

The Impact of Utility Discretion on Residential Solar Requirements

Kelly A. Stevens

Assistant Professor, School of Public Administration, UCF, Kelly.Stevens@ucf.edu

Sara Iman

Ph.D. Student, Public Affairs Program, UCF

Rabina Bissessar

Robert Reedy

Program Director, Grid Integration UCF Utilities & Energy Services, Visiting Associate Instructor,
Electrical Engineering, UCF

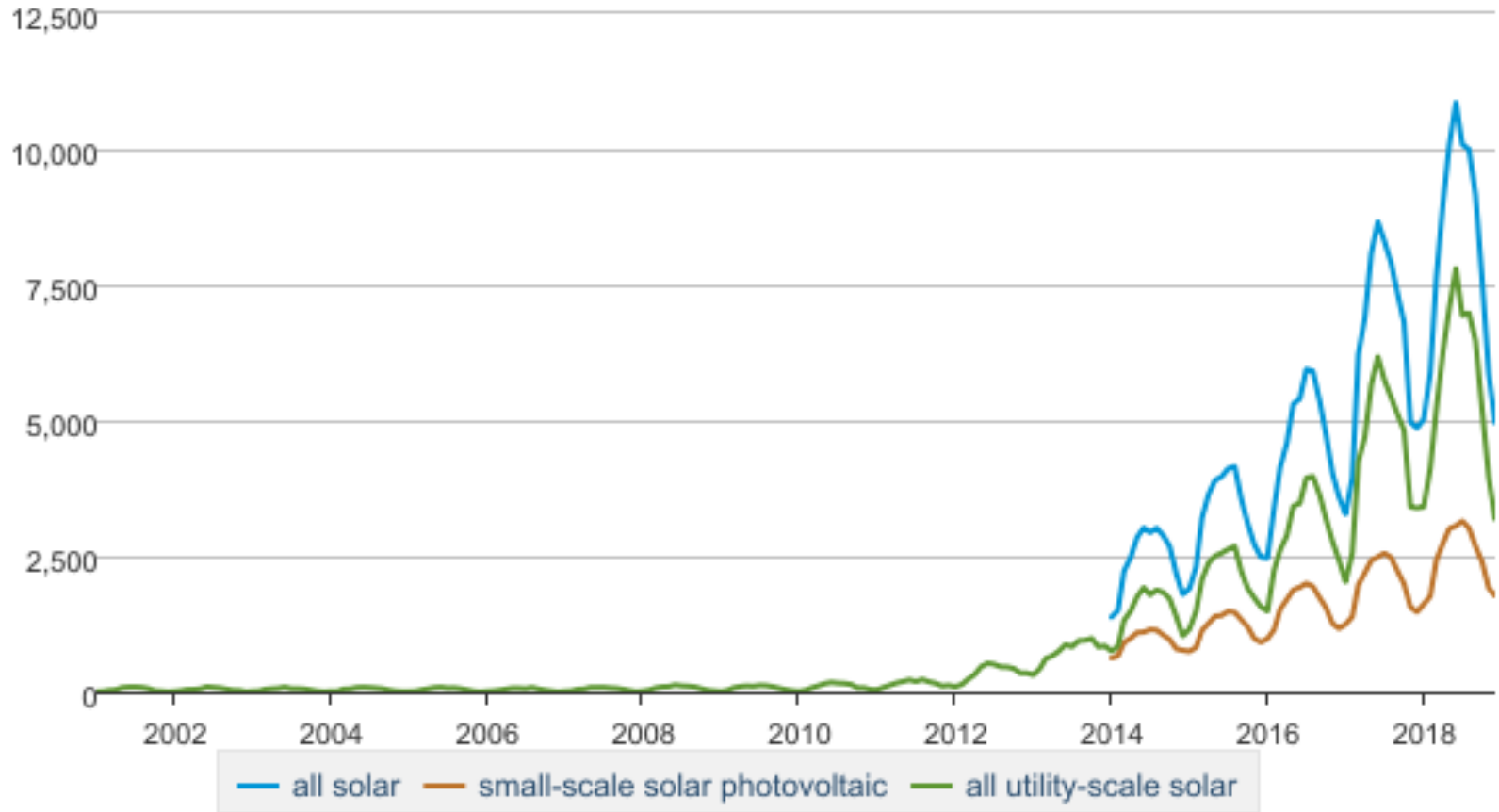
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Solar in the US

