EPC development/suitability for the government sector and how it should be implemented.

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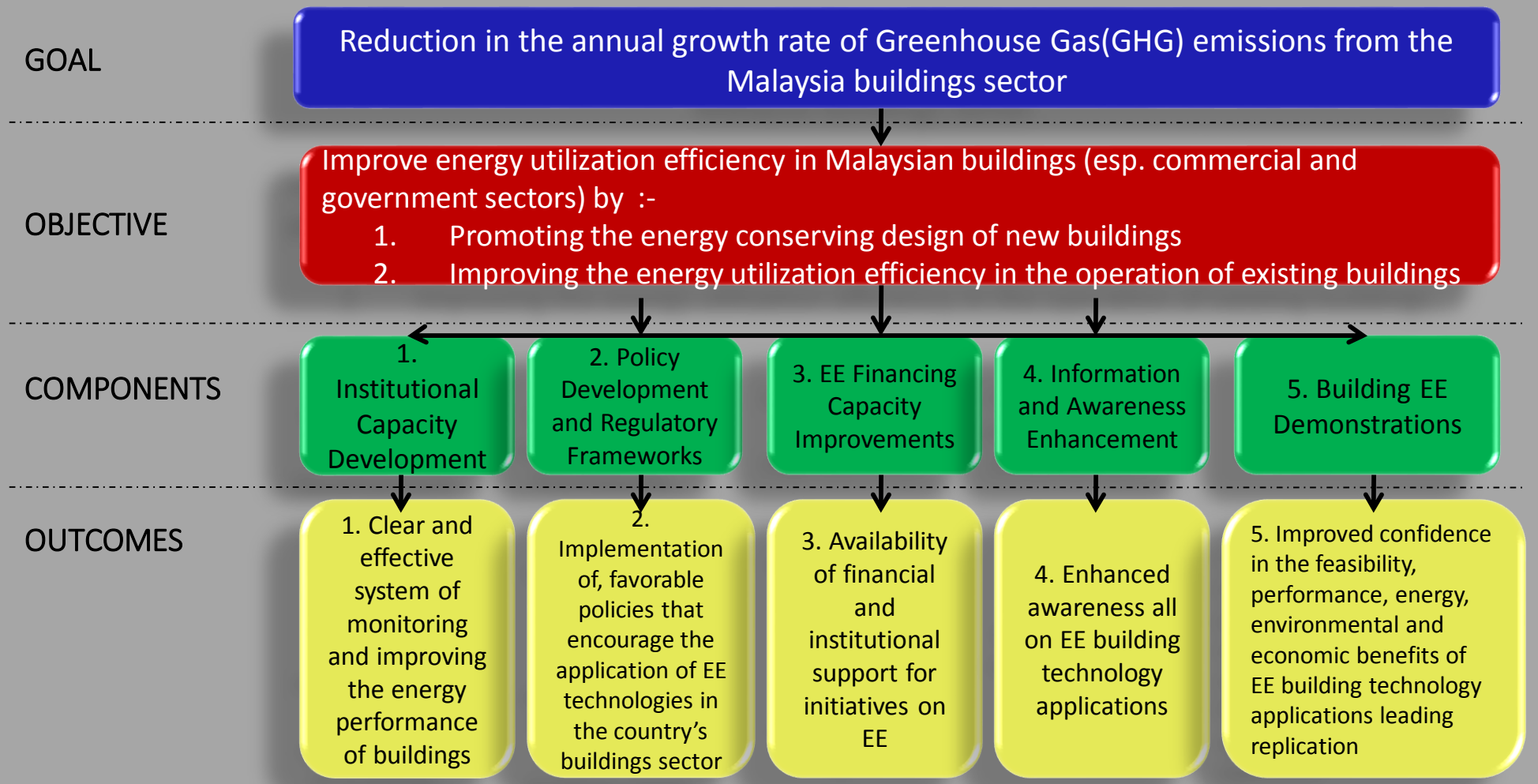

