



# PRESENTATION ON ENERGY OF CAMBODIA

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Training Course For Fiscal Year 2013  
Energy Policy (B)  
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# CONTENTS

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# Background

- Cambodia, officially known as the Kingdom of Cambodia, Capital: Phnom Penh
- Location: Southeast Asia
- Total land area: 181,035 sq km, it is bordered by Thailand to the northwest, Laos to the northeast, Vietnam to the east and the Gulf of Thailand to the southwest
- Populations : 14.95 million, 52% are females, 48% are males , 20% live in rural, 80% in urban
- National religion is Theravada Buddhism which is practiced by around 95% of the Cambodian population
- GDP growth rate: 7% (2012)
- The country minority groups include Vietnamese, Chinese, Chams and 30 various hill tribes.



Minister

Secretary of State

Under-Secretary of State

**Director General of General Department of Energy**

Deputy Director General

Secretariat

**Director of Technical Energy Department**

Deputy Director

Standard and Energy Efficiency Office

Renewable Energy Office

Research Office

**Director of Energy Development Department**

Deputy Director

Energy Planning Office

Rural & Provincial Electricity Office

Cooperation Office

**Office of Atomic Energy Technology**

**Director of Hydropower Department**

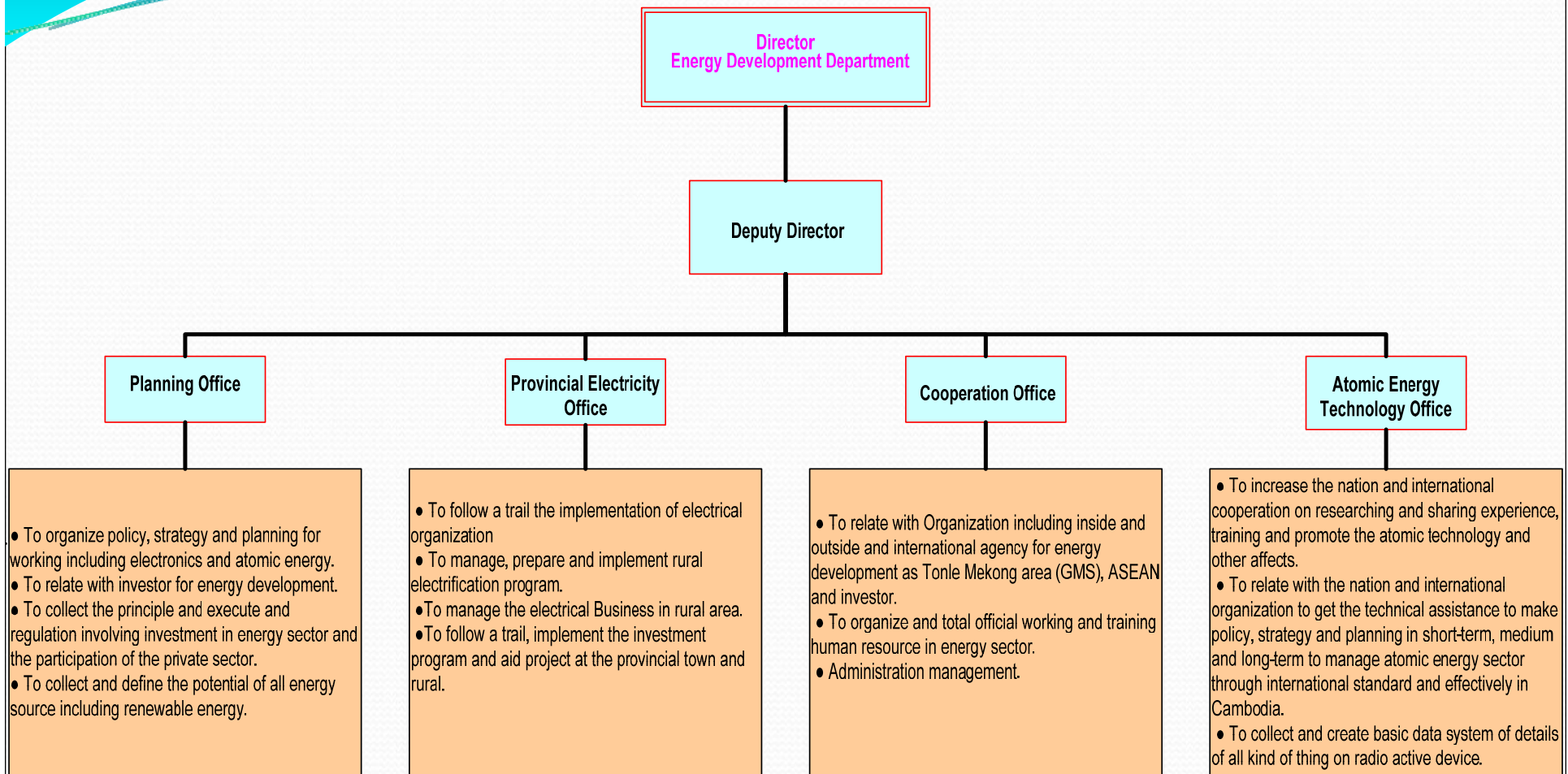
Deputy Director

Hydropower Planning Office

Hydropower Project Office

Mekong River Office

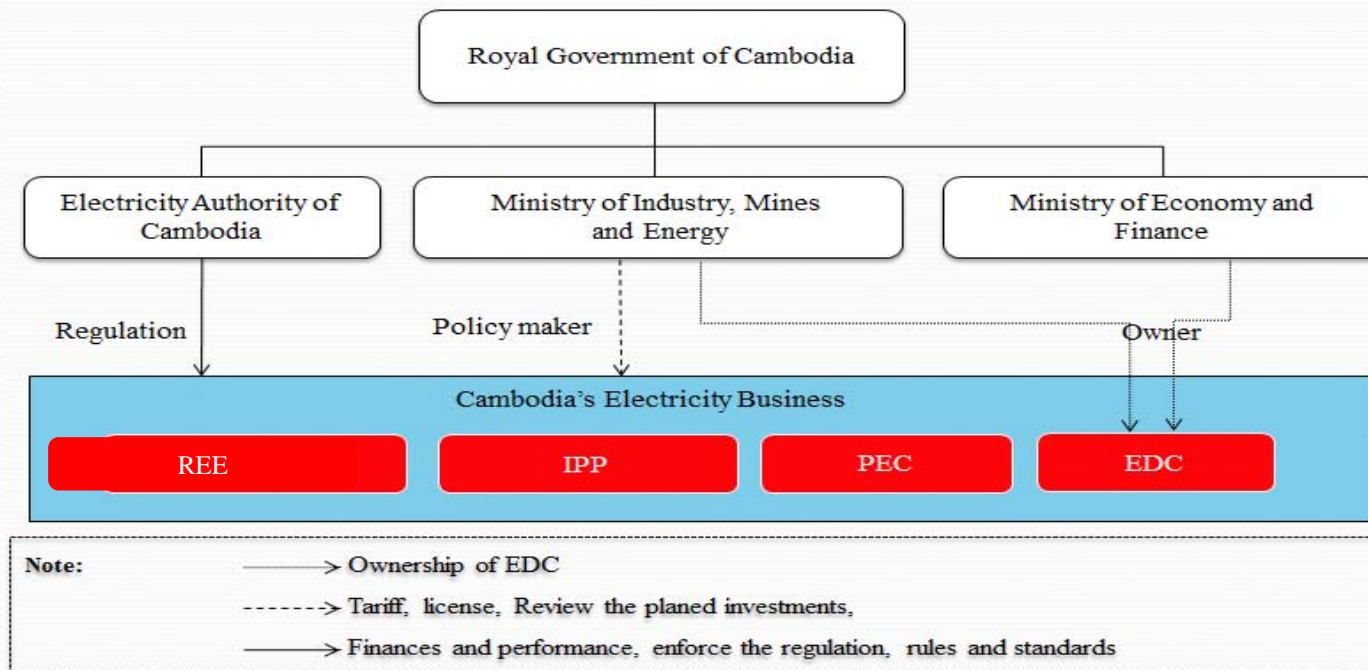
## Structure of Energy Development Department



