Where to start:

Selecting products for MEPS and Labels

Lighting, Appliances & Equipment: Session 2

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Scenario

You have been asked to expand the S&L programme to cover more products

How do you identify, prioritise and quantify these options?

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The 3-Phase Approach

1. Initial Scoping

- Covering all potential products
- Simple analysis

2. Highest Priority Products

- More detailed analysis of the top 2-3 priorities
- Detailed analysis with higher data requirements

3. Cost-Benefit Analysis of Selected Product(s)

- Detailed modelling of cost-effectiveness

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The 3-Phase Approach

1. Initial Scoping

- Covering all potential products
- Simple analysis

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What do we need to consider for the initial scoping phase?

Based on the Scenario and indicating your assumptions:

How would you go about your initial prioritisation? What steps would you take?

Which 2-3 appliances would you select for the 2nd phase in this case? And why?

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Scenario

- Existing S&L programme covers only CFLs (mandatory)
- Took five years to implement the S&L programme for CFLs
- Limited budget and staff for S&L implementation
- Large heavy industry with high energy consumption but also fast growing residential electricity consumption
- Limited local product manufacturing industry
- Good data set on residential and industrial energy consumption but outdated
- Testing facility available but would need investment to cover more products beyond lighting

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Key Criteria for Selection of Products

Criteria	Initial Scoping (1st Phase)	Highest Priority Products (2nd Phase)
S&L Programme objectives and type	MEPS and/or labels Mandatory or voluntary	
Current and future impact of the product (e.g. greenhouse gas emissions, total energy consumption*, peak demand*, etc.)	Simple Analysis	Detailed Analysis
Level of ownership and turnover/lifetime	Simple Analysis	Detailed Analysis
Potential for energy efficiency improvement *(detailed in annex)*	Not Applicable	Applicable
Anticipated stakeholder impact and level of support*	Simple Analysis	Detailed Analysis
Coverage by existing test procedures (international / regional)*	Applicable	
Existing programme in trading / neighbouring economy	Applicable	

* Most relevant based on the Scenario presented in Slide 3

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US Dept of Energy

2002 Priority Setti for Standards and Test Pr Rulemakings

Standards and Determinations (D)

High Priority Products	Page		Low Priority Products	Page
Air-Cooled Central Air Conditioners and Air-Source Heat Pumps, 65-240 kBtu/h	1		Clothes Dryers	3
Distribution Transformers	21		Clothes Washers*	5
Packaged Terminal Air Conditioners and Heat Pumps	33		Commercial A/C and Heat Pumps*	7
Residential Central AC/HP[1]	40		Commercial Furnaces & Boilers*	9
Residential Furnaces and Boilers	43		Commercial Water Heaters*	13
Small Electric Motors (D)	50		Cooking Products	15
			Direct Heating Equipment, Gas	17
			Dishwashers	19
Medium Priority Products			Electric Motors, 1-200 HP	23
Central Air Conditioners and Heat Pumps, 3 Phase, <65 kBtu/h	2		Fluorescent Lamp Ballasts*	25 Commercial
Commercial Oil and Gas-Fired Packaged Boilers	10		High Intensity Discharge Lamps (D)	27
Tankless Gas-Fired Instantaneous Water Heaters	49		Lamps	29
			Mobile Home Furnaces	31
			Plumbing Fixtures/Fittings	34
			Pool Heaters, Gas	36
			Refrigerators*	38
			Residential Water Heaters*	45
			Room Air Conditioners*	47

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2. Impact of the Product - Examples

Linked to the objectives of the programme

Greenhouse gas emissions

- Air conditioners + Refrigerators – important to account for refrigerant removal
- Contribution to NDCs

Total energy consumption

- Current and future (next slide)

Peak power demand

- Reducing demand for new electricity generation capacity
- Cost of peak power to utilities

