SAND2011-7302P

Commercial/Residential Load Shape Analysis

Abraham Ellis, Matthew Lave
Sandia National Laboratories

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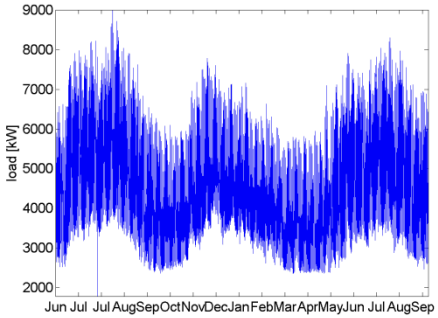
Analysis Summary

- **Q: How does minimum load relates to peak load?**
  - Focus on commercial, residential and mixed load
- **Data studied**
  - Urban area in the Southwest
  - 500 feeders, 150 substations
  - 15-minute data, 18 months
- **Methodology**
  - Filtered out industrial feeders, feeders with load transfers
  - Max load is defined as 99.9^{th} percentile
  - Min load is defined as 0.1^{th} percentile of all data
  - Min daytime load defined as 0.1^{th} percentile of daytime hours (9 AM to 4 PM)

Commercial/Residential Feeders

653 2703 159 3



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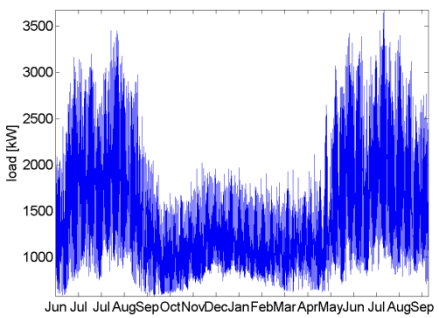

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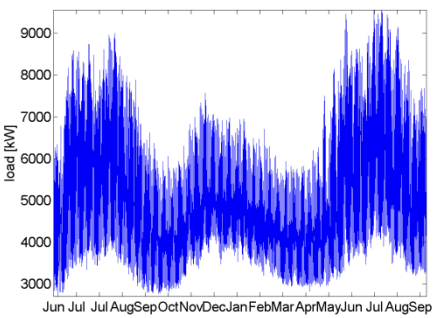

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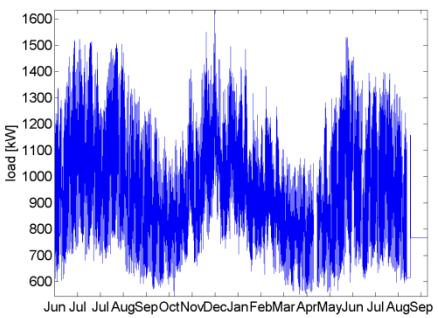

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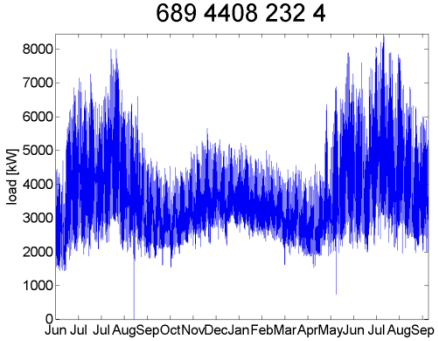

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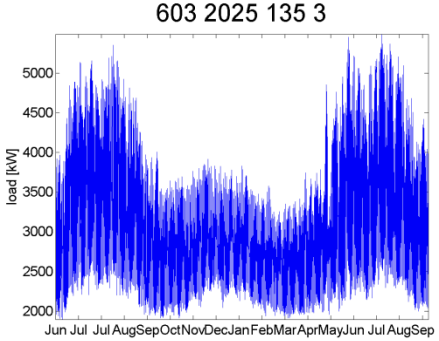

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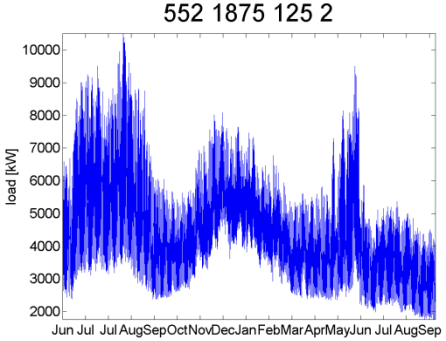

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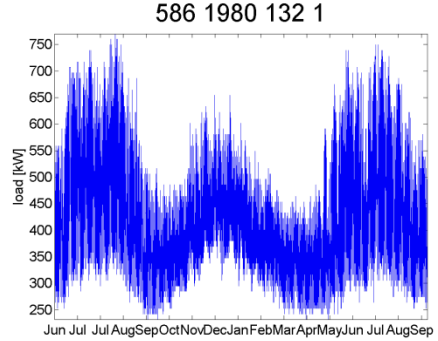

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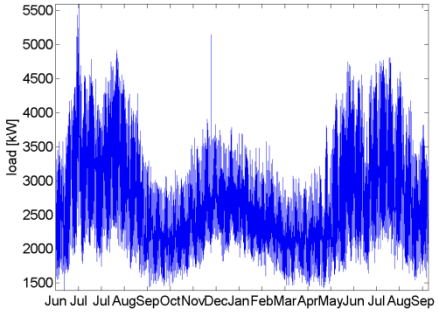

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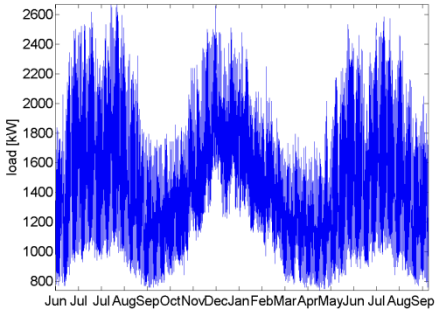

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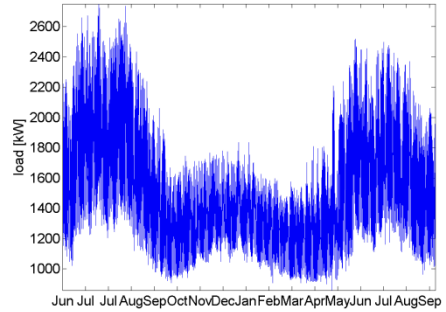

