

# Identifying Priority Households for PAYS<sup>®</sup> Energy Efficiency Investments in East Tennessee

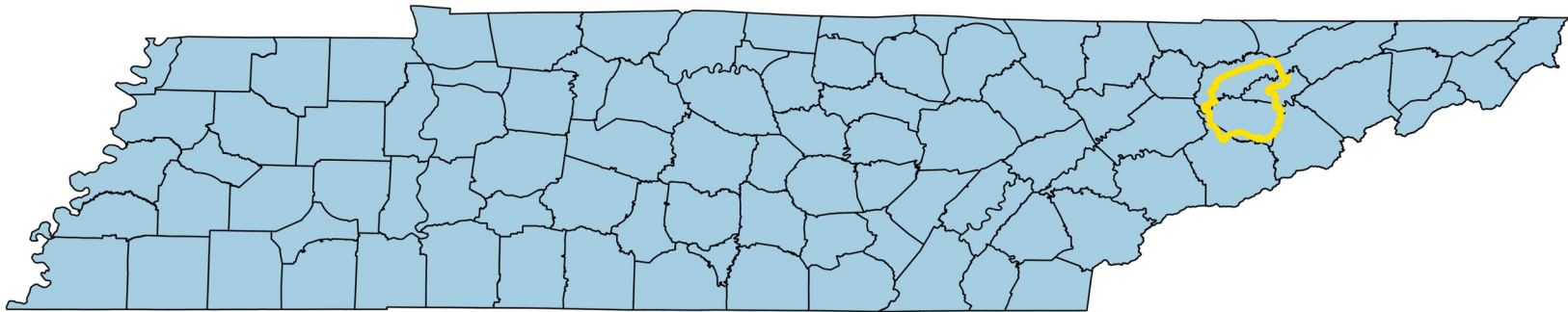
Rory McIlmoil

