A prototype tool for automatically giving energy saving advice based on smart meter data

Central Research Institute of Electric Power Industry (CRIEPI),
Tokyo, Japan

Osamu Kimura

Hidenori Komatsu, Ken Nishio, Toshi Mukai

ECEEE Industrial Summer Study 2016

電力中央研究所

© CRIEPI

Background

◆Accelerated adoption of smart-meters

- Growing amount of interval data available for energy efficiency services

◆Need to expand energy audits to SMEs

- Public audit programs can reach only a fraction of SMEs
- Traditional audits cost- and time-intensive

What if we could provide energy saving advice to SMEs automatically using smart-meter data?

© CRIEPI

Objective of our tool development

- To provide customised energy saving advice that are generated automatically using (almost sorely) smart-meter data

- Target:
  SMEs, especially in commercial sector

- Users:
  Utilities
  Energy service providers
  Multi-site companies with interval electricity meters

© CRIEPI

Input and output of our tool

30-minites interval data

	ID1	ID2	ID3	ID4	…
2015/4/1 0:00	368	184	258	161	…
2015/4/1 0:30	368	161	258	138	…
2015/4/1 1:00	368	161	258	184	…
2015/4/1 1:30	368	184	129	184	…
2015/4/1 2:00	368	138	258	161	…
2015/4/1 2:30	345	161	258	161	…
2015/4/1 3:00	322	161	129	184	…
2015/4/1 3:30	345	161	258	138	…
2015/4/1 4:00	345	138	258	161	…
2015/4/1 4:30	345	161	129	161	…
2015/4/1 5:00	322	138	258	161	…
2015/4/1 5:30	322	184	129	138	…
…	…	…	…	…	…

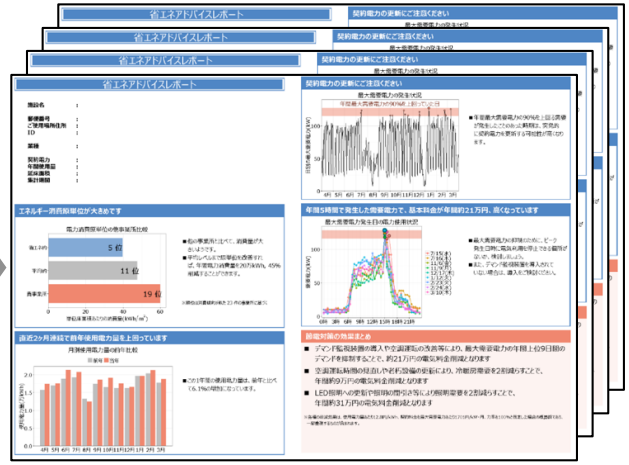
Basic demographic data (* optional)

	Building type	Address	…
ID1	…	…	…
ID2	…	…	…
ID3	…	…	…
ID4	…	…	…
ID5	…	…	…

Temperature (data public)

