



Latest trends of energy efficiency in buildings

建築節能的最新趨勢



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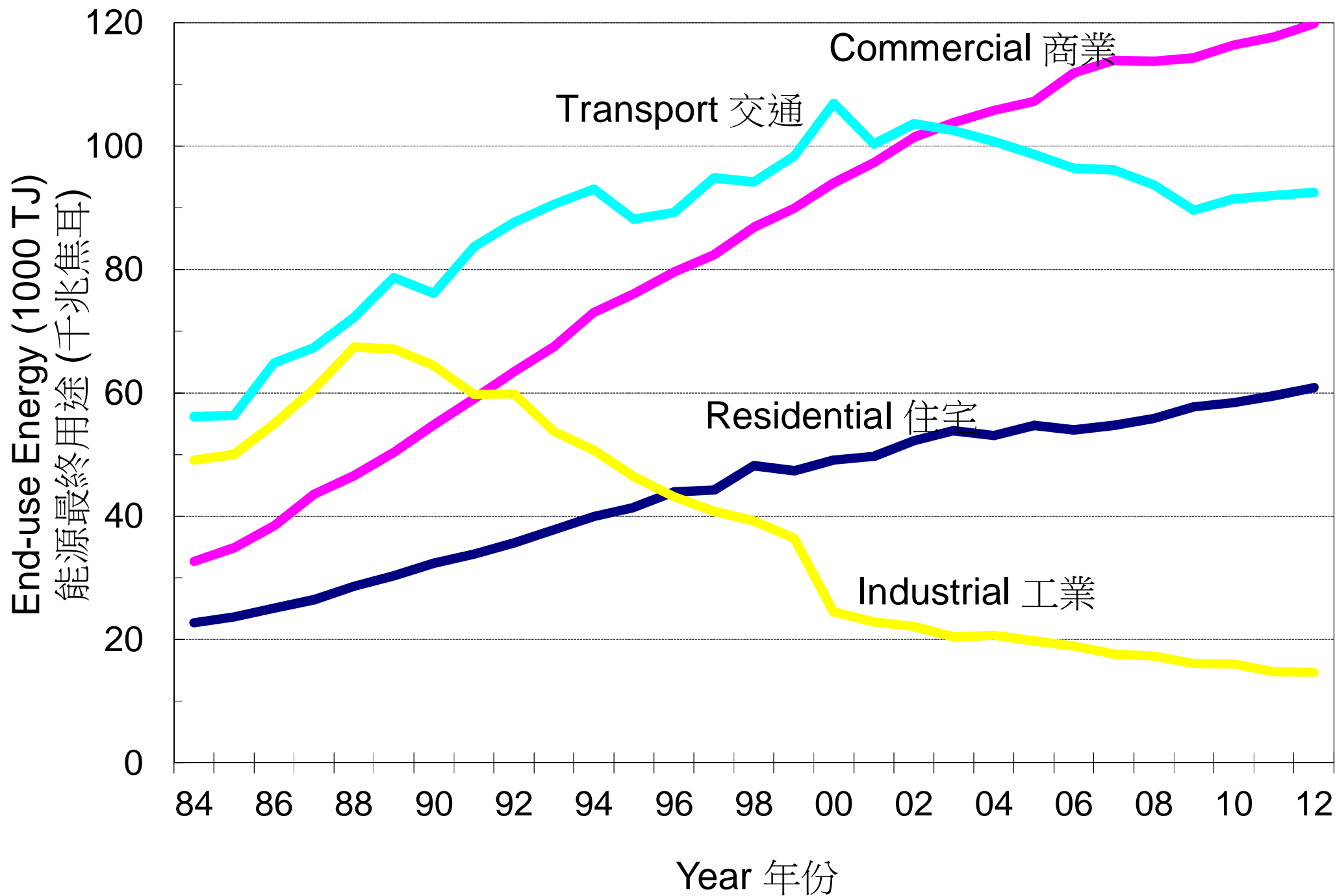
香港大學機械工程系 許俊民博士

