Demand Forecasting & Scheduling Application for Indian Railways for Open Access Power Purchase

ASHIDA | SYNERGY SYSTEMS & SOLUTIONS

What is Open Access

Open Access allows electricity consumers to have the right to procure power from the supplier of their choice other than their distribution company. As per CERC guidelines, Indian Railways is now a deemed distribution licensee, which allows it to purchase power directly from the transmission utilities.

Demand Forecasting

Every state in which IR is availing open access scheme, requires them to provide day-ahead power demand requirement. Therefore, a solution to forecast the demand is required.

Demand forecasting application uses a machine-learning model to analyze historical demand consumption and determine trends and seasons within the data. Real-time inputs made available to the system are used to re-train the model for future forecasts.

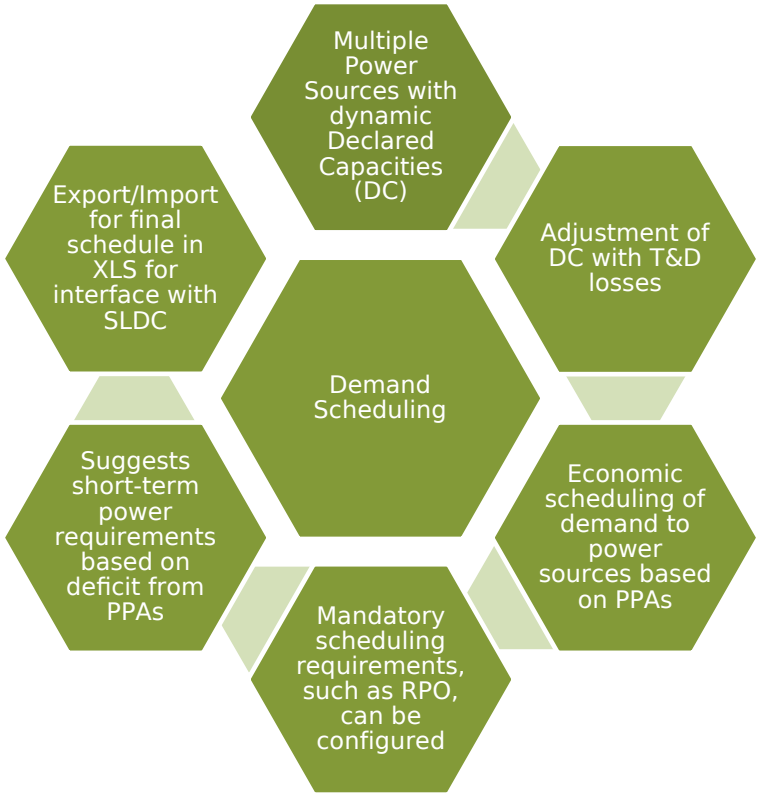
Intra-day correction of forecasted values based on real-time energy consumption inputs are used to revise the demand schedule as per operational exigencies.

- Machine Learning model based on historical data
- Detects Trends and Seasonality
- Bias correction based on real-time inputs
- Flexible block-integration period
- Tunable parameters for each installation