Our report generator

Customised energy saving advice reports



2 pages, A4 paper, by mail, 2 times a year

Energy Saving Advice Report

Company profile

……

……

Building type

Data description

Advice no.1

……

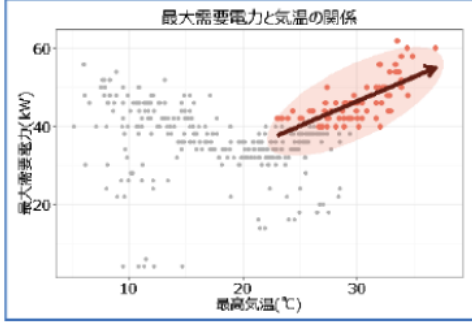
……

……

……

……

Advice no.2



……

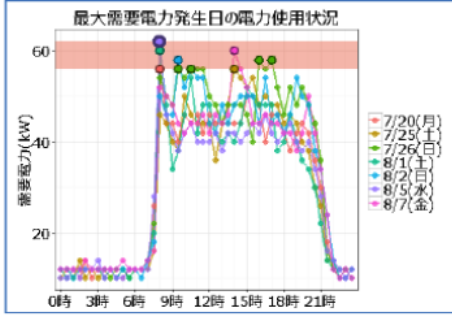
……

……

……

……

Advice no.3



……

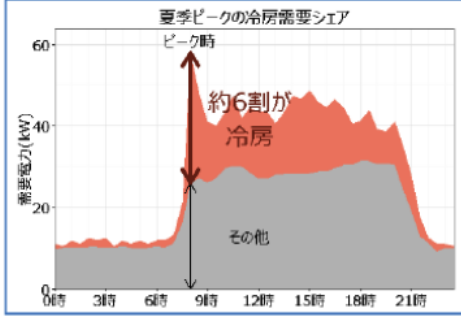
……

……

……

……

Advice no.4



……

……

……

……

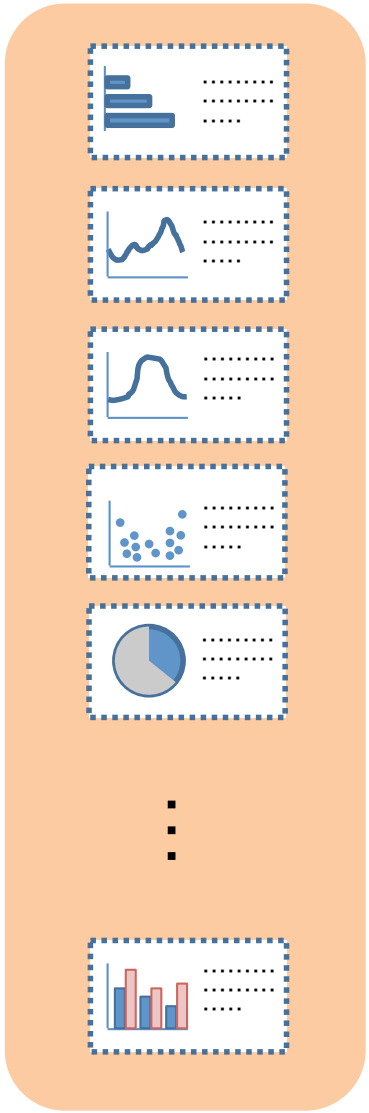
……

Summary of recommendations

- …… …… ……
  …… …… ……
- …… …… ……
  …… …… ……
  …… …… ……
- …… …… ……
  …… …… ……

© CRIEPI

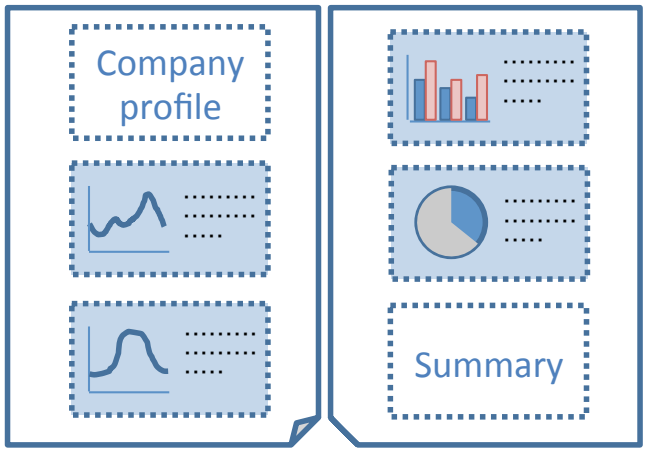
Design and selection of advice



Approaches for designing advice

1. **Fault detection**
2. **Disaggregation**
3. **Social comparison (benchmarking)**
4. **Selective visualization**

