Guaranteed Energy Savings Performance Contracting in the Public Sector

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Goh Guo Wei
Energy Efficiency & Conservation Department
National Environment Agency

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Public Sector Taking the Lead in Environmental Sustainability (PSTLES) Initiative

Requirements under PSTLES initiative

Introduced in 2006

The Public Sector is well-positioned to invest in resource efficiency



Existing Buildings (Air-con FA > 10,000m^2)

Attain Green Mark Gold ^{Plus} by 2020

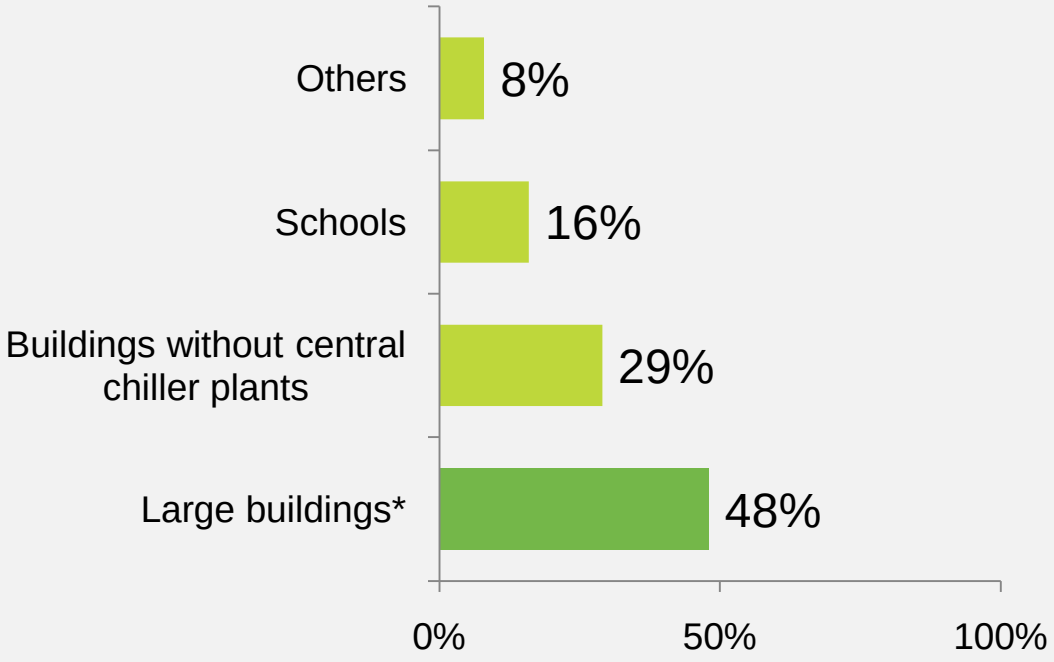
New Buildings (Air-con FA > 5,000m^2)

Attain Green Mark Platinum

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Rationale for Targeting Large Buildings