Net generation, United States, all sectors, monthly

thousand megawatthours

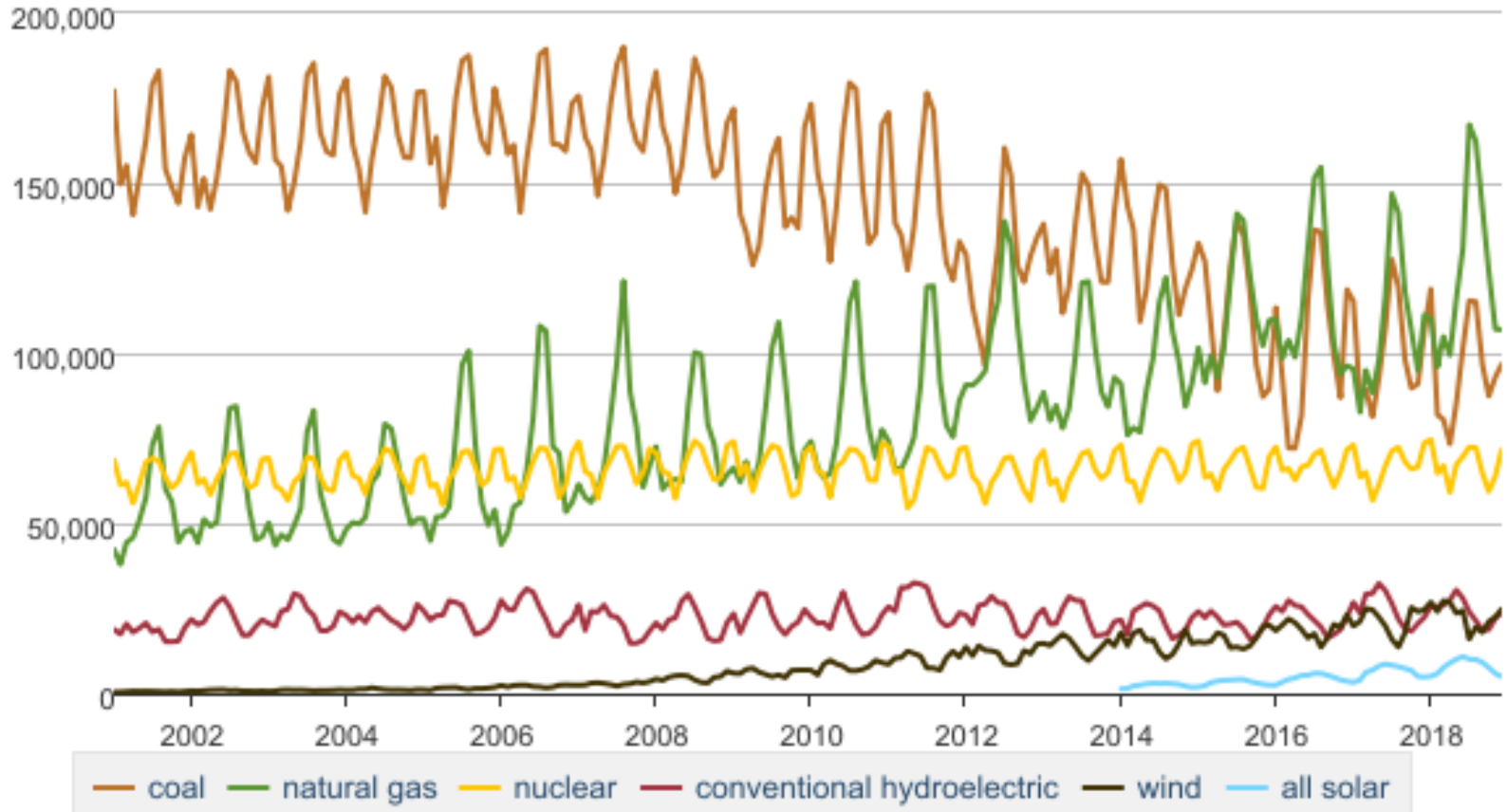


Data source: U.S. Energy Information Administration

Solar in the US

Net generation, United States, all sectors, monthly

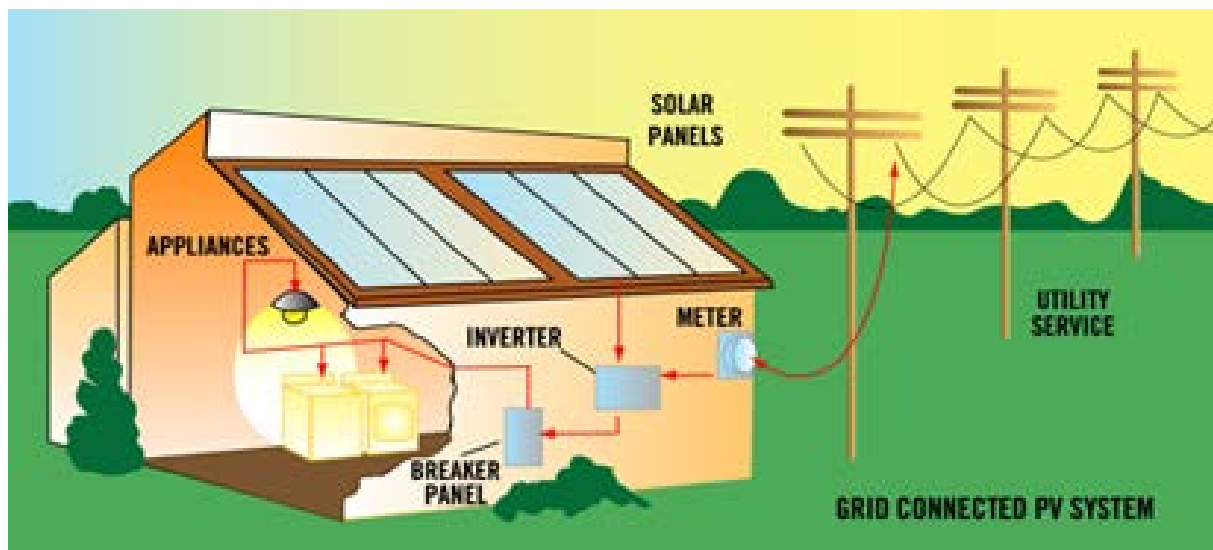
thousand megawatthours



Data source: U.S. Energy Information Administration

Home solar systems

- Residential solar systems inverter-based
 - Compliant with IEEE1547 & UL 1741
 - Automatically & reliably disconnects as a safety feature



External Disconnect Switch

- EDS
 - Costs: \$\$ and time
 - Statistically improbable need (Coddington, Margolis, Aabakken, 2008 (NREL))
- Not being used by utility anyway (Kling & Cook, 2005)



Image c/o: <https://www.builditsolar.com/Projects/PV/EnphasePV/Wiring.htm>

Research Question

- What do utility EDS policies look like? What is the cost of unnecessary equipment requirements? How does this affect solar adoption?
 - Price is a key factor in solar adoption decisions
 - Solar PV system costs heterogeneous across US (Gillingham et al. 2016)
 - Federal and state set policies to lower costs to increase adoption (Burns et al. 2012)

Data Collection

State categories (DSIRE):

- No Rule, Required, Not Required, Prohibited, Discretion, Unclear

Utility companies (EIA-861):

- 211 companies, 70% of all customers in US (municipal, IOU, IPPs, co-ops)
- Percentage of the state population each company serves

