A Markov Chain Model for Predicting Economic Curtailment of Nodal Renewable Energy Generation using Hub Prices

Brent Ho, Rob Cirincione

Intro

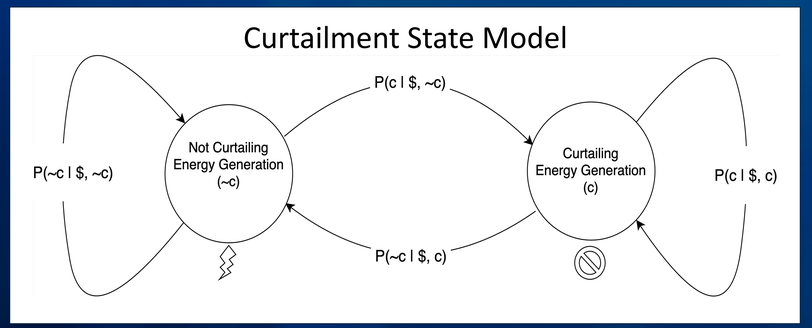
ISO markets accomplish renewable energy curtailment via nodal generator prices, which may be harder to predict than regional average (or hub) prices.

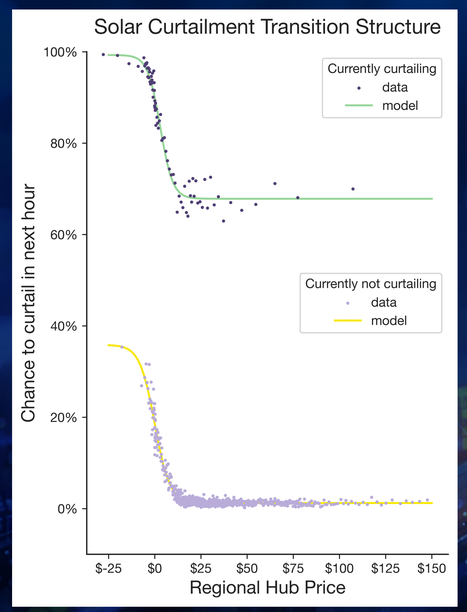
Overview

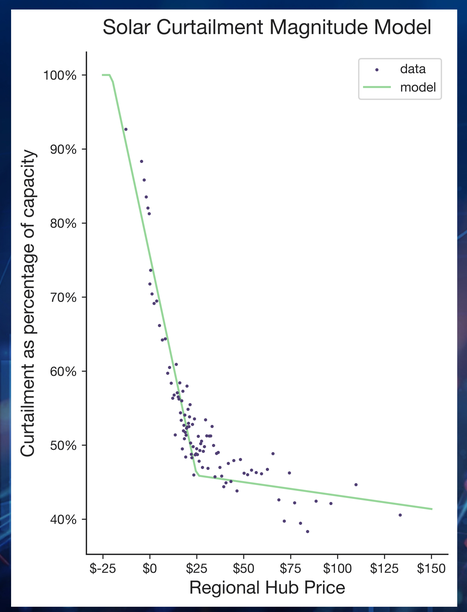
1. Start with ERCOT SCED data of hourly curtailment percentages at 88 utility-scale (> 10MW) solar* plants.
2. Associate plants with ERCOT regional price hubs.
3. Bucket data with similar regional hub prices.
4. Regress a 2-state Markov model of boolean curtailment state with price dependent transition probabilities.
5. Regress a simple model of curtailment magnitude *given* a curtailment event.

* Analogous wind energy results are also available

Simulating **nodal** energy **curtailment** via **hub** prices



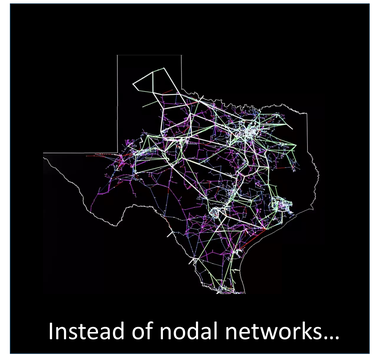


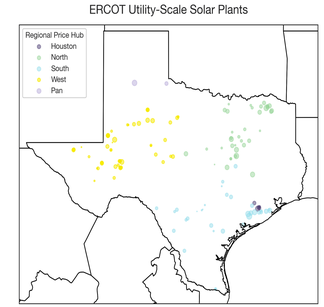


RESOURCE & TECH

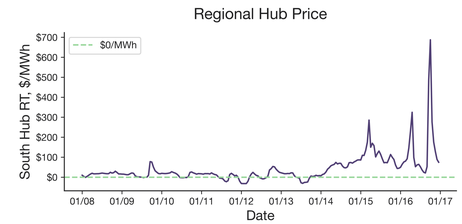
SUNAIRIO

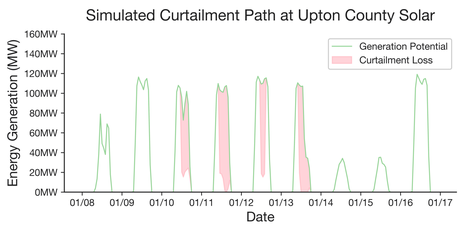
AMERICAN CLEAN POWER





we used regional hub prices...





to simulate curtailment...

Month	Curtail (%)	Month	Curtail (%)
Jan	2.13%	Feb	3.24%
Mar	1.33%	Apr	2.40%
May	0.86%	Jun	1.16%
Jul	1.30%	Aug	1.22%
Sep	1.27%	Oct	3.52%
Nov	1.76%	Dec	5.15%

over 1000 paths.