Breakdown of Energy Consumption



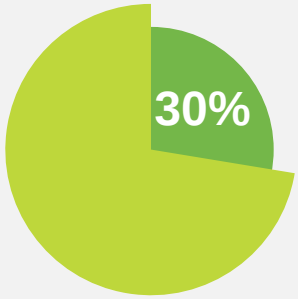
* Air-con floor area > 10,000m^2

No. of large buildings

50

750

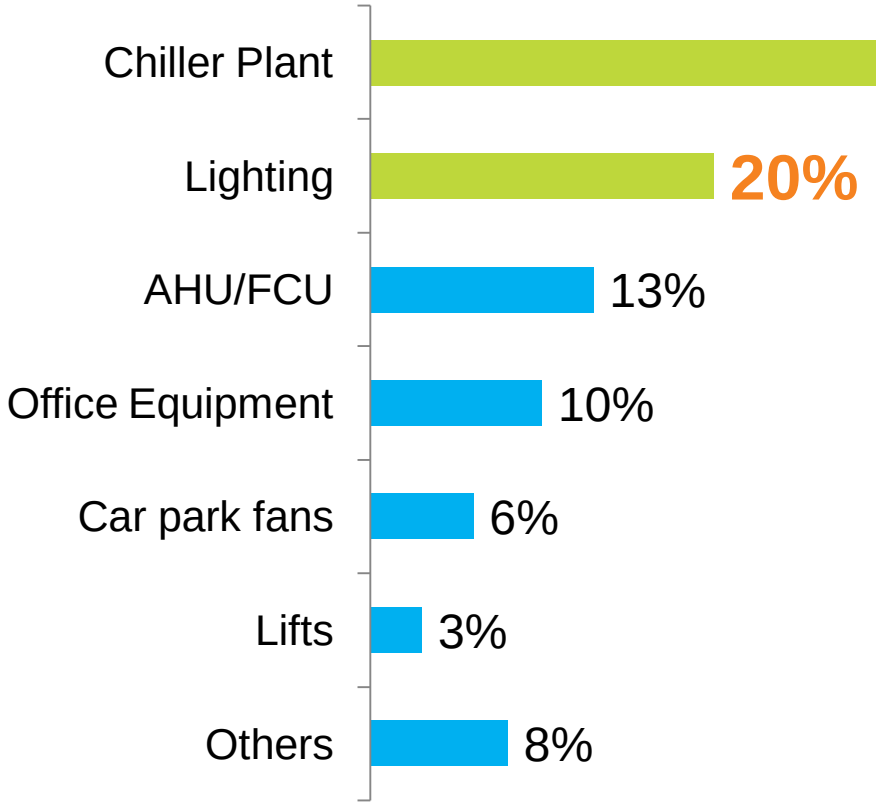
% by Gross Floor Area



Source: Submissions by public sector building owners

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Typical Consumption Profile of Large Buildings



Chiller plant efficiency has a major impact on overall energy consumption of a building

Lighting system efficiency improvements easy to implement

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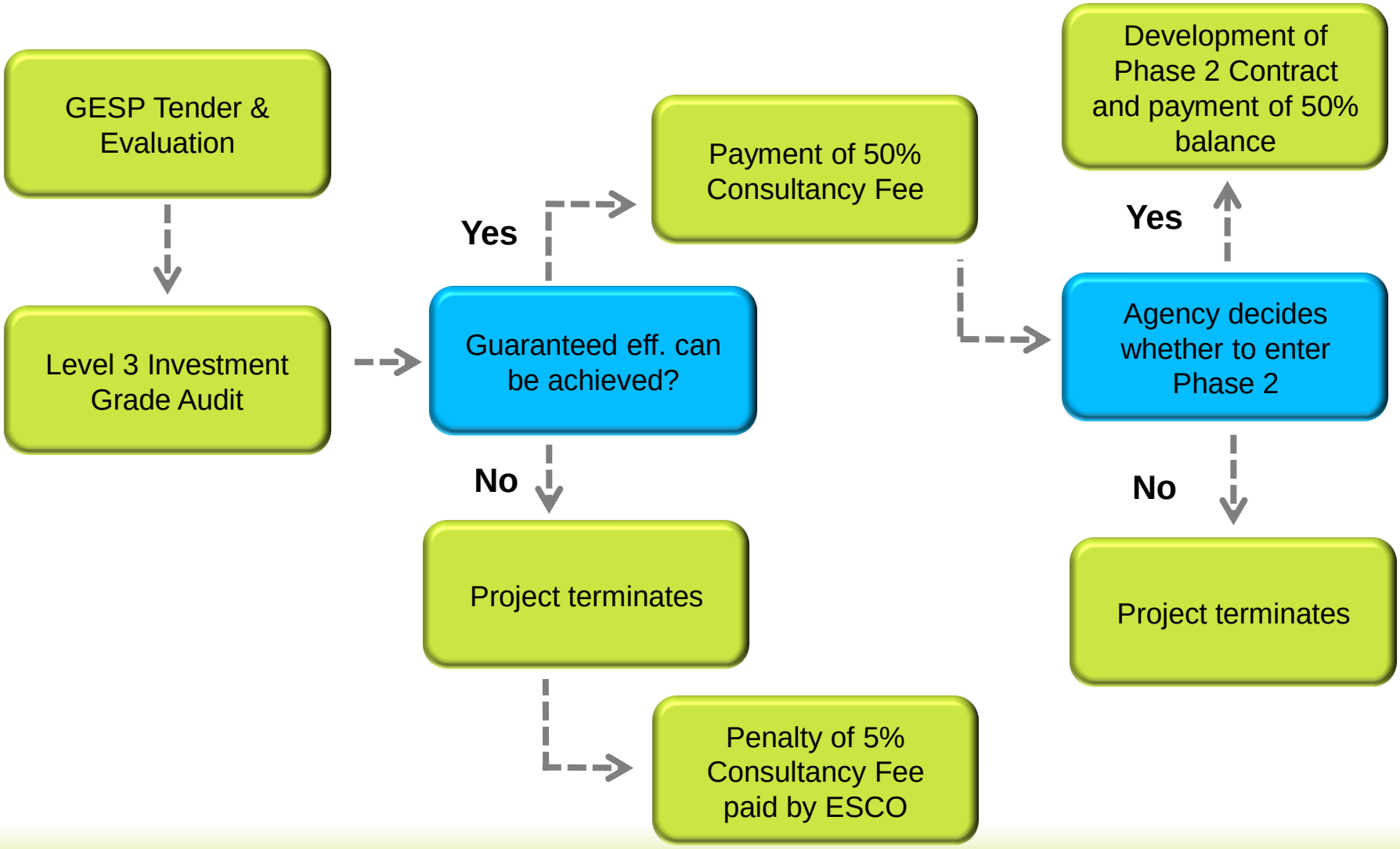