Demand Scheduling

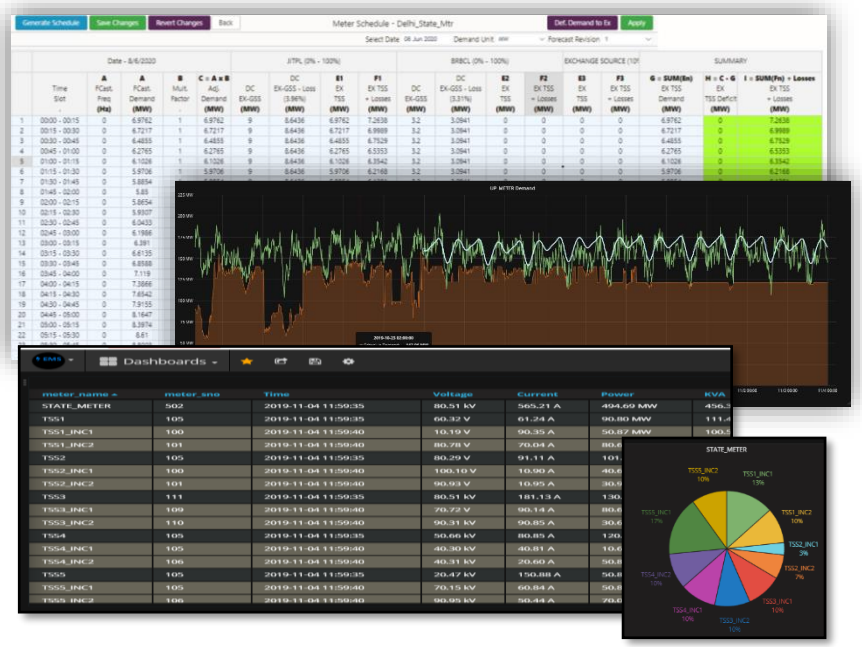
Demand scheduling under open access requires management of power purchase agreements (PPA), declared capacities (DC), T&D losses, regulatory requirements. These inputs are used along with the forecast to generate an economically optimal power purchase schedule.

Inputs such as operational exigencies such as weather, breakdown, etc. can be used to manually adjust the power demand requirement and hence the schedule.



Operational Aids

- Real-time consumption monitoring against schedule
- Alerts on projected/actual schedule violation
- Sign-change monitoring for sustained deviation
- Estimation of DSM charges
- Classification based on geography, zones, etc.



