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United Nations Environment Programme
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Quantitative Benefits of a Transition to Energy-Efficient Products and Equipment in Myanmar

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15 February 2015

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nltc National Lighting Test Centre China

Australian AID

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Electricity use in our homes….








…. is really about the services provided: hot tea and cool rooms.

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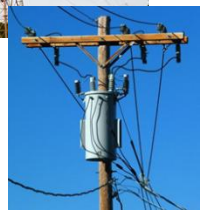
Electricity Supply and Demand

SUPPLY (power sources) and **DEMAND** (what we use)



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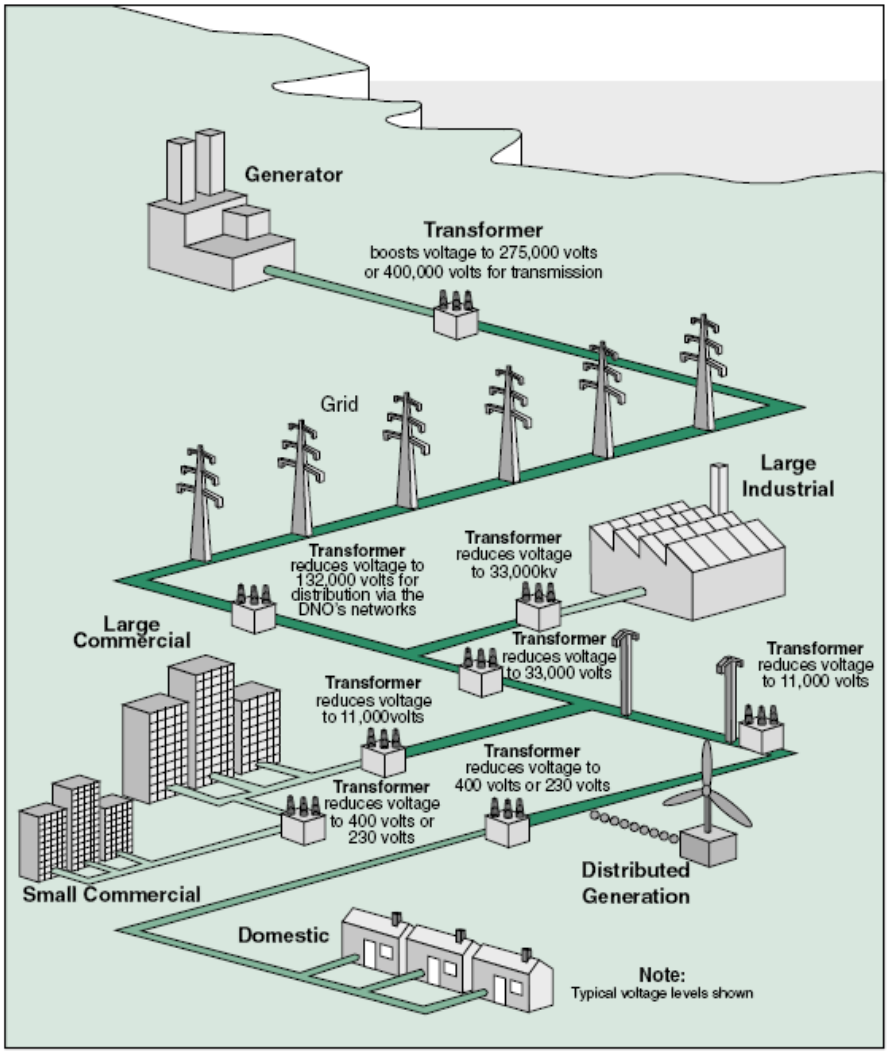
Simplified Electricity Network



This is an illustration of the UK's "National Grid"….how electricity gets from the power station to the various end-use applications.

As Myanmar's economy grows:

1) More homes connected to the grid
2) More appliances in each home – lighting, air conditioning, refrigerators…
3) Expansion of commercial sector – offices, hospitality, tourism
4) Expansion of industrial sectors – manufacturing, production

