



# Understanding the Impact of Human & Corporate Behaviours on DSO Planning

## #364

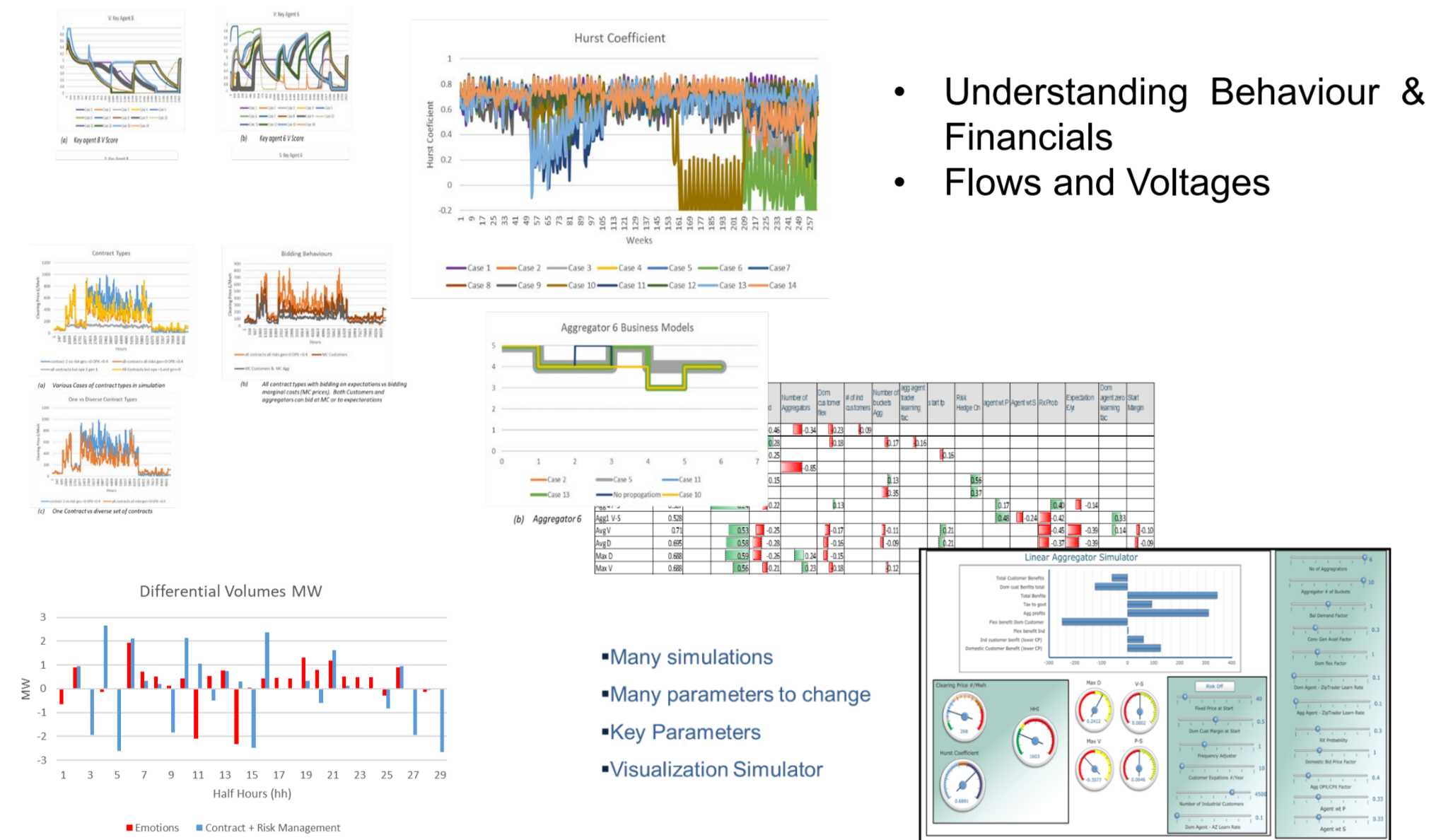
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### Challenges/Direction of Travel

- ❖ DNO/DSO's are looking for solutions to challenges in the electricity system, such as carrying increasing amounts of energy generated from renewable and low carbon sources & flexibility provision
- ❖ New actors & behaviours e.g. domestic customers (DSR), Aggregators
- ❖ Aggregation key to flexibility incorporating DSR but actors actions impact upon DSO/DNO long range planning, system operations and flexibility requirements
- ❖ Need for simulation environments to answer key questions!
- ❖ Social science researchers have started to develop conceptual frameworks, but so far no computational model incorporating emotions and social interaction in the power domain exists.
- ❖ Also Need to consider competition effects between aggregators.
- ❖ The paper discusses the development of a new agent-based modelling tool called **PyEMLab-Agg**, which incorporates human behaviour, contract and risk management, and business model selection in the simulation of power grids.