Select the most important 4 advices for each building



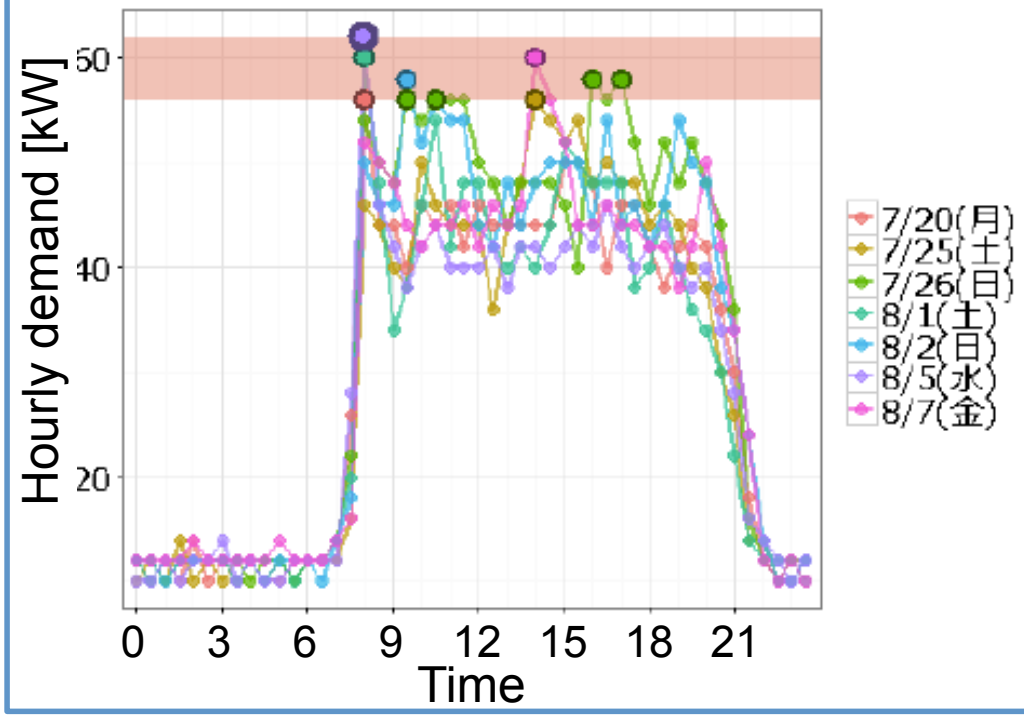
© CRIEPI

1. Fault detection

Example: detecting unnecessary demand increases.

The maximum demand was increased by 6 % in the highest 5 hours.

