

The logo for RQEI (Réseau québécois sur l'énergie intelligente) features the letters 'RQEI' in a white, sans-serif font. The letters are positioned within a dark green square, which is part of a larger graphic consisting of overlapping squares in shades of green and yellow, creating a pixelated or mosaic effect.

RQEI

Réseau québécois sur l'énergie intelligente

Decentralized Transactive Energy Control (TEC) in Digitized Smart Power Grid

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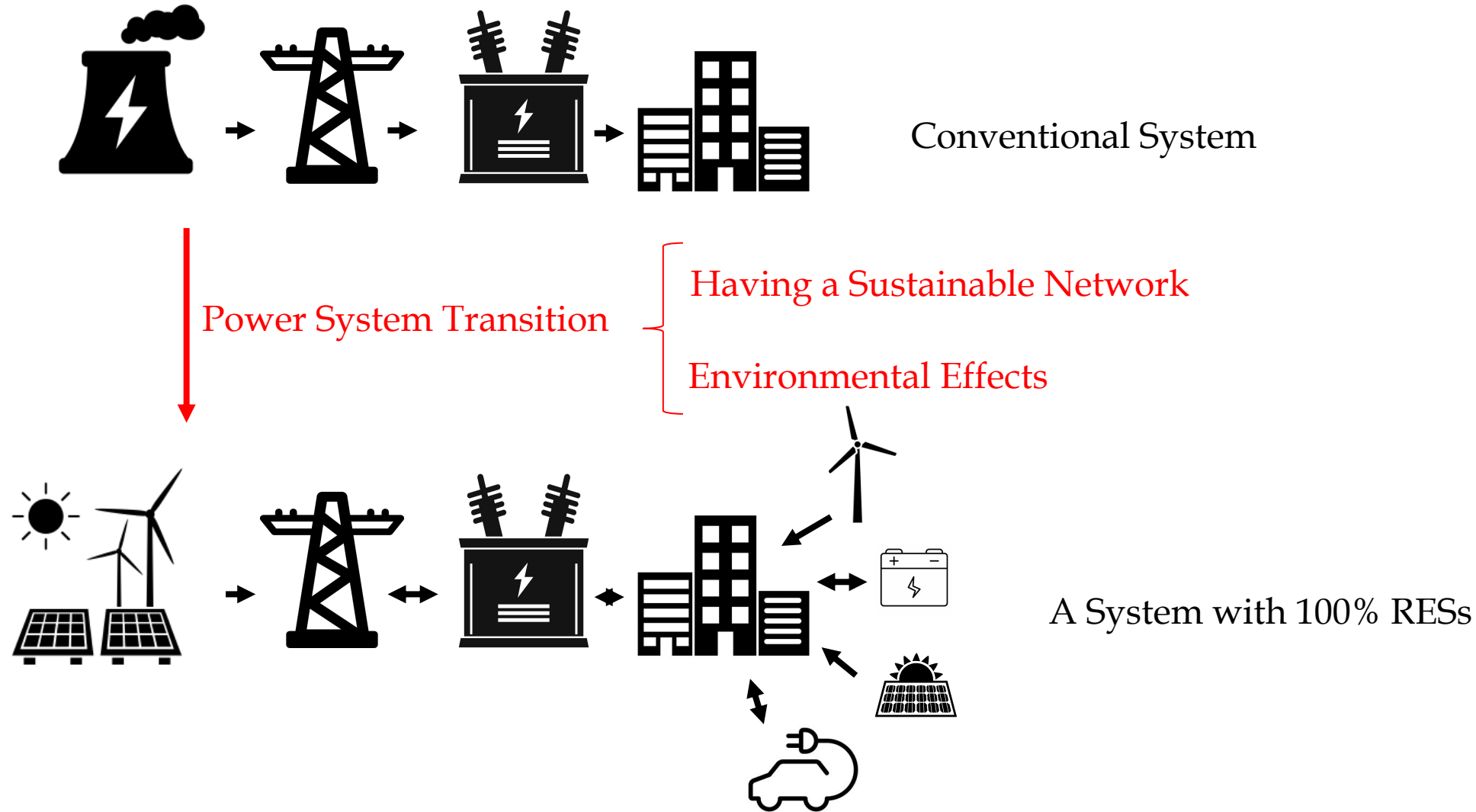
Dr. Masoud Mohseni