ACEEE Rural Energy Conference

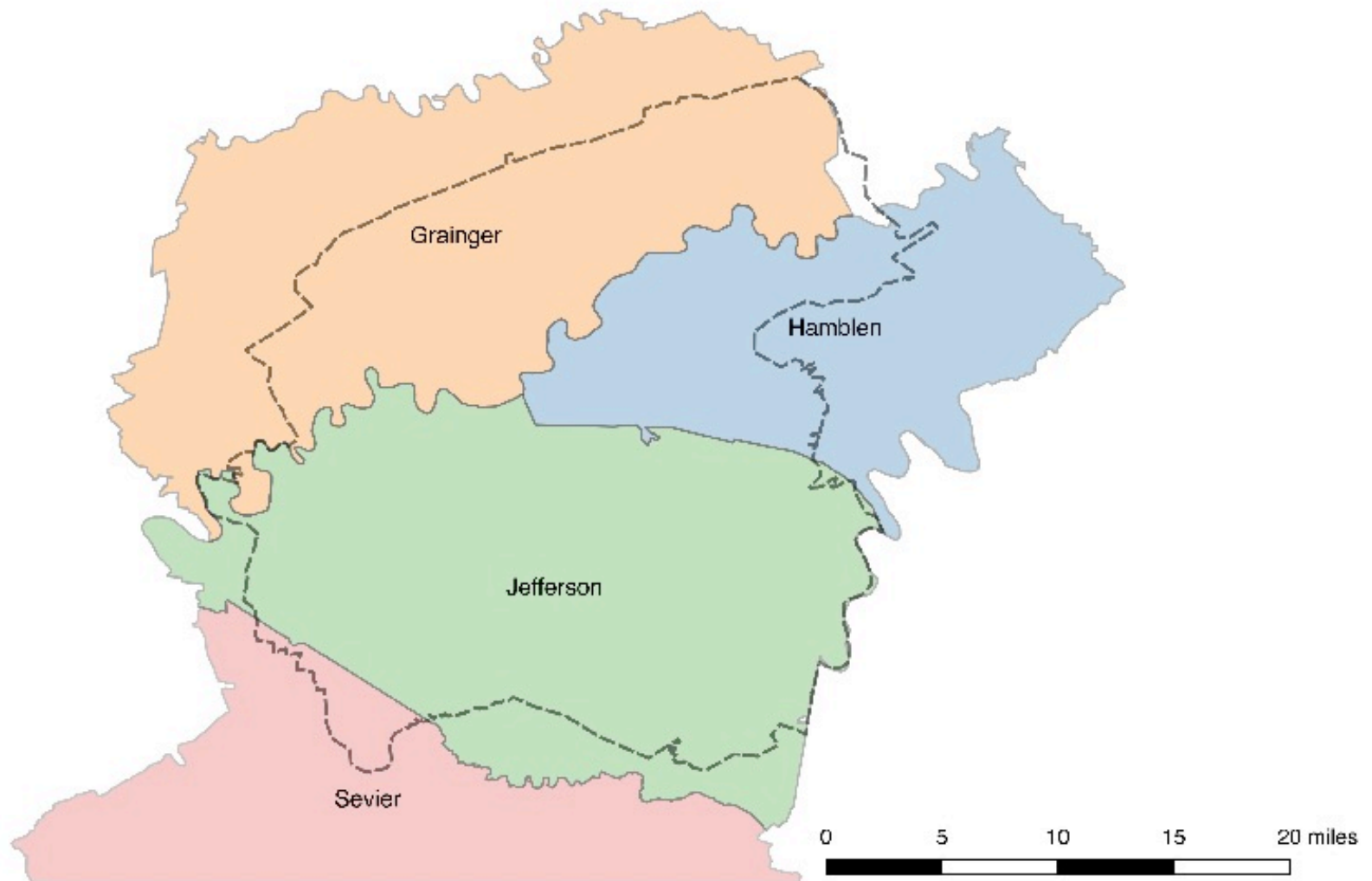
October 22, 2018



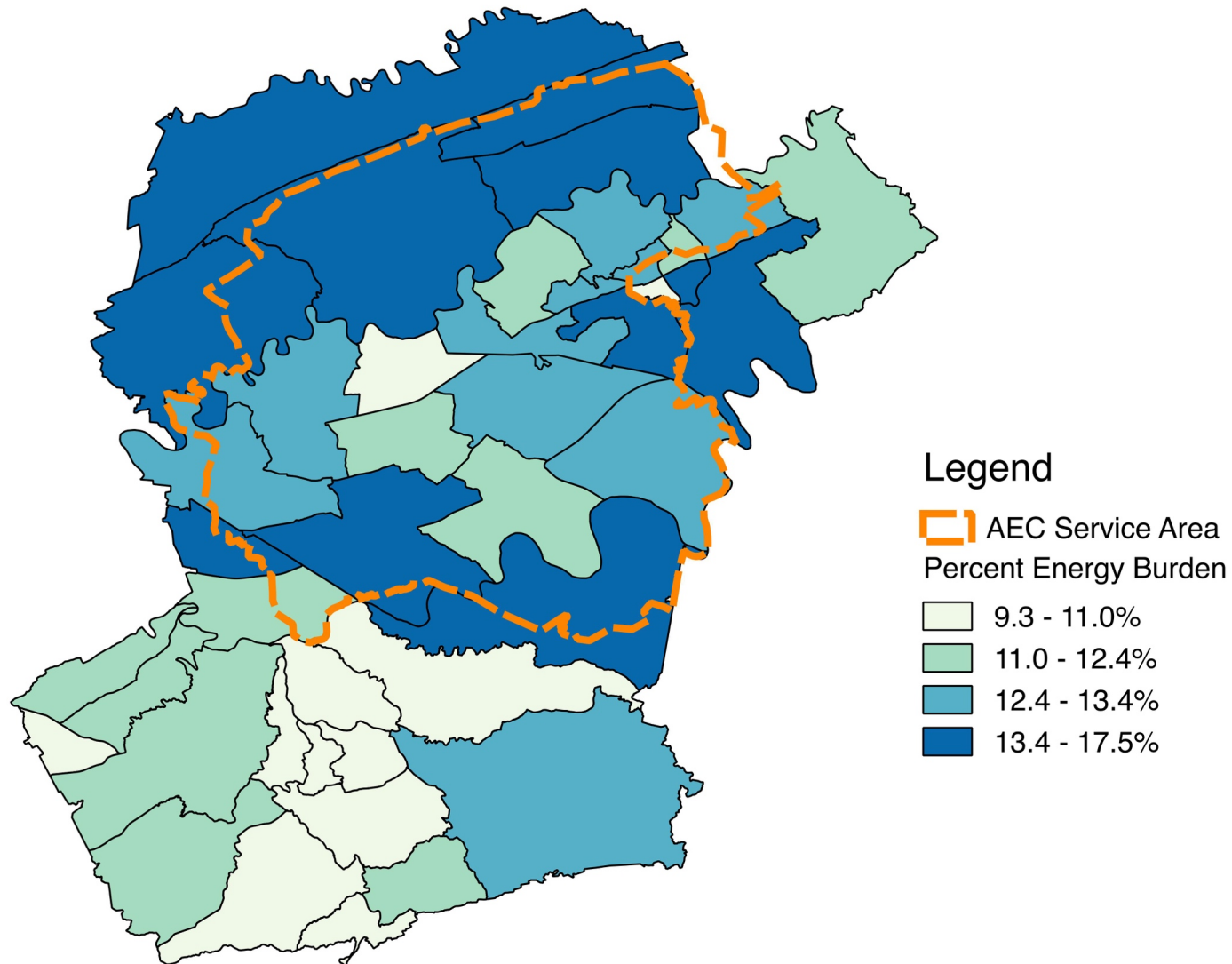
## Service Area of Appalachian Electric Cooperative