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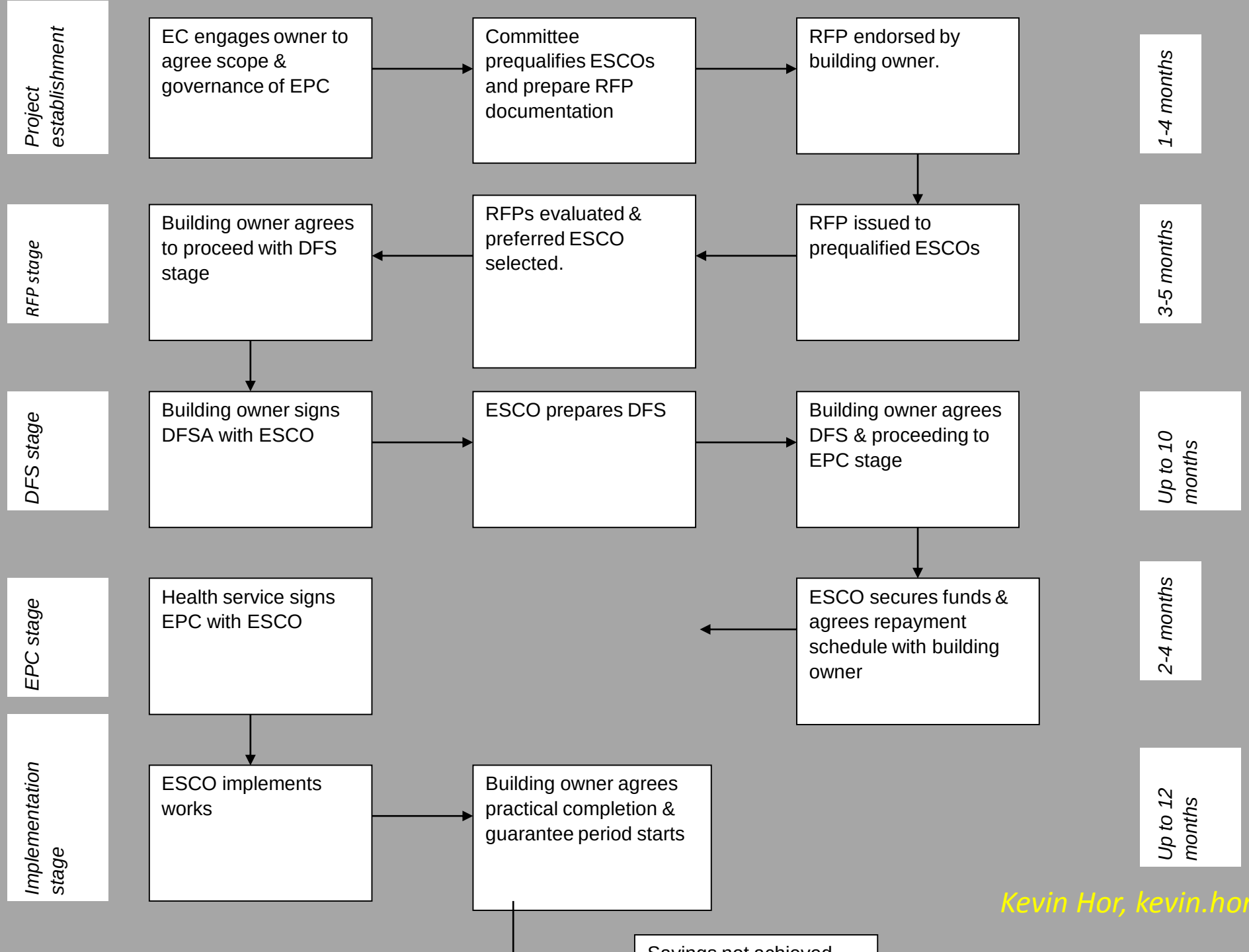