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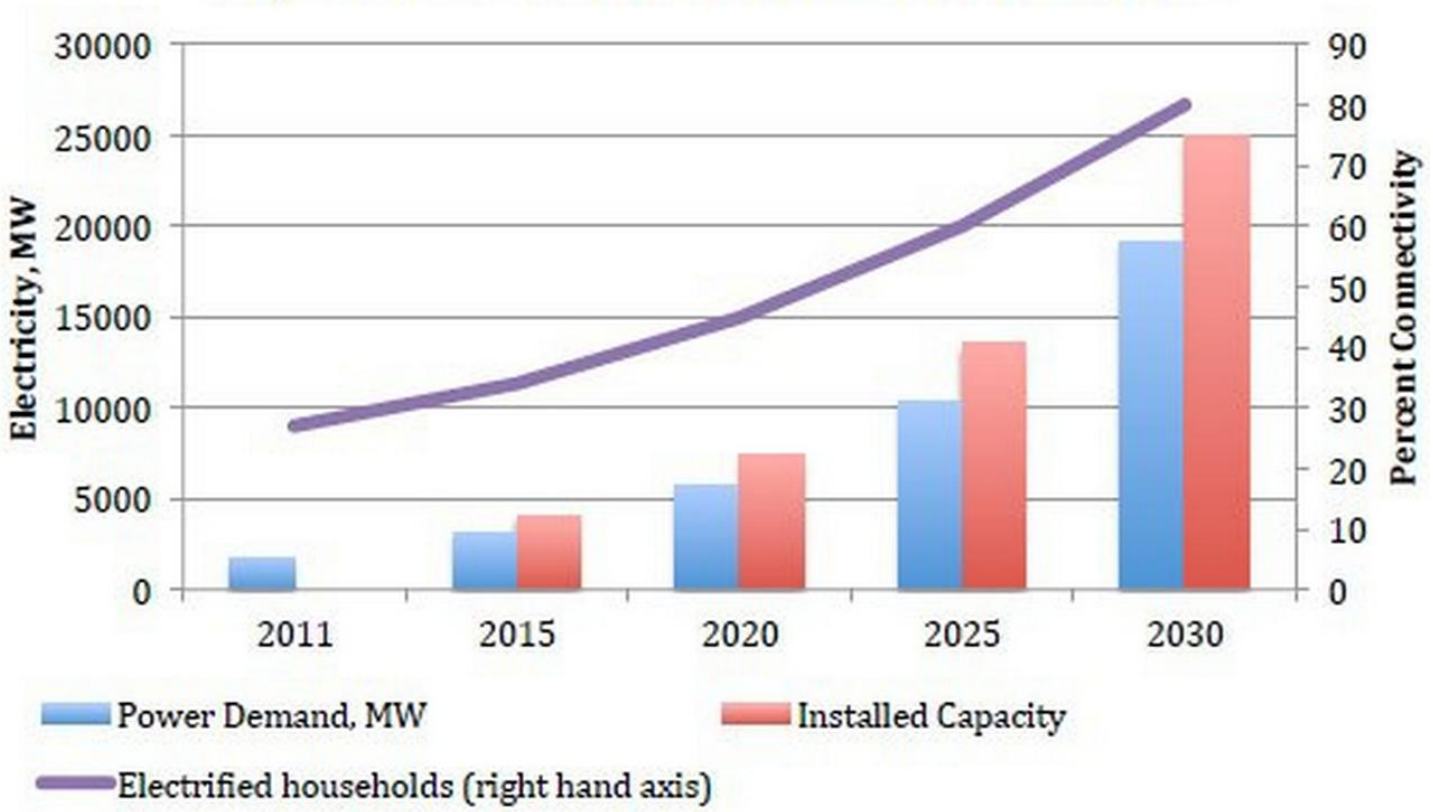
Myanmar Electricity Demand Forecast



Bottom line: Economic growth and newly electrified households are two key factors expected to drive electricity demand.

Source: http://breakingenergy.com/2014/03/20/powering-myanmar-investors-watch-closely-as-government-cautiously-cuts-subsidies/

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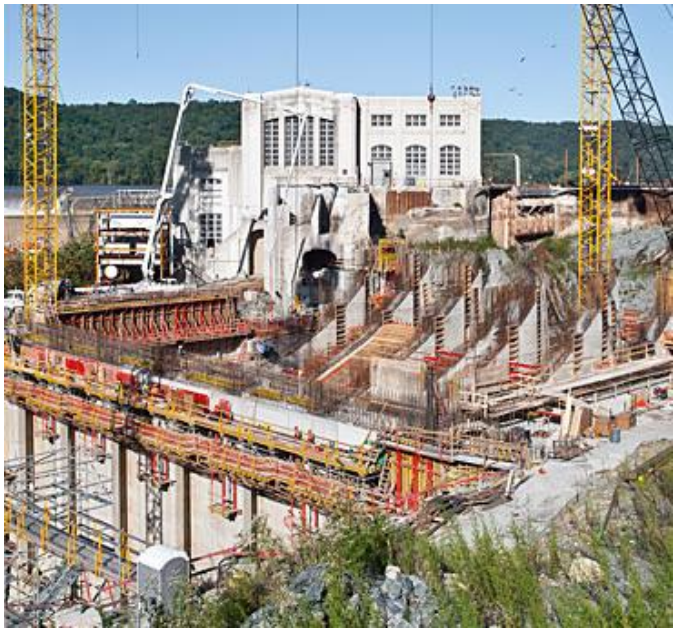
Rapid Growth in Electricity Demand

- Public and private funds tied up in power plant investment
  - Less public money available for other critical services – healthcare, education
  - Less private money available for investment in other sectors
- Risk of delays, supply may not meet demand
  - Black-outs / Brown-outs – negative impact on business
  - Investment in Myanmar could slow because of grid stability risks
  - Households inconvenienced, risk of damage to appliances
- Energy-efficiency offers a solution….use less energy while still providing the same service



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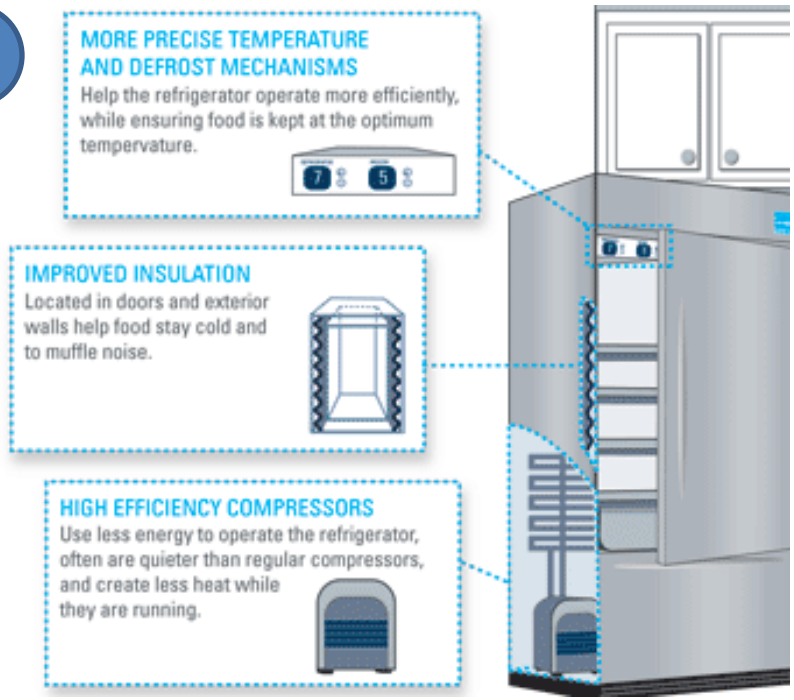
What is Energy-Efficiency?