Guaranteed Energy Savings Performance (GESP) Contract

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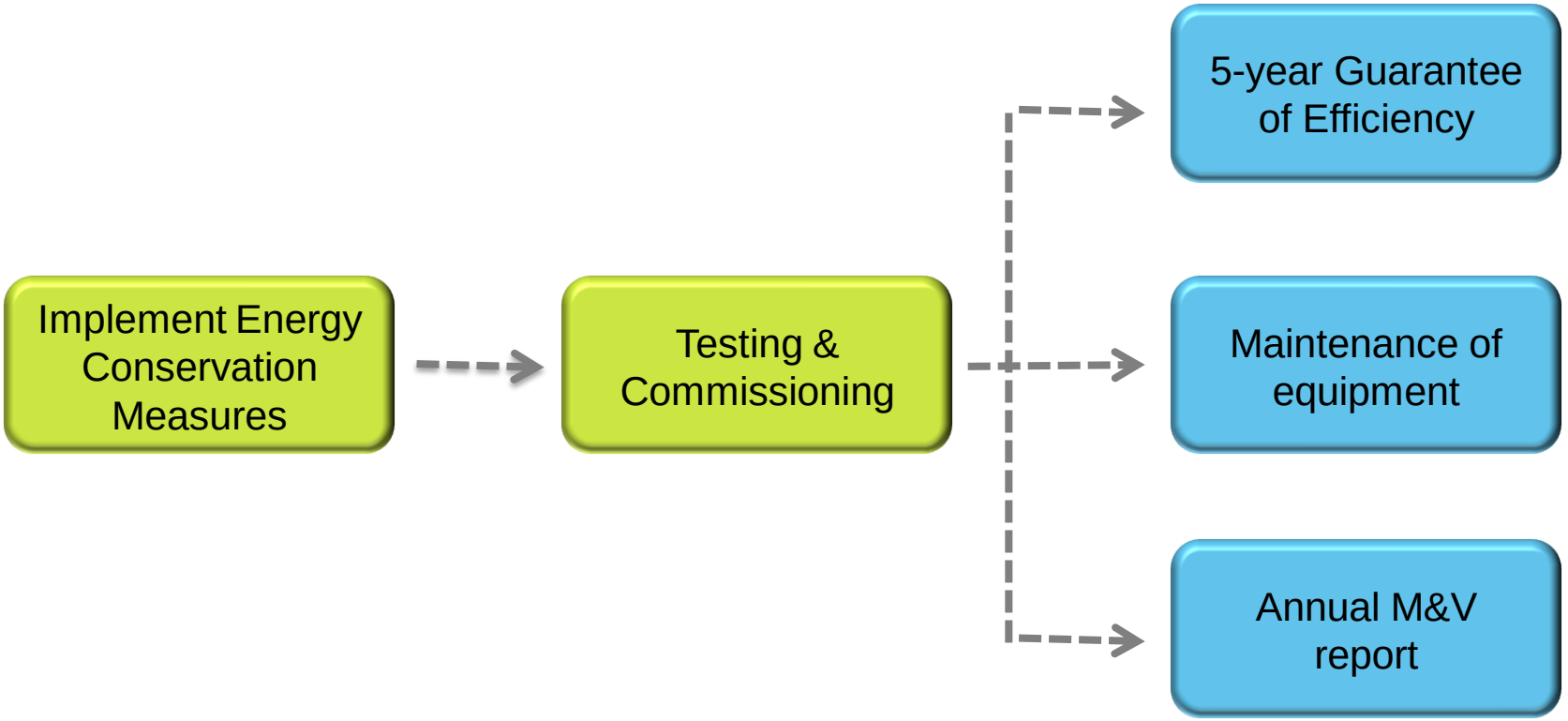
GESP Contracting Model