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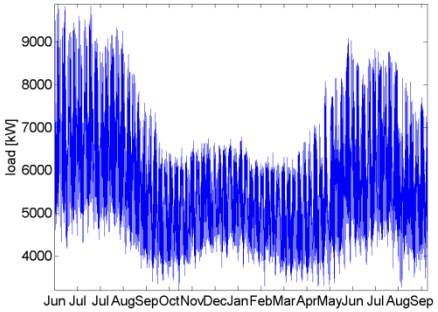

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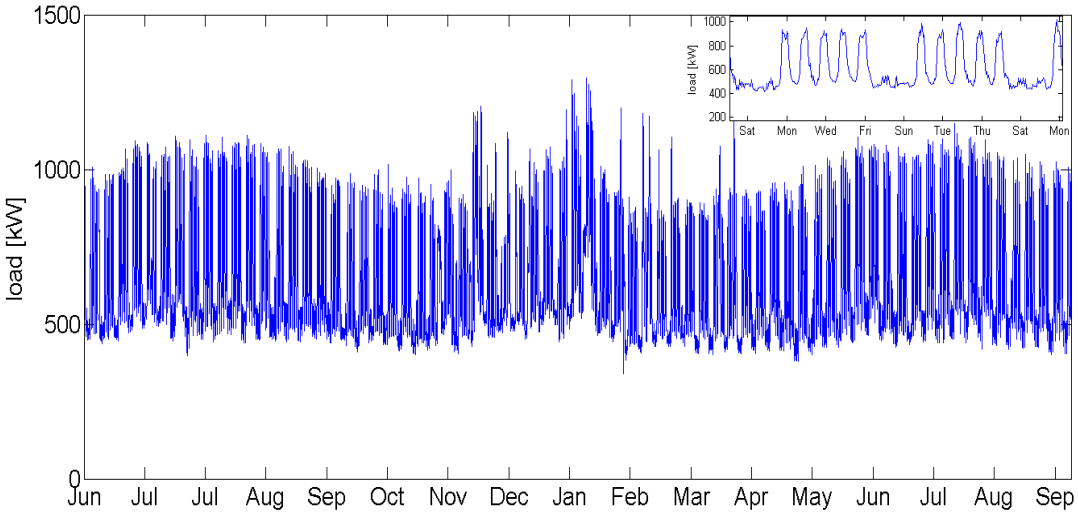
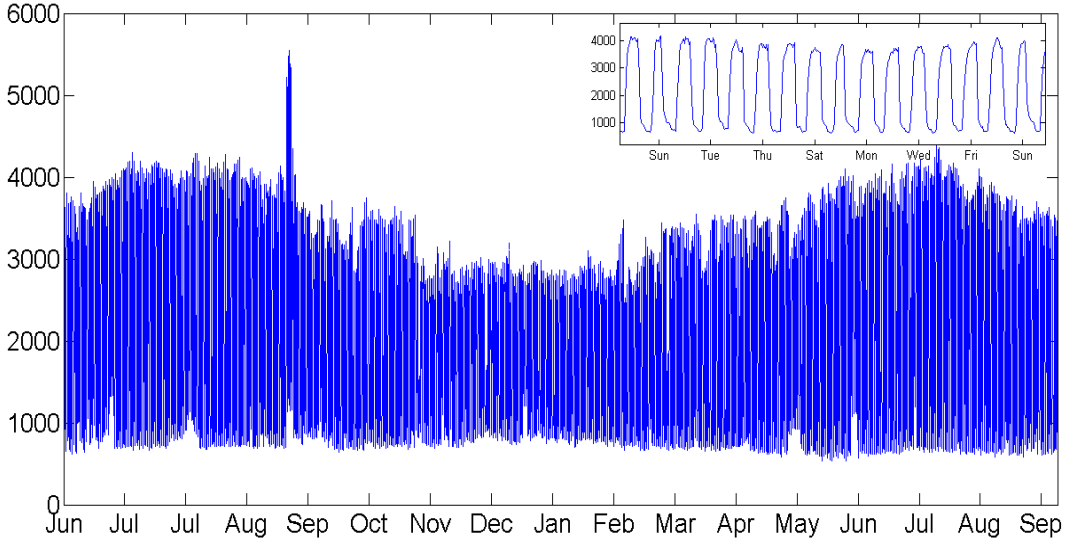
Interesting Load Profiles



- Small seasonal variation
- Low weekend peak
- Consistent minimum seasonal and weekly



- Larger seasonal variation
- Consistent weekly profile
- Consistent seasonal and weekly minimum