Contents 内容



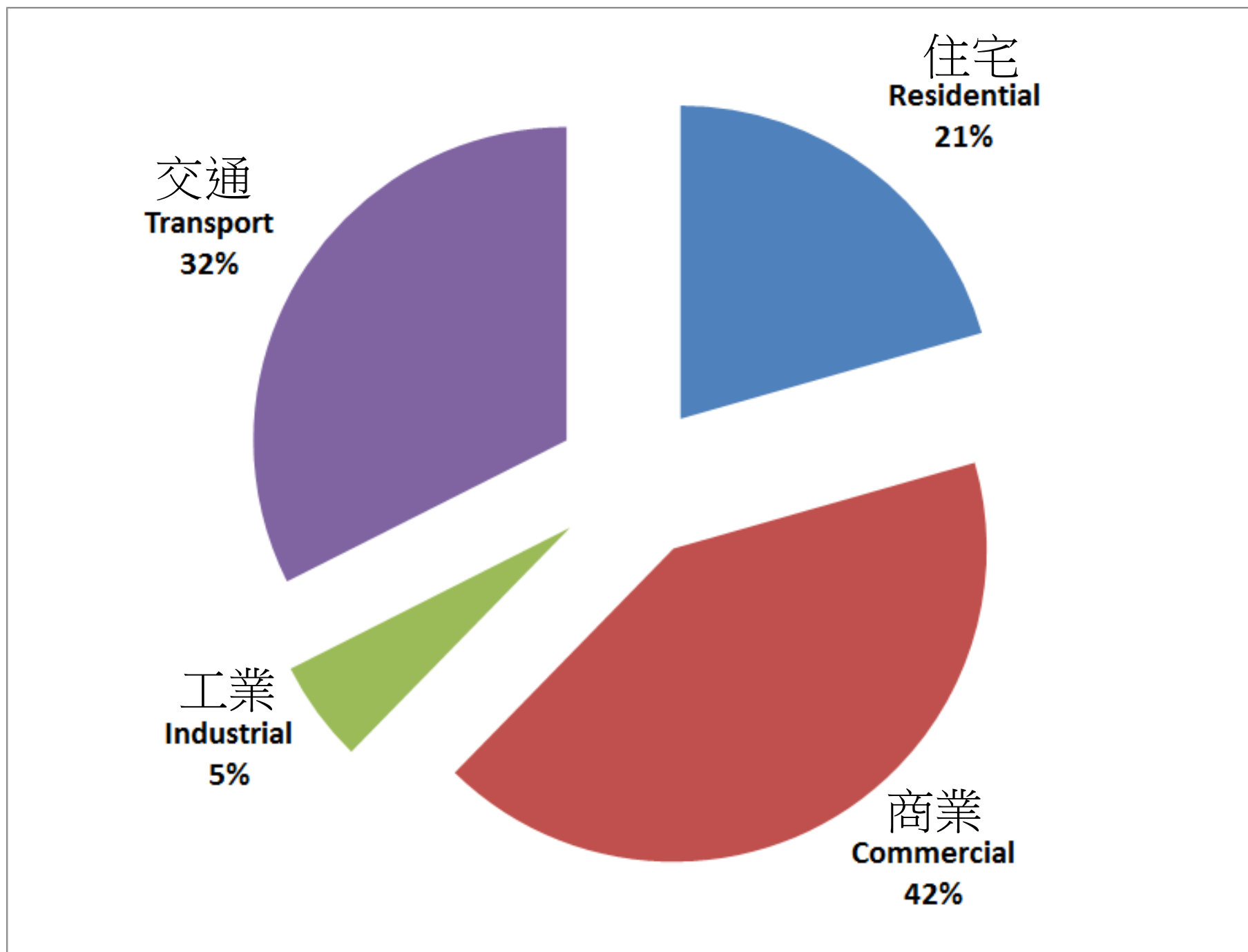
- Legislative control 立法管制
- Energy analytics 能源分析
- Intelligent efficiency 智能效率





(Data source: EMSD) Energy end-use in Hong Kong by sectors, 1984-2012

Energy end-use by sector in Hong Kong (2012) 香港能源最终用途



(Data source: EMSD)