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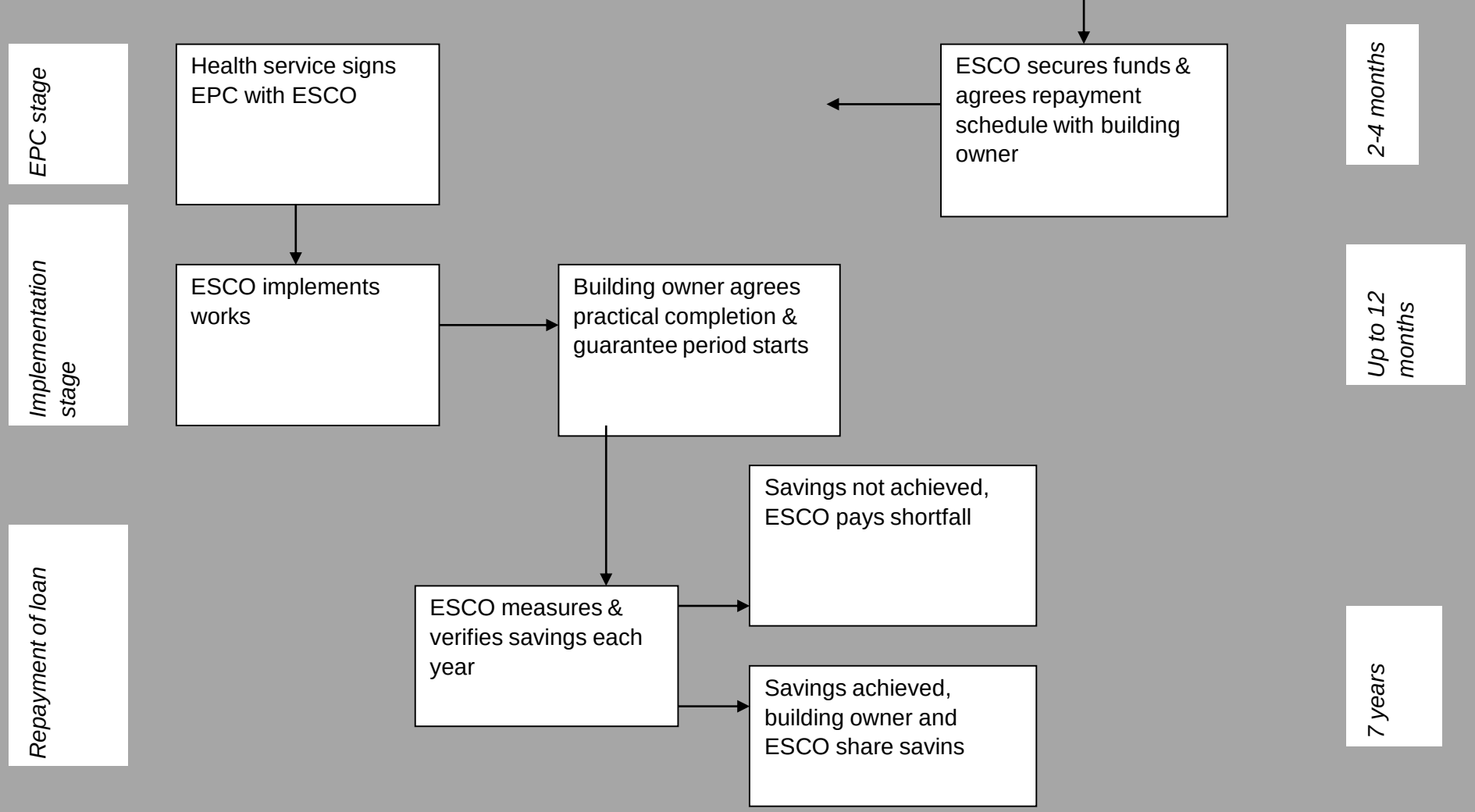

EPC = Energy performance contract

ESCO = Energy Services Company

RFP = Request for proposal

DFS = Detailed Facility Study

DFSA = Detailed Facility Study Agreement

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EPC Development

- Audit quality (IGA standard)
- Technical and Financial capability of ESCO
- Performance guarantee
- Operation and maintenance of equipment
- Contract template
- Measurement and Verification
- Ensuring long term savings

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Operation of Govt Buildings

- Relatively stable operating hours
- Clear directive for AC operating temperature
- Most have facility management companies who do not obtain upsides from energy efficiency however FM contracts will likely be longer in the future
- JKR producing a FM + EPC hybrid contract
- No contractual modality to allow for energy efficiency upsides
- Energy efficiency currently funded by owners

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- **Ensuring long term savings**

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EnMS

- EM training in January 2015 by BSEEP
- Imperative for successful execution and sustainability of EPC
- Failure likely without EnMS

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Determining Energy Savings

- Savings are the absence of energy use.
- How do you measure something that is not there?
- Measurement and Verification (M&V) is the process of using measurement to reliably determine actual savings created within an Energy conservation project (ECP).
- BSEEP has trained CMVP professionals and will repeat in 2015