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# Census-level Energy Cost Burdens for AEC's LMI Households





# Energy burden in AEC counties (2016)

< 50% FPL	# Homes	Energy Burden	Unaffordable cost per home
Jefferson	1,412	29.3%	\$1,720
Hamblen	2,054	26.8%	\$1,519
Grainger	621	32.0%	\$1,893
Tennessee	191,505	27.4%	\$1,559
125 - 149% FPL	# Homes	Energy Burden	Unaffordable cost per home
Jefferson	1,205	8.5%	\$642
Hamblen	1,793	7.8%	\$451
Grainger	757	9.3%	\$830
Tennessee	135,317	8.1%	\$516

*Note: "Energy burden" is defined as the percent of gross household income that is spent on home energy costs. Only direct home energy costs are included, not transportation costs. According to Fisher, Sheehan and Colton, affordable energy costs are those that amount to 6% or less of gross household income. Anything over 6% is deemed unaffordable. Source: Fisher, Sheehan & Colton. Home Energy Affordability Gap, 2016. <http://www.homeenergyaffordabilitygap.com/>*

# Analyzing and Mapping Energy Use and Intensity

# Purpose and guidance

- To identify the top 1,000 candidates for cost-effective energy efficiency improvements, with the greatest savings potential
- Pilot program requirements
- Key home efficiency measure used: Energy Intensity (EI)

Energy Intensity Range (kWh/SF)	Efficiency Category
< 0.5	High efficiency
0.51 - 1.00	Efficient
1.01 - 1.25	Average
1.25 - 1.50	Inefficient
1.51+	Very inefficient

# Process, Part 1

## **Appalachian Electric:**

1. Provided 3-year monthly meter data for ~44,500 accounts
2. Provided county property tax data for 3 main counties (96% of all AEC accounts)

## **Appalachian Voices:**

1. Combined property tax data w/ AEC account data
2. Calculated three-year average monthly kWh for each meter
3. Combined SF (from property data) w/ monthly kWh to generate EI measure – average and seasonal EI's
4. Calculated difference in average kWh and ratio of EI's between Winter and Shoulder months (heat loss)

# Process, Part 2

## **Account removal: Per property data**

1. Non-residential
2. All rentals, multi-unit buildings (apartments, condos, etc)
3. Existence of non-electric heating source
4. Greater than 3,000 SF
5. Assessed at more than \$250,000

## **Account removal: Per meter data and analysis**

1. Properties using less than 1,000 kWh/month
2. Seasonal properties (0 kWh average for any “season”)
3. Homes with EI less than 1.5 kWh/SF (break-even for worst EE)
4. Missing/suspect data
5. ***Used Winter/Shoulder ratios, difference in kWh to sort for most inefficient homes and select final 1,000 properties***

# Challenges/Lessons learned

- No common ID (like a social number) between both data sets
- Less familiarity with the more complex property data set
- Non-electric fuel designations -- many had high kWh/month
- Rental properties: Many show same SF for multiple accounts (tied to same property tax shapefile), even though accounts have different kWh -- can't calculate energy intensity
- Multiple property designations, some with multiple codes
- ***You never really know until you see and assess the property***
- Broader issue: inconsistent property tax data sets