《建築物能源效益條例》 The Buildings Energy Efficiency Ordinance



空調裝置
Air-conditioning installation



電力裝置
Electrical installation



升降機及自動梯裝置
Lift & escalator installation



照明裝置
Lighting installation

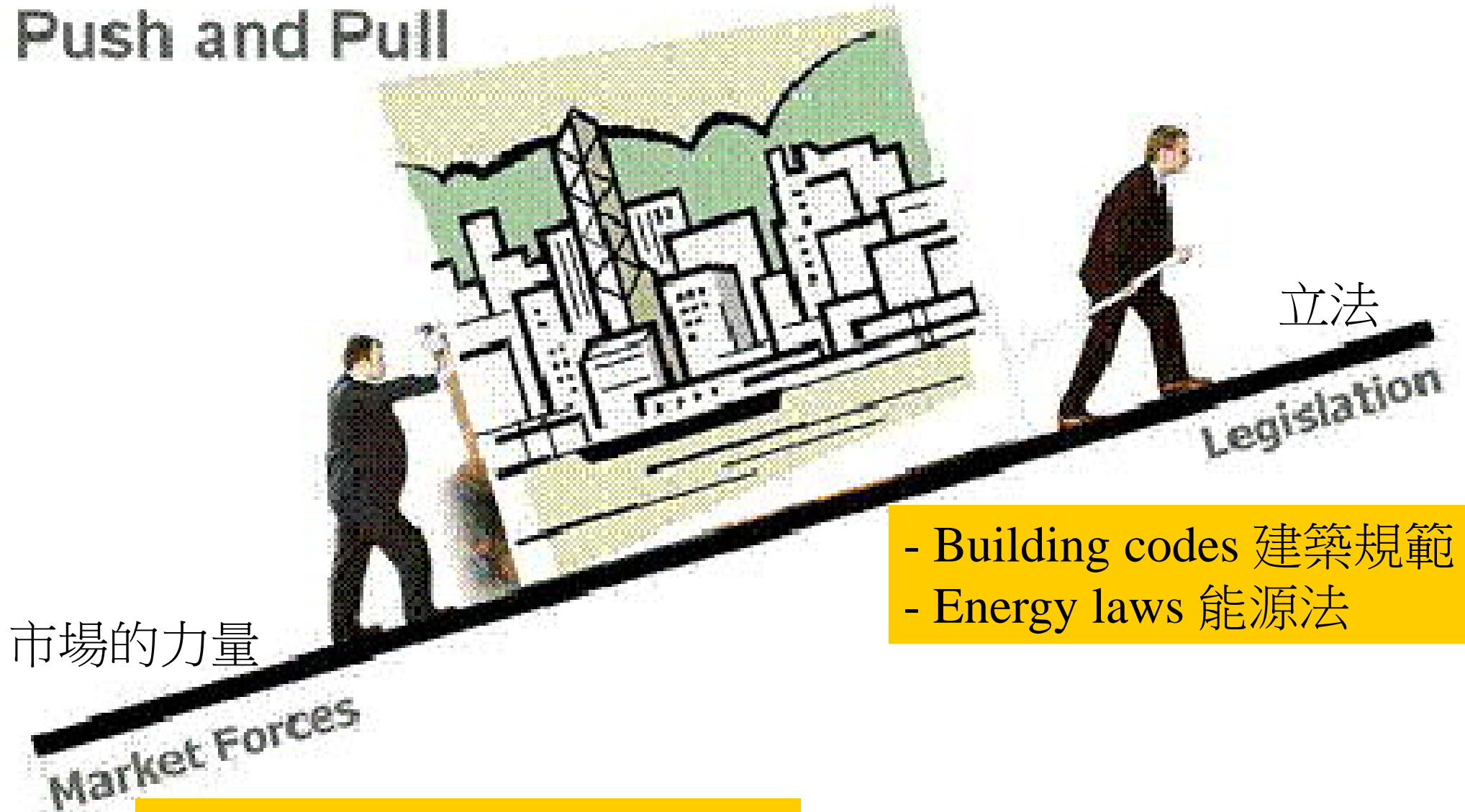


Strategy for promoting energy efficiency in buildings

推進建築節能策略

推動和拉動

Push and Pull



市場的力量

立法

- Building codes 建築規範
- Energy laws 能源法

- Energy labels 能源標籤
- Voluntary schemes 自願方案

Energy analytics 能源分析



- Energy information system 能源信息系統

- Better data and reporting 更好的數據和報告
- Inexpensive sub-metering 廉價的分戶計量
- Wireless devices + remote assessment 無線設備+ 遠程評估



- Energy data analytics 能源數據分析

- “Big Data (energy)” “ 大數據（能源） ”
- Monitoring and assessment 監測和評估
- Software and cloud services 軟件和雲端服務