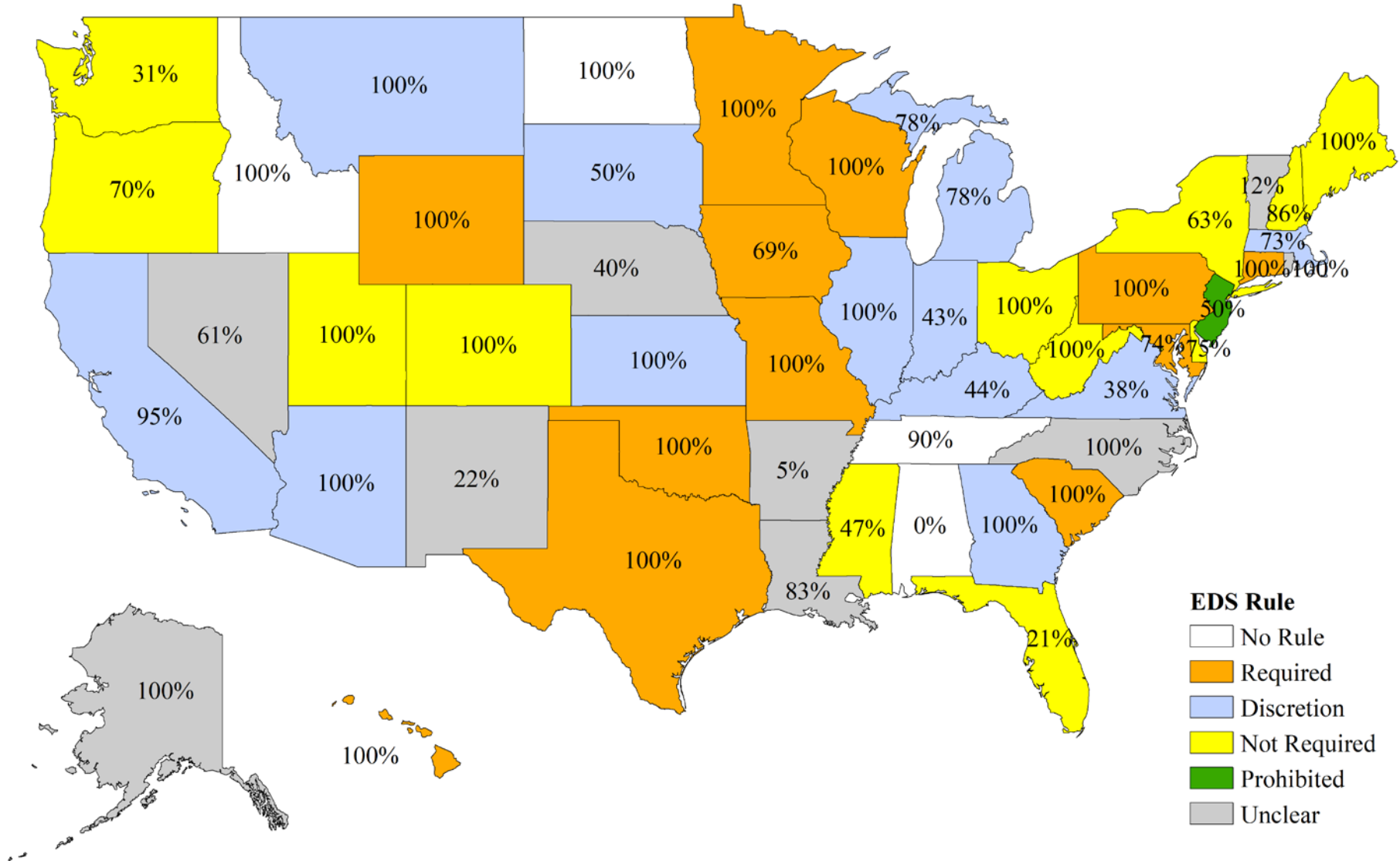
Each utility company (websites, email, phone calls):

- Search for policies regarding the requirements of an EDS & insurance
- Scoring the company based on their requirements (require, strongly recommend, require but utility will pay for, not required, etc.)

Small Scale Solar Estimates (EIA Electric Power Monthly)

- Estimate # of EDS per state

State Policies and % of Customers Required to have an EDS



Method

1. Estimate number of residential solar projects per state

$$\frac{(\text{State small scale solar capacity}) * \% \text{ Residential}}{\text{Average residential solar project size}} = \frac{(\text{MW Capacity}) * 0.56}{0.005 \text{ MW}} = \text{Residential}_s$$

