



Pathway to 100% Renewable Energy Solar Energy Initiative Update

Presented to UAB - 1/10/19

Where is GRU Today?

Presently 27% Renewable Energy

	Capacity	Production 2018	Percent Production	Capacity Factor
Solar	26	45,552	2%	20%
DHR	102	521,242	25%	58%
Kelly	110	437,684	21%	45%
DH-1	76	179,485	9%	27%
DH-2	228	706,837	34%	35%
Grid	450	205,791	10%	-
Total	-	2,096,591	100%	-

2018 CO₂ Emissions

	Production 2018	Tons of CO ₂	Percentage of Production	Tons per MW
Solar	45,552	0*	0*	0*
DHR	521,242	0*	0*	0*
Kelly	437,684	218,842	20%	0.5
DH-1	179,485	128,152	12%	0.714
DH-2	706,837	641,101	58%	0.95
Grid	205,791	118,330	11%	0.575
Total	2,096,591	1,106,425	100%	-

*Classified as a zero emitter

Operational Challenges

- Today's technology provides few renewable options for Florida.
- How to incorporate energy storage
- How to solve dusk to dawn energy consumption - (42% of GRUs annual consumption).
- How to deal with weather transients.
- Meeting FRCC balancing authority reserve requirements of 41 MWHrs.
- Matching generation assets to system load

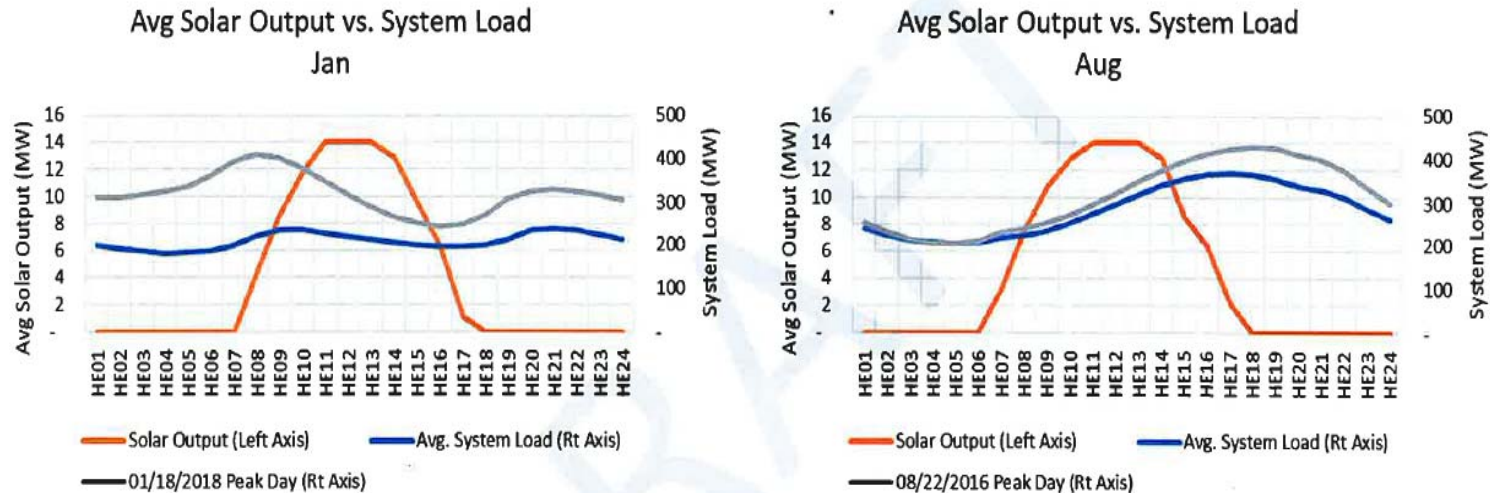
GRU's System Requirements

Flexible system requirements (90 to 440 MWs)