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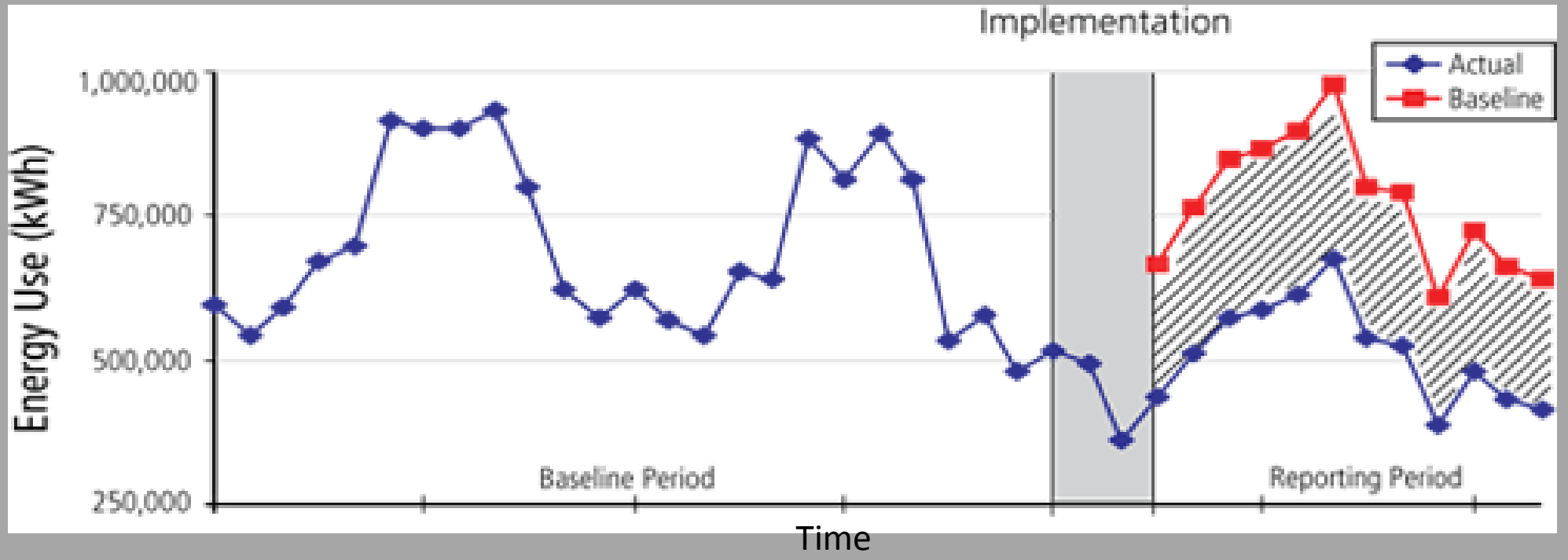
Determining Energy Savings



- Savings = Baseline Period energy – Reporting Period energy ± Adjustments

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IPMVP – International Measurement and Verification Protocol

- Defines a framework and standard approaches for “measure savings” after implementation of a project
- Legitimizes Energy Service Company (ESCO) projects through recognition of the payment through savings
- Provides guidance on the trade-off between measurement accuracy and measurement cost (risk vs. cost)

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Certified Professionals in EPC

- January 6 to 16 2015
- www.eeperformance.org
- Developing a set of protocols for standardizing project development and documentation
- Addresses project performance risk
- Gaining traction in US, about to launch in Europe
- Want to build coalition in Asia to launch here

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PUTRAJAYA HOSPITAL

- Detailed energy audit carried out
- Commissioned : Y-2000
- No of beds: 341
- Land Area: 25.74 acres
- GFA: 40,575m²
- AFA : 34,513m² (85%)
- C1 tariff

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Putrajaya Hospital

- Operating Hour : 8am – 5pm
- Electrical Supply
  - Electrical Distributors : Tenaga Nasional Bhd
  - Tariff : C1 (Medium Voltage General Commercial)
  - Unit Rate : RM 0.365/kWh
  - Maximum Demand : RM 30.30/kW-month
- Air Conditioning System
    - Mostly served by central water-cooled chiller system
- Lighting System
    - Mostly served by standard T8 fluorescent lamps
- Building Automation System
    - Out of Order