2. Estimate number of EDS in each state (s) based on utility policies (i)

Scores: Requires: 1 Recommended: 0.75 Unclear: 0.5 Not Required: 0

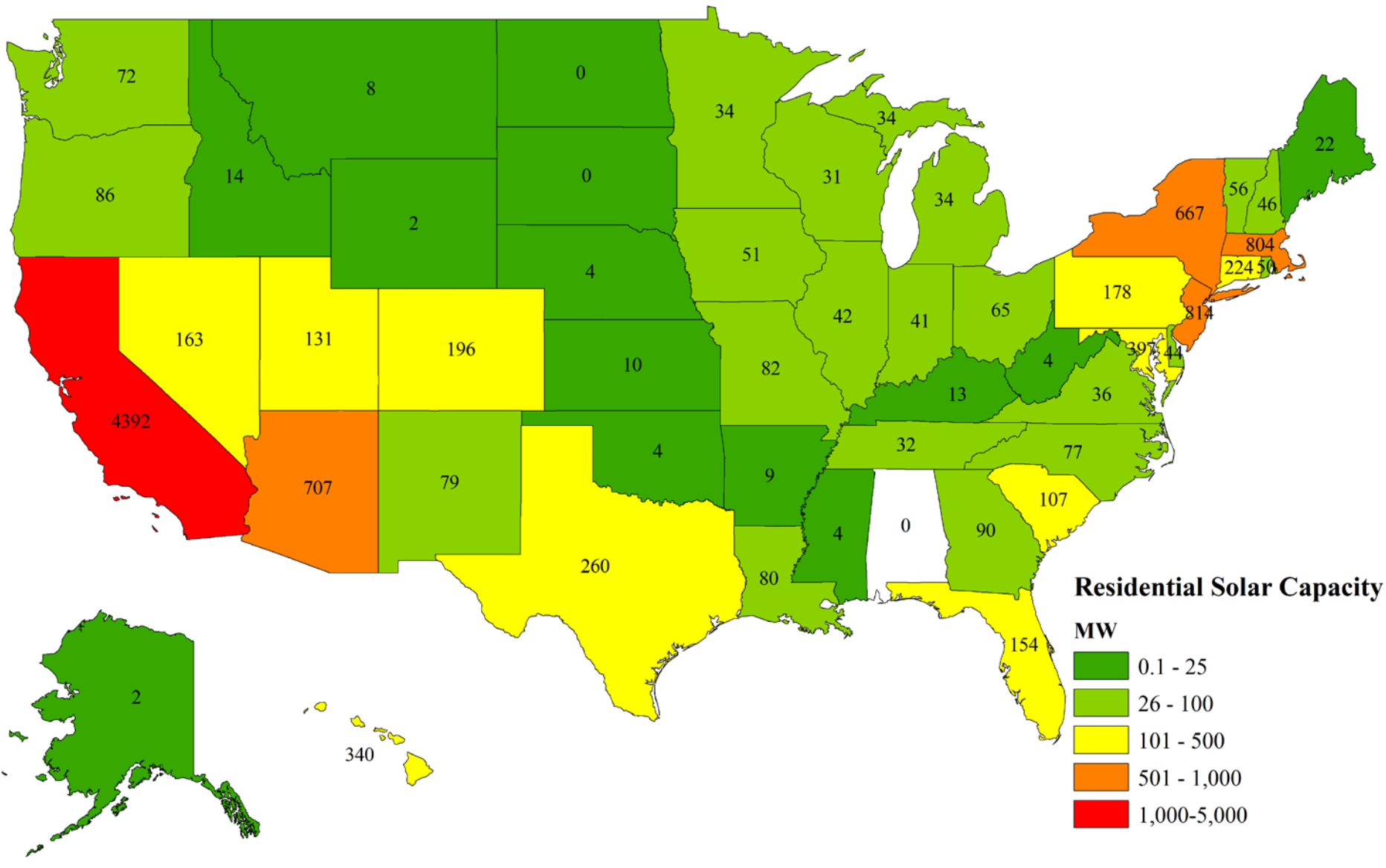
$$\frac{\sum_{i=1}^n (\% \text{ customers}_i * \text{EDS requirement score}_i)}{\sum_{i=1}^n \% \text{ customers}_i} = \text{WtAvg Score}_s$$