	Off Peak	On Peak
Winter	200	410
Spring	120	250
Summer	200	440
Fall	120	250

As a balancing authority we need 41 MWs of reserve

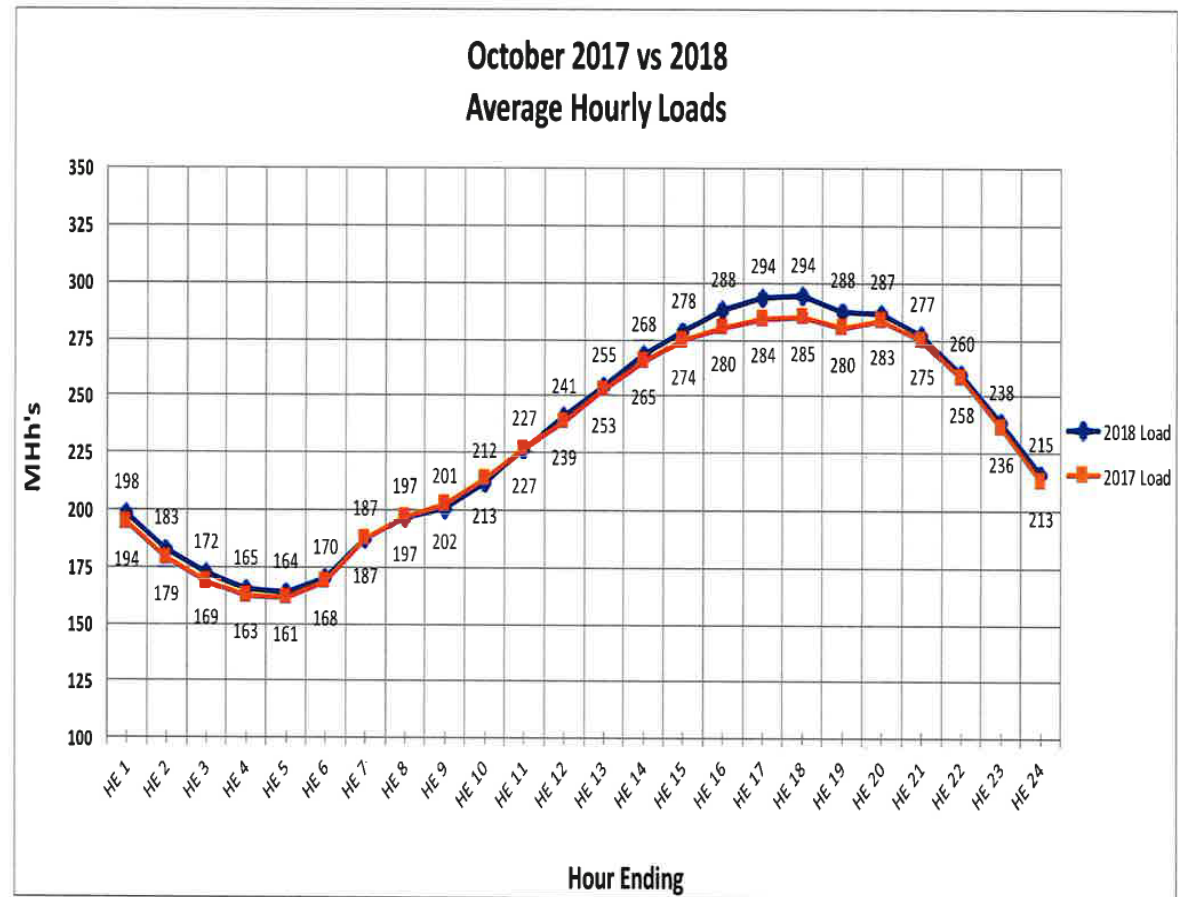
Solar Output



- The Solar PPA is modelled as a 20 MW purchase
 - The shape of the solar output is based on the Solar Fit shape provided by GRU.
 - This hourly shape is based upon the average for the same hour in all days of the month. For example, there are 24 hours of shape data for each month. Variations of the daily shapes only change from month-to-month. As such, a solar PV facility will never have a full 20 MW of output in the model.
 - The solar generation is modeled as providing 35% of its max capacity towards GRU’s capacity obligation.
 - A 20 MW PPA would provide 7 MW of capacity.