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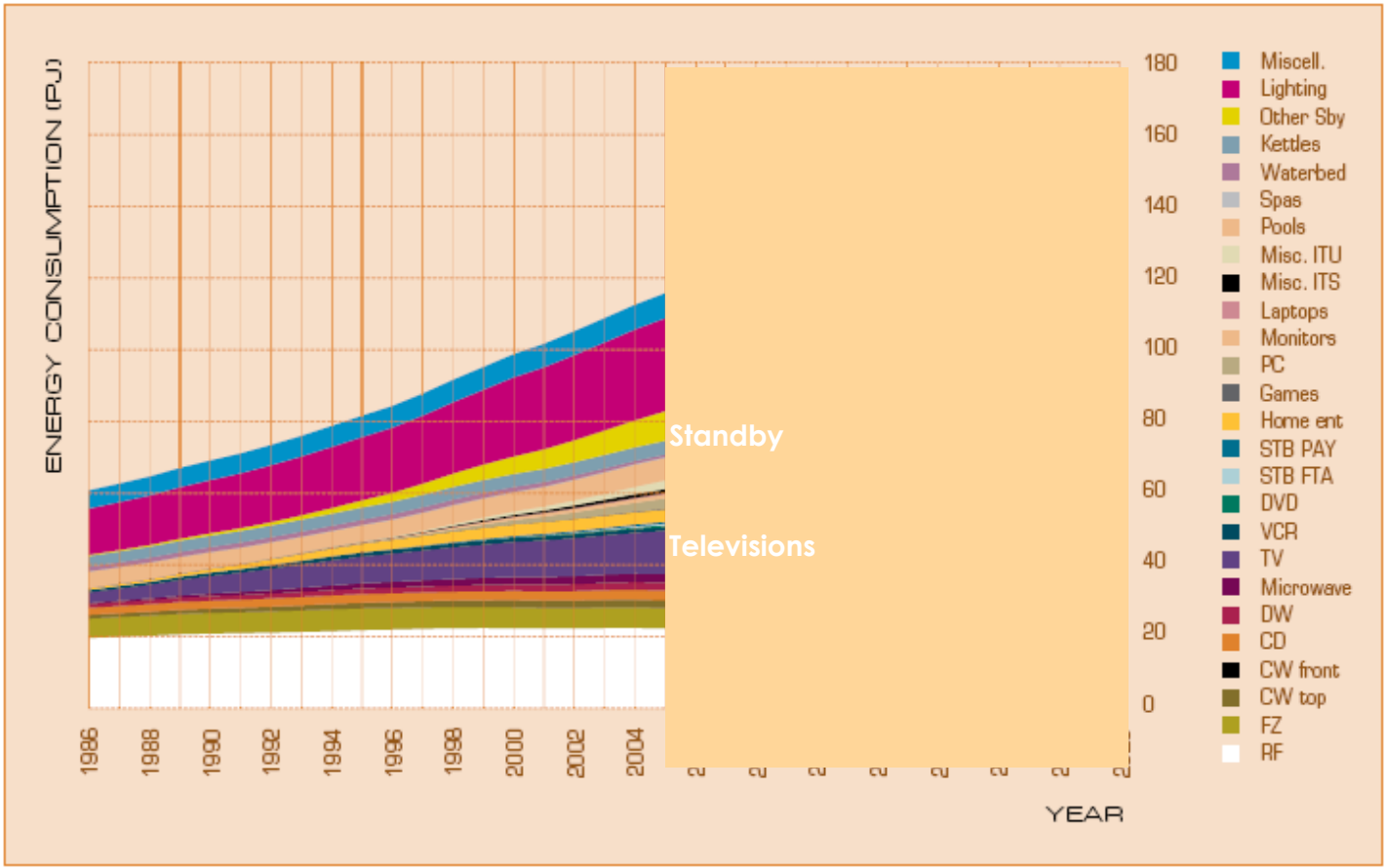
Share of Total Energy Consumption in Australia – Today & Future