# Results

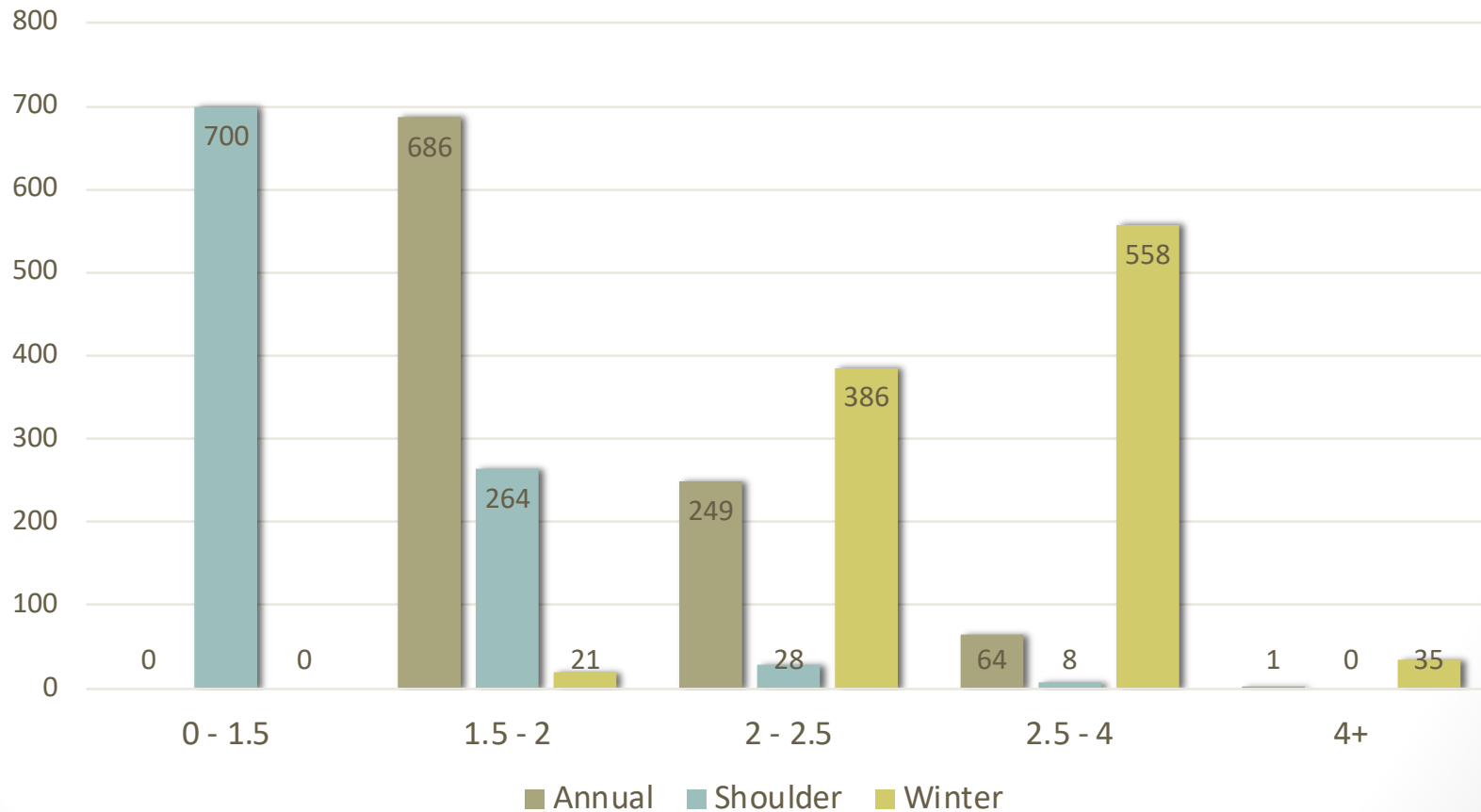
# Final candidate list (1,000)

- County breakdown of final candidate list:
  - Jefferson: 443 (44.3%)
  - Hamblen: 263 (26.3%)
  - Grainger: 294 (29.4%)
- Average monthly kWh (2014 – 2016): 2,171
  - *Average kWh, Winter months:* 3,003
- Average monthly EI (2014 – 2016): 1.9 kWh/SF
  - *Average EI, Winter months:* 2.7 kWh/SF
- **Homes > 24,000 kWh/year: 589**
  - **This is the kWh threshold used for AEC's Meister analysis**