Phase 1



GESP Contracting Model

Phase 2



Contractor's obligations

Throughout the term (typically 5 years)

1. Guarantee system efficiency and savings (0.65 kW/RT or better)

2. Provide comprehensive maintenance for all new equipment
   Provide preventive maintenance for existing equipment

3. Repay lost savings if energy performance is not achieved

At the end of the term

4. "Make-good" to achieve guaranteed performance, else repay full amount of lost savings at end of term



Measurement and Verification



Fully instrumented plant
- Data captured at one minute intervals
- Stored to disk for 3 years



Full-bore magnetic flowmeters
High accuracy temperature measurements
(end-to-end ±0.03 ^{o}C error)



Continuous monitoring of heat balance with at least 80% of data points within ±5%

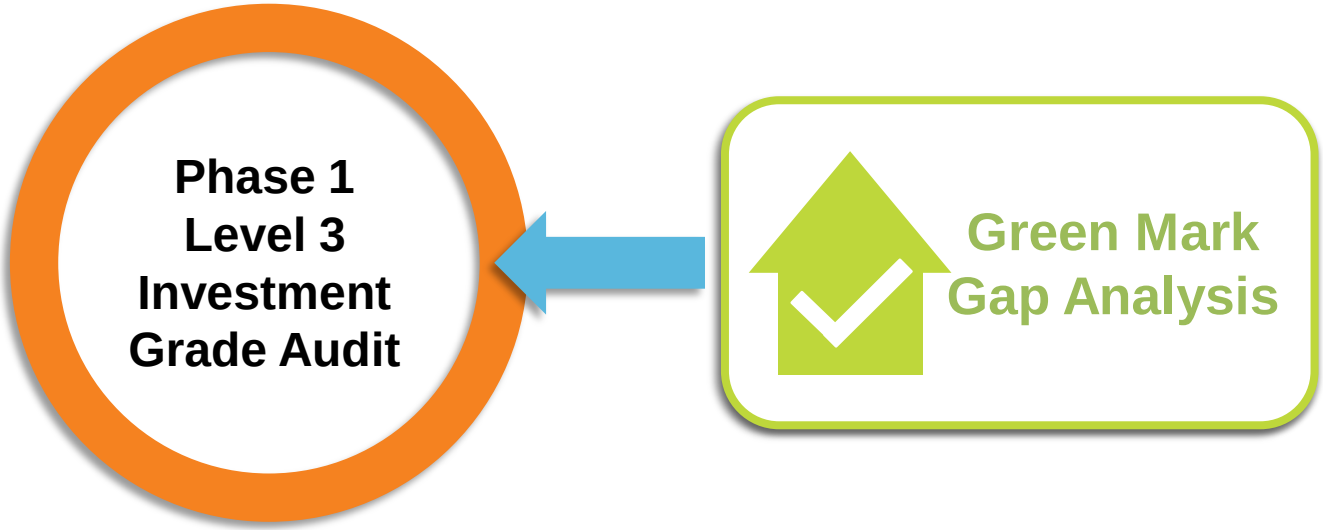


Additional thermowells to check temperature readings
Weather station (at least 2 for large plants)



Man-machine interface that allows multiple variable trending on the same display

New Addition: Green Mark Certification



In Phase 1, ESCO will

- Conduct a gap analysis (full building audit)
- Recommend measures to be implemented in order to achieve GM certification