Source: Energy Use in the Australian Residential Sector 1986-2020 – Part 1, 2008

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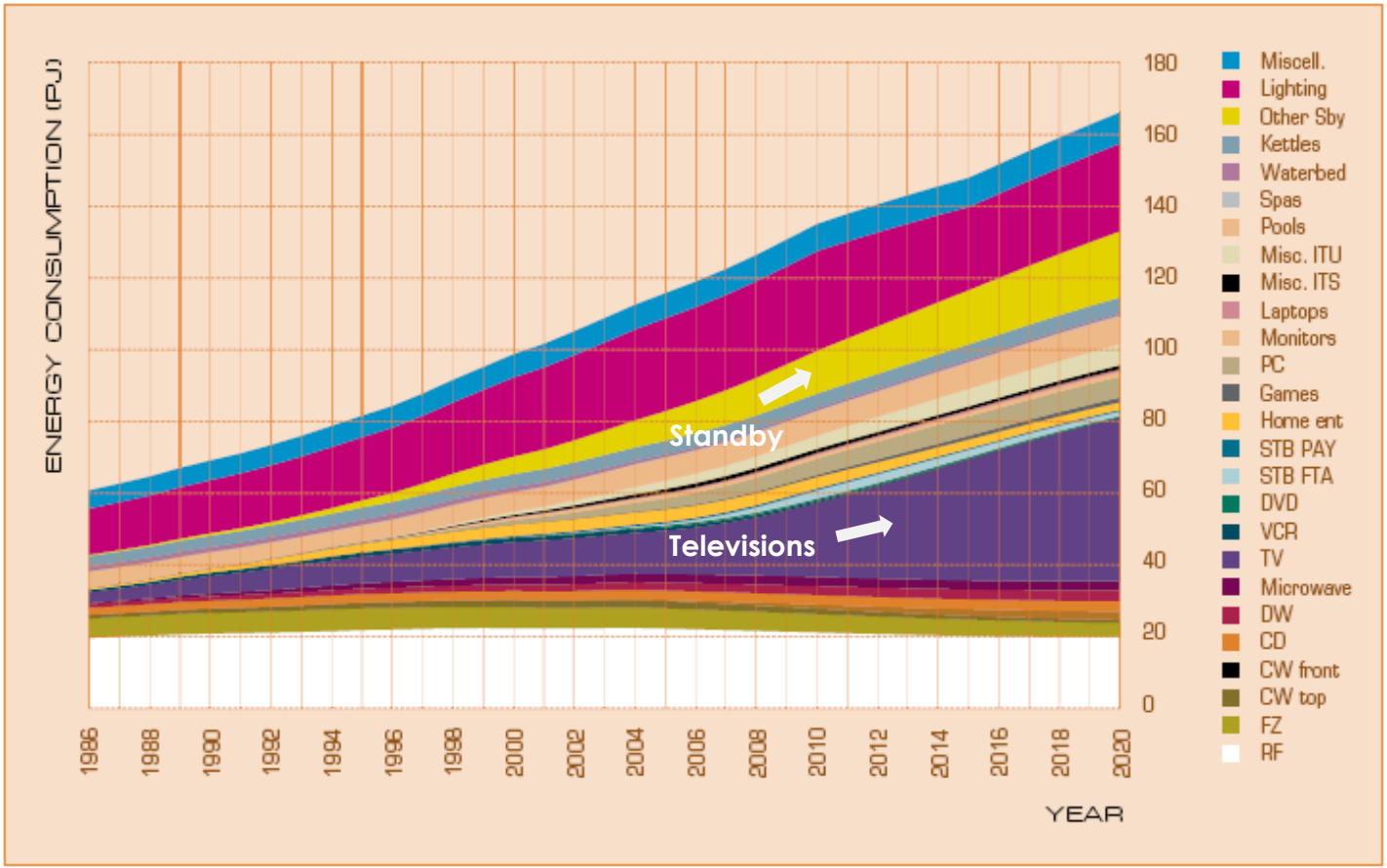
Share of Total Energy Consumption in Australia – Today & Future