## II. The Energy Sector:

### 1. The Actors in Energy:

- The main institutions involving in the Energy Sector in Cambodia are the Ministry of Industry, Mines and Energy (MIME), Ministry of Economy and Finance (MEF), Electricité du Cambodge (EDC), the Electricity Authority of Cambodia (EAC), Provincial Electricity Utilities and private sector. EDC is owned and controlled by MIME and MEF.
- The Ministry of Industry, Mines and Energy (MIME) Through General Directorate of Energy (GDE) and Electricity of Cambodia are responsible for 1) Strategy, 2) Planning 3) Resource, 4) Monitoring and 5) Supplying electricity in whole country.





## Cambodia Power Situation

According to Ministry of Industry, Mines and Energy report in 2012 annual average amount of electricity use for each people 247.95 Kwh and the annual power supply in the hold country 725.30 Mw. electricity supply in Phnom Penh, about 538 Mw

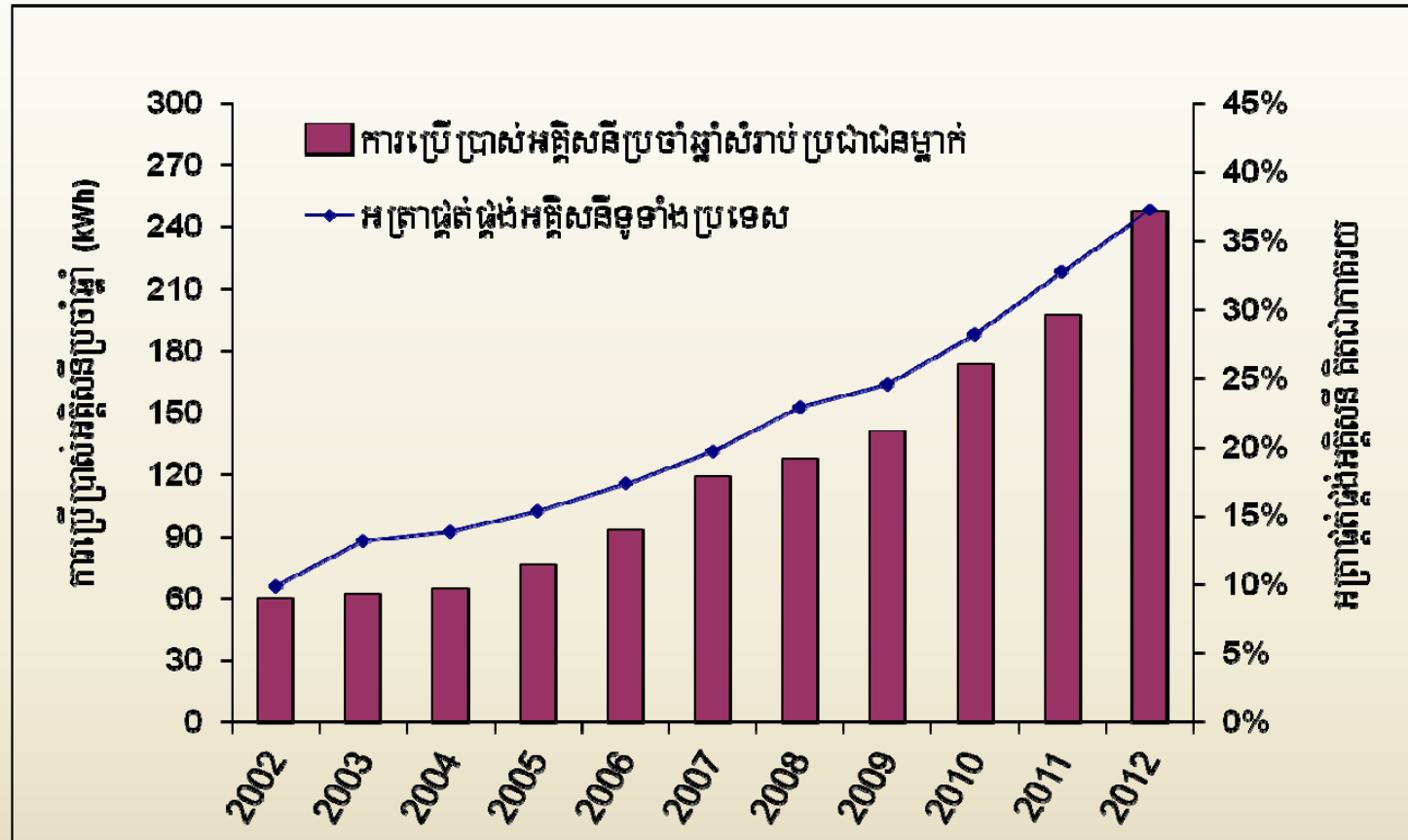
Table 1 Compare electricity use by 2011 and 2012