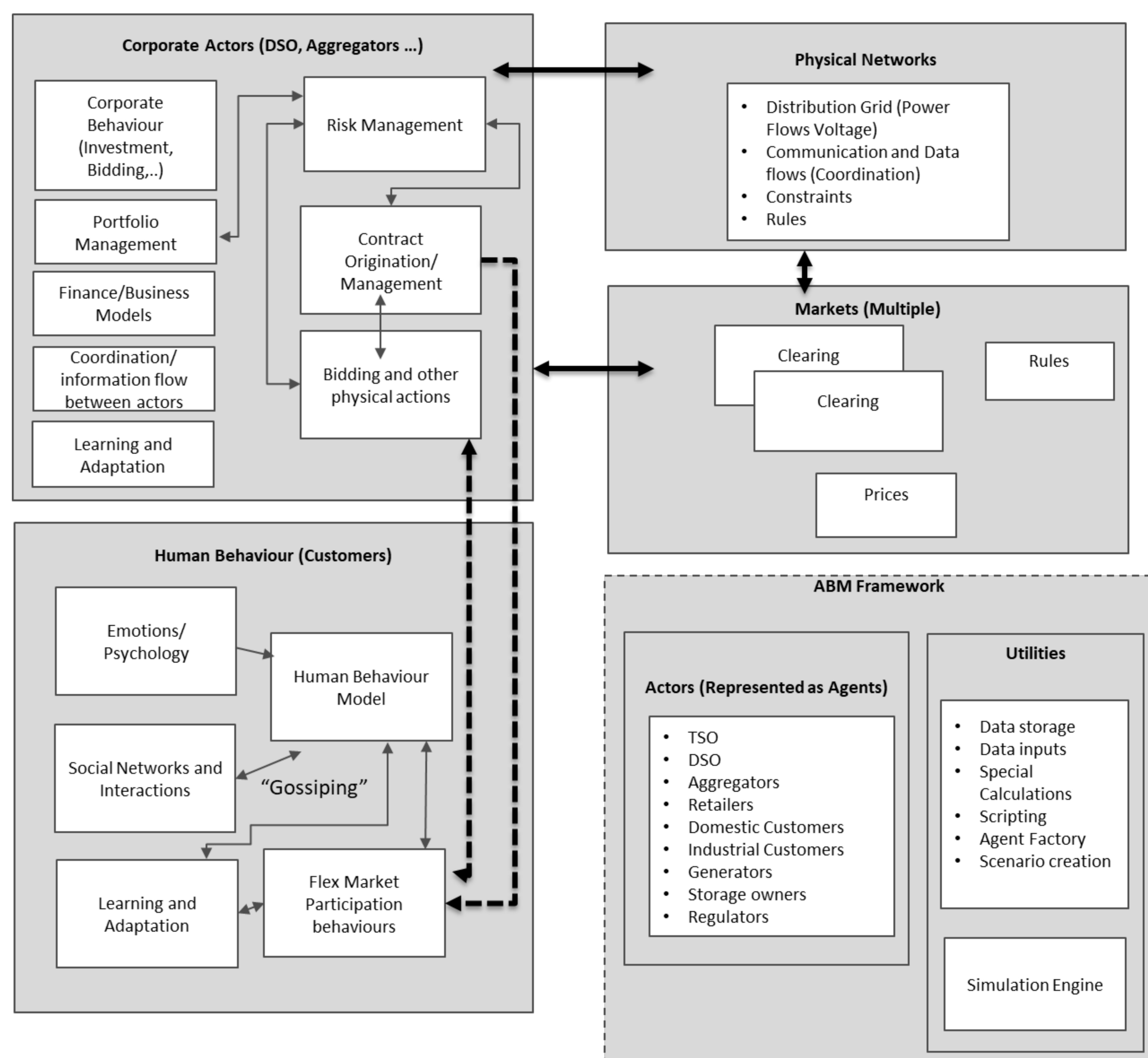
### Example Output



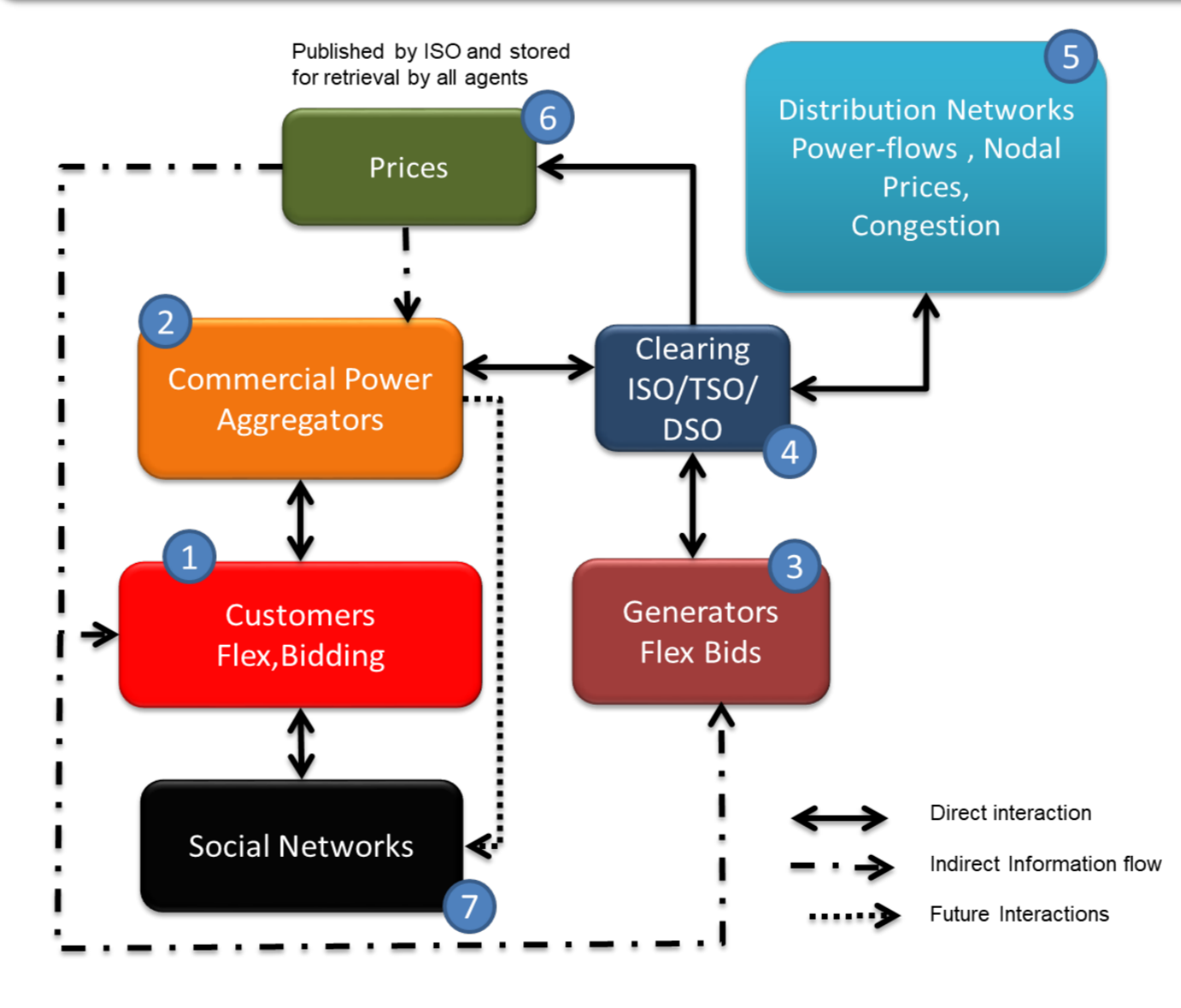
### Conclusions

- ❖ Preliminary simulations using PyEMLab-Agg show that evaluating Distributed Network Operator (DSO) flexibility markets without considering consumer sentiments and social interactions can result in an over or underestimation of average market pricing by 20% to 50%.
- ❖ The inclusion of human and corporate behaviors in the simulation is important for accurately predicting system power flows and market prices, which can help DSOs improve their ability to host additional capacity on their systems.
- ❖ The PyEMLab-Agg framework includes modules for corporate actors (aggregators) to assess past performance and forecast the performance of future business models, as well as adjust and bid for new customers on a monthly basis.
- ❖ The tool also incorporates a novel extension of the Agent\_Zero framework to model emotions, economics, and social impacts, including a large social gossiping network that affects emotions and provides a social network dimension to customer behavior.

### Simulation Environment PyEMLab-Agg



### ABM Actor Interactions



### References

- [1] D. Cliff, "ZIP60: Further explorations in the evolutionary design of trader agents and online auction-market mechanisms," IEEE Transactions on Evolutionary Computation, vol. 13, no. 1, pp. 3-18, 2009.
- [2] J. M. Epstein, Agent\_zero: Toward neurocognitive foundations for generative social science. Princeton University Press, 2014.
- [3] L. de Vries, E. Chappin, and J. Richstein, "Emlab-generation: An experimentation environment for electricity policy analysis," TU Delft, 2013.