Efficiency provides the same service using less energy

1) Incorporating design improvements into existing models
2) Using different technologies, providing same service

1



2

Incandescent
60 Watts
800 lumens

LED
8 Watts
800 lumens

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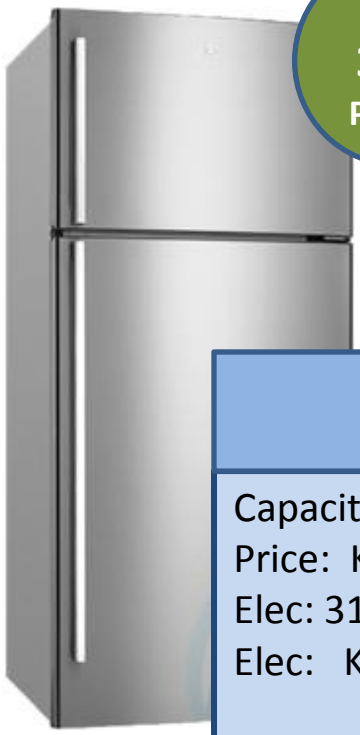
Compare two refrigerators…



Save 37% Power

Model A	Model B
Capacity: 422 Litres Price: Ks. 389,000 Elec: 506 kWh/yr Elec: Ks. 20,240 /yr Total cost for 10-years Ks. 591,400	Capacity: 420 Litres Price: Ks. 419,000 Elec: 318 kWh/yr Elec: Ks. 12,720 /yr Total cost for 10-years Ks. 546,200 Payback: 4 years

Note: Used Ks. 40/kWh

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Compare three lightbulbs…

Incandescent
Light: 800 lumens Life: 1000 hours Price: Ks. 400 Power: 60 Watts Elec: 66 kWh/yr Elec: Ks. 2628 /yr Total cost for 10-years Ks. 30,280

Save 75% Power

Compact Fluorescent Lamp (CFL)
Light: 800 lumens Life: 8000 hours Price: Ks. 2000 Power: 15 Watts Elec: 16 kWh/yr Elec: Ks. 657 /yr Total cost for 10-years Ks. 10,570 Payback: 0.8 years

Save 87% Power

Light Emitting Diode (LED)
Light: 800 lumens Life: 15,000 hours Price: Ks. 8000 Power: 8 Watts Elec: 9 kWh/yr Elec: Ks. 350 /yr Total cost for 10-years Ks. 11,504 Payback: 3.3 years

Note: Assumed 3 hours/day; used Ks. 40/kWh

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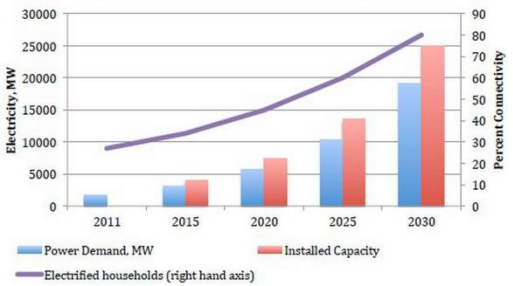
Efficiency is a Negawatt Power Station

- A challenge of very rapid electricity growth
- Efficiency can be a “Negawatt” power station
- Efficiency offers many benefits:
  - Free up existing electric power capacity
  - Slow rate of new electricity demand growth
  - Lower electricity bills for consumers and business
  - Lower electric power subsidy cost for government
  - Reduce peak power demand
- So how much electricity could Myanmar save?



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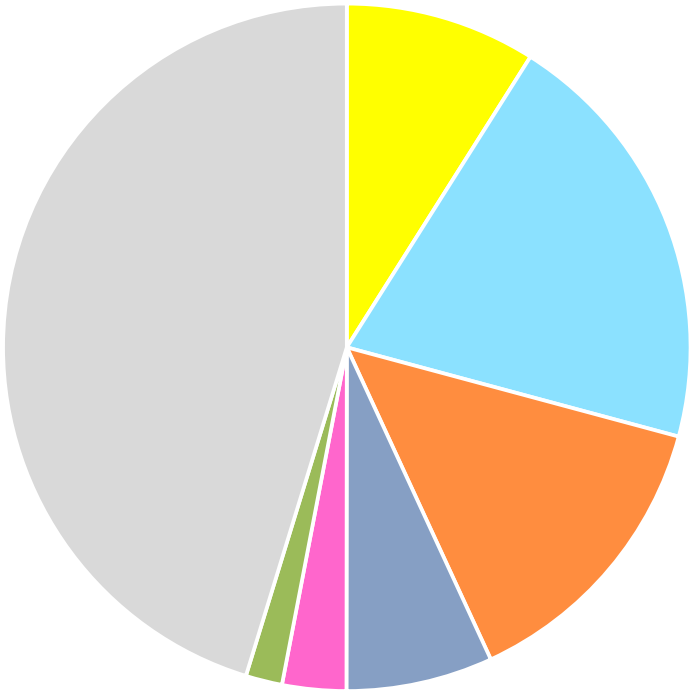
Global Efficient Appliances and Equipment

Global Electricity Consumption in 2030



36,000 TWh
current policies scenario

- Lighting - continuing with LEDs & controls
- Electric motors (excl. AC & refrigerators)
- Air conditioners
- Information technology
- Refrigerators
- Transformers