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Power System Transition and TEC Concept



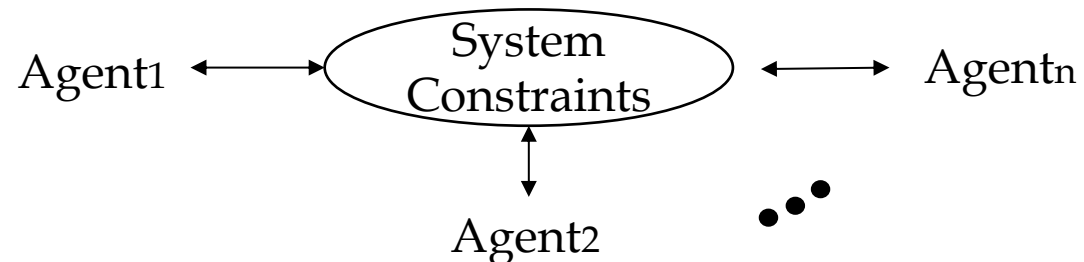
Power System Transition and TEC Concept

How to Control Such a System? Using TEC ☺

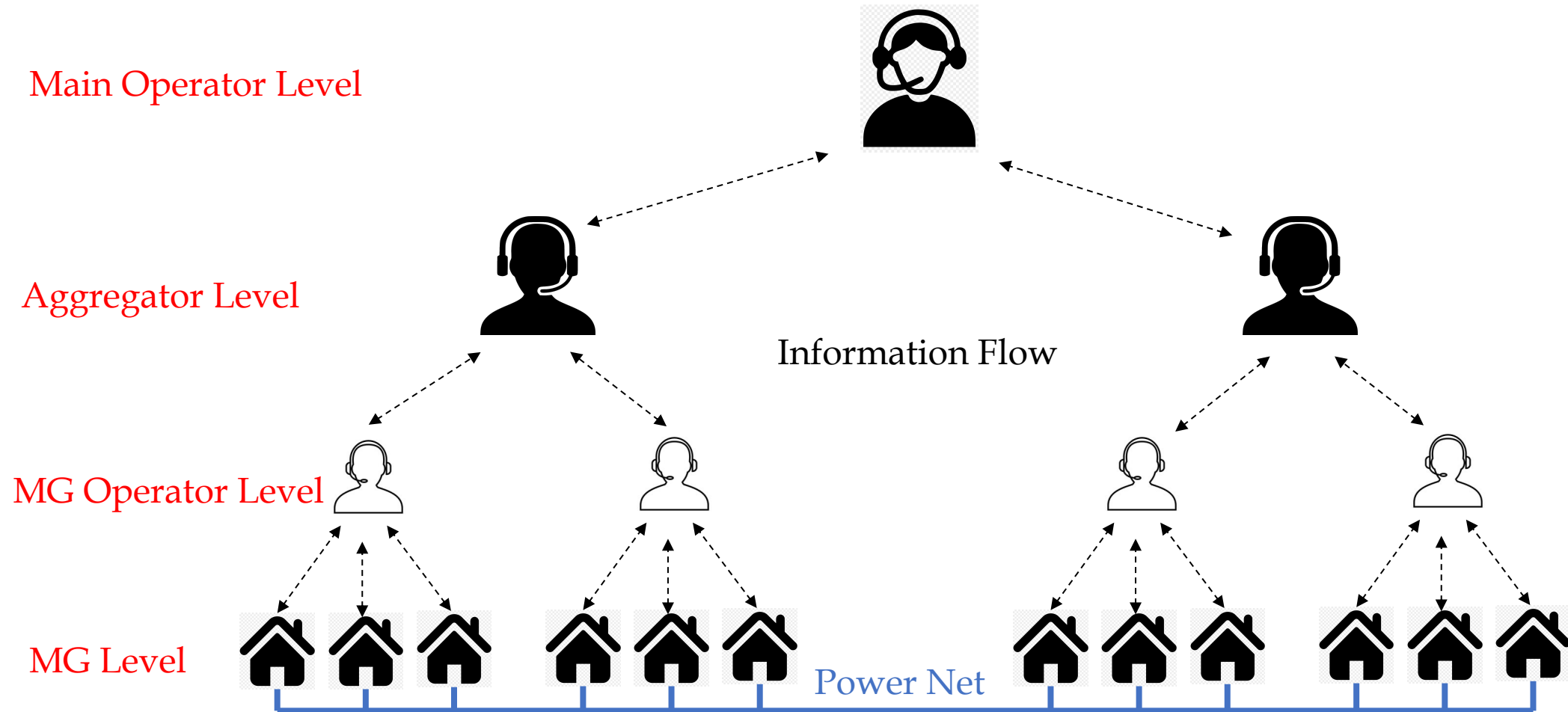
TEC: Utilizing the available **flexibility** to control and satisfy systems' constraints by market mechanism and **decentralized participations**

