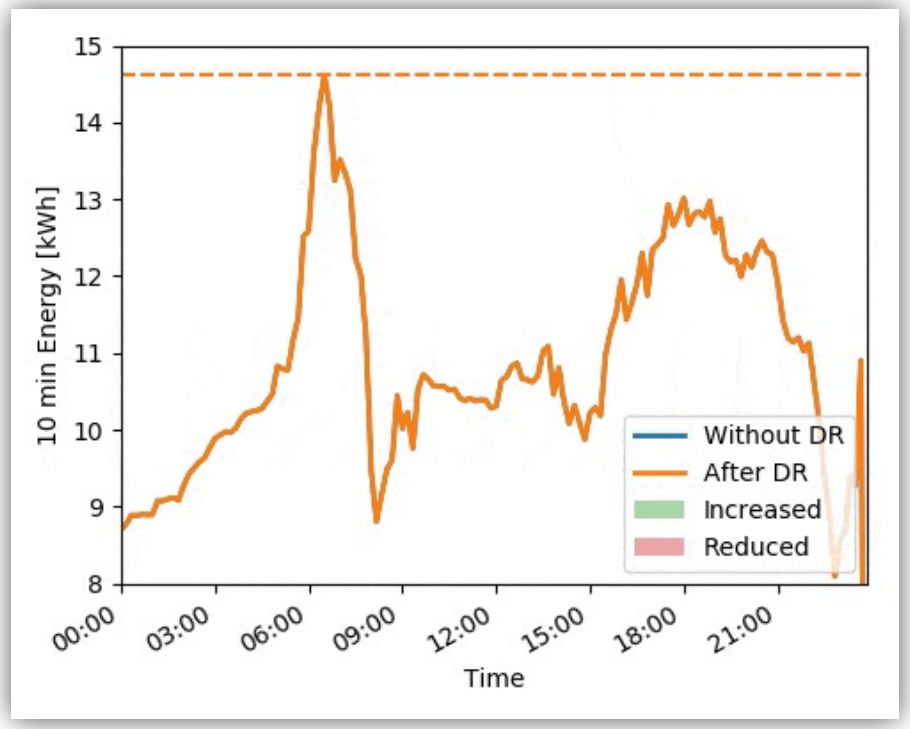


- ✓ Distribution circuit in a large power system
- ✓ Power system big enough to absorb imbalances
- ✓ Customers are followers and one demand aggregator plays as leader
- ✓ The leader advantage should be regulated
- ✓ The only commodity in trade is active energy
- ✓ The market is cleared day-ahead

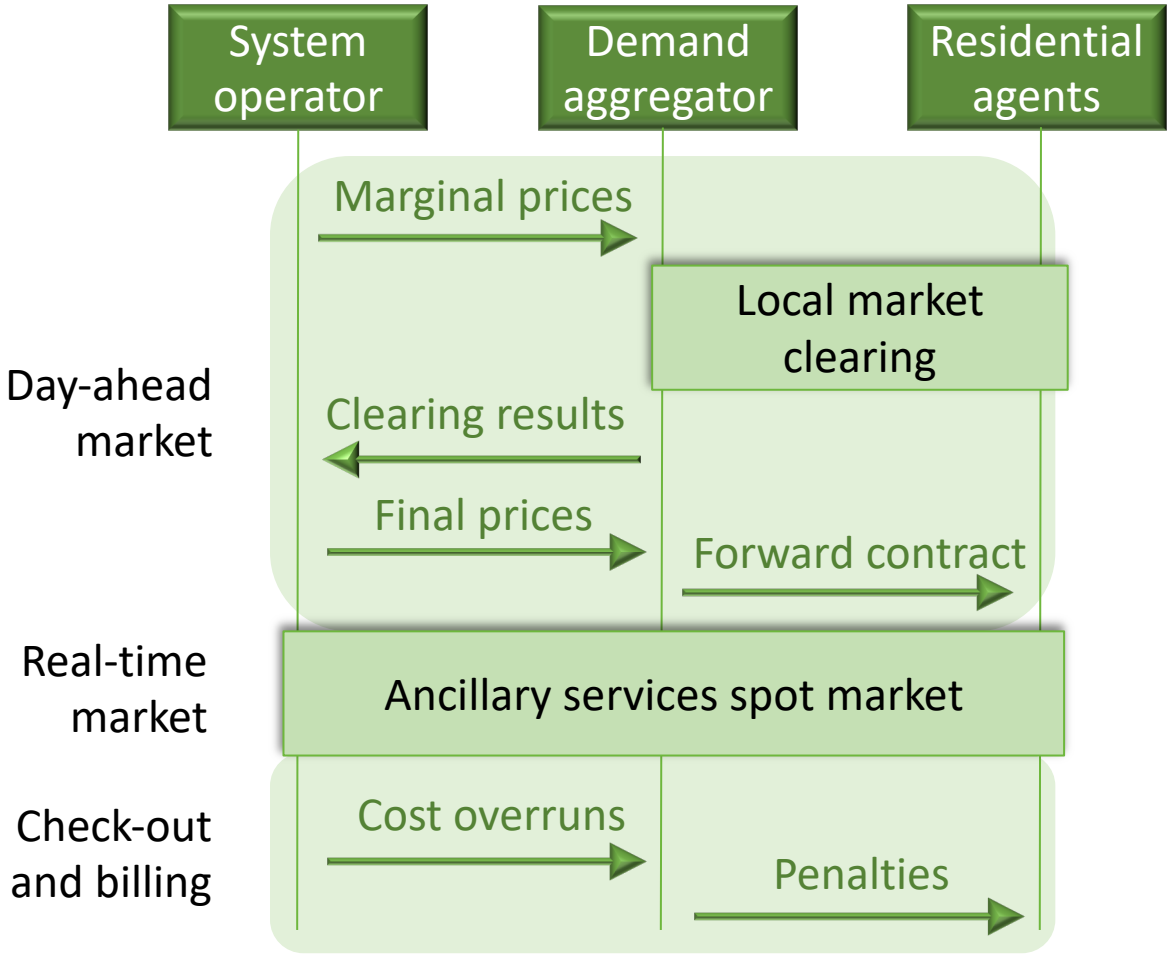
Market clearing mechanism



Peak reduction example



Fully integrated TE



Requirements:

- ✓Smart-grid infrastructure
- ✓Residential agents
- ✓Standards and interoperability
- ✓Data security and privacy

Conclusions

- ✓Demand aggregators will help to integrate TE local markets with wholesale energy markets and to engage customers
- ✓Demand aggregators can find market equilibrium points by parametrizing customers responses instead of using intrusive methods
- ✓The monopolistic position of demand aggregators should be regulated to guarantee a level of economic efficiency

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THANK YOU - MERCI!