$$\text{Residential}_s * \text{WtAvg Score}_s = \text{EDS count}_s$$

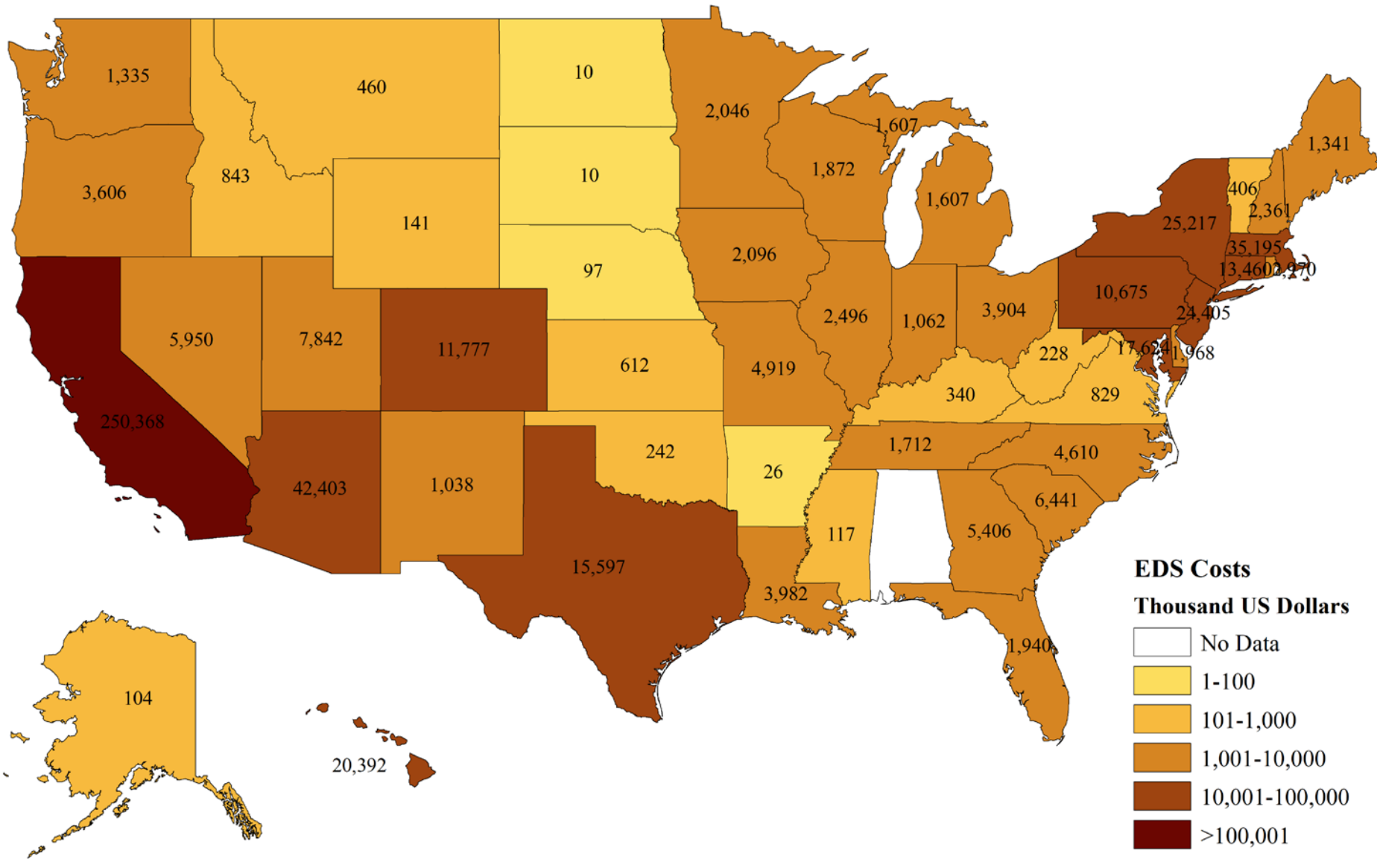
3. Estimate cost assuming \$300 for EDS

$$\text{EDS count}_s * 300 = \text{EDS cost}_s$$

Residential Solar Capacity (MW)



Estimated EDS Costs (in Thousand US dollars)



Findings

- Total redundant costs EDS: \$545 million
- Total number of utility companies: 211
 - 19% of the companies have no publicly-available information on EDS
 - 9% of the companies recommend the installation of EDS
 - 11% of the companies do not require EDS
 - 61% of the companies require EDS
- Average 77% of companies require EDS when state rule is discretionary as well as "not required"
- Mostly older state rules require EDS (< 2008, except Iowa)
 - Updated policies could save time and \$\$

Next Steps

- Cost of insurance
- Estimate the impact on adoption
 - Other policies: net metering, rate design, other interconnection standards, local permitting, incentives, financing options

Thank you!

- Kelly A. Stevens, Assistant Professor, School of Public Administration, UCF, Kelly.Stevens@ucf.edu
- Sara Iman, PhD Student, Public Affairs Program, UCF
Sara.iman@knights.ucf.edu
- Rabina Bissessar, rabina.bissessar@gmail.com
- Robert Reedy, Program Director, Grid Integration UCF Utilities & Energy Services, Visiting Associate Instructor, Electrical Engineering, UCF, Bob.Reedy@ucf.edu