Hourly demand in days with highest demands in a year

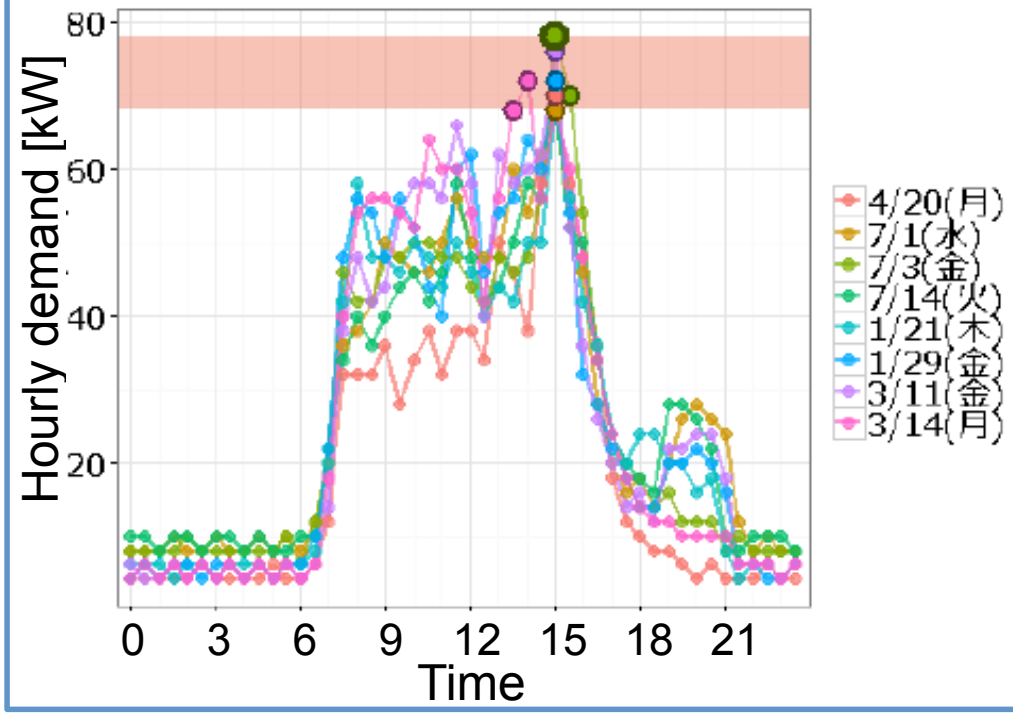


- To avoid demand peaks, be careful for operation of air-conditioning, when e.g. starting-up, or extremely hot.
- Check if any equipment can be stopped in a peak time.

1. Fault detection (cont.)

The maximum demand was increased by 13 % in the highest 5 hours.

Hourly demand in days with highest demands in a year



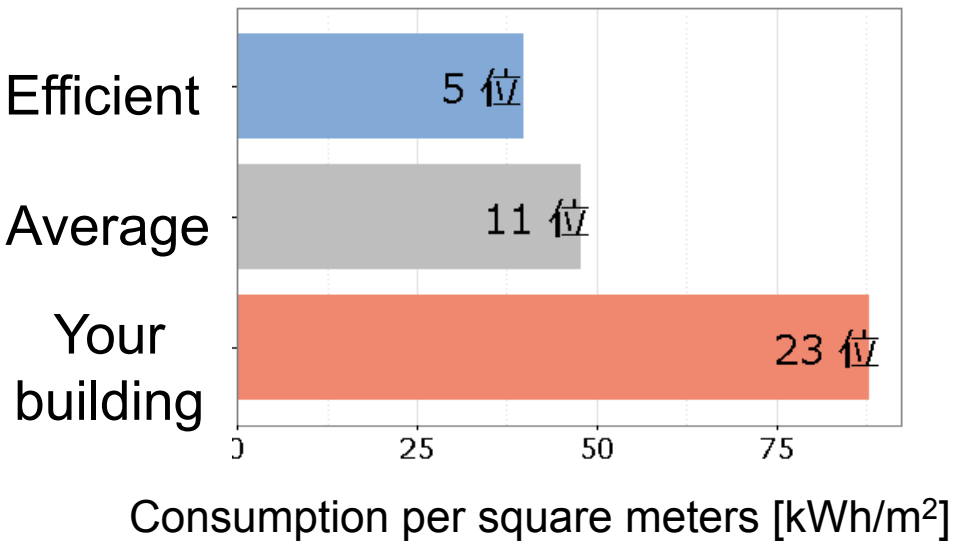
- To avoid demand peaks, be careful for operation of air-conditioning, when e.g. starting-up, or extremely hot.
- Check if any equipment can be stopped in a peak time.

© CRIEPI

2. Social comparison (benchmarking)

Example: benchmarking of yearly kWh per m^2

Your building consumed more than similar ones



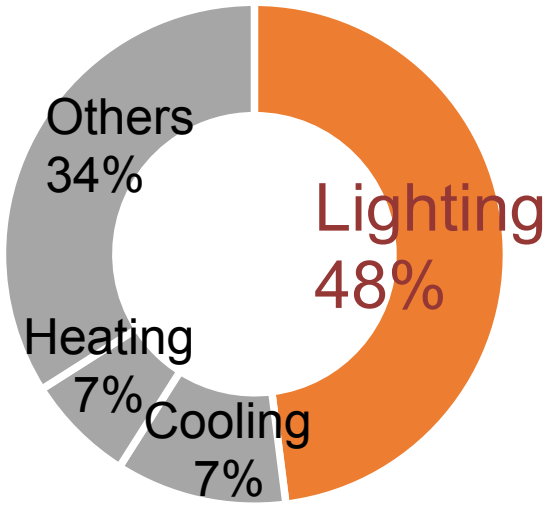
- Your building consumed more than similar ones last year, and ranked 23rd out of 25.
- If you reduce consumption to the average level, it will save 40% of your total consumption.