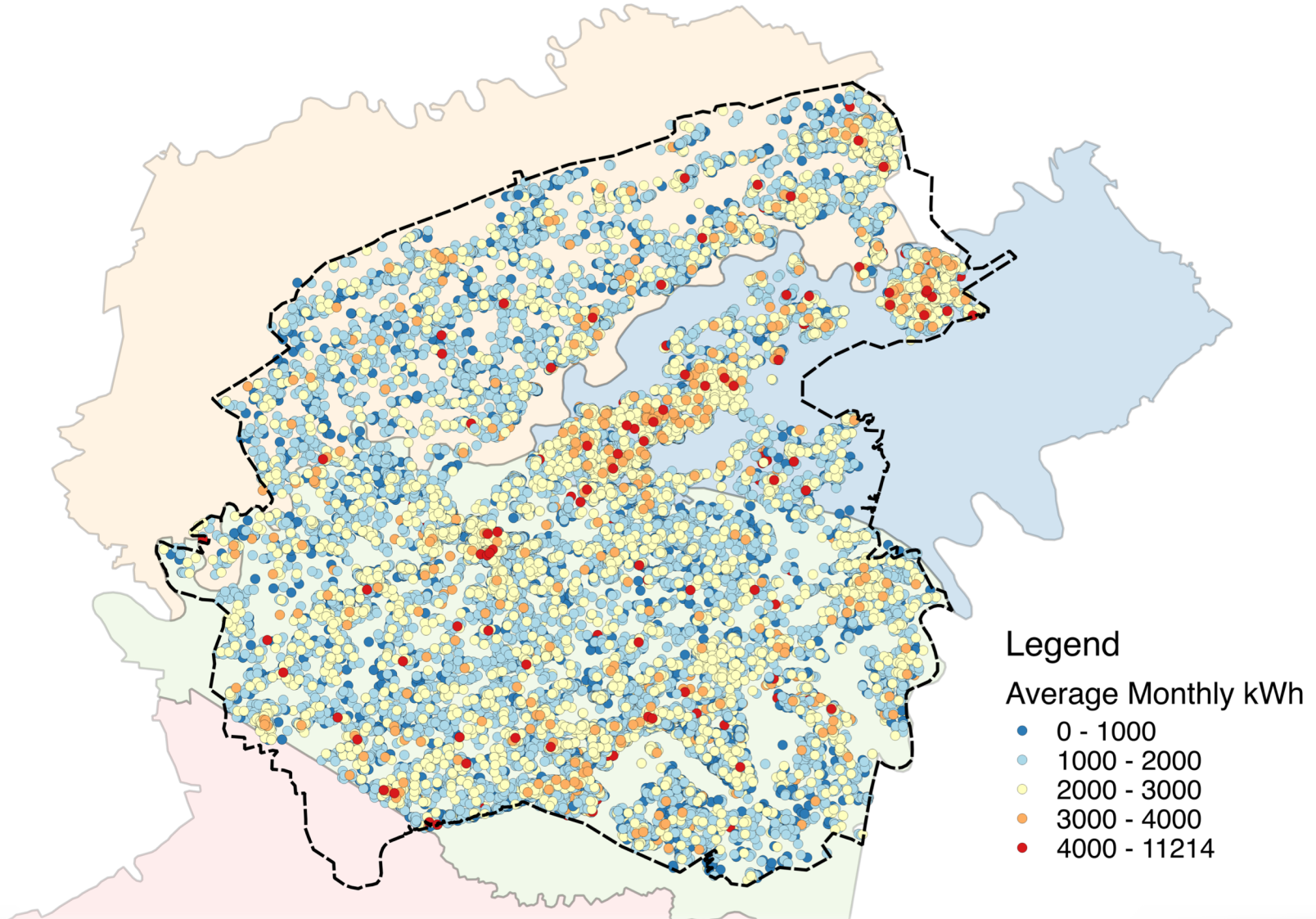
# The worst of the worst

## Seasonal Energy Intensity of Candidate Homes

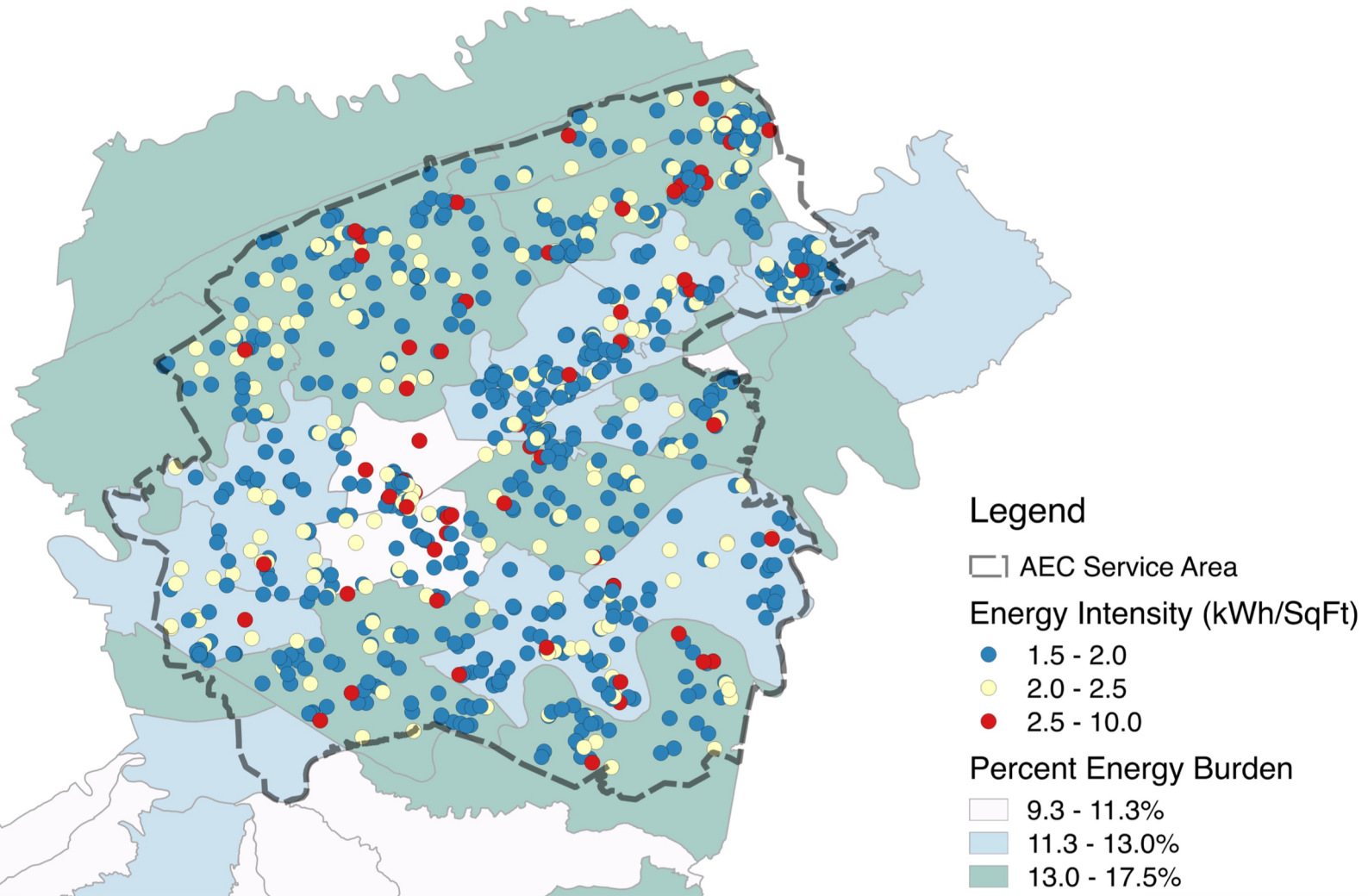


# Maps

# Average Monthly kWh for AEC Residential Properties (2014-2016)



# Annual Energy Intensity of PAYS-Candidate Homes



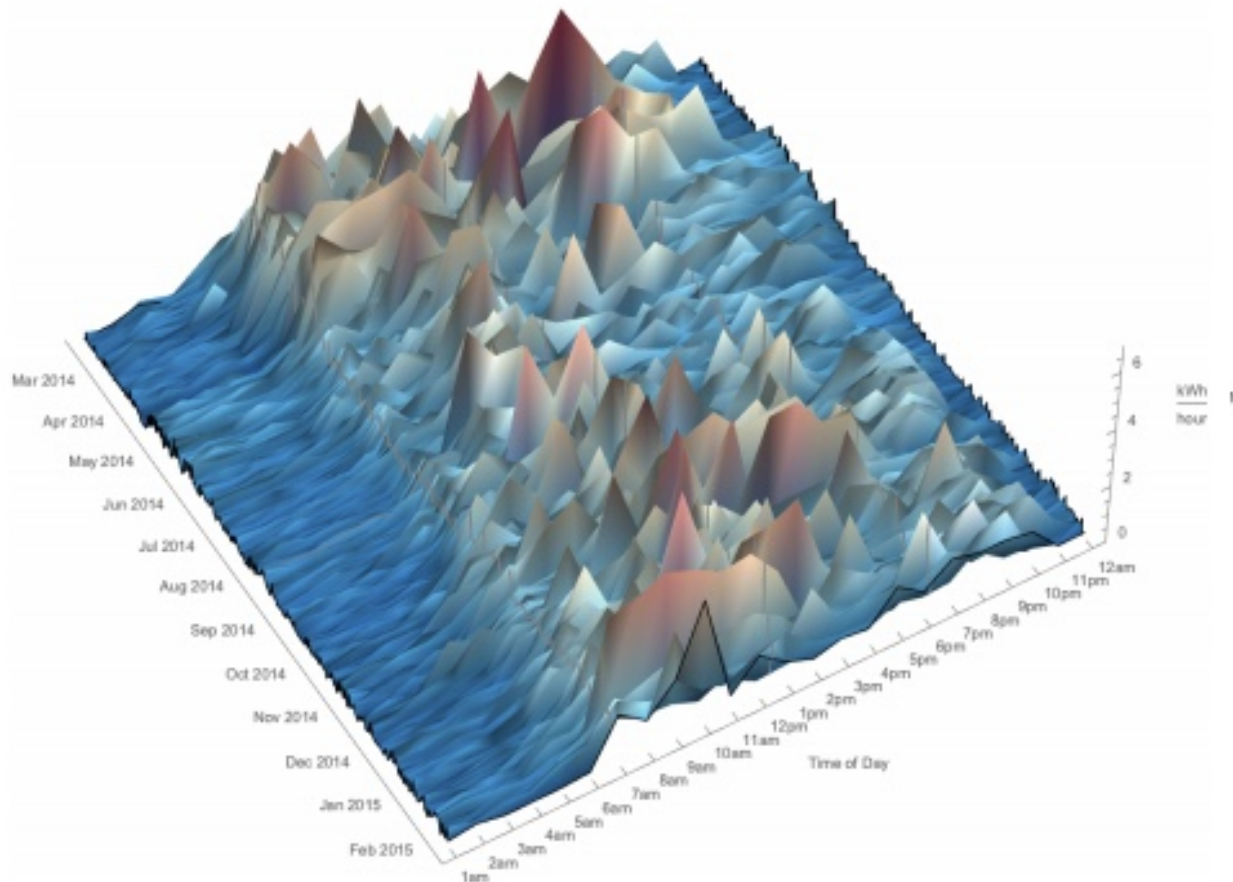
# Prioritizing homes to target

**The strongest PAYS candidates in order of potential usefulness:**

1. Ratio of winter to shoulder energy intensities
2. Higher winter energy intensities
3. Higher winter kWh per month
4. Higher annual energy intensities
5. Higher annual average for kWh per month

# Beyond Energy Intensity

- Utilities can use GreenButton to track/assess electricity use
  - Can see hourly, baseline and seasonal usage



# EFFICIENCY AND SAVINGS POTENTIAL

# Impacts for AEC's program

- **Assumptions**

- 600-700 homes over 2 years
- ~\$8,000 per home (\$5 million total)
- Avg. initial kWh/year = 24,000
- 25% electricity savings per project

- **Results**

- 3,900 MWh/year energy savings
- Net savings for participants: \$120/year
  - \$600/year after cost recovery
- 10-15 direct jobs (30-40 indirect jobs)



# Tennessee EE Potential

## Cost-effective package savings potential in Tennessee single-family homes



**1.1**  
billion

dollars per year utility bill savings



**17.3**  
trillion

Btu per year gas, propane, and fuel oil savings



**8.8**  
billion

kWh per year electricity savings



**1.5**  
million

cars of pollution reduction

NREL Restock  
Analysis – State  
Fact Sheets

# Contact

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Appalachian Voices

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