	2011	2012	Growth rate (%)
Electricity supply in hold country(Mw)	635.5	725.3	12.4 %
Electricity use for each people (Kwh/year)	197.3	247.9	20.4 %
Number of electricity client in Phnom Penh	256,642	274,524	6.5 %

- About 22.62 % rural population use electricity from the national grid supply
- About 10% use batteries to supply the light, TV, and radio
- About 3% uses their own small diesel generators with the output from 500W to 5,000W.
- About 100 % people live in city and urban have electricity use.



# Cambodia Power Situation



Year Graph of Electricity use by each people





## Electricity Import from Neighboring countries

### A. Electricity import by high voltage Transmission line 115/230 Kv

- Electricity import 80 MW from Thailand on high voltage transmission line 115 Kv and the total energy use 400.85 million Kwh.
- Electricity import 170 MW from Vietnam on high voltage transmission line 230 Kv and the total energy use 1,295.28 million Kwh

### B. Electricity import by medium voltage transmission line 22Kv

- Actually the energy import 18.33 MW from Thailand on transmission line 22Kv has 56.38 million Kwh, energy import 57.66 MW from Vietnam has 278.01 million Kwh and electricity import 4MW from Lao has total energy use 8.74 million Kwh

Electricity Import (Million Kwh)	Medium Voltage 22 kV			High voltage 115/230 kV		
	2011	2012	increas %	2011	2012	Increas %
1-Vietnam	204.42	278.04	36%	1134	1295.28	14.2%
2-Thailand	45.06	56.97	26.4%	308.89	400.85	29.8%
3-Lao	6.59	8.73	32.5%	-	-	-
<b>Total</b>	256.07	343.74	34.2%	1442.89	1696.13	17.6%

Energy import from neighbor country



## Hydro electricity sector

Hydropower potential about 10,000 MW, of which 50% in the Mekong mainstream, 40% in its tributaries and remaining 10% is in the south-western coastal area outside the Mekong River Basin.