3. Disaggregation by end use

Example: Disaggregation highlighting the lighting demand

Lighting accounted for 59% of total consumption last year.

Share of electricity consumption by end-use

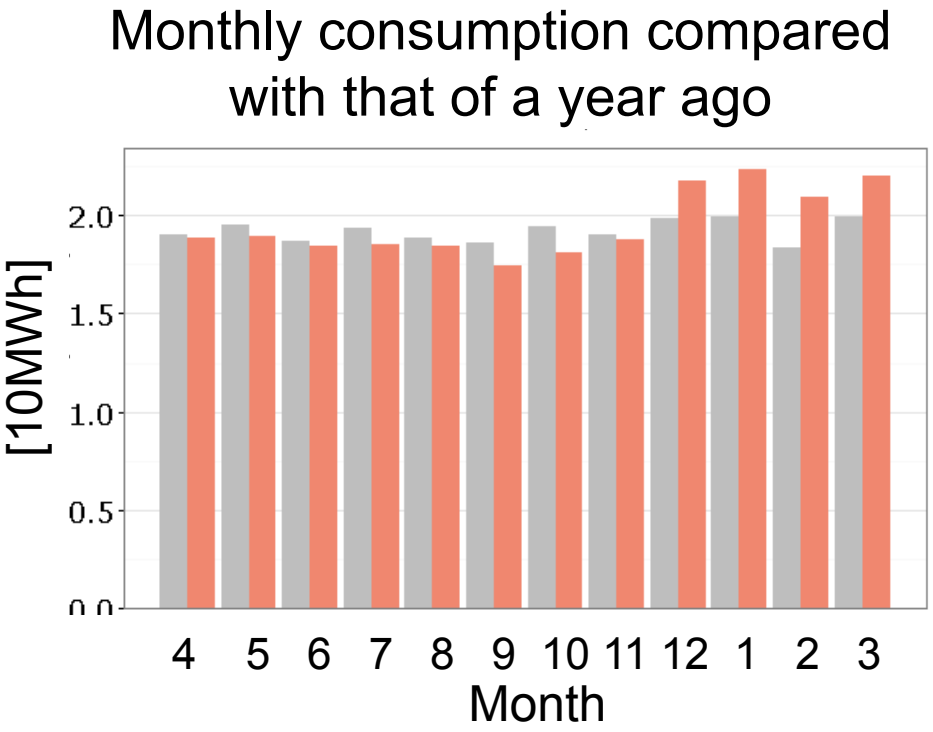


- This can be saved by reducing lamps and switching to LED lighting.
- Measure light levels and you will find areas with excessive lighting.