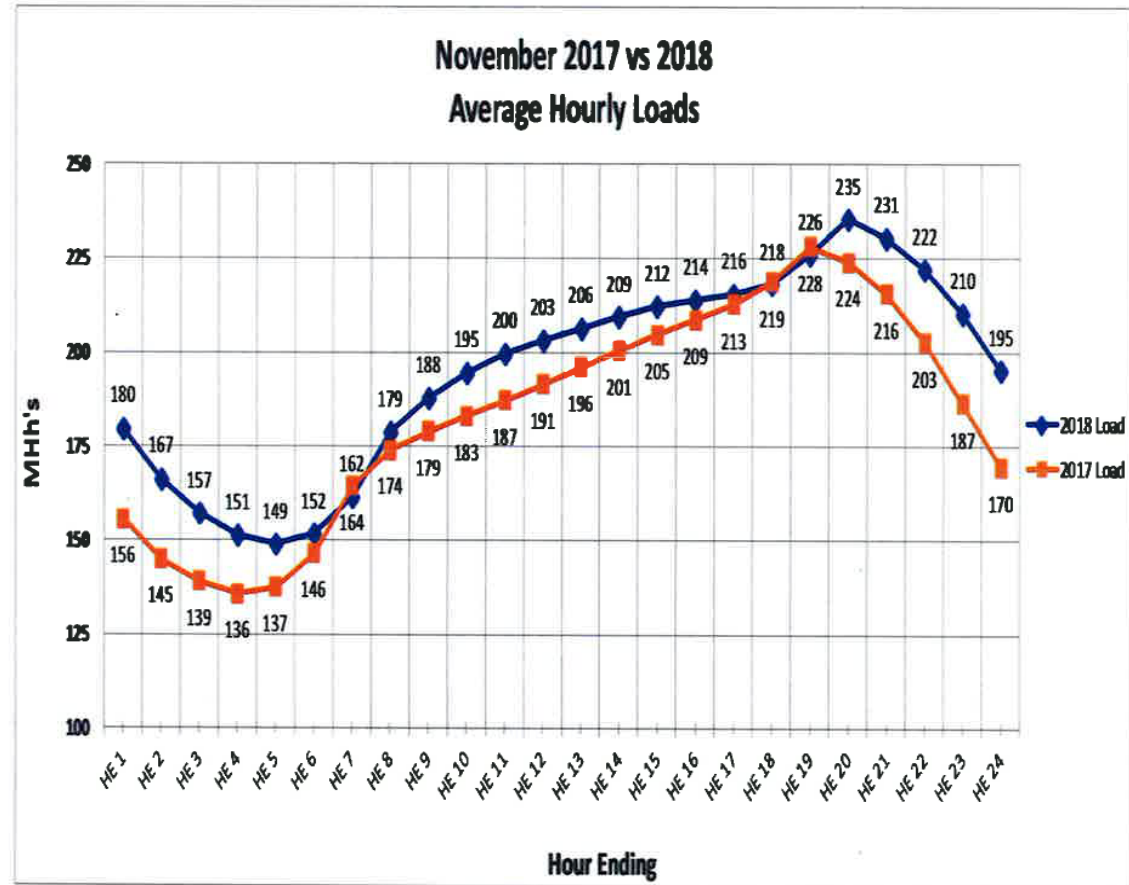
System Load Profile - Oct

October Average Hourly Loads		
Hour Ending	2017 Load	2018 Load
HE 1	194	198
HE 2	179	183
HE 3	169	172
HE 4	163	165
HE 5	161	164
HE 6	168	170
HE 7	187	187
HE 8	197	197
HE 9	202	201
HE 10	213	212
HE 11	227	227
HE 12	239	241
HE 13	253	255
HE 14	265	268
HE 15	274	278
HE 16	280	288
HE 17	284	294
HE 18	285	294
HE 19	280	288
HE 20	283	287
HE 21	275	277
HE 22	258	260
HE 23	236	238
HE 24	213	215



System Load Profile - Nov

November Average Hourly Loads		
Hour Ending	2017 Load	2018 Load
HE 1	156	180
HE 2	145	167
HE 3	139	157
HE 4	136	151
HE 5	137	149
HE 6	146	152
HE 7	162	164
HE 8	174	179
HE 9	179	188
HE 10	183	195
HE 11	187	200
HE 12	191	203
HE 13	196	206
HE 14	201	209
HE 15	205	212
HE 16	209	214
HE 17	213	216
HE 18	219	218
HE 19	228	226
HE 20	224	235
HE 21	216	231
HE 22	203	222
HE 23	187	210
HE 24	170	195



GRU Solar Initiative –Actions Taken

Market Research

- On site meetings held at GRU with seven large scale solar providers
 - Purpose was to gain an understanding of the available technologies being deployed
 - Compile an understanding of the marketplace economics
 - Develop an understanding of the deal structures typically being utilized in the marketplace

Information Gathering Meetings

- Nextera
- Terrawatt Energy
- Origis Energy
- Cypress Creek Renewables
- Strata Solar
- Florida Municipal Power Authority - FMPA
- 174PG Power Global
- FAASSTeR Solar project

Transmission ACE Study

- ACE - Area Control Error Signal
 - Generation - Load Balancing
 - Measurement of Grid Intertie power flow +/-
- Study Project released to Burns and McDonnell on 11/30/18
- Results of the study due back by 1/31/19
- Will provide an assessment of GRU system tolerance of additional solar generation
 - Industry has used 10% of average load as a threshold limitation
 - GRU presently at 26 MW solar with an average load of 220 MW

Integrated Resource Plan

- The Energy Authority was tasked with updating GRU's IRP
 - Last IRP was issued by TEA in 2017
- Multiple meetings held in 2018
 - Multiple operating scenarios modeled to develop long term generation asset options
- Final Report is expected by 2/28/19
 - Report will be completed after receiving the ACE study

Solar Initiative – Next Steps

- Develop primary commercial terms and conditions to be integrated into a Solar PPA
- Assemble an ITN or RFP document to solicit for a vendor and suitable technology for the development and construction of a large scale solar generation facility within GRU's territory.