Source: Energy Use in the Australian Residential Sector 1986-2020 – Part 1, 2008

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3. Level of Ownership & Turnover/Lifetime

- Focus on products with high level market penetration today or rapidly increasing
- Example of factors, depending on data availability and quality:
  - Operation hours per day & lifetime
  - Energy consumption / Energy performance
  - Population, economic growth, household size
- Typical appliances selected:
  - Refrigerators
  - Air Conditioners
  - Motors
  - Lighting

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Potential for Energy Efficiency Improvement

- Can product efficiency be improved?
- Bigger appliances have greater opportunities
- Use existing studies – e.g. IEA 4E, SEAD, LBNL, UN Environment
- Most appliances efficiency potential are well understood today

Description	Annual kWh	Energy Saving (%)	Manufacturer Cost (USD)	Retail Cost (%)
Base case (Refrigerator)	255	-	-	-
Add 1 cm insulation	234	8.2	1.0	1.5
Add 2 cm insulation	227	11.0	2.5	3.0

Wiel et al., Energy-Efficiency Labels and Standards: A Guidebook for Appliances, Equipment, and Lighting. 2nd Edition. 2005

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India's Prioritisation Exercise

- All products and equipment possible = 81!
- Prescreening = 57
- Prioritisation Criteria:
    1. **GHG abatement potential - 75%** (surviving stock, annual energy consumption, energy savings potential & emission factor)
    2. **Market implementability index - 25%** (test procedures & standards, number of stakeholders, % organised sector, implementing partner)
- Top 25 appliances identified
- Motors and residential air conditioners had highest:
    - annual energy demand and peak demand reduction
    - energy savings and annual GHG abatement potential
    - existing standards and test procedures

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4. Anticipated Stakeholder Impact

- Impact will depend on the level of stringency
- Impact of economy and society (e.g. loss and creation of local jobs)
- Important to have stakeholder input:
  - Government agencies
  - Energy utilities
  - Private businesses
  - Major appliance importers, suppliers, wholesalers, retailers, distributors
  - Major accommodation operators
  - Consumer and Environmental Groups

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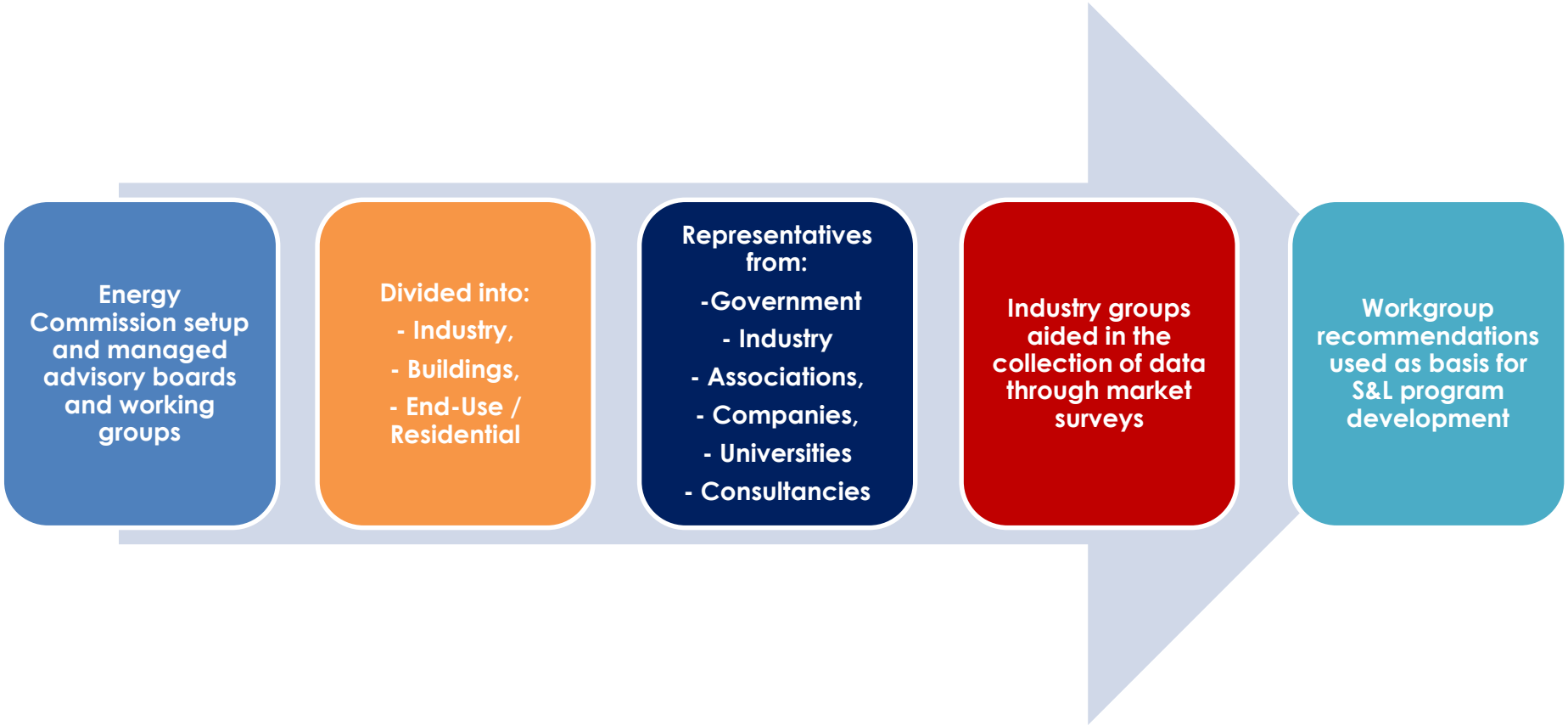
Malaysian Approach to Stakeholder Involvement & Data