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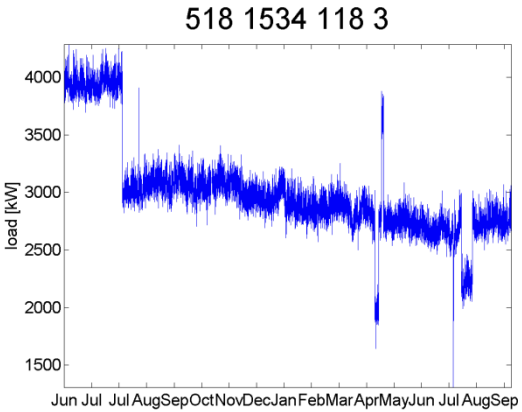
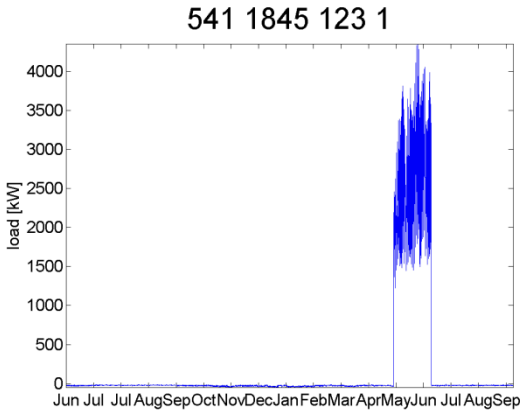
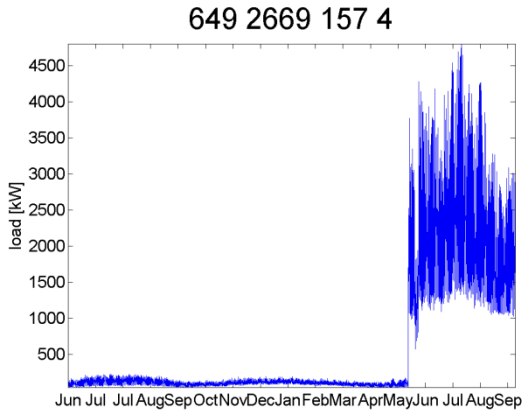
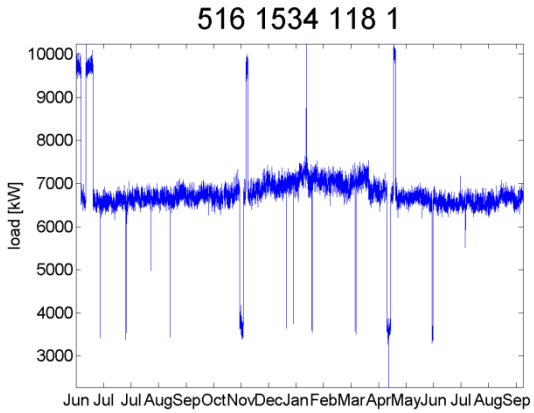
Interesting Load Profiles (Filtered Out)

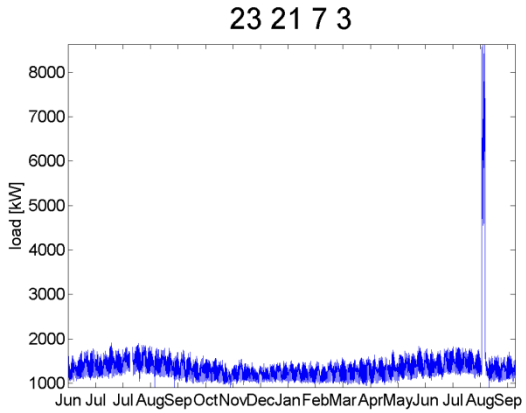
- **Non-conforming shapes**

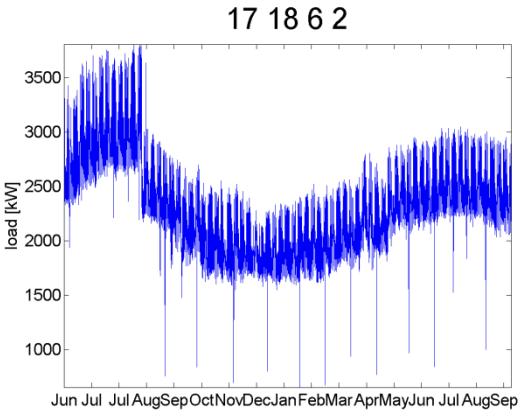












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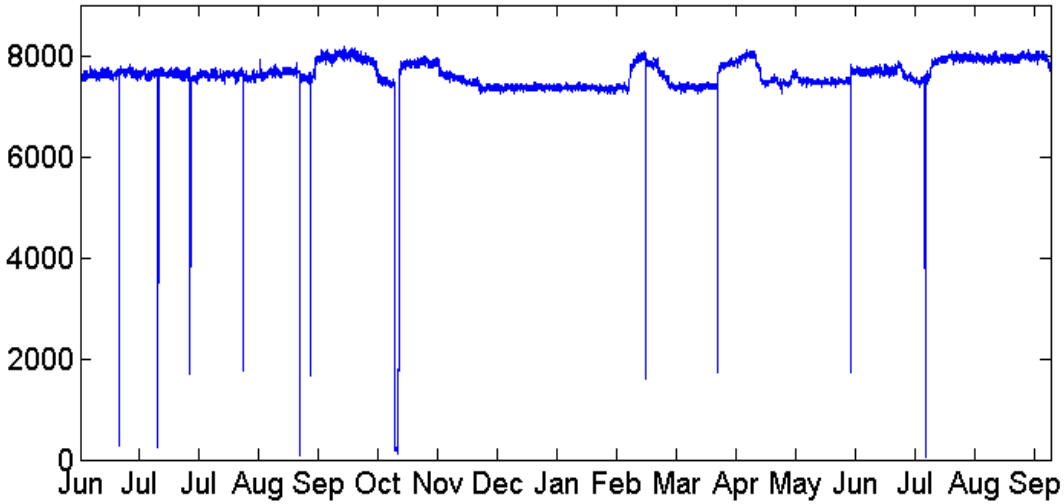
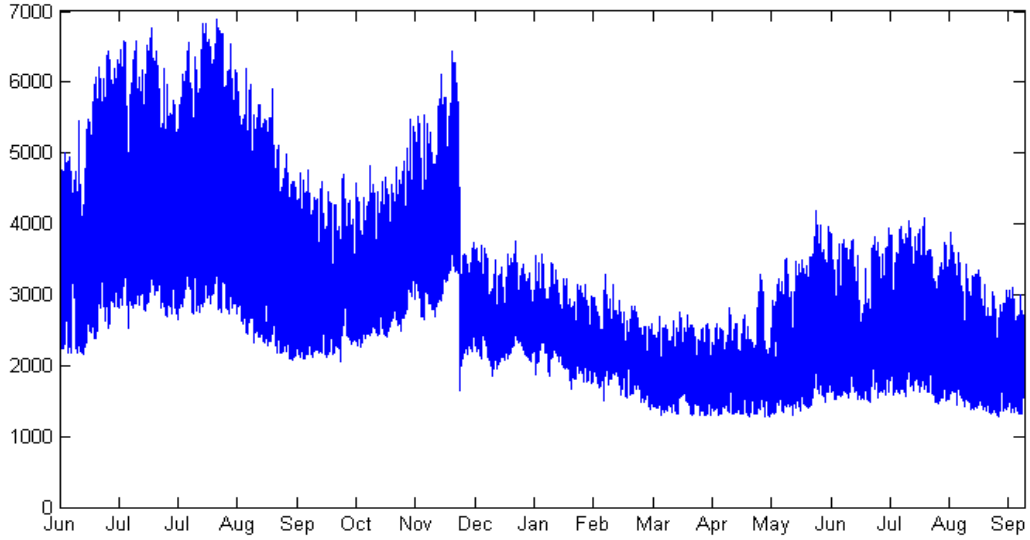
Interesting Load Profiles (Filtered Out)