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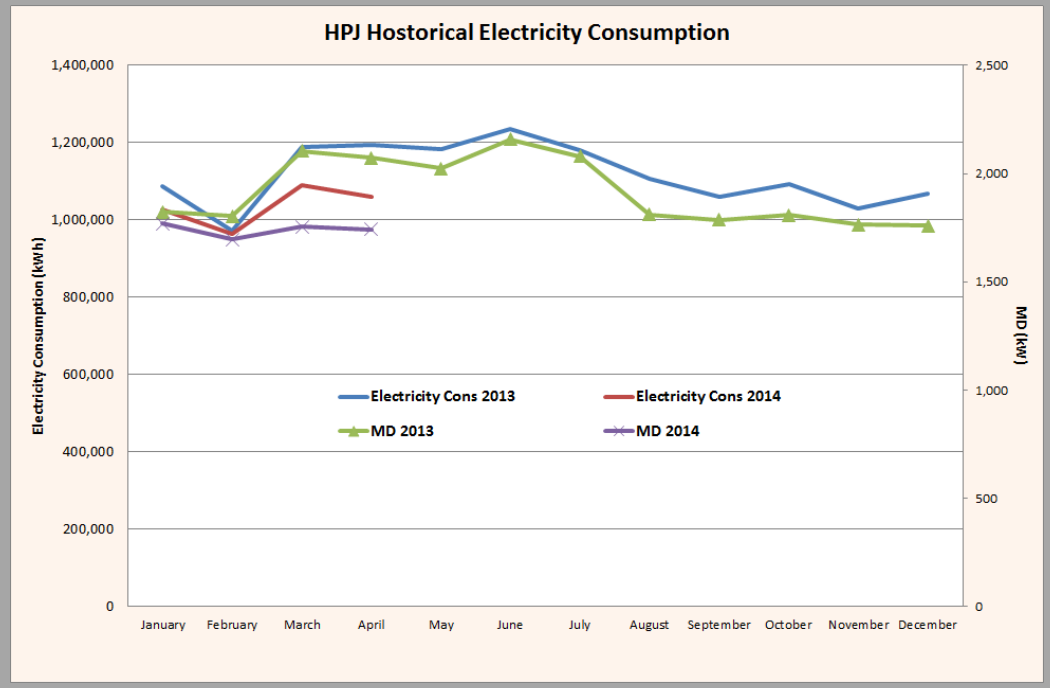
Putrajaya Hospital

Month	Electricity Consumption (kWh)		Maximum Demand (kW)	
	2013	2014	2013	2014
Jan	1,086,420	1,026,206	1,824	1,769
Feb	972,255	963,058	1,803	1,696
Mar	1,187,696	1,089,844	2,104	1,755
Apr	1,193,472	1,059,726	2,073	1,742
May	1,182,929		2,024	
Jun	1,234,208		2,159	
Jul	1,179,895		2,079	
Aug	1,106,602		1,811	
Sep	1,060,077		1,786	
Oct	1,092,520		1,809	
Nov	1,028,443		1,763	
Dec	1,067,732		1,759	