Wiel et al., Energy-Efficiency Labels and Standards: A Guidebook for Appliances, Equipment, and Lighting. 2nd Edition. 2005

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5. Coverage by Test Procedures

- Do not reinvent the wheel – learn from others
- Refer to international standards and test protocols for minimum energy performance standards such as:
  - International Electrotechnical Commission (IEC)
  - International Organisation for Standardisation (ISO)
  - Regional standards or in neighbouring countries
- Explore synergies within the region

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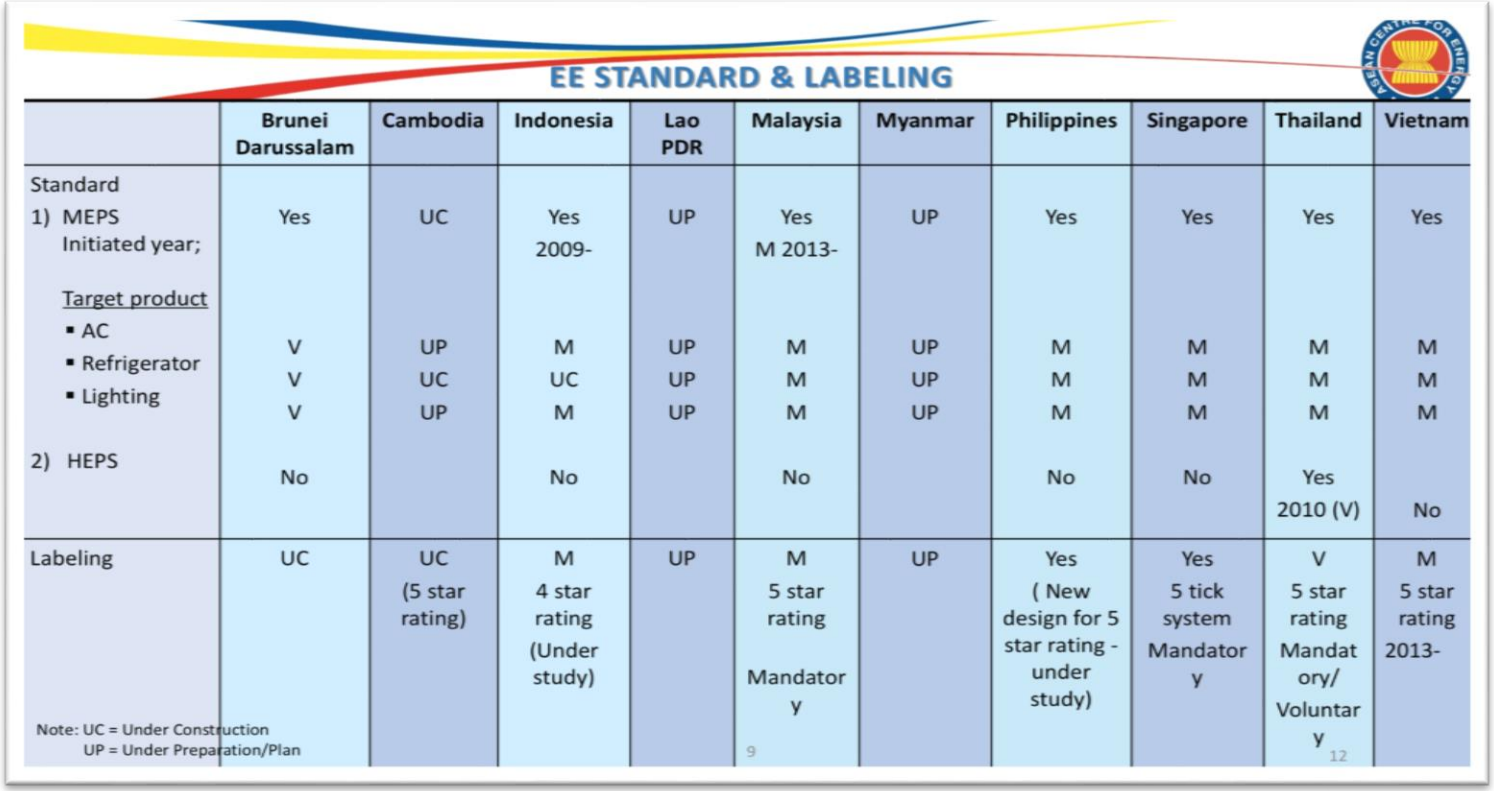
Explore synergies within the region



EE STANDARD & LABELING

	Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Vietnam
Standard										
1) MEPS Initiated year;	Yes	UC	Yes 2009-	UP	Yes M 2013-	UP	Yes	Yes	Yes	Yes
Target product										
▪ AC	V	UP	M	UP	M	UP	M	M	M	M
▪ Refrigerator	V	UC	UC	UP	M	UP	M	M	M	M
▪ Lighting	V	UP	M	UP	M	UP	M	M	M	M
2) HEPS	No		No		No		No	No	Yes 2010 (V)	No
Labeling	UC	UC (5 star rating)	M 4 star rating (Under study)	UP	M 5 star rating Mandatory	UP	Yes (New design for 5 star rating - under study)	Yes 5 tick system Mandatory	V 5 star rating Mandatory/ Voluntary	M 5 star rating 2013-

Note: UC = Under Construction
UP = Under Preparation/Plan

9 12

Many opportunities for harmonization (policy and technical) are already available!

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6. Existing Programme in Trading Partner / Neighbouring Economy

- This can simplify market acceptance by domestic and international manufacturers
- Can help simplify MEPS adoption

Pacific Islands Case Study

- Limited data on household energy use and appliance uptake
- Issues with customs classification for appliance
- Limited capacity and resources available
- Opted to adopt S&L based on main country of origin and focusing on highest consuming appliances

https://www.reeep.org/news/reeep-commissioned-report-sets-sl-baseline-pacific-island-countries

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The 3-Phase Approach

2. Highest Priority Products

- More detailed analysis of top 2-3 priorities
- Detailed analysis with higher data requirements
  (see examples in Annex)