- Industrial customer
- Nearly constant load



- Residential/commercial
- Permanent load transfer

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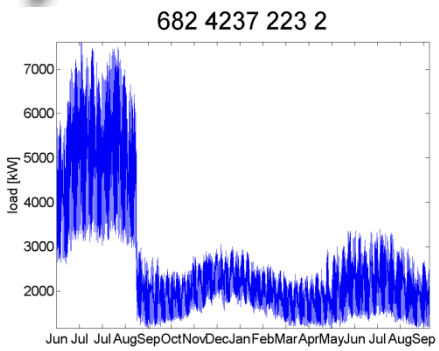
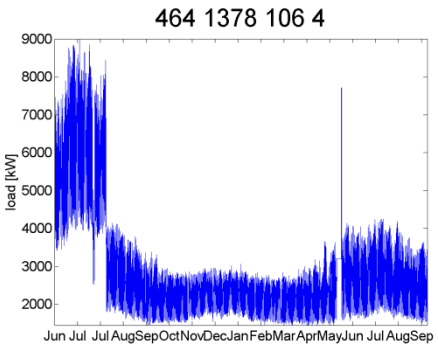
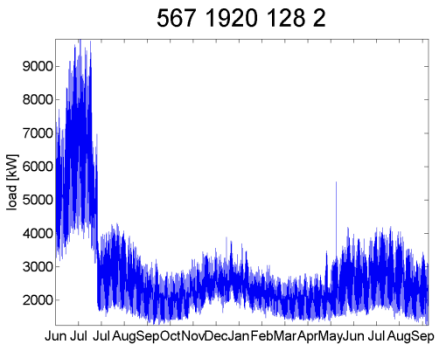
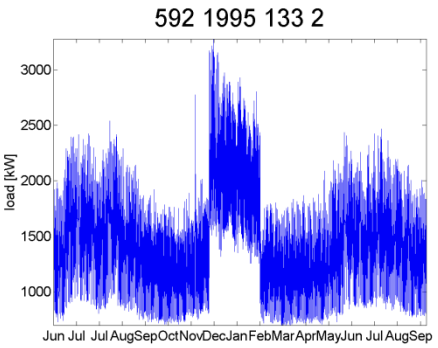
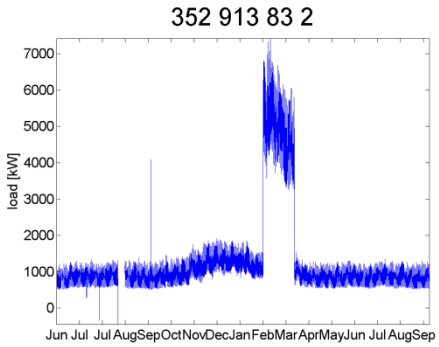
Load Transfers (Filtered Out)