An example of energy dashboard for buildings

建築能源儀表板的例子

Welcome: Demo | Logout



能源狀況一目了然

Example of analysing the electricity billings 分析電力賬單的例子

Electricity Consumption Data

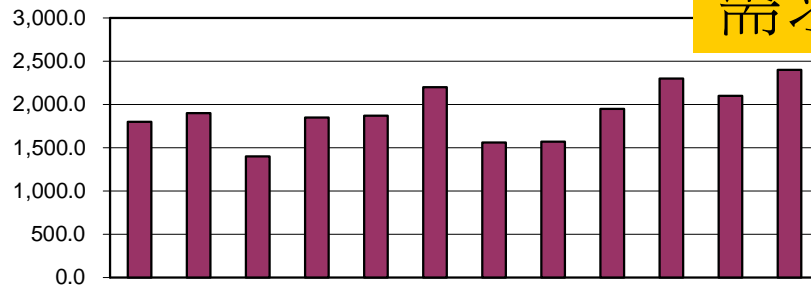
Location: ABC Facility

用電量數據

[C:\Project Files\Audit Manual\Spreadsheets\[Electricity Cost.xls]Electricity Consumption Data]

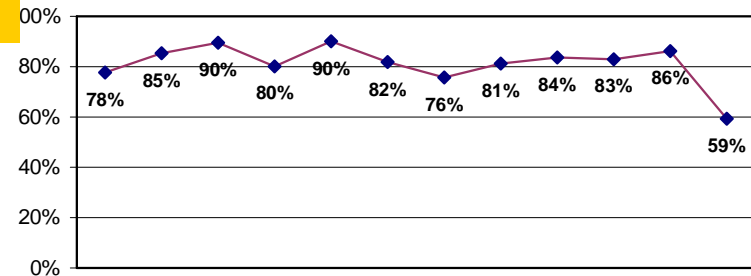
Billing Date	Metered kVA	Metered kW	Power Factor	Billed kW	Energy kWh	Days	Daily kWh	Load Factor	Demand Cost	Energy Cost	Adjust (+/-)	Sub Total	Total Cost
01/01/99		1,800.0		1,800.0	1,006,703	30	33,557	78%	\$21,250	\$50,365	(\$11,147)	\$71,615	\$64,701
02/01/99		1,900.0		1,900.0	1,206,383	31	38,916	85%	\$22,750	\$56,441	(\$13,204)	\$79,191	\$70,607
03/01/99		1,400.0		1,400.0	842,286	28	30,082	90%	\$15,250	\$42,144	(\$9,263)	\$57,394	\$51,501
04/01/99		1,850.0		1,850.0	1,102,176	31	35,554	80%	\$22,000	\$53,315	(\$12,132)	\$75,315	\$67,606
05/01/99		1,870.0		1,870.0	1,213,021	30	40,434	90%	\$22,300	\$56,641	(\$13,252)	\$78,941	\$70,287
06/01/99		2,200.0		2,200.0	1,339,599	31	43,213	82%	\$27,250	\$60,438	(\$14,716)	\$87,688	\$78,080
07/01/99		1,560.0		1,560.0	850,195	30	28,340	76%	\$17,650	\$42,540	(\$9,438)	\$60,190	\$54,304
08/01/99		1,570.0		1,570.0	948,747	31	30,605	81%	\$17,800	\$47,467	(\$10,429)	\$65,267	\$58,677
09/01/99		1,950.0		1,950.0	1,213,798	31	39,155	84%	\$23,500	\$56,664	(\$13,308)	\$80,164	\$71,536
10/01/99		2,300.0		2,300.0	1,373,054	30	45,768	83%	\$28,750	\$61,442	(\$15,111)	\$90,192	\$80,337
11/01/99		2,100.0		2,100.0	1,347,059	31	43,454	86%	\$25,750	\$60,662	(\$14,731)	\$86,412	\$76,699
12/01/99		2,400.0		2,400.0	1,024,475	30	34,149	59%	\$30,250	\$50,984	(\$11,685)	\$81,234	\$74,418
Totals/Max		2,400.0		2,400.0	13,467,496	364			\$274,500	\$639,104	(\$148,415)	\$913,604	\$818,752

Monthly Demand (kW)

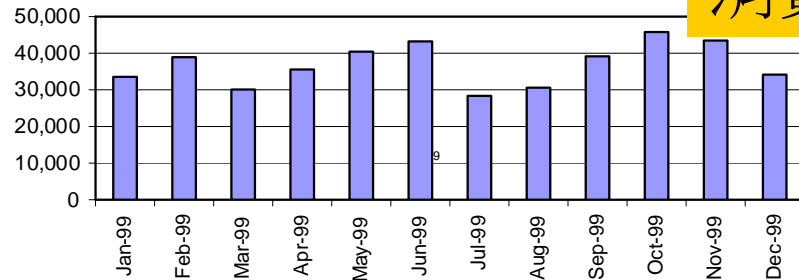


需求狀況

Monthly Load Factor (%)