Key benefits of GESP projects

Accountability
by a single
contractor (ESCO)

GM Platinum
Guarantee of efficiency
better than 0.65 kW/ton

Emphasis on good M & V

- Placement of flow meters to ensure sufficient straight pipe length
- Consistency checks (individual and header data)
- Accuracy checks for temp readings (with accurate sensor by BCA)
- Checks on calibration certificates of sensors to ensure traceability

Close review of key design considerations

- Chiller plant design, esp. piping
- BMS graphics and user-interface





Update on Public Sector GESP Projects

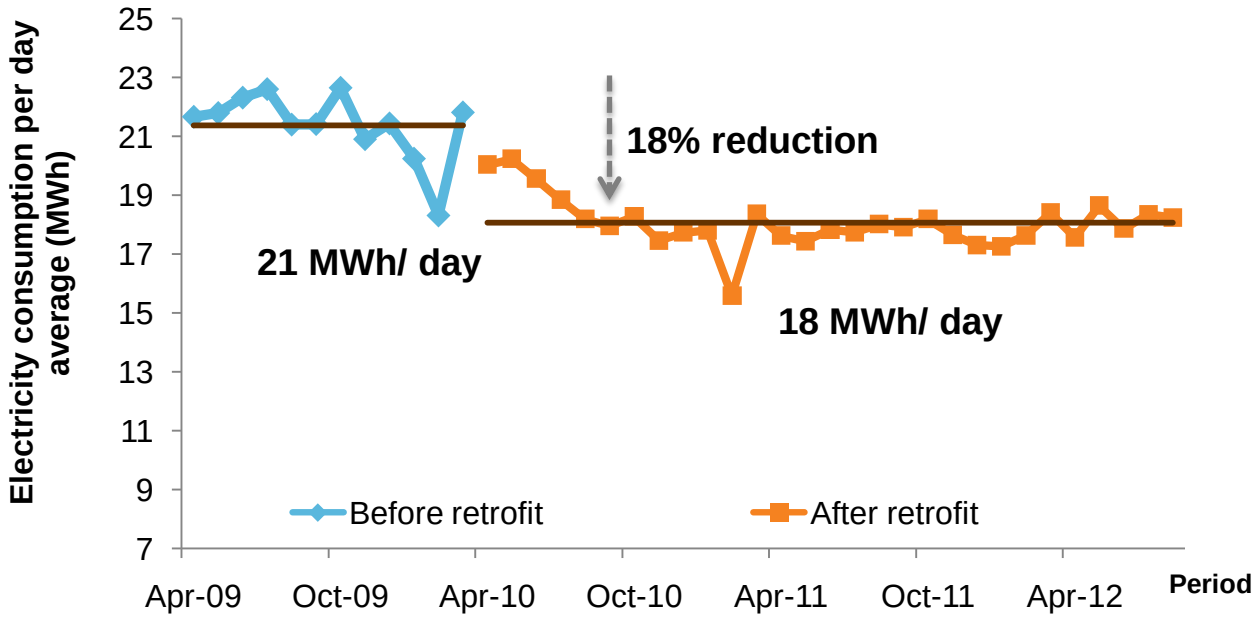
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Pilot projects- MOM & MOF