Σ >50% of global electricity

Data Sources: IEA Key World Energy Statistics 2013, IEA World Energy Outlook 2013, Lawrence Berkeley National Laboratory BUENAS Model; US EIA , UNEP

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Country Lighting Assessment – On-Grid

Myanmar

Financial Benefits

11.0 million USD
annual savings

12 months
payback period

Energy Saving Benefits

Potential Savings:

281.9 GWh in annual electricity consumption

5.4% of total national electricity consumption

37.4% of electricity consumption for lighting

Equivalent to:

Annual electricity consumption of 141.0 thousand households

Power output of 2 small (20MW) power plants

24.2 kilotonnes of crude oil

Climate Change Mitigation Benefits

48.8 kilotonnes annual reduction of carbon dioxide emissions

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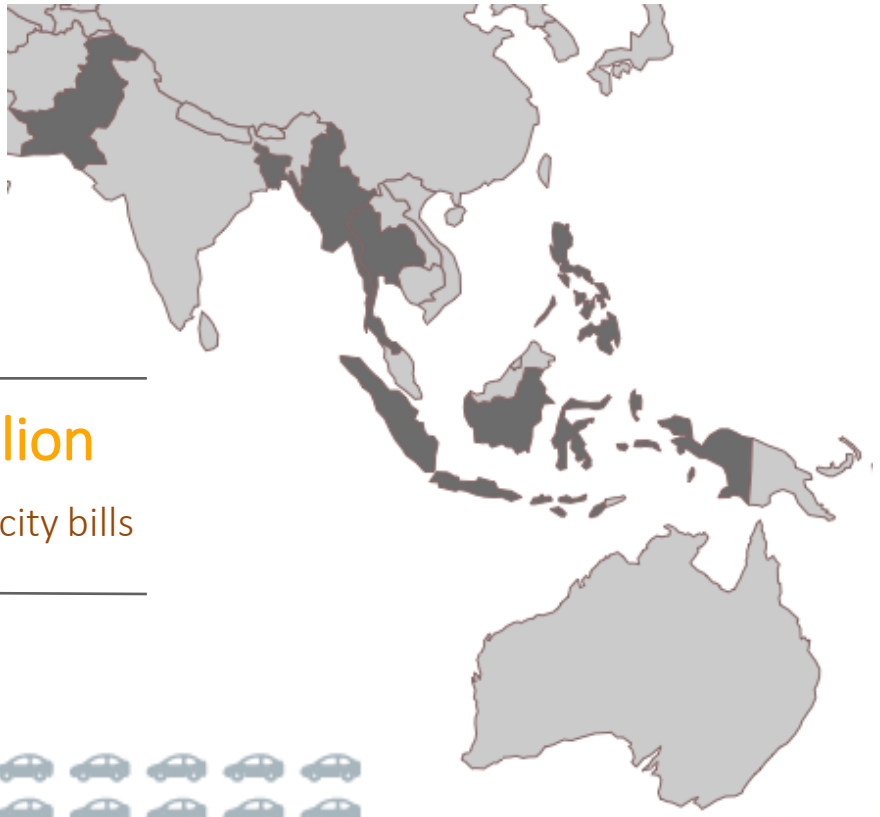
Global Efficient Appliances and Equipment

The potential annual savings in **select Asian countries** from refrigerators and AC
(Bangladesh, Indonesia, Myanmar, Pakistan, Philippines, & Thailand)

Save electricity
→ by over **140 TWh**
→ more than **28%** of current electricity use



Save **14.0 billion US$** on electricity bills

Reduce CO2 emissions by
83 million tonnes per year
…equivalent to
46 million passenger cars

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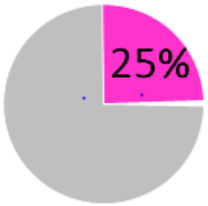
Data Sources: IEA Key World Energy Statistics 2013, IEA World Energy Outlook 2013, The Green Cooling Initiative, SAPP Annual Report 2013, UNEP

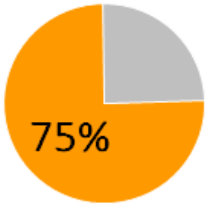
Global Efficient Appliances and Equipment

Shares in savings from each product

Domestic refrigerators



Room air conditioners



Other appliances & equipment to be assessed:

Motors Transformers ICT Fans

Data Sources: IEA Key World Energy Statistics 2013, IEA World Energy Outlook 2013, The Green Cooling Initiative, SAPP Annual Report 2013, UNEP

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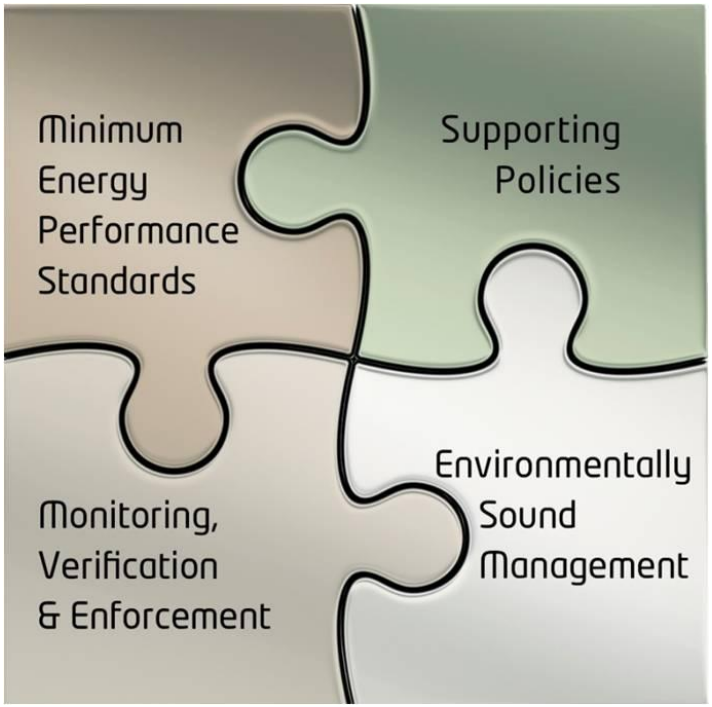
Integrated Policy Approach