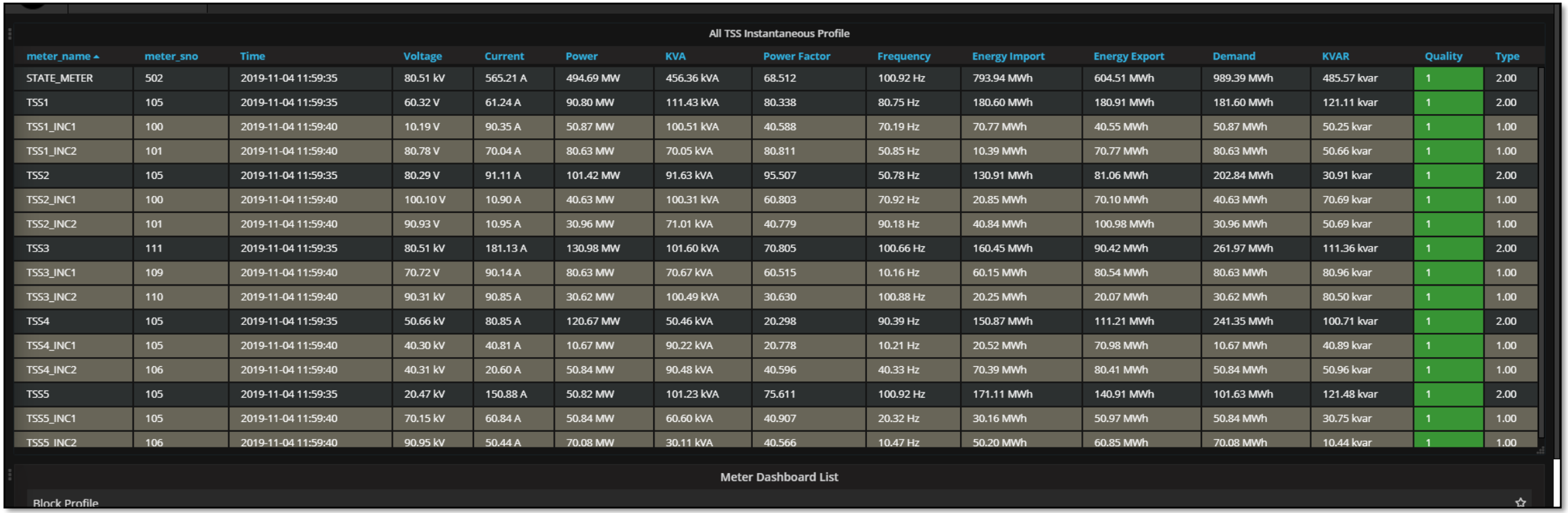
EMS Configuration

Select Date 08 Jun 2020 | Demand Unit MW | Forecast Revision 1

	Date - 8/6/2020					JITPL (0% - 100%)				BRBCL (0% - 100%)				EXCHANGE SOURCE (10		SUMMARY		
	Time Slot .	**A** FCast. Freq **(Hz)**	**A** FCast. Demand **(MW)**	**B** Mult. Factor .	**C = A x B** Adj. Demand **(MW)**	DC EX-GSS **(MW)**	DC EX-GSS - Loss (3.96%) **(MW)**	**E1** EX TSS **(MW)**	**F1** EX TSS + Losses **(MW)**	DC EX-GSS **(MW)**	DC EX-GSS - Loss (3.31%) **(MW)**	**E2** EX TSS **(MW)**	**F2** EX TSS + Losses **(MW)**	**E3** EX TSS **(MW)**	**F3** EX TSS + Losses **(MW)**	**G = SUM(En)** EX TSS Demand **(MW)**	**H = C - G** EX TSS Deficit **(MW)**	**I = SUM(Fn) + Losses** EX TSS + Losses **(MW)**
1	00:00 - 00:15	0	6.9762	1	6.9762	9	8.6436	6.9762	7.2638	3.2	3.0941	0	0	0	0	6.9762	0	7.2638
2	00:15 - 00:30	0	6.7217	1	6.7217	9	8.6436	6.7217	6.9989	3.2	3.0941	0	0	0	0	6.7217	0	6.9989
3	00:30 - 00:45	0	6.4855	1	6.4855	9	8.6436	6.4855	6.7529	3.2	3.0941	0	0	0	0	6.4855	0	6.7529
4	00:45 - 01:00	0	6.2765	1	6.2765	9	8.6436	6.2765	6.5353	3.2	3.0941	0	0	0	0	6.2765	0	6.5353
5	01:00 - 01:15	0	6.1026	1	6.1026	9	8.6436	6.1026	6.3542	3.2	3.0941	0	0	0	0	6.1026	0	6.3542