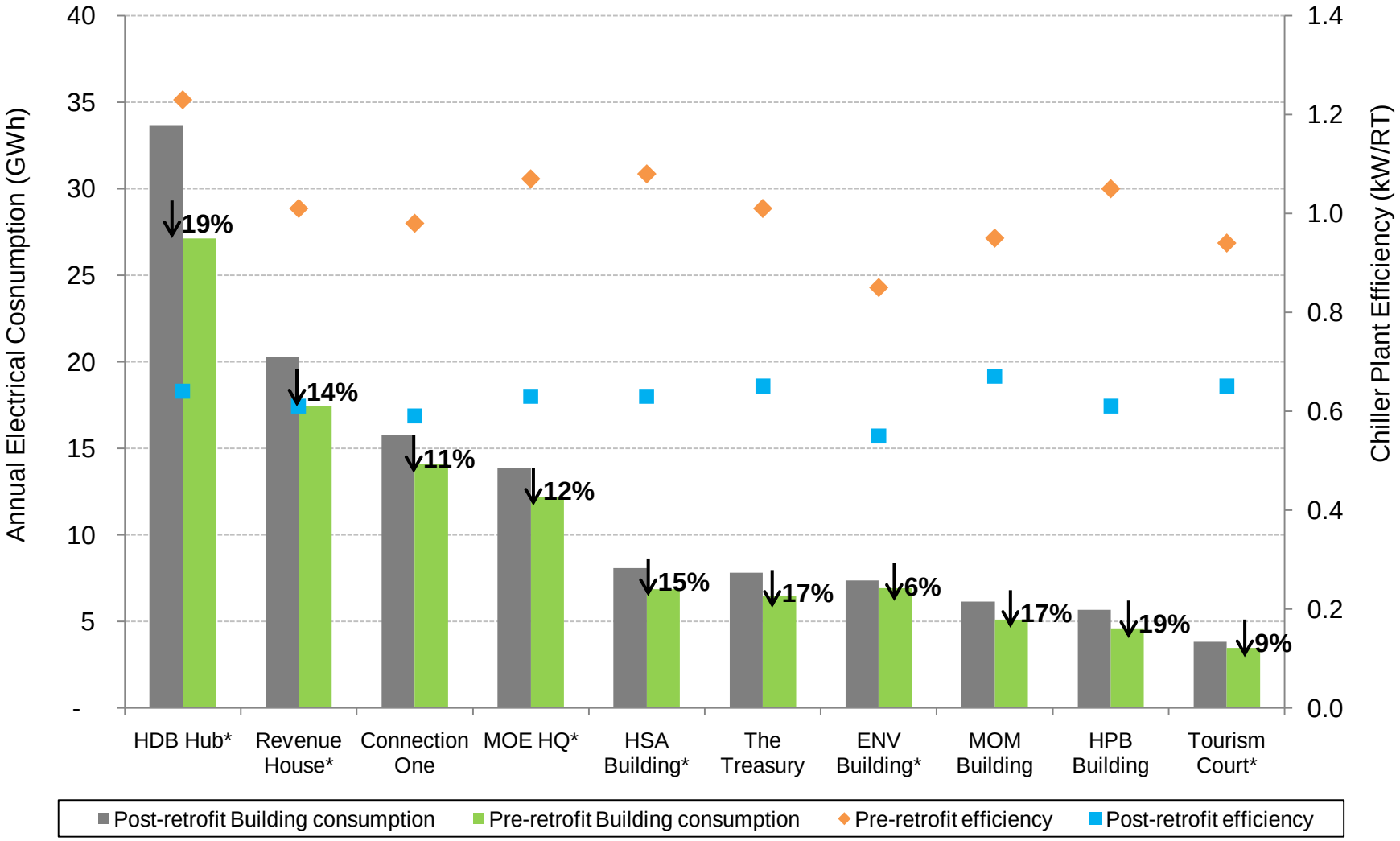
Agency	Building	Contract Period	Efficiency (kW/RT)	Investment Cost ($)	Annual Savings ($)
MOM	MOM Building	2009 to 2014	0.67	2.59mil	352k
MOF	The Treasury	2010 to 2015	0.65	1.3mil	260k







Public Sector GESP Projects



* Estimated savings

Observations and lessons learnt

1. Measurement error and uncertainty of true performance have significant cost implications
2. Existing building automation systems unsuitable for data capture, trending and analysis
3. Calibration of thermistors has to be done properly
   - Stability of water bath temperature
4. Fair allocation of contract risks to both client and contractor is key
5. System efficiency is further improved after the temperature set-points are relaxed – actual savings is higher
6. Tolerance buffered in for chiller selection sheet – actual chiller performance is often poorer

Status of Large Public Sector Buildings

Completed projects

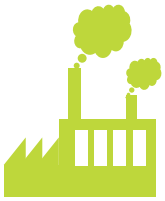
6



Buildings

6.9 GWh

Of reduction in energy consumption



S$1.65 million



In annual savings

Buildings undergoing retrofit

8



Buildings

S$3.67 million



In annual savings

Buildings to be retrofitted

5

Buildings

Undergoing audit



~10

Buildings

In the pipeline



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