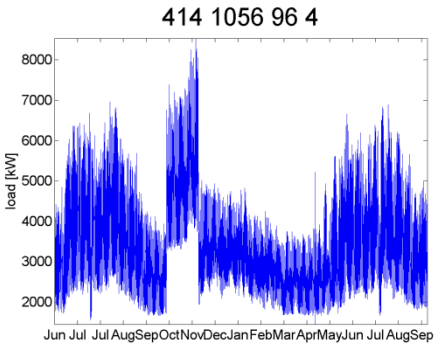


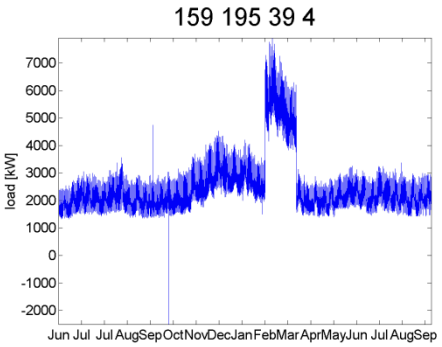


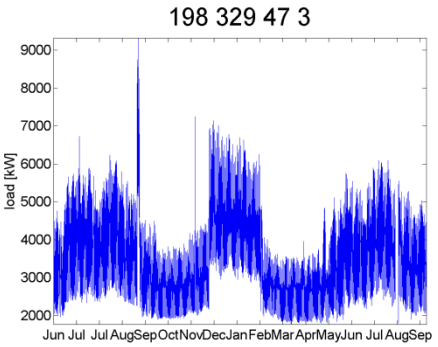


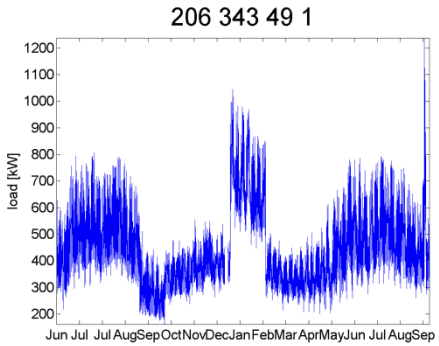


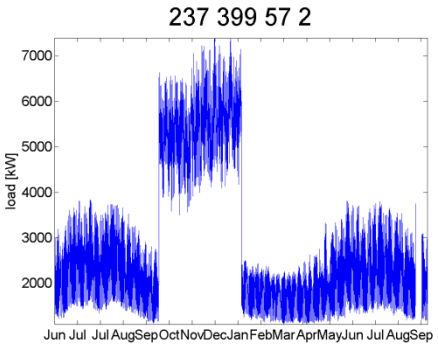


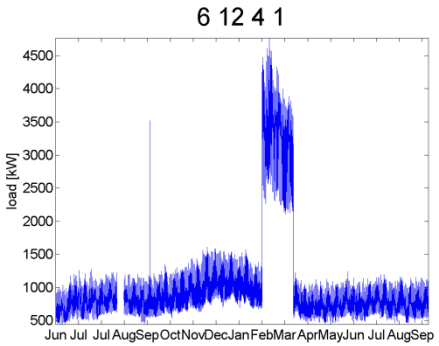


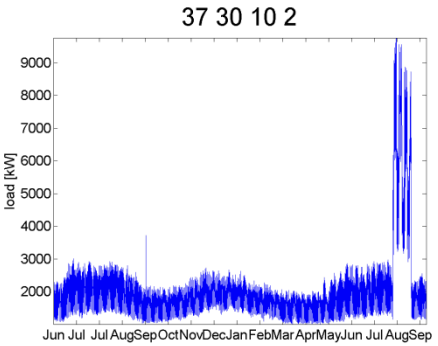












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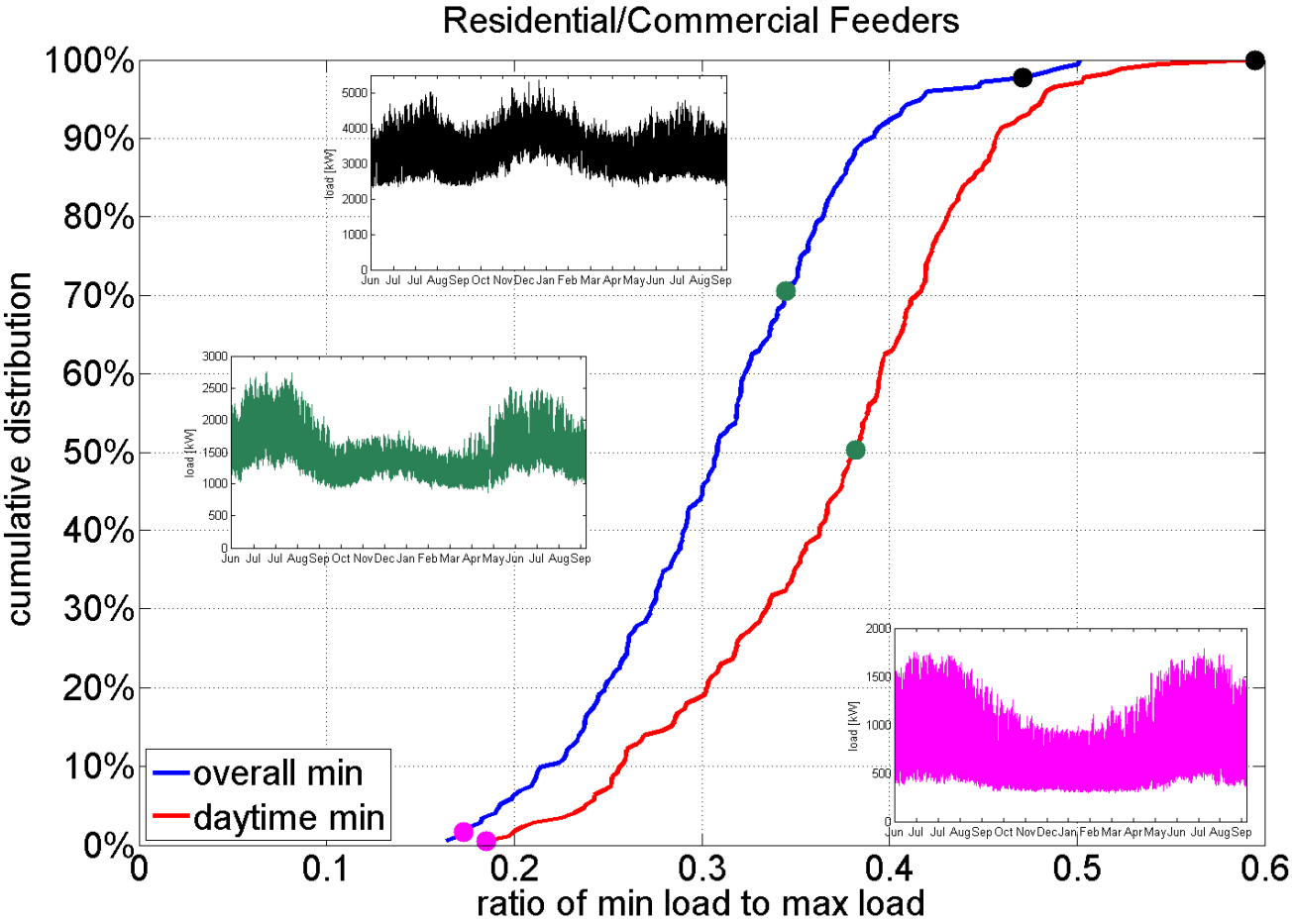
Results for Feeder Load

- **Daytime min load to peak load ratios are significantly higher than absolute min load to peak load ratios**