6	01:15 - 01:30	0	5.9706	1	5.9706	9	8.6436	5.9706	6.2168	3.2	3.0941	0	0	0	0	5.9706	0	6.2168
7	01:30 - 01:45	0	5.8854	1	5.8854	9	8.6436	5.8854	6.1281	3.2	3.0941	0	0	0	0	5.8854	0	6.1281
8	01:45 - 02:00	0	5.85	1	5.85	9	8.6436	5.85	6.0912	3.2	3.0941	0	0	0	0	5.85	0	6.0912
9	02:00 - 02:15	0	5.8654	1	5.8654	9	8.6436	5.8654	6.1072	3.2	3.0941	0	0	0	0	5.8654	0	6.1072
10	02:15 - 02:30	0	5.9307	1	5.9307	9	8.6436	5.9307	6.1752	3.2	3.0941	0	0	0	0	5.9307	0	6.1752
11	02:30 - 02:45	0	6.0433	1	6.0433	9	8.6436	6.0433	6.2925	3.2	3.0941	0	0	0	0	6.0433	0	6.2925
12	02:45 - 03:00	0	6.1986	1	6.1986	9	8.6436	6.1986	6.4542	3.2	3.0941	0	0	0	0	6.1986	0	6.4542
13	03:00 - 03:15	0	6.391	1	6.391	9	8.6436	6.391	6.6545	3.2	3.0941	0	0	0	0	6.391	0	6.6545
14	03:15 - 03:30	0	6.6135	1	6.6135	9	8.6436	6.6135	6.8862	3.2	3.0941	0	0	0	0	6.6135	0	6.8862
15	03:30 - 03:45	0	6.8588	1	6.8588	9	8.6436	6.8588	7.1416	3.2	3.0941	0	0	0	0	6.8588	0	7.1416
16	03:45 - 04:00	0	7.119	1	7.119	9	8.6436	7.119	7.4125	3.2	3.0941	0	0	0	0	7.119	0	7.4125
17	04:00 - 04:15	0	7.3866	1	7.3866	9	8.6436	7.3866	7.6912	3.2	3.0941	0	0	0	0	7.3866	0	7.6912
18	04:15 - 04:30	0	7.6542	1	7.6542	9	8.6436	7.6542	7.9698	3.2	3.0941	0	0	0	0	7.6542	0	7.9698
19	04:30 - 04:45	0	7.9155	1	7.9155	9	8.6436	7.9155	8.2419	3.2	3.0941	0	0	0	0	7.9155	0	8.2419