3. Cost-Benefit Analysis of Selected Product(s)

Detailed modelling of cost-effectiveness
(see examples in Annex)

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Detailed Analysis for Highest Priority Products

Energy Sector	• Energy consumption and demand • Investment in generation capacity • Electricity tariffs and sales • CO_2 emissions
Government	• Taxation on appliances and manufacturers • Resources and funding available
Consumers (usage and behavioural data)	• Attitude towards energy efficiency • Appliance ownership and operating expenses (e.g. Census) • Equipment prices
Manufacturers, Suppliers, Distributors, Wholesalers and Retailers	• Number of companies and employees, • Annual sales and profits, growth rate…

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Opportunities for using New Technologies and Approaches

- Web crawling
- Quick Response (QR) Codes
- Smart meters
- Real-time energy monitoring systems
- *More details in the session on Information and Communication Technologies*

For more information: https://www.iea.org/workshops/21st-century-energy-efficiency-standards-and-labelling-programmes.html

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Summary

- Do not reinvent the wheel
- Determine the key criteria and work with stakeholders to gather the data
- Prioritise data needs using the 3-Phase approach
- Explore synergies and opportunities with neighbouring countries and trade partners
- Make use of existing studies, policies, standards and new digital technologies and approaches
  - E.g. Use of existing framework for CFLs to expand to linear fluorescent and LEDs depending on market characteristics
- Do not prioritise too many appliances (success will drive more support)

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Types of Assessment

1. Engineering Assessment:	2. National Impact and Consumer Assessment:	3. Manufacturing, Distributor and Retailer Assessment:

• Performance of products
• Technical feasibility for improvement *(next slide)*
• Economic feasibility for improvement (cost)
	• Cost-benefit for consumers and society
	• Impact on utilities and government
	• Environmental impacts
		• Impact of mandatory/voluntary standards and/or label scheme on:
		  • Sales, profitability and competitiveness,
		  • Productivity and growth,
		  • Employment

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Cost-Benefit or Cost-Effectiveness Analysis

- Cost-benefit to the:
  - Country
  - Consumers
  - Utilities
  - Manufacturers
- Models and support available (next slides):
  - Policy Analysis Modeling System for Minimum Energy Performance Standards (PAMS-MEPS)
  - Bottom-Up Energy Analysis System (BUENAS)
  - Superefficient Equipment and Appliance Deployment (SEAD) Initiative