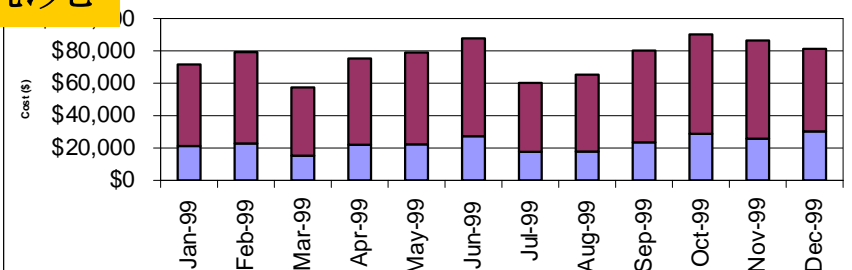


Daily Energy (kWh/day)

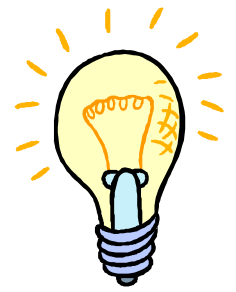


消費概況

Energy Cost Demand Cost

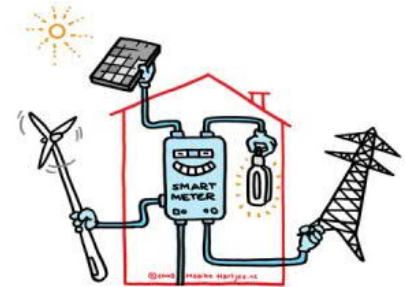


Intelligent efficiency 智能效率



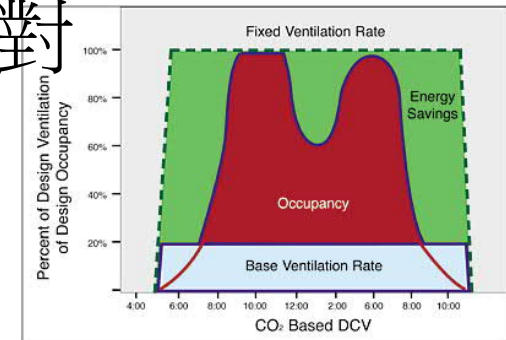
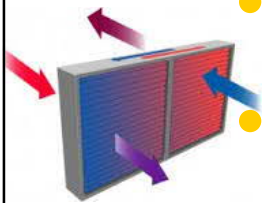
- Intelligent devices 智能設備

- Intelligent lighting fittings 智能照明配件
- High efficient systems 高效率的系統
- Smart meters 智能電錶



- Smart operation 智能操作

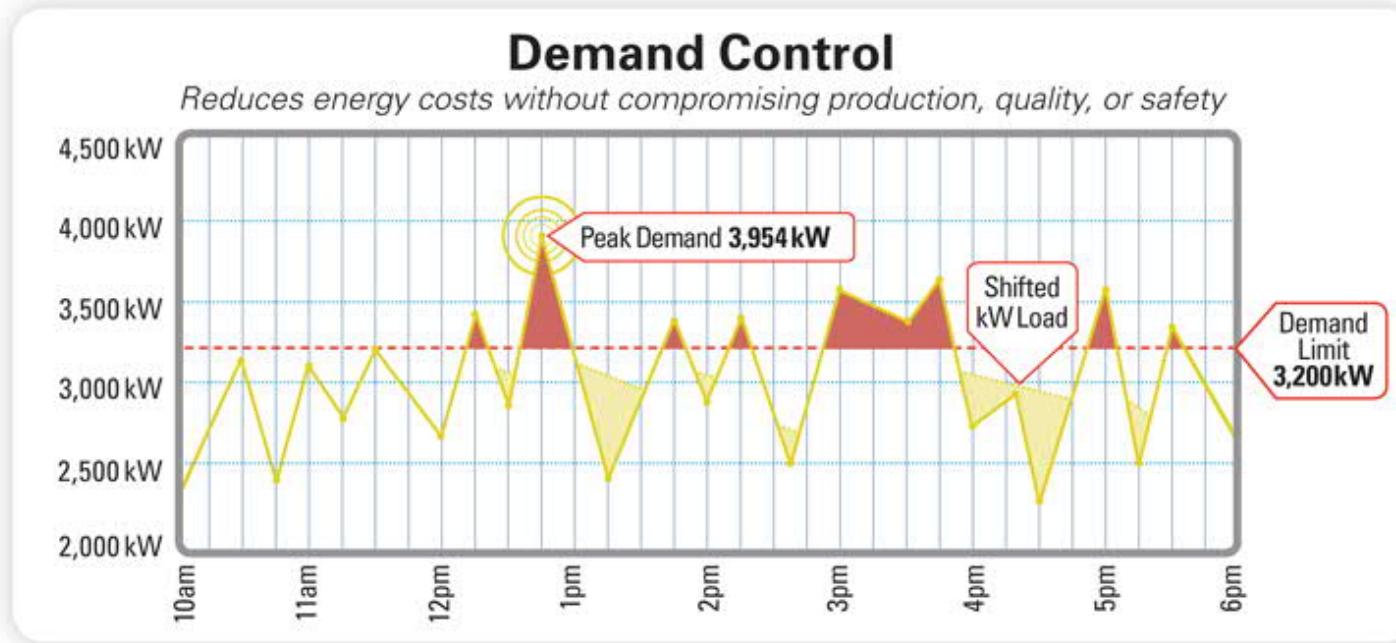
- Demand control/response 需求控制/應對
- Energy recovery 能量回收
- Variable speed/frequency 變速/變頻



