Vanilla Class,
Tutti Frutti Customers

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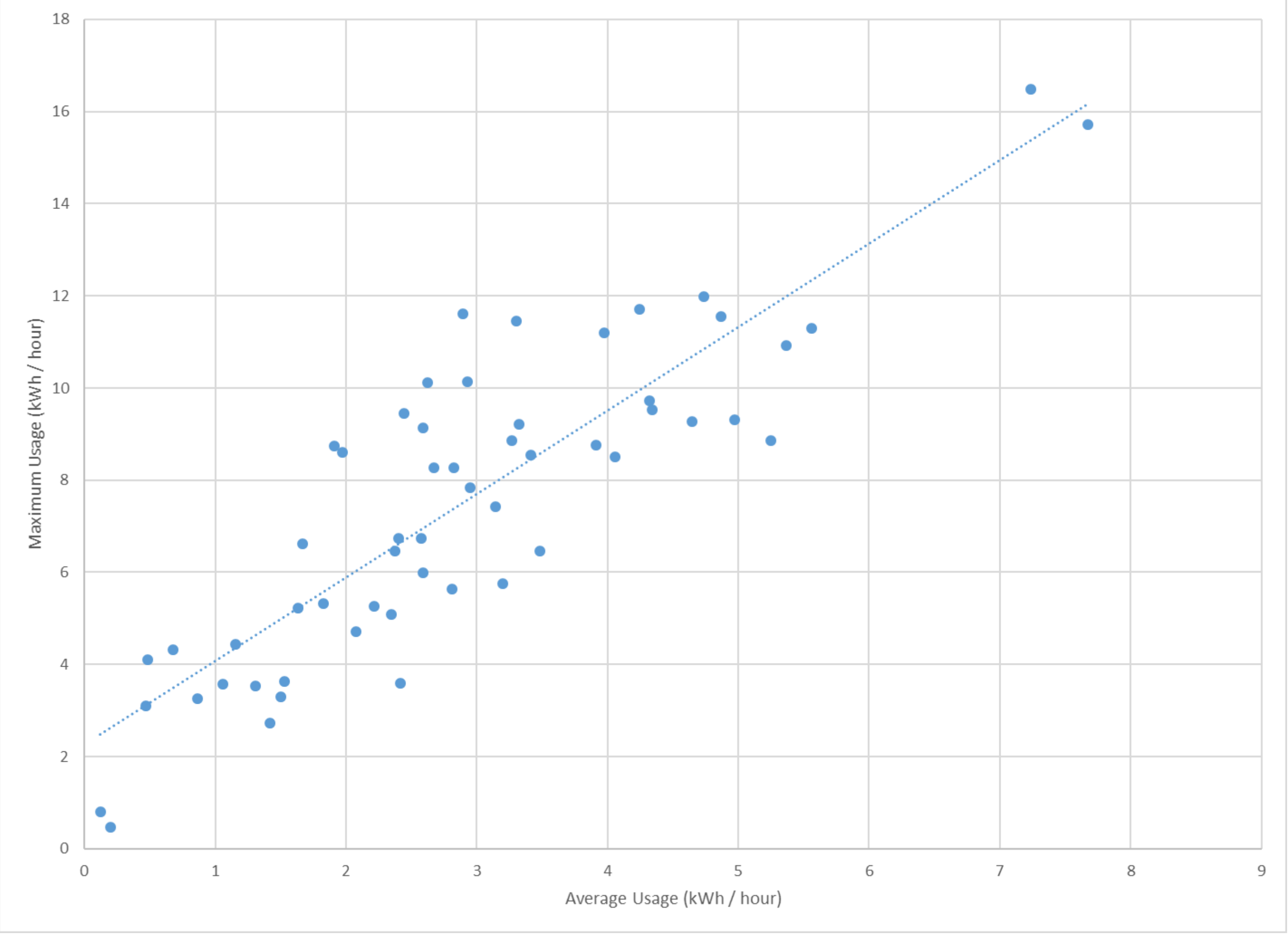
Managing Customer Diversity

- What observable information captures customer diversity?
  - (kW, kWh, voltage service level, …)
  - Location?
    - Weather? California; fixed billing
- Does the rate use the information?
  - Recovery of embedded costs
  - Any reflection of marginal cost?
- Can a diverse rate portfolio help?

Example of Increased Diversity

- Distributed Energy Resources (DER) customers increase Residential class diversity
- Assumption of two-part Residential rates:
  - Customers have similar load factors: LF=(kWh/(kW*hours)
  - Customers with equal total consumption have equal cost to serve
- DER customers violate the load factor assumption

Average Usage vs. Maximum Demand: Traditional Customers



For traditional customers, there is a fairly predictable relationship between demand and energy.

