Introduction

This task is designed to test your ability to solve energy system optimisation problems. You should use open-source software (e.g., Python or Julia) to complete the task. The code you develop should be shared with the interview panel using an appropriate platform. You must also prepare a short (5 minute) presentation covering your solution and discussing the results.

The Task

There are three houses on a rural street. They have a variety of low-carbon technologies as shown in the table below.

	House 1	House 2	House 3
Generation	Solar PV – 3kWp		Solar PV – 4kWp
Storage	Energy Storage 2kW/4kWh	Energy Storage 3kW/6kWh	Energy Storage 4kW/8kWh

All three houses have a variable energy tariff, and the heat pumps are not considered controllable. Come up with an optimal schedule (minimising energy cost) for the energy storage systems in the following scenarios:

1. Each house is behind its own meter and peer-to-peer trading is not permitted.
2. All three houses are behind a single meter.

On page 2, half hourly data are provided for the demand of each house, the PV generation, and the electricity price (import and export).

If you require any additional data, you should find it using appropriate sources. If you need to make any assumptions these should be explained and justified within the code and the presentation.

Data

	Demand (kW)			Solar Generation (kW)			Electricity Price (p/kWh)	
	H1	H2	H3	H1	H2	H3	Import	Export
00:00	0.452	0.5	0.188	0	0	0	10.3425	3.86
00:30	0.32	0.352	0.092	0	0	0	10.5735	3.82
01:00	0.372	0.36	0.184	0	0	0	10.668	3.82
01:30	0.208	0.232	0.084	0	0	0	10.185	3.82
02:00	0.3	0.392	0.188	0	0	0	10.143	3.82
02:30	0.376	0.548	0.092	0	0	0	10.1955	3.82
03:00	0.208	0.188	0.184	0	0	0	10.668	3.82
03:30	0.276	0.352	0.084	0	0	0	10.0065	3.82
04:00	0.308	0.22	0.2	0	0	0	9.9225	3.82
04:30	0.136	1.016	0.084	0	0	0	9.9225	3.82
05:00	0.196	0.9	0.188	0	0	0	9.9225	4.16
05:30	0.324	0.248	2.852	0.01	0	0.03	10.143	4.16
06:00	0.124	1.024	3.024	0.02	0	0.06	11.823	4.86
06:30	0.192	0.7	1.344	0.084	0	0.252	11.6865	4.48
07:00	0.324	0.668	0.172	0.148	0	0.444	11.0565	5.02
07:30	0.136	0.344	0.104	0.218	0	0.654	12.285	5.52
08:00	0.972	0.152	0.184	0.288	0	0.864	12.348	6
08:30	0.656	0.468	0.092	0.38	0	1.14	13.3245	5.31
09:00	0.376	0.548	0.184	0.472	0	1.416	14.1645	5.52
09:30	0.964	0.44	0.104	0.626	0	1.878	13.734	4.86
10:00	2.524	0.92	0.16	0.78	0	2.34	12.1275	4.41
10:30	0.868	0.328	0.116	0.898	0	2.694	11.025	4.29
11:00	0.616	0.868	0.148	1.016	0	3.048	10.584	4.24
11:30	0.244	0.88	0.136	0.882	0	2.646	10.584	4.2
12:00	0.716	0.788	0.112	0.748	0	2.244	10.8255	4.26
12:30	0.604	1.92	0.172	0.528	0	1.584	10.8045	4.2
13:00	0.492	0.492	0.096	0.308	0	0.924	10.584	4.2
13:30	0.352	0.72	0.196	0.242	0	0.726	10.584	4.18
14:00	0.228	1.208	0.084	0.176	0	0.528	10.584	4.13
14:30	1.068	0.452	0.212	0.146	0	0.438	10.143	4.13
15:00	0.572	0.672	0.088	0.116	0	0.348	9.9225	3.98
15:30	0.312	0.356	0.18	0.086	0	0.258	9.975	4.15
16:00	1.104	0.872	0.104	0.056	0	0.168	22.743	9.08
16:30	0.672	0.684	0.148	0.036	0	0.108	24.7275	9.37
17:00	0.36	0.768	0.164	0.016	0	0.048	26.481	9.48
17:30	0.588	0.564	0.088	0.008	0	0.024	29.568	9.93
18:00	0.668	0.668	0.196	0	0	0	32.2245	10.02
18:30	0.916	0.664	0.092	0	0	0	31.2165	10.5
19:00	0.428	0.684	0.208	0	0	0	15.876	5.43
19:30	0.464	0.816	0.28	0	0	0	14.0175	5.52
20:00	0.888	1.34	0.984	0	0	0	12.348	5.32
20:30	0.488	0.604	0.876	0	0	0	10.8465	5.21
21:00	0.548	0.52	0.832	0	0	0	11.2455	5.32
21:30	0.684	0.66	0.88	0	0	0	10.584	4.56
22:00	0.448	0.532	0.824	0	0	0	9.975	4.43
22:30	0.504	0.256	0.924	0	0	0	9.744	4.43
23:00	0.984	0.356	0.164	0	0	0	10.3635	4.86
23:30	0.548	0.312	0.228	0	0	0	10.3635	4.82

Data