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Improving benchmarks for energy consumption in schools

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Project concept

To reduce building energy consumption we need to know where and how much we consume

New low energy buildings often use more energy than predicted

Highly detailed energy consumption data is now available

How can we exploit it for problem diagnosis and advising remedial action?

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Research questions

1. Do electrical load profiles at short time resolution show useful features?
2. Can these features be used for diagnosis?
3. Can load profiles be used to give benchmarks, against which buildings can be assessed?
4. How useful would this be to building energy managers, designers and other professionals?

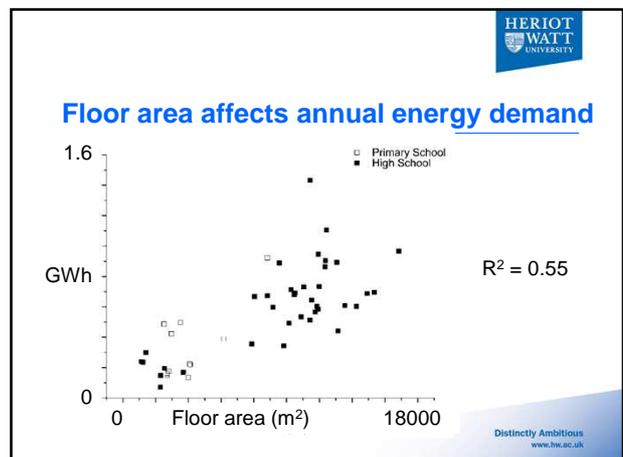
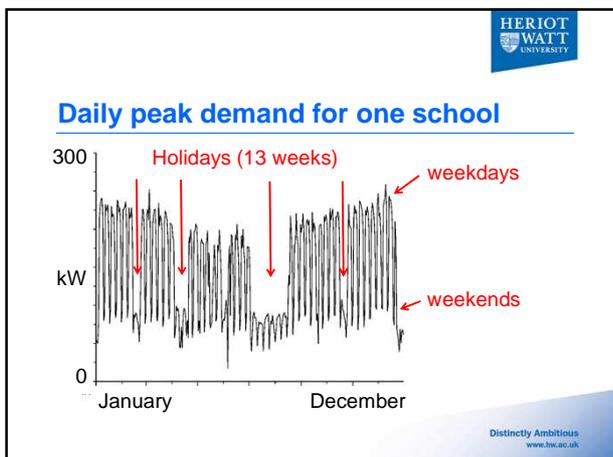
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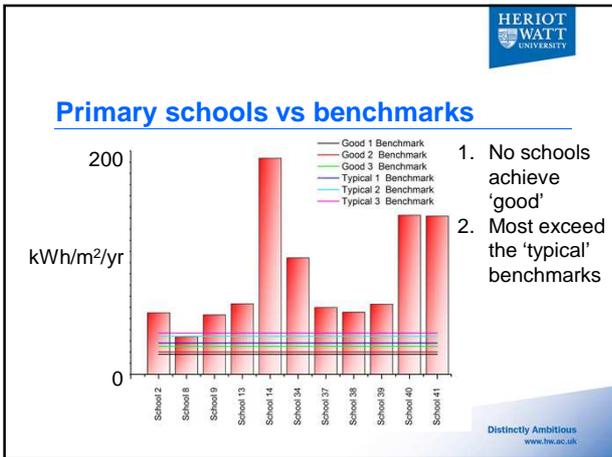
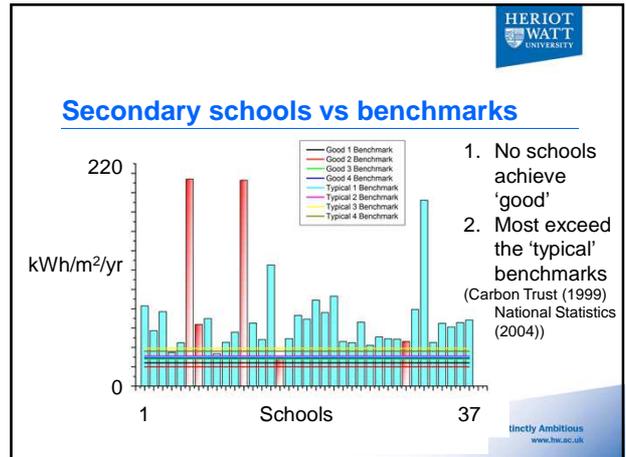
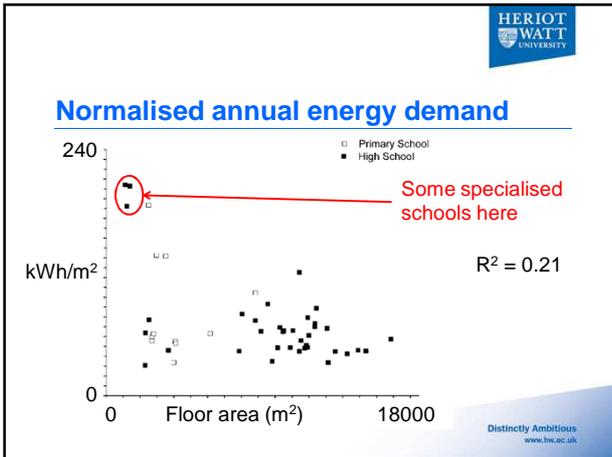
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Research process