To permanently remove inefficient products from the marketplace and to promote the uptake of high efficiency products

To monitor and enforce the efficient appliance policy, and ensure the energy performance and environmental benefits



To communicate the policy, promote the transition among all stakeholders and to finance the programmes and initiatives

To promote principles and best practices such as extended producer responsibility and establishment of collection and recycling schemes

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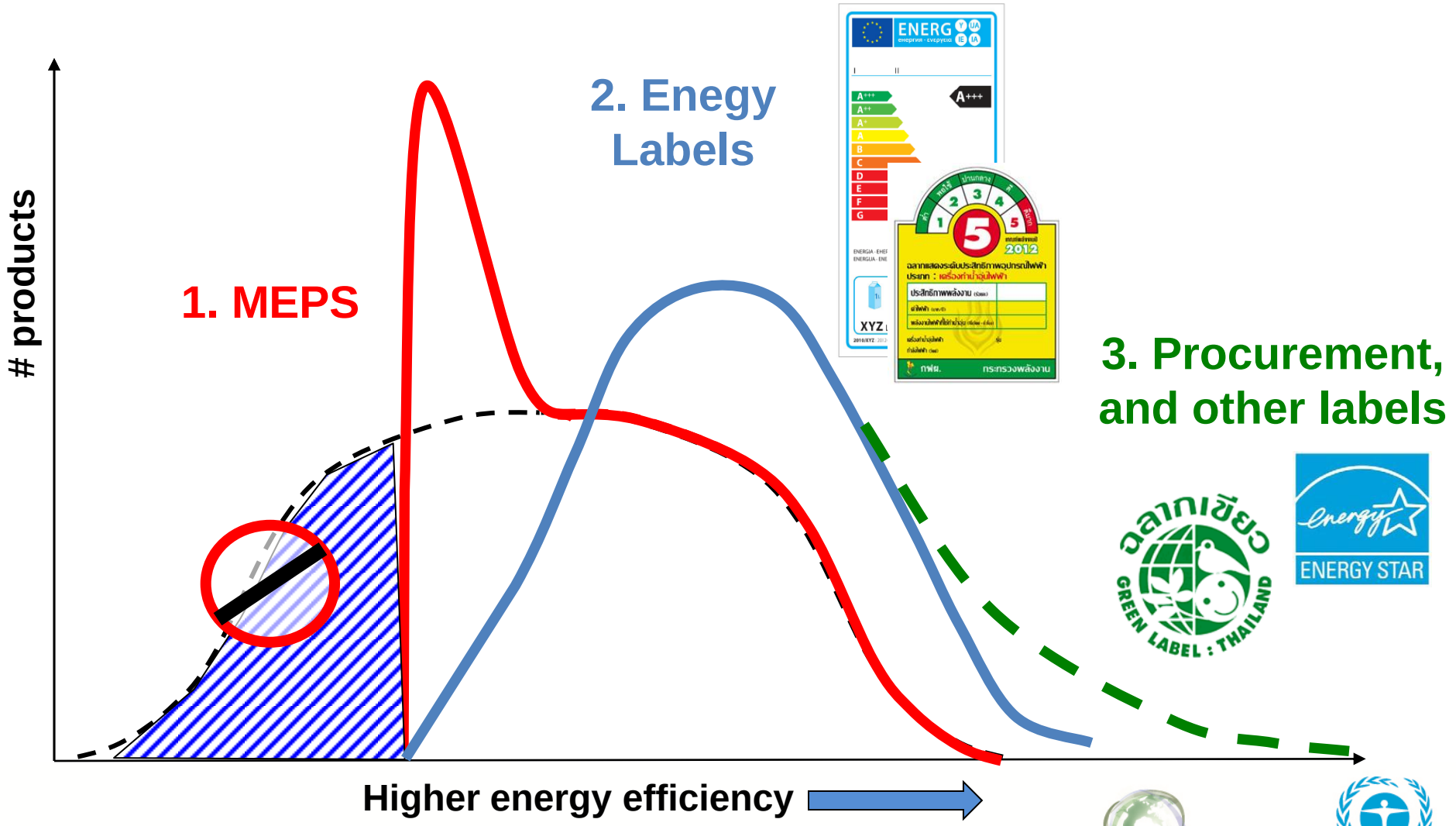
Transforming the Market



UNEP Resources to Support the Process

Tools

- Global Efficient Lighting Policy Map
- Country Lighting Assessments
- Payback Period Calculator

Guidebooks

- Accelerating the Transition to Efficient Lighting Toolkit
- National/Regional Efficient Lighting Strategy Guide
- Nationally Appropriate Mitigation Action (NAMA) Guide
- Minimum Energy Performance Standards (MEPS) Guidebook

