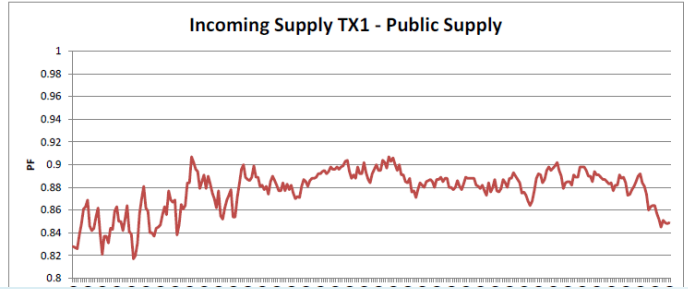
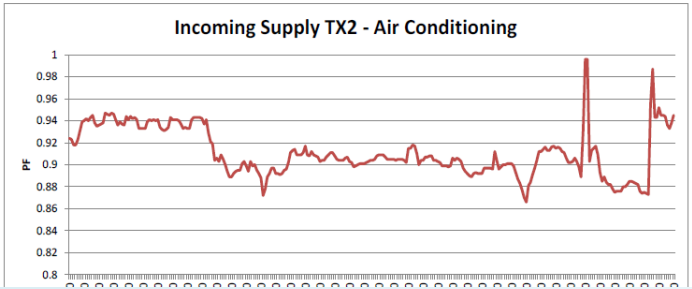
Retro-commissioning (RCx)

Example 12 – Electrical Installation

➢ ESO: To review power quality of electrical distribution network

Facility / Equipment





Observation

Baseline case:

1. The building has 2 transformers (1 Tx for AC, 1 Tx for Ltg & power)
2. Measured PF below 0.92 and 0.9 respectively

Optimization opportunities:

1. Check Capacitor Banks, carry out necessary repair / upgrade work to improve PF

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Retro-commissioning (RCx)

Example 12 – Electrical Installation

- ESO: To review power quality of electrical distribution network

Excessive distribution loss and poor power quality reduce efficiency of the electrical distribution network, cause unwanted energy losses, as well as overheating of conductors and apparatus that may impose additional cooling load for air-conditioning system.

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Example 12 – Electrical Installation

- ESO: To review power quality of electrical distribution network

Power Factor & Copper Loss

- copper loss = I^2R
- The loss fraction reduction through improving power factor is expressed by:
  $[1-(PF/PF')^2] \times 100\%$
- When PF improves from 0.85 to 0.95, the loss fraction reduction is:
  $[1-(0.85/0.95)^2] \times 100\% = 20\%$
- Assume the original copper loss of the circuit without correction device is 2%, the reduced copper loss is 0.4% (=2% x 20%) (assume correction devices install at load side)
- i.e. max. 0.4% energy saving

Example 12 – Electrical Installation

- ESO: To review power quality of electrical distribution network

Power Factor & Demand Charge

- Improving TPF of the building can directly reduce the demand charge by reducing the peak demand value
- Reduction in peak demand can be calculated by:
  (1- TPF /TPF') x100%
- When TPF improves from 0.85 to 0.95
- Reduction in peak demand (kVA)
  =(1- 0.85/0.95) x 100% = 10.5%

Example 12 – Electrical Installation

- ESO: To review power quality of electrical distribution network

Example

- Annual electricity charge : $4,000,000 (85% energy charge ,15% demand charge
- TPF from 0.85 to 0.95
- Energy charge saving = $ 4,000,000 x 0.85 x 0.4% = $ 13,600
- Demand charge saving = $ 4,000,000 x 15% x 10.5%= $ 63,000
- Total saving = $76,600

HKE Tariff table (for reference)

Max Demand Tariff (min. 100 kVA of chargeable demand) (1 Jan 2017)	
(a) Demand Charge	
For each of the first 400kVA	$48.3
For each of the next additional kVA	$47.3
(b) Energy Charge (basic without fuel adjustment)	
On-Peak Period	
For each of the first 200 units supplied per month per kVA of maximum demand	101.0 cents
For each additional unit supplied in the month	96.4 cents

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CLP Tariff table (for reference)

Bulk Tariff (expected monthly consumption min. 20,000 units) (1 Jan 2017)	
(a) Demand Charge	
On-Peak Period	
Each of the first 650 kVA	$68.4
Each kVA above 650	$65.4
Off-Peak Period	
Each off-peak kVA up to the on-peak billing demand	$0.0
Each off-peak kVA in excess of the on-peak billing demand	$26.8
(b) Energy Charge (basic without fuel adjustment)	
On-Peak Period	
Each of the first 200,000 units	73.8 cents
Each unit over 200,000	72.2 cents
On-Peak Period	
Each unit	66.1 cents

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CLP Tariff table (for reference)