1. We obtained half-hourly electricity consumption data from 48 schools in Scotland
 - 37 secondary, 11 primary
2. We cleaned the data to deal with
 - Weekends, holidays, half days
 - Summer / winter time changes
 - Normalisation by floor area
3. Analysis and evaluation

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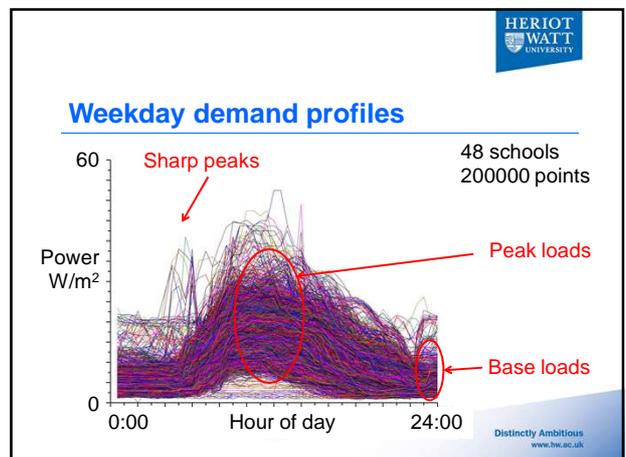
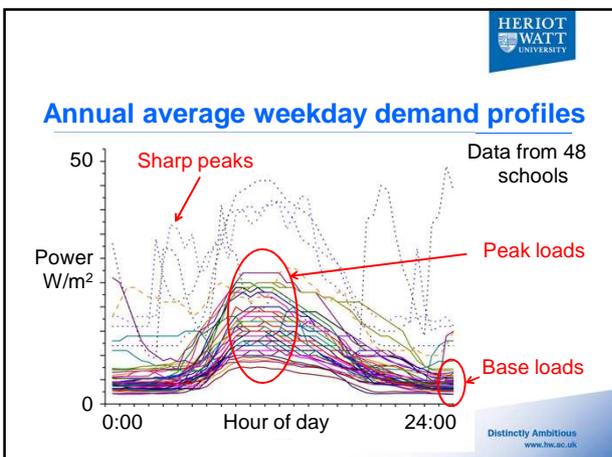