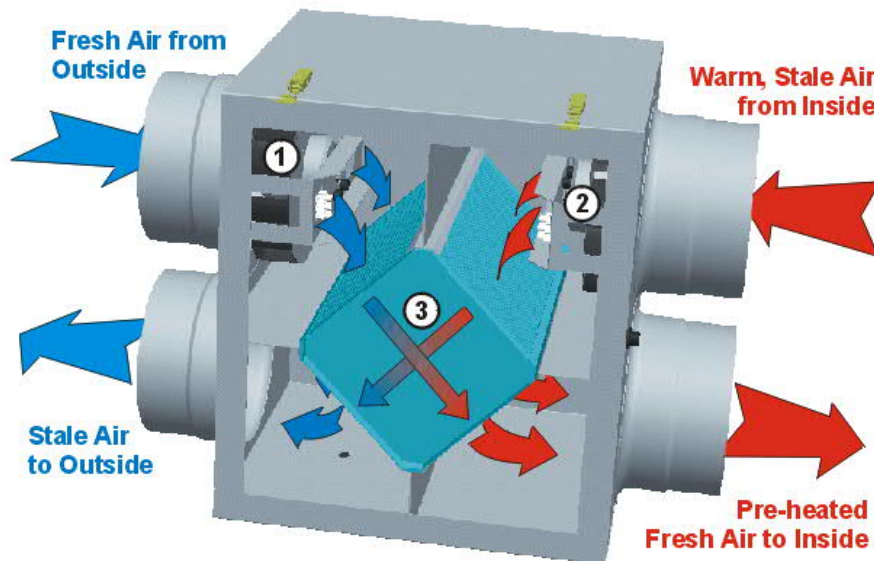
Intelligent luminaires have the potential to integrate various sensors 智能燈具可能整合各種傳感器



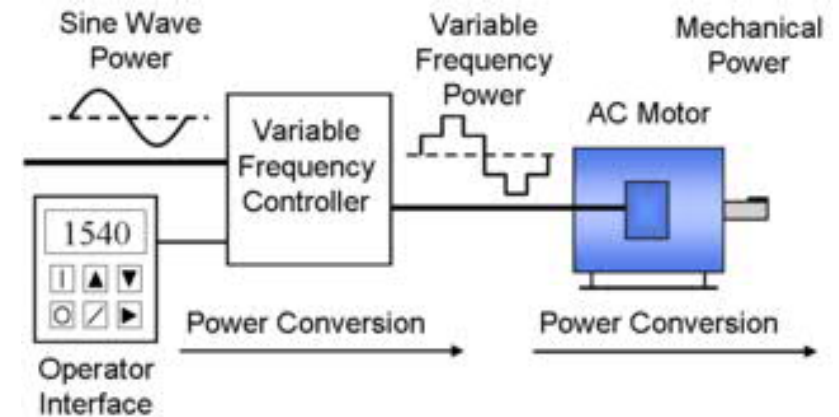
Demand control ventilation 需求控制通風



Energy recovery system 能量回收系統



Variable speed/frequency 變速/變頻



THANK YOU 謝謝 !!



(More information: <http://me.hku.hk/bse/bee-sbd/>)