Collaborating Centres

- Global Efficient Lighting Centre
- Ambilamp Academy

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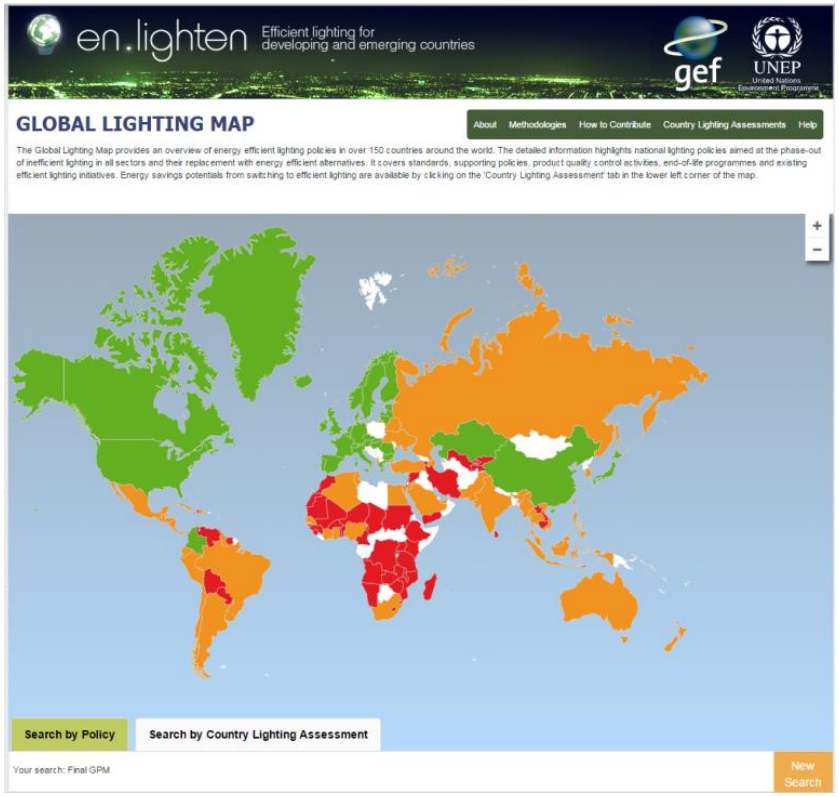
Global Efficient Lighting Policy Map

- Progress in countries adopting the integrated approach – all four components
- See examples from the countries that have already begun to phase out inefficient products
- On the en.lighten policy map, use the links to find the legislation for each country, including the details of which types of lamps are addressed, what energy and light output levels determine acceptable performance, and when the phase-out will occur
- http://map.enlighten-initiative.org/



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Payback Period Calculator – Inputs

Myanmar

Spreadsheet to look at cost-effectiveness of efficient lighting policy measures.

Calculation Inputs (per lamp):

Country:	Myanmar	
Currency:	Ks.	
Lamp is on for hours/day:	3.00	hours/day
Electricity price:	40	Ks./kWh
Annual change in price of Electricity:	1.0%	percent
Electricity CO2 intensity:	0.220	kg CO2/kWh
Discount Rate:	10.0%	percent
Incandescent (INC) lamp		
Incandescent (INC) lamp wattage:	60	Watts
Incandescent (INC) lamp lifetime:	1000	Hours
Incandescent (INC) lamp cost:	400	Ks./lamp
Halogen (HAL) lamp		
Halogen (HAL) lamp wattage:	52	Watts
Halogen (HAL) lamp lifetime:	2000	Hours
Halogen (HAL) lamp cost:	1000	Ks./lamp
Compact Fluorescent (CFL) lamp		
Compact Fluorescent (CFL) lamp wattage:	15	Watts
Compact Fluorescent (CFL) lamp lifetime:	8000	Hours
Compact Fluorescent (CFL) lamp cost:	2000	Ks./lamp
Light Emitting Diode (LED) lamp		
Light Emitting Diode (LED) lamp wattage:	8.0	Watts
Light Emitting Diode (LED) lamp lifetime:	15000	Hours
Light Emitting Diode (LED) lamp cost:	8000.00	Ks./lamp

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Payback Period Calculator - Results

Calculation Outputs (per lamp):	Incandescent	Halogen	CFL	LED	
Annual electricity consumption for each lamp type:	65.7	57.1	16.4	8.8	kWh/year
Annual electricity savings compared to incandescent lamps:	---	8.6	49.3	56.9	kWh/year
Percent electricity savings compared with incandescent lamps:	---	13%	75%	87%	percent
Annual electricity cost for operating the lamps (each year):	2,628	2,285	657	350	Ks./year
Savings in Ks. of electricity costs per year		343	1,971	2,278	Ks./year
Life-Cycle Cost (LCC) of one lamp operating for 13 years.					
LCC time period of analysis:	13.0	13.0	13.0	13.0	years
LCC of operating lamp for 13 years:	24,811	23,646	8,409	10,871	Ks. (2015)
LCC savings compared with incandescent lamps:	---	1,165	16,402	13,940	Ks. (2015)
Percent LCC savings compared with incandescent lamps:	---	5%	66%	56%	percent
LCC savings are (X) times larger than halogen LCC savings	---	---	14.1	12.0	times greater
CO2 emissions due to electricity for one lamp operating for 13 years:	187.9	163.4	47.0	25.1	kg CO2/13 yrs
CO2 savings compared with an incandescent lamp:	---	24.5	140.9	162.8	kg CO2/13 yrs
CO2 savings is (X) percent more than halogen CO2 savings:	---	---	475%	564%	percent
Simple Payback Period and Internal Rate of Return (IRR)					
Simple Payback period in years.	---	1.75	0.81	3.34	years
Simple Payback period in months:	---	21.0	9.7	40.0	months
Payback period is (X) percent better than halogen payback:	---	---	54%	not defined	shorter
Internal Rate of Return (IRR) for each lamp type:	---	26%	150%	34%	percent