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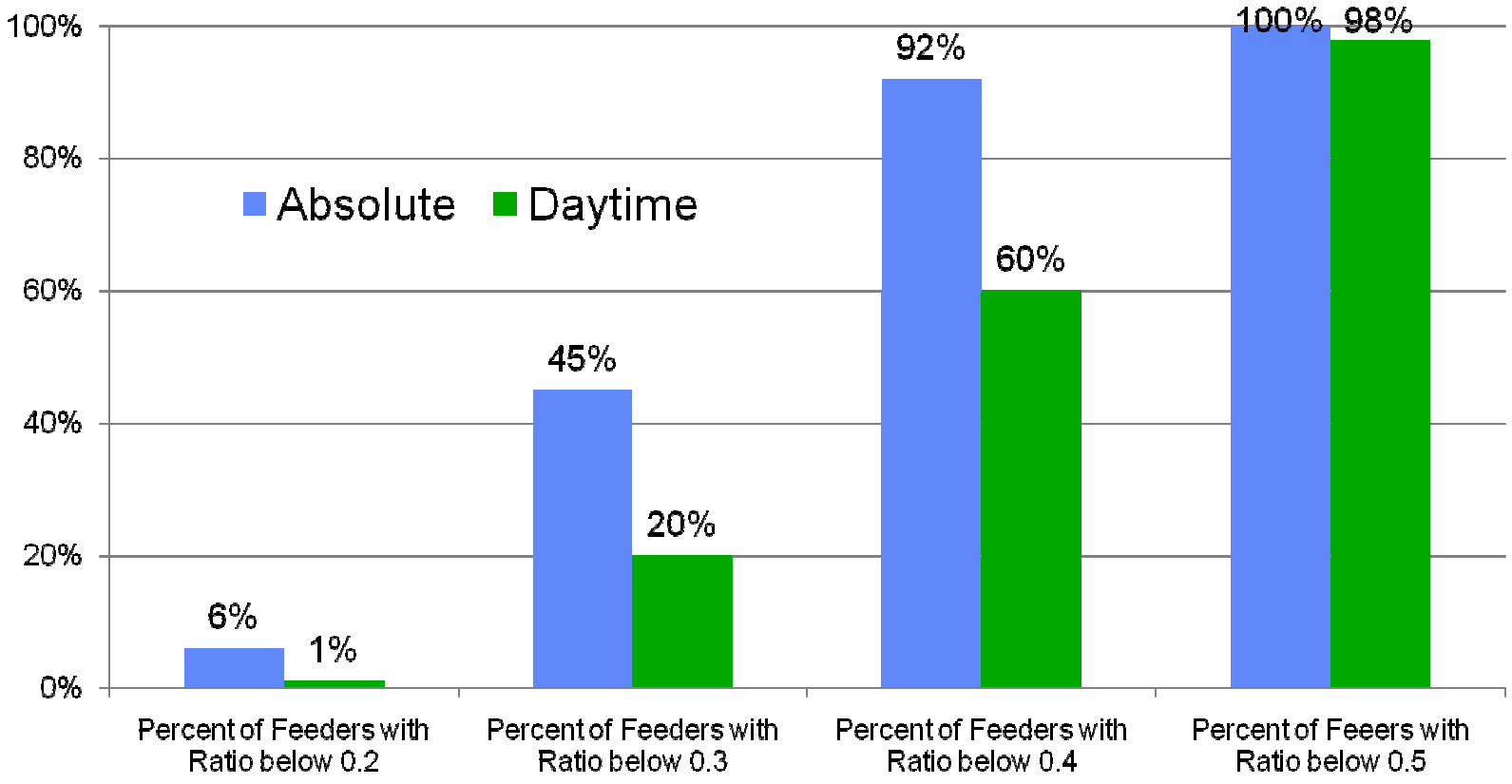
Results for Feeder Load

- **Another way to look at it: What percentage of feeders have rations below 0.2, 0.3, 0.4 and 0.5?**



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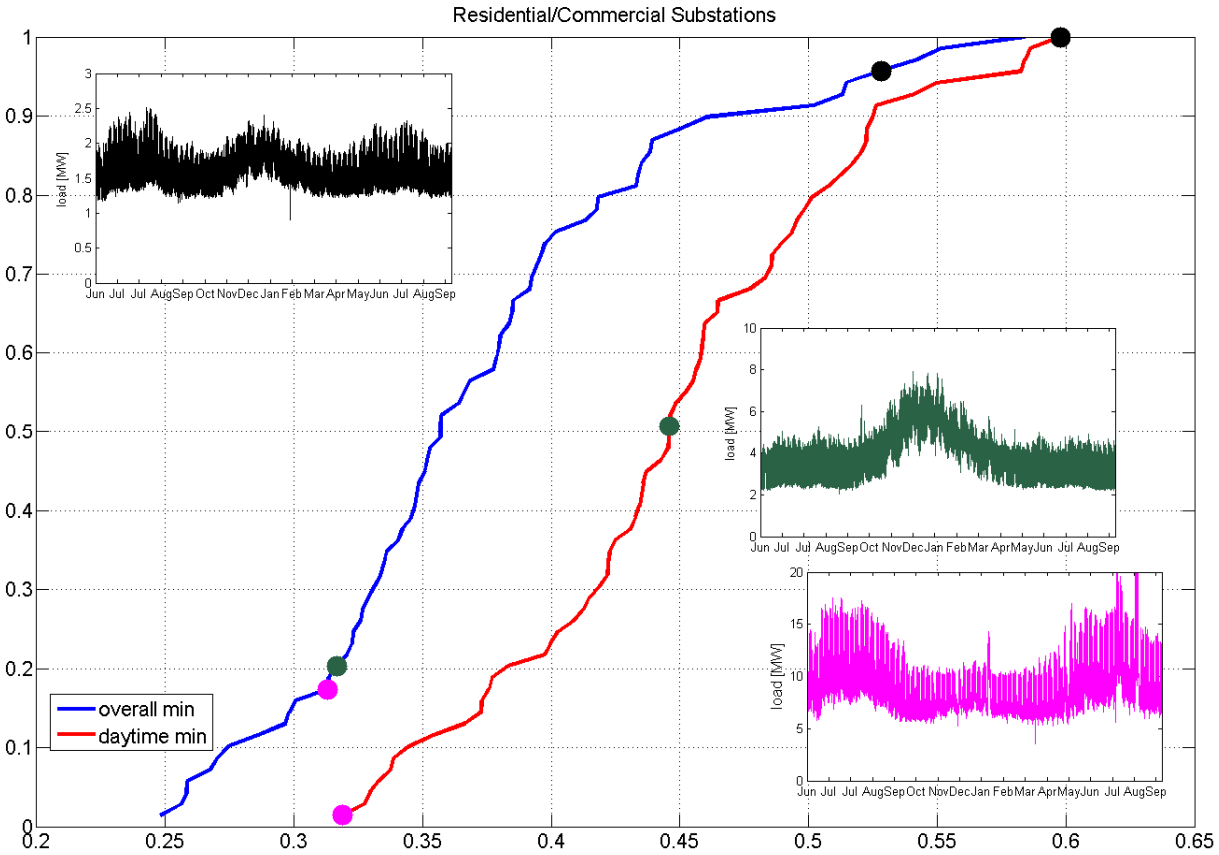
Results for Station Load