Large Power Tariff (expected monthly consumption min. 3,000 kVA) (1 Jan 2017)	
(a) Demand Charge	
On-Peak Period	
Each of the first 5,000 kVA	$120.3
Each kVA over 5,000	$115.3
Off-Peak Period	
Each off-peak kVA up to the on-peak billing demand	$0.0
Each off-peak kVA in excess of the on-peak billing demand	$33.9
(b) Energy Charge (basic without fuel adjustment)	
On-Peak Period	
Each of the first 200 units per kVA of on-peak billing demand	56.7 cents
Each unit in excess of above	54.7 cents
On-Peak Period	
Each unit	46.9 cents

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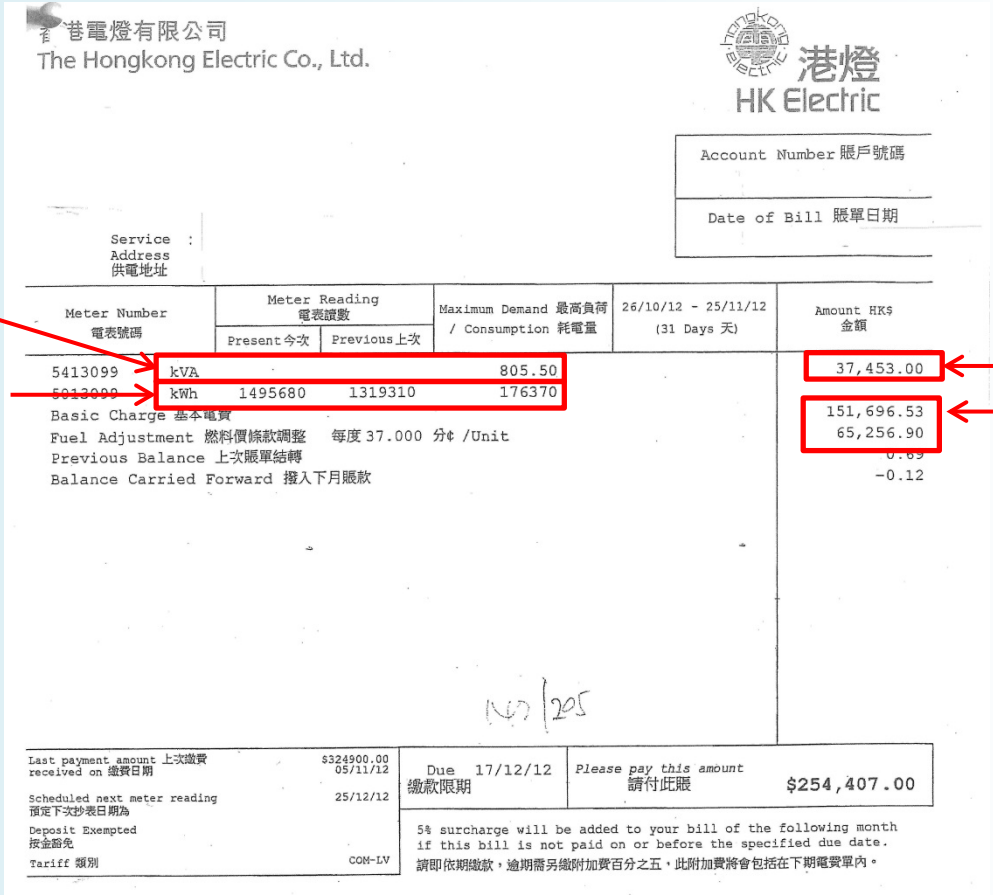
Energy Charge & Demand Charge in Electricity Bill

Peak demand

Total consumption



香港電燈有限公司
The Hongkong Electric Co., Ltd.

港燈 HK Electric

Account Number 賬戶號碼

Date of Bill 賬單日期

Service Address 供電地址 :

Meter Number 電表號碼		Meter Reading 電表讀數 Present 今次	Meter Reading 電表讀數 Previous 上次	Maximum Demand 最高負荷 / Consumption 耗電量	26/10/12 - 25/11/12 (31 Days 天)	Amount HK$ 金額
5413099	kVA			805.50		37,453.00
5413099	kWh	1495680	1319310	176370		
Basic Charge 基本電費						151,696.53
Fuel Adjustment 燃料價條款調整		每度 37.000 分¢ /Unit				65,256.90
Previous Balance 上次賬單結轉						0.69
Balance Carried Forward 撥入下月賬款						-0.12

Last payment amount 上次繳費 received on 繳費日期 $324900.00 05/11/12

Scheduled next meter reading 預定下次抄表日期為 25/12/12

Deposit Exempted 按金豁免

Tariff 類別 COM-LV

Due 17/12/12 繳款限期

Please pay this amount 請付此賬 $254,407.00

5% surcharge will be added to your bill of the following month if this bill is not paid on or before the specified due date.
請即依期繳款，逾期需另繳附加費百分之五，此附加費將會包括在下期電費單內。

Demand charge

Energy charge

EMSD