Flexibility {
Storage Systems (e.g., Battery, Hydrogen, and Thermal storage system)
Flexible Loads (e.g., HVAC, TCL, and Smart Appliances)

Decentralized Participations:



A Distributed Hierarchical TEC Model



A Distributed Hierarchical TEC Model

Features

Security of each agent is preserved

Converge Speed is improved

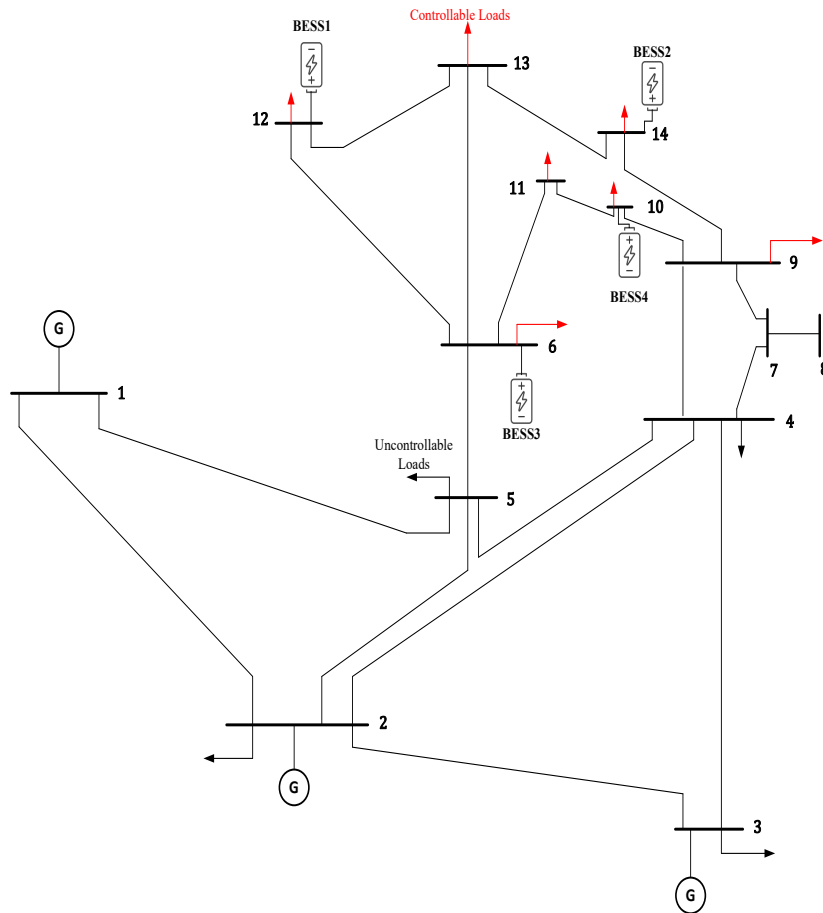
Less band-width is required for sending/receiving information