- **Results similar to feeder load analysis; however, ratios are higher**



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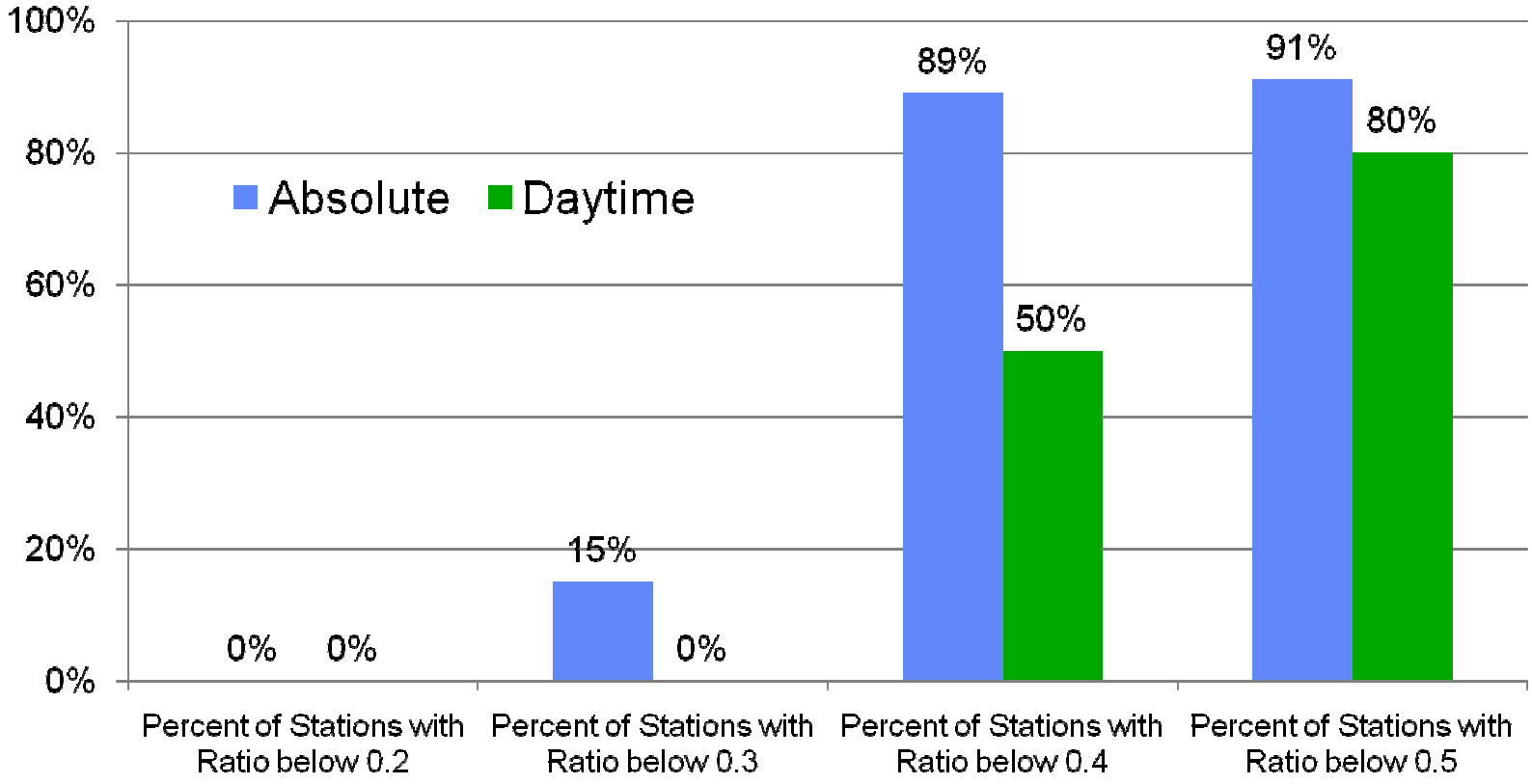
Station Level Results

- **Another way to look at it: What percentage of stations have rations below 0.2, 0.3, 0.4 and 0.5?**