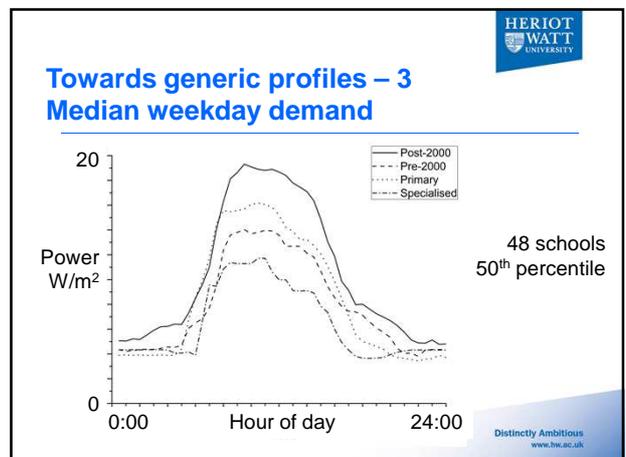
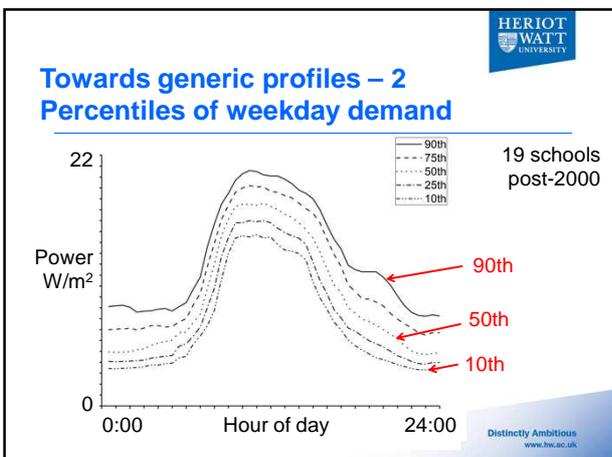
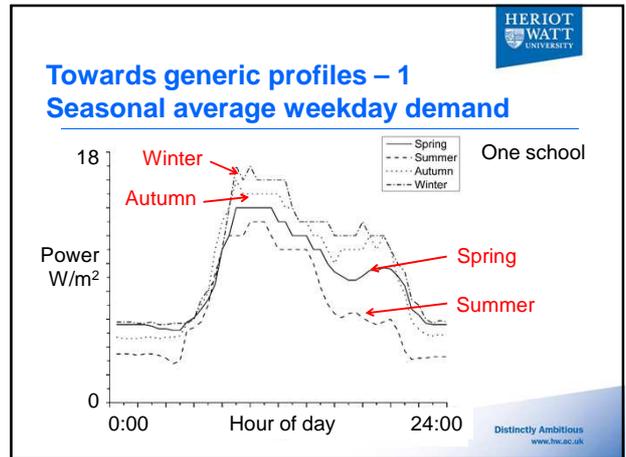
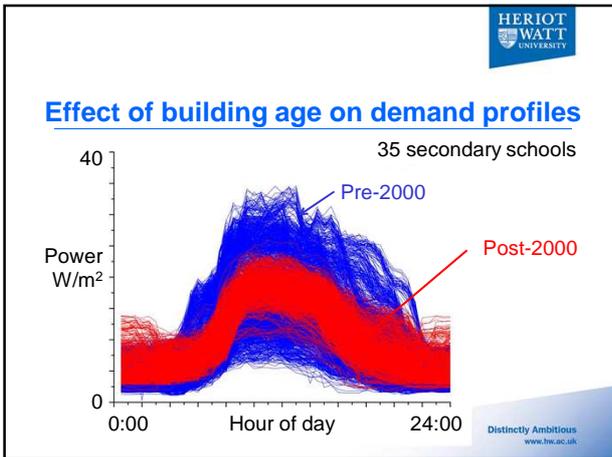
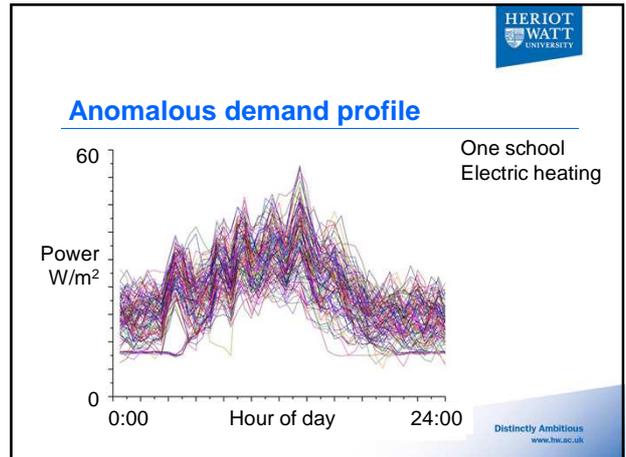
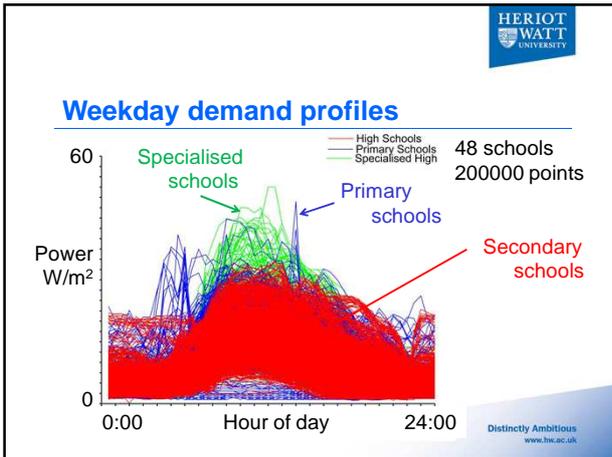
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Preliminary conclusions

1. There is something wrong with our schools
2. They fail to meet the benchmark values (are they appropriate?)
3. Annualised information doesn't give enough detail
4. We need to look more closely at demand profiles

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Conclusions

- Current energy demand benchmarks have limited utility
- Half-hourly demand profiles have useful features
 - They can show up anomalies for diagnosis of issues
- Demand profiles show clear differences between types of schools, occupancy patterns and seasons
- More reliable benchmarks can be established
- The approach could be adopted for other building types and for thermal demand (e.g. gas consumption)

A possible application

1. Build up a database of half-hourly demand data
2. Develop profiles representative of different building types
3. Compare what you see with what you would expect
4. Diagnose the cause
5. Take corrective action

Steps 3 and 4 could be embedded in an energy management system

We would be interested in data sources to develop this idea.

Thank you for listening

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