Multi-Area Power Transformation is possible without sharing secure data

Exploitation of demand flexibility in a accurate way without forecast

Distributed uncertainty management

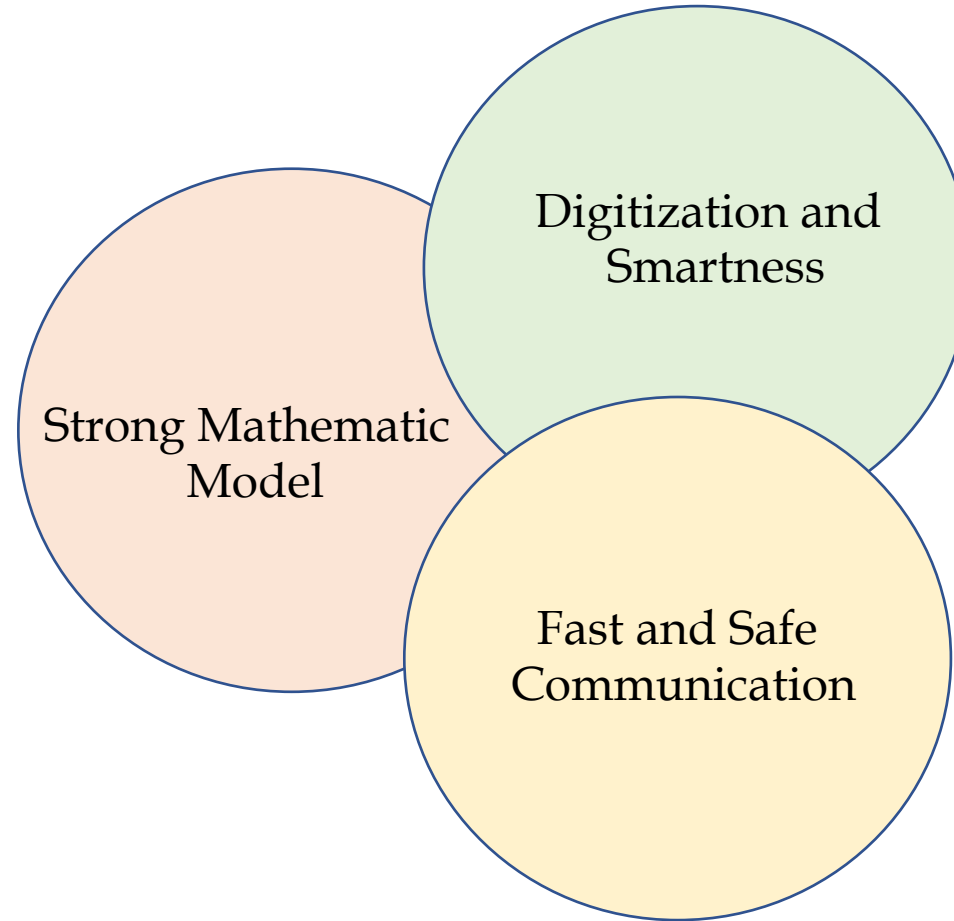
An Example of Implementation



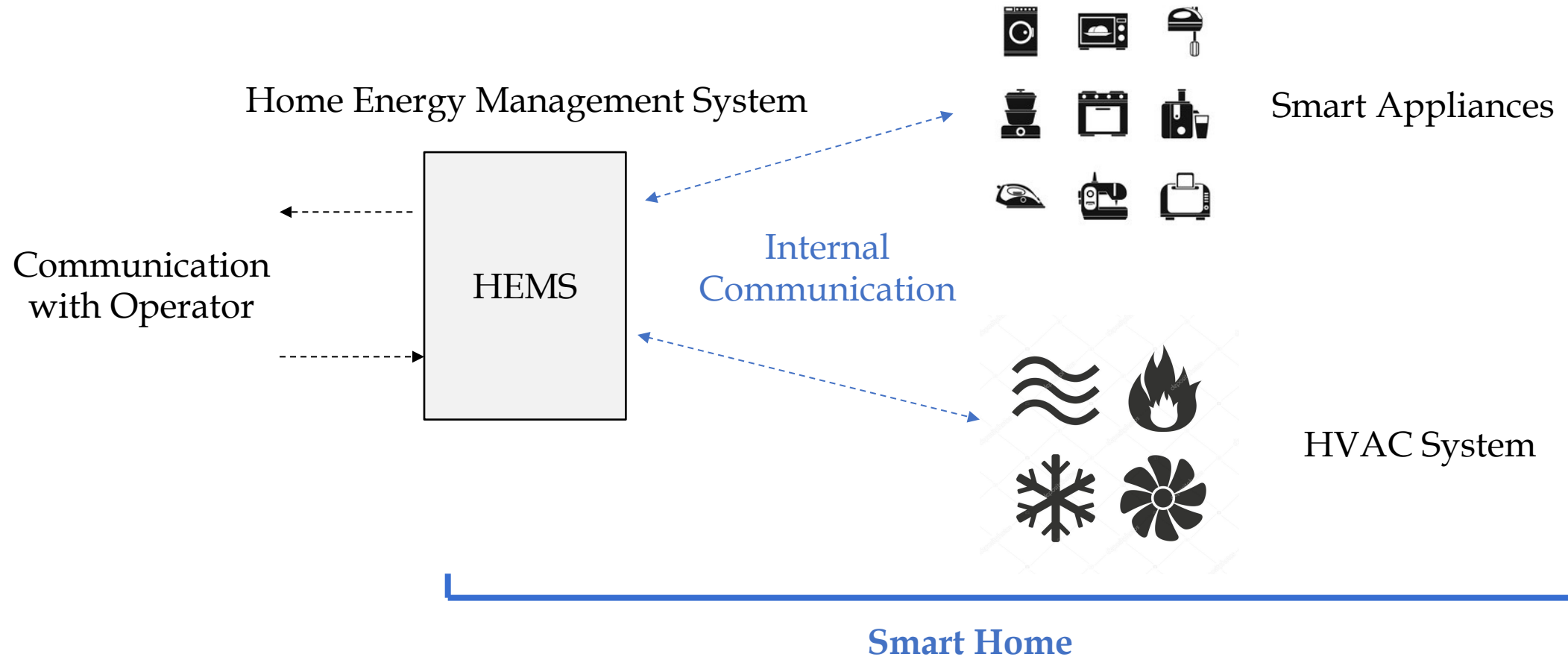
	Without DR and BESS	With DR	The proposed Method
Lines	Occupied Cap (%)		
1-2	84.222	76.262	62.515
1-5	77.751	71.052	70.761
2-3	153.598	100	100
2-4	151.35	100	53.867
2-5	78.596	75.65	49.213
4-3	57.562	55.661	8.576
4-7	76.757	70.702	36.442
4-9	36.034	32.011	17.108
5-4	210.542	100	89.560
5-6	179.52	100	44.716
6-11	37.322	34.583	22.864
6-12	27.437	25.655	6.636
6-13	61.835	57.012	33.794
7-9	107.94	100	51.247
7-8	0	0	0
9-14	24.601	23.424	9.529
10-9	37.667	35.054	16.573
11-10	21.939	20.111	34.296
12-13	13.829	13.066	36.085
13-14	44.489	42.937	35.268

The Role of Digitization in TEC

TEC Requirements:



The Role of Digitization in TEC



Thanks For Your Attention

Nowadays, energy system is not an infrastructure, but it is the infrastructure of all infrastructures.

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