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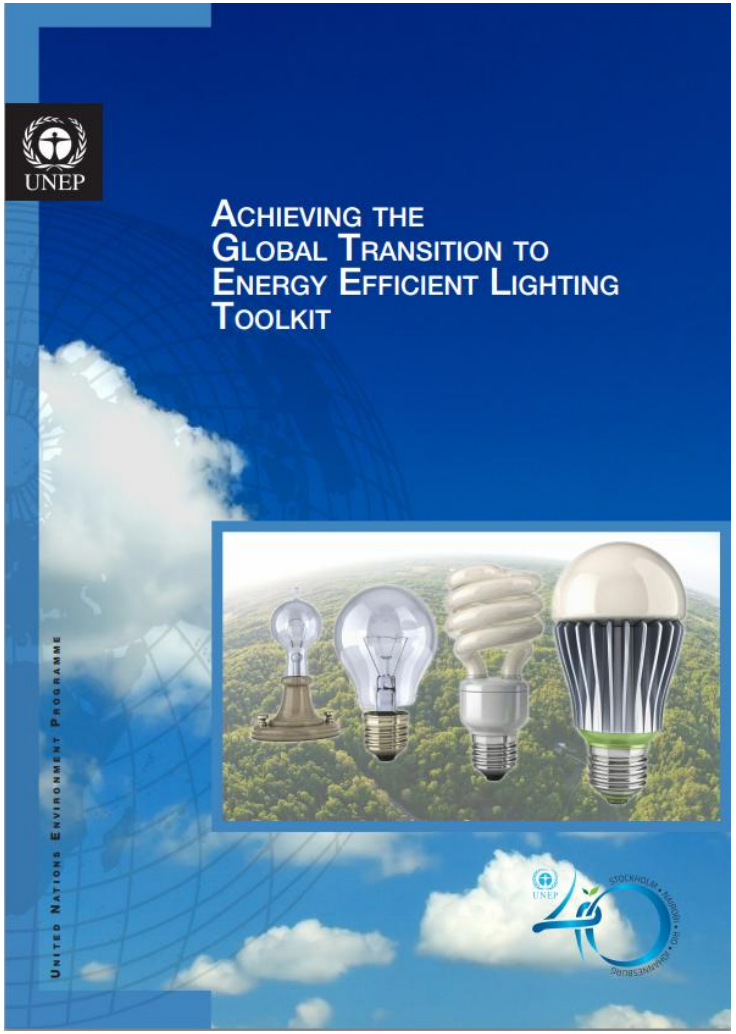
En.lighten Toolkit



- Developed to present a concise set of options and policy suggestions to countries and interested stakeholders
- Efficient lighting best practices and case studies from programmes throughout the world
- Technology, policy, consumer and environmental protection issues
- Countries can select relevant information and guidance and apply these to suit local or regional conditions
- Promotes the integrated policy approach for lighting

http://www.learning.enlighten-initiative.org/ebook/en_lighten_english_complete.pdf

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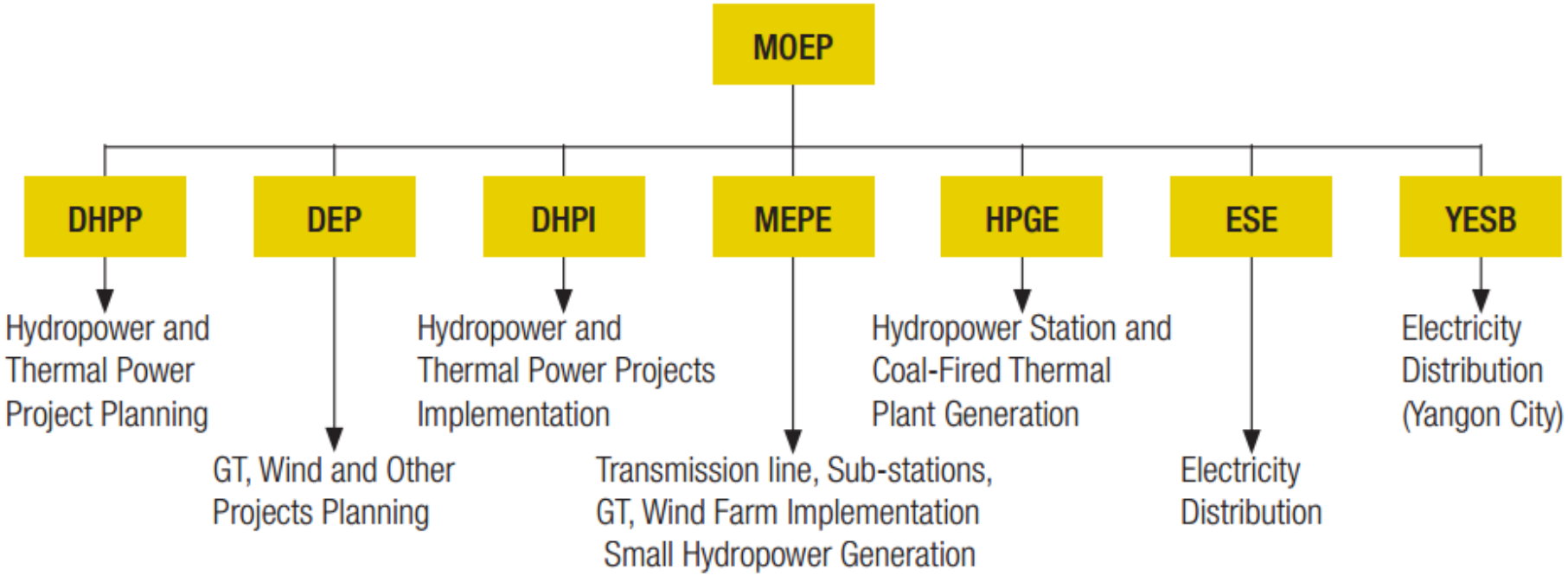
Myanmar - Ministry of Electric Power



DEP = Department of Electric Power, DHPI = Department of Hydropower Implementation, DHPP = Department of Hydropower Planning, ESE = Electricity Supply Enterprise, GT = gas turbine, HPGE = Hydropower Generation Enterprise, MEPE = Myanmar Electric Power Enterprise, MOEP = Ministry of Electric Power, YESB = Yangon City Electricity Supply Board.