4. Selective visualization

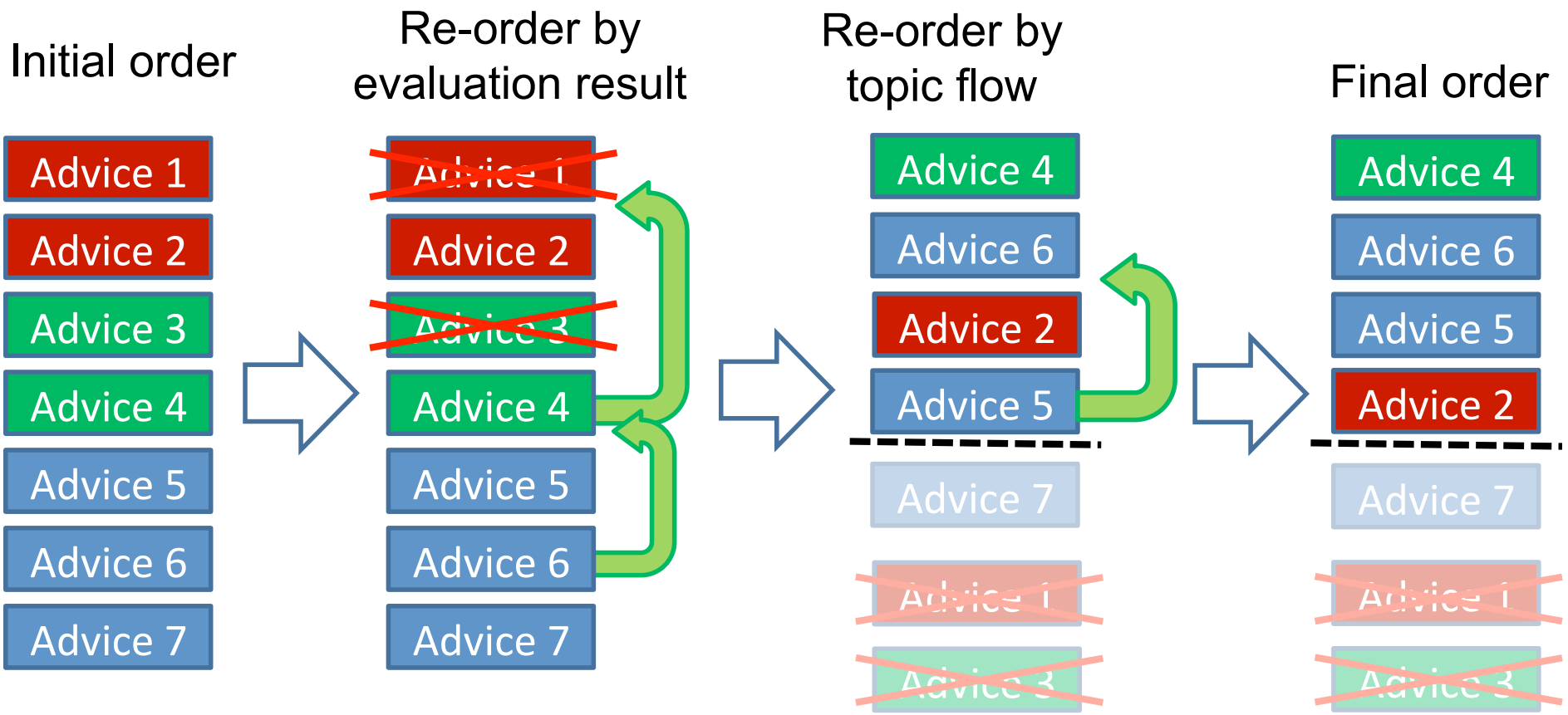
Example: comparison of monthly consumption with last year

Consumption increased in four months in a row



- Consumption of the last year was 5% larger than a year ago.
- Look for reasons why it increased.

Selection of advice



© CRIEPI

Does it useful? effective in saving energy?

Responses from energy managers (preliminary results)

- “Useful for understanding usage patterns, since we do not have demand monitors.”
- “Important material for planning EE measures.”
- “Too busy to even take a look at it.”
- “We’ve done those recommendations already.”

© CRIEPI

Discussions

- Advice from fault detection and disaggregation should be useful, but they are not selected or do not work properly in some occasions.

- For industrial SMEs?
  - would be very difficult.
  - would work for a homogeneous segment, especially with additional data to normalise operation ratio.

- A “Home energy report” by OPOWER reduces by 2.5% in average, implying our reports would have similar level of impact at most, which is still meaningful if achieved.

© CRIEPI

End of presentation

Thank you!