Consumption 13,091 MWh/year
MD 1,700-2,000 kW/month



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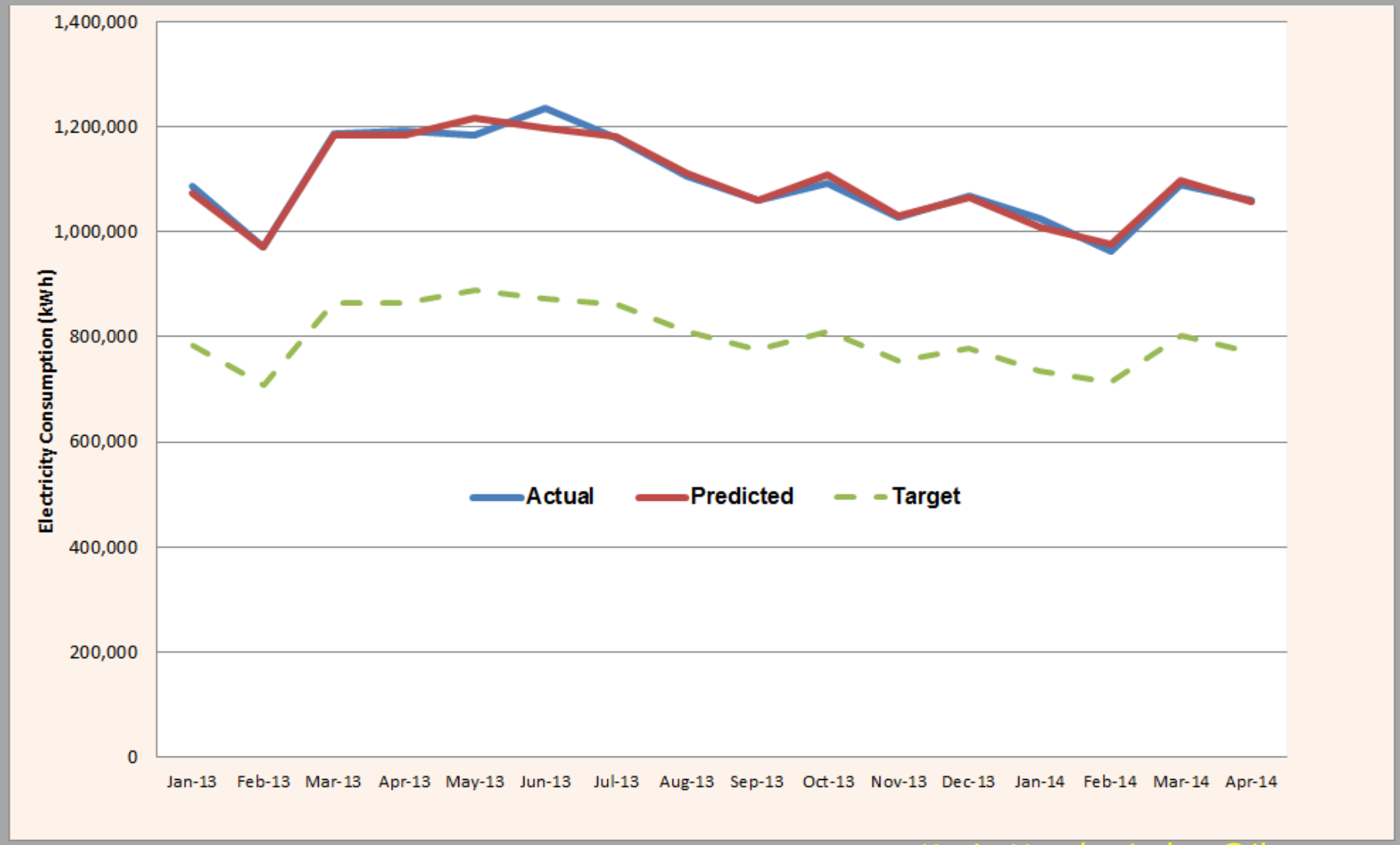
Baseline Determination



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Audit ECM Proposal

No	Measure	Savings		CAPEX	P/back
		MWh	RM	RM	year
1	***Cooling System***				
1.1	Replacement / Upgrading of Chiller Plant				
1.2	Installation of VSD at AHU				
2	***Lighting System***				
2.1	Retrofitting of LED Lights				
2.2	De-lamping				
3	***Controls***				
3.1	Refurbishment of BAS				
4	***Management System***				
4.1	Establishment of Energy Management System (EnMS)				
5	***TOTAL/AVERAGE***				

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Issues at Putrajaya Hospital

- There is an existing FM
- Loss of revenue to FM from ESCO installed equipment (except lighting)
- Would relationship between FM and ESCO be amicable?

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If FM Contracts Cannot Provide Upside

- Limited to retrofits which can be measured in isolation (Option A M&V) such as LED lighting retrofits or appliance upgrades
- Owners should never shy from renegotiating terms in FM contracts

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Suitable EPC Bundles and Where

- Large office buildings with stable operating hours (Putrajaya)
- Hospitals
- Underground structures/buildings
- Public transport infrastructures

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Key Take Aways

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When To Bundle EPC

- In public projects where energy simulation models were developed
- In projects where the FM is on board at the early stages
- Negotiate EPC upfront
- Provide upside in maintenance

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EE Project Financing Options

- End-User
  - End-User using own Cash and/or Bank Loan and/or Grants
- EE equipment Vendor (leasing scheme to the End-User)
  - Vendor using own Cash and/or Bank Loan
- ESCO (Energy Performance Contract with End-User – shared savings)
  - ESCO using own Cash and/or Bank Loan
- Third Party EPC Financier
  - EEPs repackaged into SPVs under contract with ESCO & End-User

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EE Financing Mechanism

- EE financing mechanisms stuck in a "Catch-22" situation
  - Financiers not willing to invest in EE capabilities without seeing high-level of deal flow
  - Deal flow, in turn, hampered by lack of financing

- Challenge: How to break the stale-mate?
  - Requires a unique combination of technical, financial, deal structuring and business development expertise

