HEC’s Load Research – An Innovative Approach for Electric Utility Planning

Presentation to: Seminar on Hong Kong Energy

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What is load research?
- Utility activities to measure and monitor customers’:
  - load profiles;
  - stocks of electric appliances; and
  - electricity consumption behaviour.

Why utilities have to do load research?
- Load forecasting
- Supply side planning
  - Planning of generation capacity
  - Planning of transmission capacity
  - Planning of substation capacity
- Demand side planning

How load research is conducted by most utilities? (1/2)
- Analysis of billing data
  - Monthly energy consumption data only
  - Cannot obtain daily load profiles from billing data

How load research is conducted by most utilities? (2/2)
- Conduct load profile measurements and/or market surveys on stocks of electric appliances and their time of use.
  - Apply only to a small subset of customers chosen randomly with sample sizes based on statistics theory (90/10 criteria for a manageable sampling size – 90% confidence level, 10% error)
  - Expensive - depending on accuracy required and thus the sample sizes
  - Intrusive – need to install demand profile recorders at customers’ premises or to interview customers in conducting market survey
  - Not too accurate – at least 10% error for a manageable sampling size
HEC’s Innovative Load Research (1/2)

- Obtain the full set of load data for all buildings in HEC’s supply territory from HEC’s Distribution Management System (DMS).
- Classify and group these load data based on
  - the geographical information obtained from HEC’s Mapping Computer System, and
  - the land use zoning information obtained from Government’s publications of Outline Zoning Plan (OZP).

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HEC’s Innovative Load Research (2/2)

- Load Data from DMS
- Buildings on Hong Kong Island
- Distribution Substation, Distribution Transformer & Remote Terminal Unit (RTU)
- HEC’s System Control Centre
Distribution Management System (DMS)
- Over 3500 RTUs installed in distribution substations.
- Load data of all distribution transformers measured and transmitted to DMS at 5-minute interval.

Transformer Supplying Public Housing Estate

Transformer Supplying Commercial Office

Government's Outline Zoning Plans

Outline Zoning Plans
- OZPs are prepared and published by the Town Planning Board under the Town Planning Ordinances
- OZP includes:
  - boundaries and areas covered;
  - estimated population; and
  - land use zonings – residential, commercial, commercial / residential, government, institution or community, open space, etc.
Daily Load Profile of North Point
A Mixed Commercial & Residential OZP

Daily Load Profile of Mid-Levels West
A Mainly Residential OZP

Load Profiles of HEC's Customers

HEC System Load Profile

Public Housing Estates

Shopping Centres
Conclusions

- HEC's innovative load research is based on:
  - Full set of online, real-time load data from DMS
  - Geographical information from Mapping Computer
  - Land use zoning information from OZP

- HEC's load research is accurate because
  - All load data acquired by real-time measurements;
  - All load data acquired at the same time;
  - Full set of load data utilized in analysis, not by sampling

Thank You