ENERGY AUDIT FOR HOUSEHOLDS

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INTRODUCTION

• Fossil Fuels still constitute 82% of the current energy sources

• Estimated to not last for more than next 40-50 years

• Environmental cost of using fossil fuels?

• Renewable energy sources still constitute only 2% of the total energy needs
WHO USES MORE ENERGY?

- Contrary to the popular belief, households consume more than 40-50% of the energy produced.
- Rest of it is consumed by industrial and commercial activities.
- Energy audits and certifications are already in place for these sectors.
- Green buildings, green industrial parks are a right step in the direction of reducing the energy needs.
HOUSEHOLDS, ANY SENSE OF RESPONSIBILITY?

• Households being the largest consumer of energy needs responsible behavior too
• Households need to understand how they consume energy and plus wastage
• Inefficient building design, inefficient insulation, inefficient building materials, old appliances, defective appliances, careless human behavior are some of the common causes for energy to be wasted
• Awareness is currently an issue. Consumers do not know how much energy is used by each of their appliances
• Studies indicate 15% of the energy can be saved by giving this information to the consumers
SOLUTIONS?

• Energy Audits by certified energy auditors
• Can identify all inefficiencies and suggest remedial measures
• Not a scalable solution. May work out for huge mansions and not for common households
• Certified auditors are also expensive and short in supply
• One time kind of activity and no sustained monitoring or feedback available
SOLUTIONS?

• Build energy consumptions models for typical household profiles
• Embed these models into mobile apps or web apps
• Evaluate monthly bills against these models to understand points of excess consumption or wastage
• Provide recommendations based on the above analysis
• Apply recommendations, monitor and improve on a regular basis
EXISTING RESEARCH/WORK

• Energy Disaggregation or Non Intrusive Load Monitoring (NILM)
• Models are built using data gathered from smart meters and appliance level consumption devices (smart plugs)
• Predict appliance level consumption based on the trained models
• Existing methods can achieve up to 80% accuracy
• Lots of ongoing work to increase the accuracy
• Active research in developing new models and algorithms
PROBLEM STATEMENT FOR HACK

• Build and train energy disaggregation model based on identified datasets
• Use this model to predict disaggregation of monthly total consumption of energy
• Additional credits for hackers who build a recommendation model based on the output from disaggregation model
• Note: Only electricity usage is considered although households use other sources of energy like Natural Gas, Solar, Fuel Oils
DATASETS

• REDD – Reference Energy Disaggregation Dataset

• Available for free at [http://redd.csail.mit.edu](http://redd.csail.mit.edu)

• Check the website and request for credentials

• Note: Resample the appliance level consumption to match the sampling frequency of the smart meters. You could consider resampling to 30 mins or 60 mins too
DATASETS (CONTD…)

• Could consider other datasets like:
  RECS 2015

• UK Dale
REFERENCES

• Search for “Energy Disaggregation” in google
• Youtube - <https://www.youtube.com/watch?v=9pzwG1WpM2A&t=>
• Toolkits - NILMTK