- Typical financing mechanisms
  - Lending Programs
  - Loan Guarantees
  - Demand Side Management
  - Energy Performance Contracting
  - Third-party financing

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Public Intervention Mechanisms

- INCENTIVES
  - Government subsidies, grants, rebates etc.
  - PROs: Useful to create interest and kick-start market;
  - CONs: Expensive; How long should subsidies be extended? Sustainability issues
  - *Applicability: Useful to continue grants in conjunction with a new mechanism; maybe restructured as a 'Repayable grant' instead*

- LENDING MECHANISMS
  - Deployed by Thailand, India, Germany, Korea, Romania and others; Lent at market rates or subsidized rates; sometimes as revolving fund
  - PROs: Easy to structure and implement loan mechanism; Creates liquidity in tight credit situations at cheaper cost
  - CONs: Not effective as near-term solution if banking system doesn't have capability; Not effective when loans are already very cheap; Subsidized schemes do not price risk well
  - *Applicability: End-users reluctant to borrow for EE projects; ESCOs not credit-worthy to borrow; Banks do not have capacity, may not be effective as a near-term solution*

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Public Intervention Mechanisms

- LOAN GUARANTEES
  - Deployed by Hungary , China and Others; Used as stand-alone mechanism or for credit enhancement in conjunction with other schemes
  - PROs: Partial guarantees can align incentives and manage risks;
  - CONs: Limited strength as a stand-alone tool, not as useful if banking system doesn't have capability
  - *Applicability: Needs to be combined with another tool like ESCO financing or third party financing to be effective;*

- DSM
  - Deployed by countries like India and U.S.A; Peak energy demand management by capping/prioritizing consumption
  - PROs: Utilities understand EE best;
  - CONs: Conflict of interest (prefer to increase sales; Useful only in 'Energy shortage' situations
  - *Applicability: limited due to over-capacity, market-priced electricity (ex: Singapore Tuas Power Supply Green Programme)*

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Public Intervention Mechanisms

- ESCO FINANCING
  - Successfully deployed in U.S.A
  - PROs: Commercially driven mechanism with optimal risk transfer; could reduce transaction costs
  - CONs: Needs credit-worthy ESCO sector; FIs need to understand business model (capacity building)
  - *Applicability: Model capable of meeting needs of End-users, but needs changes to adapt to local ESCO and FI sectors, which are either nascent or lack capability*

- THIRD-PARTY FINANCING
  - Deployed in Bulgaria (BEEF), Belgium (FEDESCO), SPAIN (IDAE)
  - PROs: Transfer of risks and responsibility of financing, technology and investment decision; Allows deal-aggregation and reduces transaction costs; Transfers risk of deal structuring to qualified entities
  - CONs: is not a silver bullet; May not appeal to all market participants;
  - *Applicability: Model capable of meeting most needs of all stakeholders if combined with 'information center' and 'regulation' and credit enhancement tool like 'loan guarantees'*

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BSEEP's Support to EPC

A For Profit Private Third Party Financing vehicle, guaranteeing performance, aggregating EE projects & kick-started by the government would address the shortcomings

- Malaysia Energy Efficiency Fund ("MEEF")
- US$100-200m Public Private Partnership
- Provides 100% financing for EE Projects under a shared savings model
- Contractual agreements with end-users and ESCOs (EE as a Service)
- Commercially / Profit Driven
- Targets: Hotels, Shopping Malls, Offices, Hospitals, Schools, etc
- EE projects include equipment upgrades (chillers, lighting, VSDs…)
- Typical investment range is US$0.5-10m / EE project
- MEEF assumes market, finance & credit risk
- ESCO implements and guarantees performance (technical risk)

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BSEEP Capacity Building

Date	Training event
6-16 January 2015	Certified Professional in Energy Performance Contracting (Core 5 days and technical 5 days) **Confirmed*
5-7 March 2015	Building Commissioning **Confirmed*
17 – 18 March 2015	Certified Lighting Efficiency Professional
7-9 April 2015	Certified Energy Manager
5-7 May 2015	Certified Energy Auditor
2-4 June 2015	Certified Measurement and Verification Professional
16-18 June 2015	Certified Building Commissioning Professional (CBCP®) Program
7-9 July 2015	Certified Building Energy Simulation Analyst Certifications
4-6 August 2015	Existing Building Commissioning Professional
8-10 September 2015	Certified Residential Energy Auditor

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THANK YOU

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