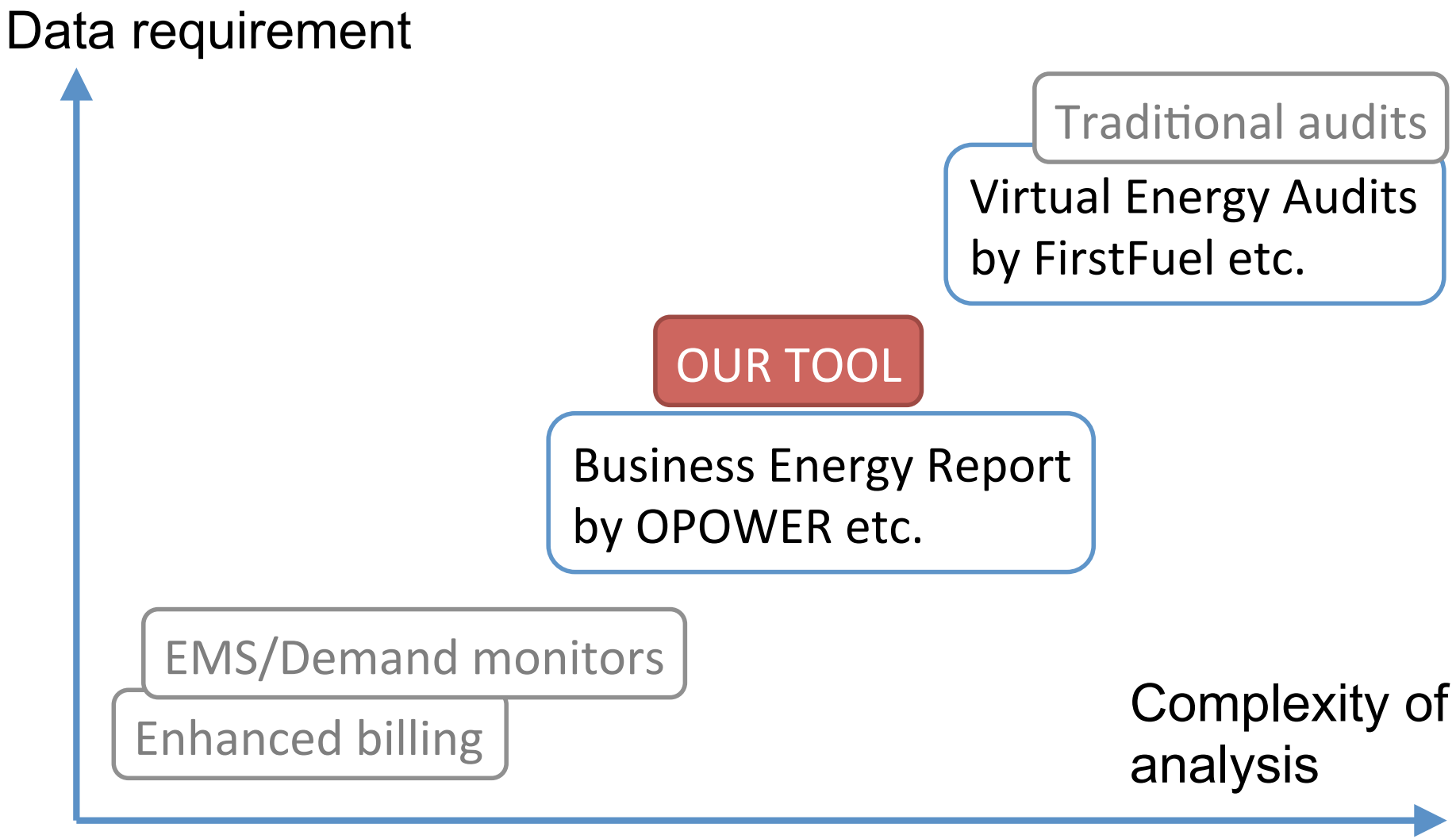
Contact:

Osamu Kimura

Central Research Institute of Electric Power Industry

o-kimura@criepi.denken.or.jp

Comparing traditional/emerging services and tools using smart-meter data



© CRIEPI