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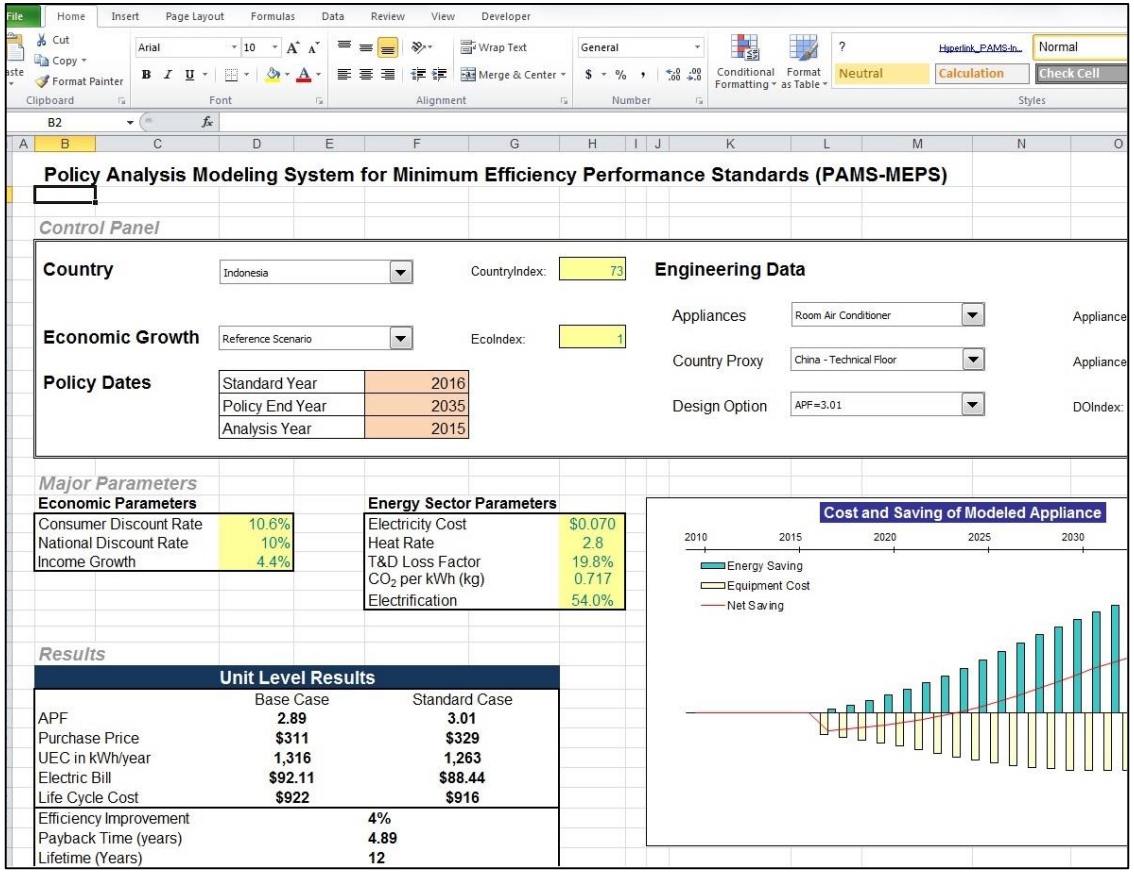
Policy Analysis Modeling System for MEPS (PAMS-MEPS)



Policy Analysis Modeling System for Minimum Efficiency Performance Standards (PAMS-MEPS)

Control Panel

Country	Indonesia	CountryIndex:	73	**Engineering Data**	
Economic Growth	Reference Scenario	EcoIndex:	1	Appliances	Room Air Conditioner
Policy Dates	Standard Year	2016		Country Proxy	China - Technical Floor
	Policy End Year	2035		Design Option	APF=3.01
	Analysis Year	2015			

Major Parameters

Economic Parameters	
Consumer Discount Rate	10.6%
National Discount Rate	10%
Income Growth	4.4%

Energy Sector Parameters	
Electricity Cost	$0.070
Heat Rate	2.8
T&D Loss Factor	19.8%
CO_2 per kWh (kg)	0.717
Electrification	54.0%

Cost and Saving of Modeled Appliance

2010 2015 2020 2025 2030

Energy Saving
Equipment Cost
Net Saving

Results

Unit Level Results

	Base Case	Standard Case
APF	2.89	3.01
Purchase Price	$311	$329
UEC in kWh/year	1,316	1,263
Electric Bill	$92.11	$88.44
Life Cycle Cost	$922	$916
Efficiency Improvement	4%	
Payback Time (years)	4.89	
Lifetime (Years)	12	

Source: LBNL, Policy Analysis Modeling System. Available for free! https://ies.lbl.gov/project/policy-analysis-modeling-system

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Bottom-Up Energy Analysis System (BUENAS)

- Evaluate potential energy savings and emission reductions under different policy scenarios
- Forecasting energy consumption based on macroeconomic parameters
- Analysis available for specific countries including China, India, Indonesia, Mexico and South Africa
- Helps policymakers:
  - Forecast the energy saved and emissions reduced
  - Identify policy goals that are achievable
  - Prioritise policy actions to maximize impact
  - Understand the economic potential

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Example of BUENAS model inputs

- Population
- Household size
- Number of households
- GDP per capita and growth rates
- GDP per household
- Electrification
- Urbanisation
- Appliance penetration
- Floor space
- Employment
- Unit sales
- Unit stock
- Market shares
- Lifetimes
- Carbon factor
- Etc……

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