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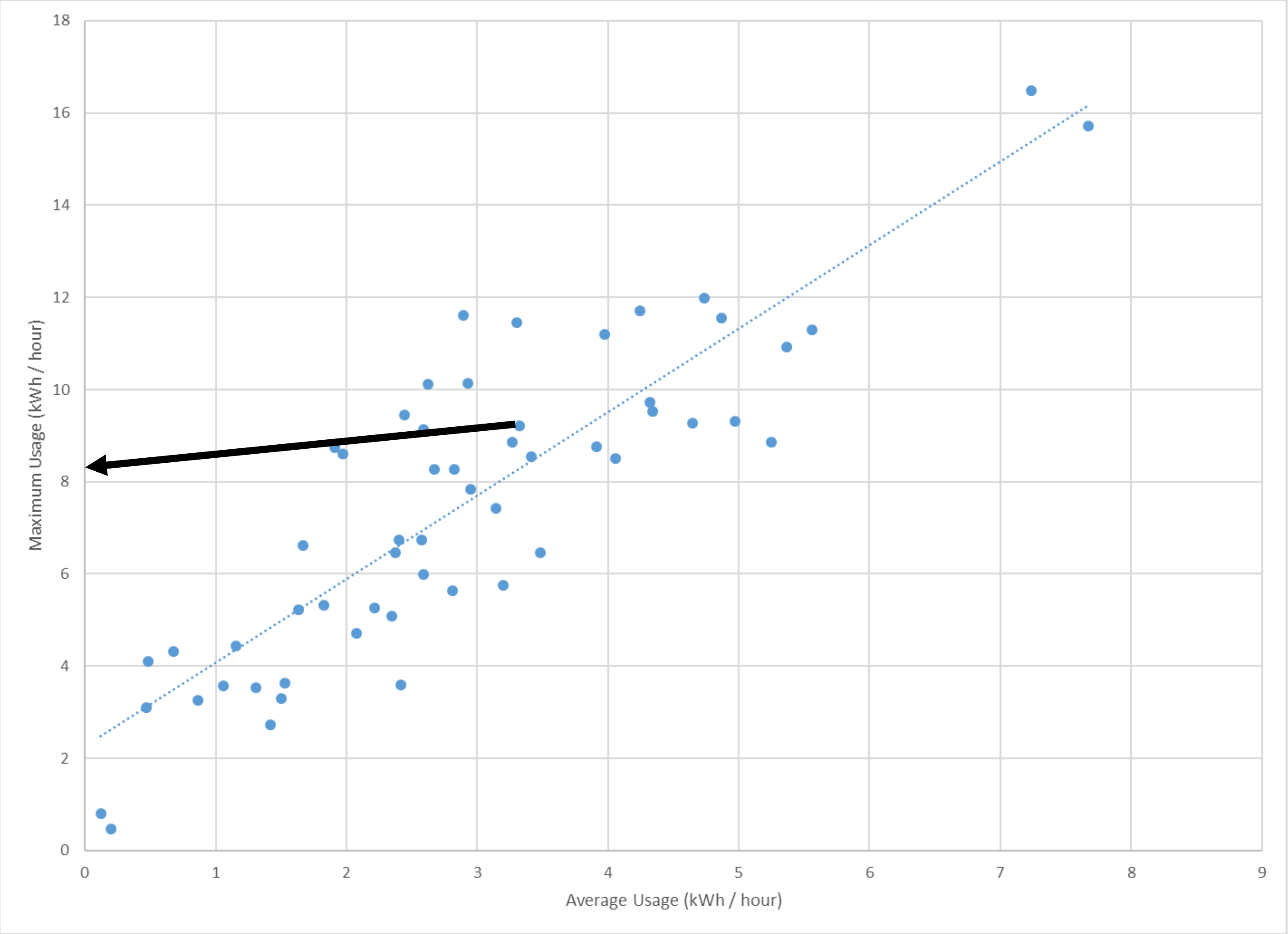
Average Usage vs. Maximum Demand: DER Customers

DER customers' demands would slide leftward, toward the y axis.



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Can Rates Cope?

- Traditional DER pricing: net metering
  - Insufficient information: net flow of kWh
- Alternatives:
  - Residential demand charge permits use of extra information (net demand)
  - Buy-all/sell-all: pretend that there are two economic agents at one customer site
    - All site consumption bought from provider
    - All site generation sold to the grid
- Objective: match revenue to cost

Residential Portfolio Diversity: Direct Energy (Houston, TX)

- 8 rate plans
  - Simple platform: customer charge plus flat energy
- 4 contract periods (1, 12, 24, 36 months)
- Fixed bill up to 2,000 kWh
- Varied renewable content
- And…

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Free Electricity!

- Direct Energy (TX) offers "Free Power Weekends 12"
  - Electricity is FREE on weekends from 6pm Fri
    - Direct Energy reimburses the local distribution company for its distribution services charges
  - Energy price locked in for a year: 11.8¢/kWh, Mon. 12am – Fri 5:59pm (quote for Houston, Sept. 2018)
  - 24-month offering as well
- Will diversity of rate offerings match increasing customer diversity?