- Yangon City Electricity Supply Board (YESB) is responsible for the supply of electricity to consumers in Yangon City.
- Electricity Supply Enterprise (ESE) covers the rest of the country comprising 13 states and regions, including off-grid.

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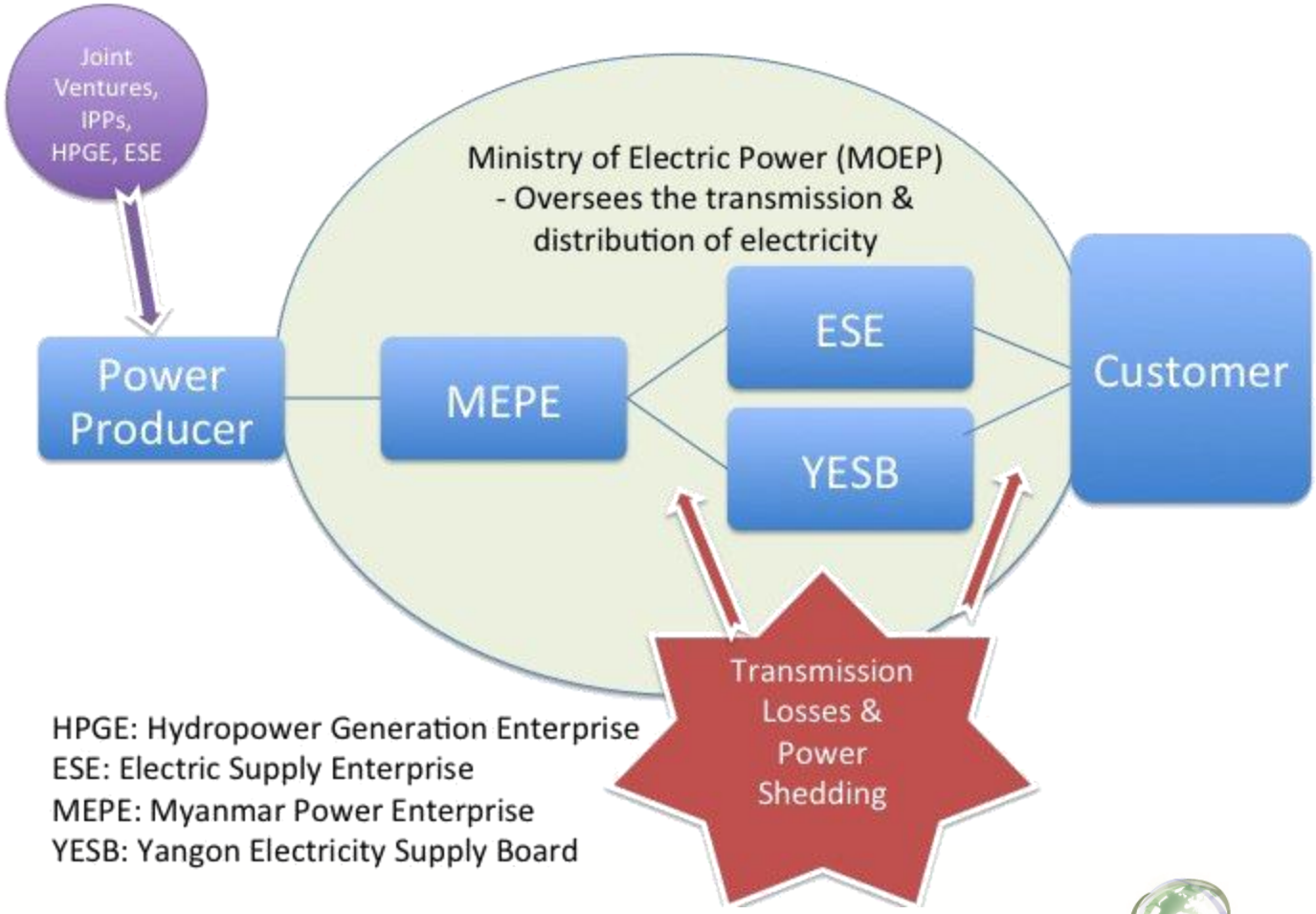
Electric Power Sector Structure



HPGE: Hydropower Generation Enterprise
ESE: Electric Supply Enterprise
MEPE: Myanmar Power Enterprise
YESB: Yangon Electricity Supply Board

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Key Points

- Myanmar is experiencing a rapid increase in electricity demand
- Meeting that demand consumes considerable resources and puts quality of supply at risk
- Energy-efficiency offers a “Nega-watt” power station solution
- Reducing consumption while providing the same service (e.g., hot tea)
- Slow rate of increase in demand from electrification and economic growth while lowering consumer bills
- Cost-effective payback periods available now, with large reductions in electricity consumption
- Sustainable market transformation - the Integrated Policy Approach
- UNEP’s Global Efficient Appliances and Equipment Programme can help with lighting, air-conditioning, motors, transformers, refrigerators, information technology and fans

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Thank You

www.enlighten-initiative.org