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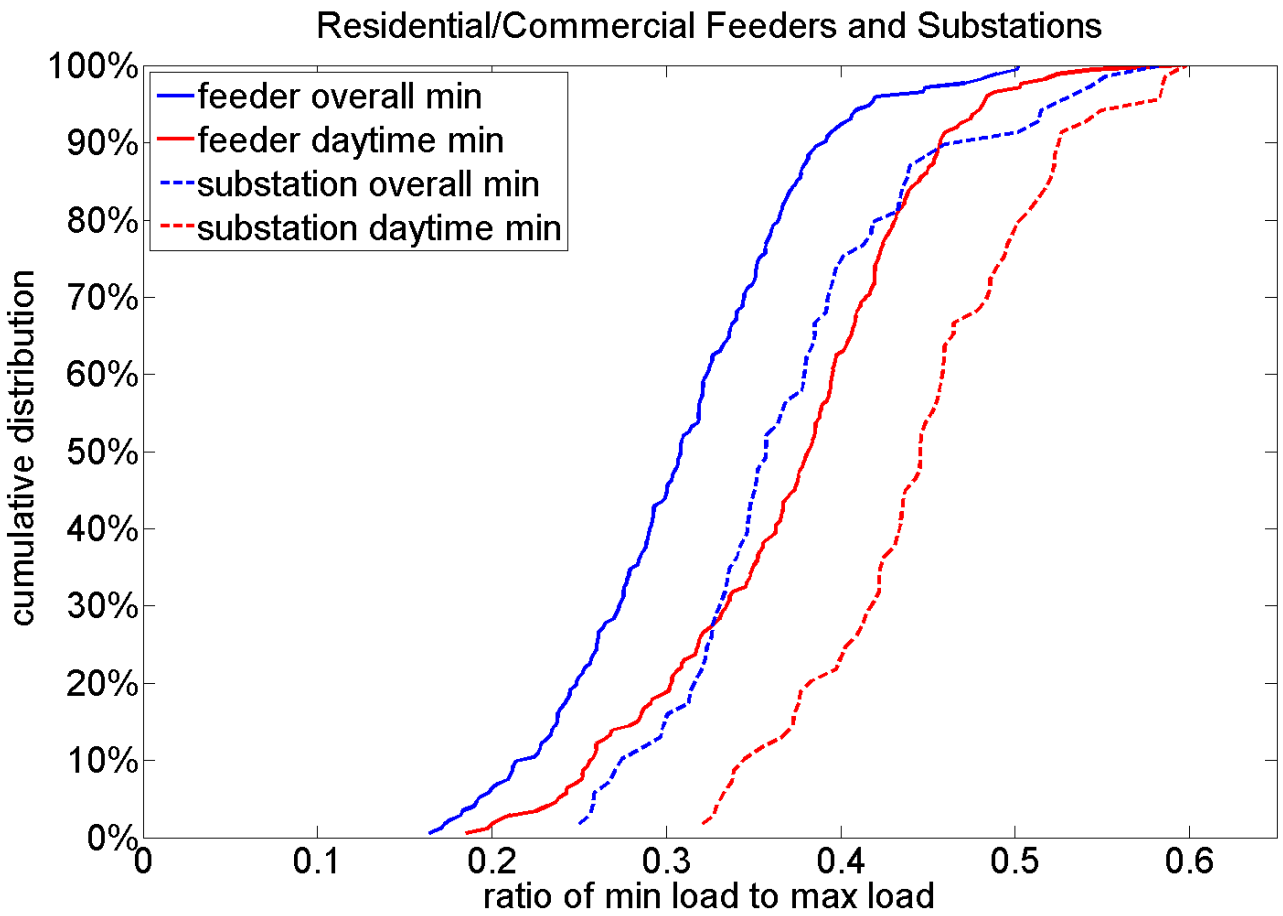
Comparing Feeder and Station Ratios

- **Load diversity increases min-to-peak ratio**



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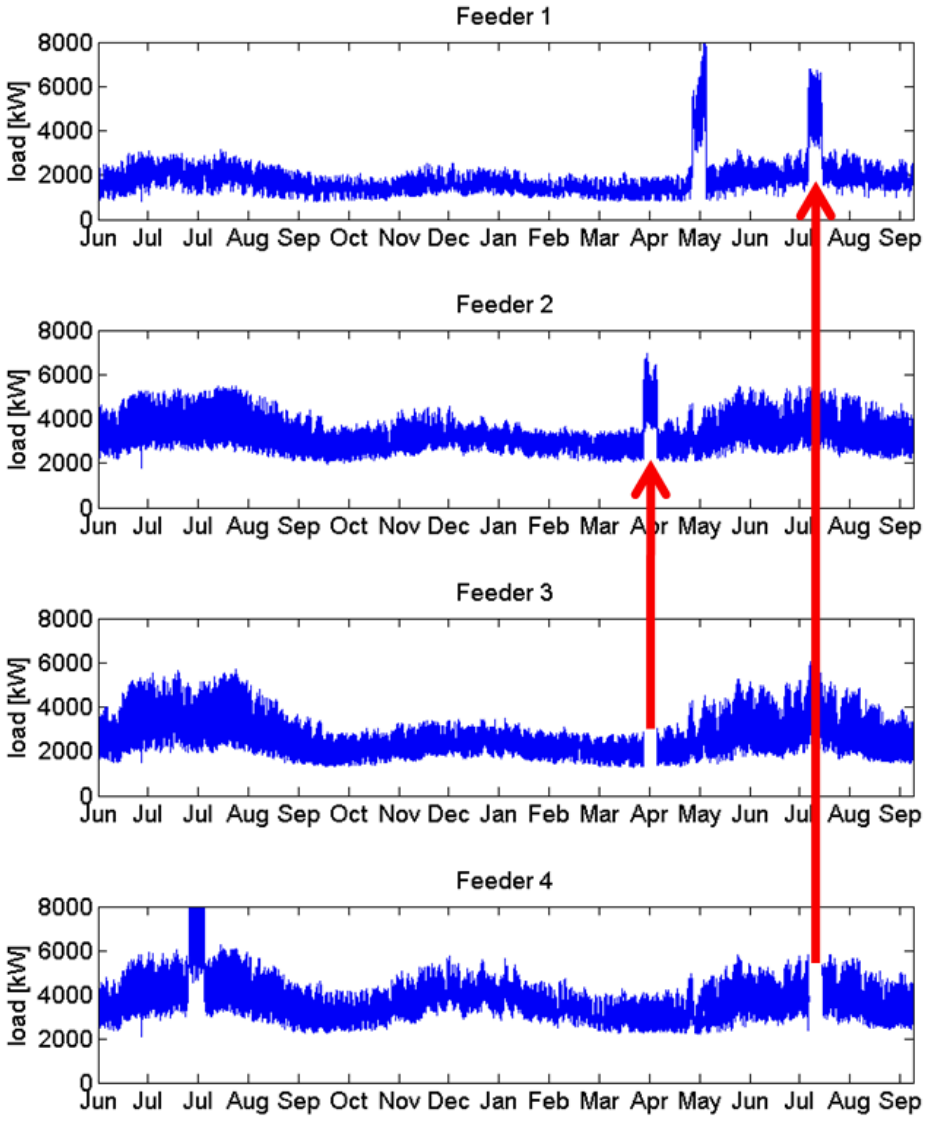
Summary

- **Analysis of residential/commercial load from one metropolitan area puts 15% in perspective**

- **Ratio of absolute min load to peak load**
  - Varies from 0.15 to 0.50 for feeder load
  - Varies from 0.25 to 0.58 for station load

- **Ratio of daytime min load to peak load**
  - Varies from 0.16 to 0.59 for feeder load
  - Varies from 0.33 to 0.60 for station load

Accounting for Load Transfers



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