APPLICATION SCREENSHOTS

Power Scheduling Worksheet



All TSS Instantaneous Profile

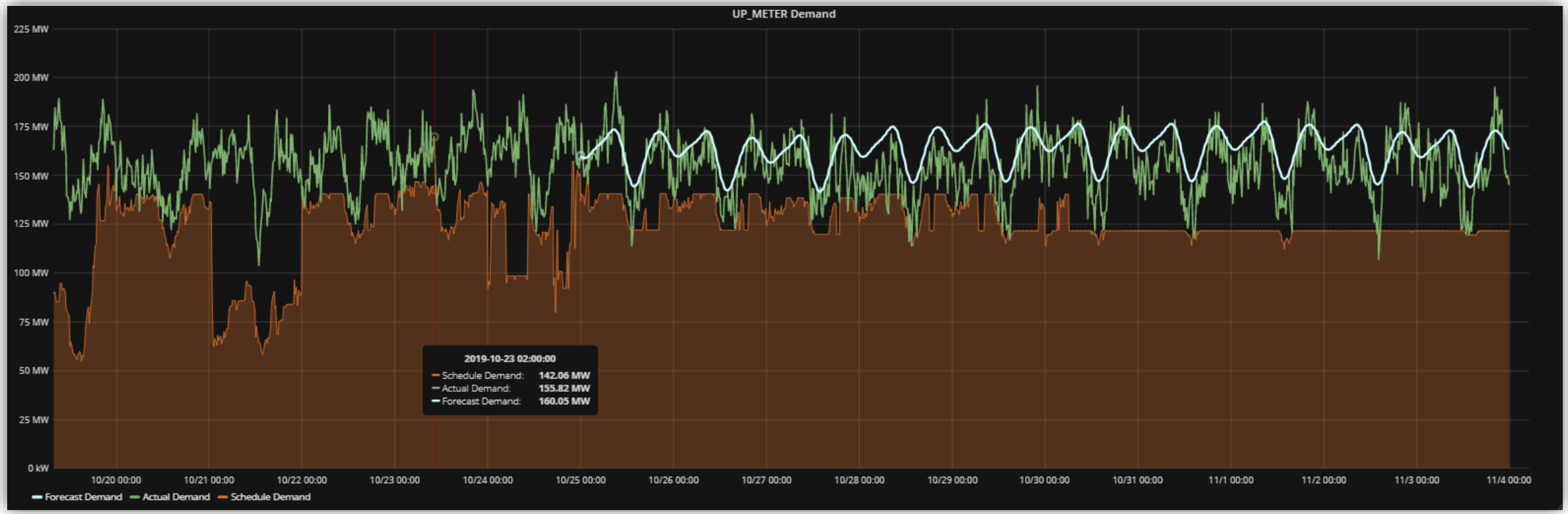
meter_name	meter_sno	Time	Voltage	Current	Power	KVA	Power Factor	Frequency	Energy Import	Energy Export	Demand	KVAR	Quality	Type
STATE_METER	502	2019-11-04 11:59:35	80.51 kV	565.21 A	494.69 MW	456.36 kVA	68.512	100.92 Hz	793.94 MWh	604.51 MWh	989.39 MWh	485.57 kvar	1	2.00
TSS1	105	2019-11-04 11:59:35	60.32 V	61.24 A	90.80 MW	111.43 kVA	80.338	80.75 Hz	180.60 MWh	180.91 MWh	181.60 MWh	121.11 kvar	1	2.00
TSS1_INC1	100	2019-11-04 11:59:40	10.19 V	90.35 A	50.87 MW	100.51 kVA	40.588	70.19 Hz	70.77 MWh	40.55 MWh	50.87 MWh	50.25 kvar	1	1.00
TSS1_INC2	101	2019-11-04 11:59:40	80.78 V	70.04 A	80.63 MW	70.05 kVA	80.811	50.85 Hz	10.39 MWh	70.77 MWh	80.63 MWh	50.66 kvar	1	1.00
TSS2	105	2019-11-04 11:59:35	80.29 V	91.11 A	101.42 MW	91.63 kVA	95.507	50.78 Hz	130.91 MWh	81.06 MWh	202.84 MWh	30.91 kvar	1	2.00
TSS2_INC1	100	2019-11-04 11:59:40	100.10 V	10.90 A	40.63 MW	100.31 kVA	60.803	70.92 Hz	20.85 MWh	70.10 MWh	40.63 MWh	70.69 kvar	1	1.00
TSS2_INC2	101	2019-11-04 11:59:40	90.93 V	10.95 A	30.96 MW	71.01 kVA	40.779	90.18 Hz	40.84 MWh	100.98 MWh	30.96 MWh	50.69 kvar	1	1.00
TSS3	111	2019-11-04 11:59:35	80.51 kV	181.13 A	130.98 MW	101.60 kVA	70.805	100.66 Hz	160.45 MWh	90.42 MWh	261.97 MWh	111.36 kvar	1	2.00
TSS3_INC1	109	2019-11-04 11:59:40	70.72 V	90.14 A	80.63 MW	70.67 kVA	60.515	10.16 Hz	60.15 MWh	80.54 MWh	80.63 MWh	80.96 kvar	1	1.00
TSS3_INC2	110	2019-11-04 11:59:40	90.31 kV	90.85 A	30.62 MW	100.49 kVA	30.630	100.88 Hz	20.25 MWh	20.07 MWh	30.62 MWh	80.50 kvar	1	1.00
TSS4	105	2019-11-04 11:59:35	50.66 kV	80.85 A	120.67 MW	50.46 kVA	20.298	90.39 Hz	150.87 MWh	111.21 MWh	241.35 MWh	100.71 kvar	1	2.00
TSS4_INC1	105	2019-11-04 11:59:40	40.30 kV	40.81 A	10.67 MW	90.22 kVA	20.778	10.21 Hz	20.52 MWh	70.98 MWh	10.67 MWh	40.89 kvar	1	1.00
TSS4_INC2	106	2019-11-04 11:59:40	40.31 kV	20.60 A	50.84 MW	90.48 kVA	40.596	40.33 Hz	70.39 MWh	80.41 MWh	50.84 MWh	50.96 kvar	1	1.00
TSS5	105	2019-11-04 11:59:35	20.47 kV	150.88 A	50.82 MW	101.23 kVA	75.611	100.92 Hz	171.11 MWh	140.91 MWh	101.63 MWh	121.48 kvar	1	2.00
TSS5_INC1	105	2019-11-04 11:59:40	70.15 kV	60.84 A	50.84 MW	60.60 kVA	40.907	20.32 Hz	30.16 MWh	50.97 MWh	50.84 MWh	30.75 kvar	1	1.00
TSS5_INC2	106	2019-11-04 11:59:40	90.95 kV	50.44 A	70.08 MW	30.11 kVA	40.566	10.47 Hz	50.20 MWh	60.85 MWh	70.08 MWh	10.44 kvar	1	1.00

Meter Dashboard List

Block Profile

APPLICATION SCREENSHOTS

Instantaneous Profile for all TSS



APPLICATION SCREENSHOTS

Actual vs Scheduled vs Forecasted Demand