Large-Customer Diversity

- Diversity is augmented by competitive alternatives for mobile or multi-jurisdiction enterprises
- Utility response:
  - Diverse portfolio
  - Discounting, including:
    - Interruptible/curtailable rates
    - Economic development, load retention rates
    - Special contracts ~ competitive markets
  - Two-part RTP – markup of wholesale price, plus access charge; hedging available
- Challenge: price competitively based on a simple platform ~ competitive retail markets

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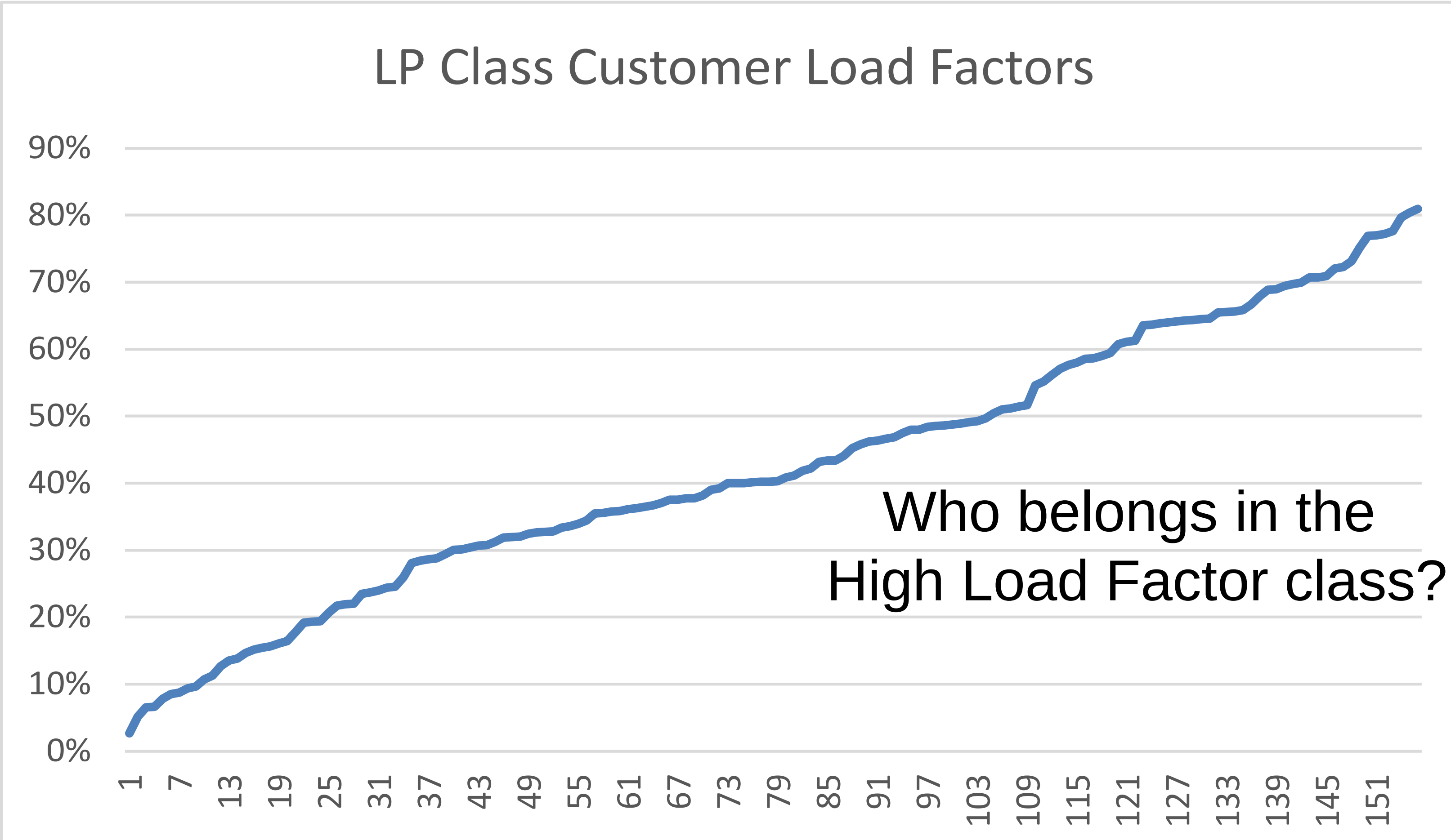
Example of Rate-Splitting Attempt

- Customers with high load factors claimed that they were over-paying
- Utility issues:
  - Who should be included in the High LF class?
  - What is the cost difference?
  - Is that reflected in the current rate?

High LF Large Power Customers Request Separate Rate



Outcome

- Cost difference for selected split: 18%
- Rate difference much less due to high demand charge
- Utility issues:
  - Administration
    - Customer dissatisfaction for those moved to lower load factor class annually
  - Regulatory resistance
- Initiative abandoned, but the cost difference remains

Summary

- Increasing customer diversity under regulation produces effect similar to competition: portfolio diversity
- Rates do best when they use available data, even at expense of rate complexity
- Large-customer diversity is spurred by competitive alternatives; produces competitive ratemaking by proxy and class fragmentation