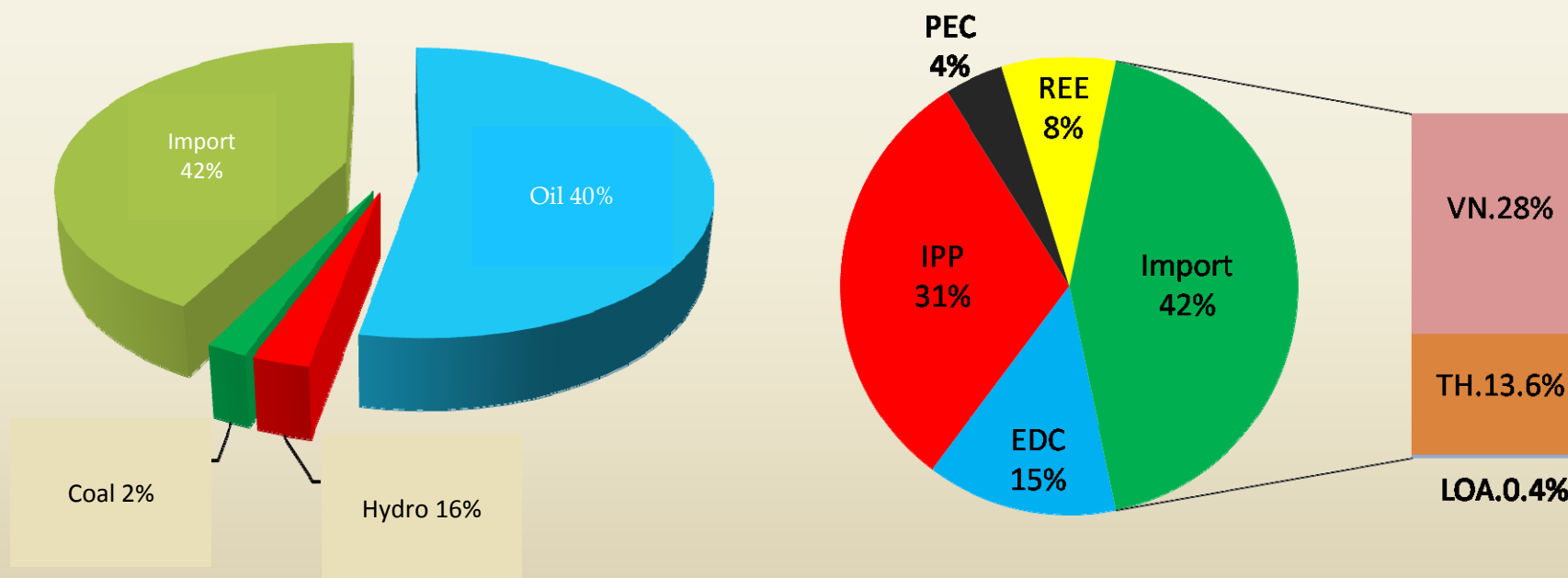
Type of HPP	Installed Capacity (kW)
Small	-Micro Up to 500
	-Min 501 - 5,000
	-Small 5,001 - 10,000
Medium	10,000 - 20,000
Large	More than 20,000

### Classification of Hydropower Plants (HPP)



## Hydro electricity sector cont

. KiriromI hydro (12MW) in Kampong Speu and Koh Kong Provinces were completed in 2002. A Mini-hydropower station OchumII with the Installed Capacity of 1MW in Rattanakiri province was commissioned since 1993, Kam chay hydro 194.1 MW in Kompot Province invest by china company, Kirirom III 18 MW Kompong speu Province 2012, Oromleng mini hydro and Oromeas 370 KW Modolkiri supported by Jica in Cambodia.







# Implementation and Power Transmission Development in 2020

No	Power Transmission Line	Operated years
1	Will operate 230kV transmission line connected from Takeo to Kampot and build substation at Kampot provincial town	2012
2	Operated 230 kV transmission line from Stung treng-Lao and build a substation in Stungtreng	2011
3	Will operate 230kV transmission line connected from Kampot to Preahsihanouk city and build 2 substations in Vealrinh-Preahsihanouk city	2012
4	Will operate 230kV transmission line connected from PP-Kampongchhnang-Pursat-Battambang and build 3 substations in Kampongchhnang-Pursat-Battambang	2013
5	Will operate 230kV transmission line connected from Pursat -Atay Hydropower Plant and build 1 substation in O'Som commune	2013
6	Will operate 230kV transmission line connected from PP- Kampongcham	2013
7	Will operate 230kV transmission line connected from Kampongcham substation- Kratie	2015
8	Will operate 115kV transmission line connected from Kratie-stungtreng	2015
9	Will operate 230kV transmission line connected from PP-Preahsihanouk city (National road 4)	2015
10	Will operate 115kV transmission line connected from EPP to Neak Loeung and Svay Rieng and build 2 substations at Neak Loeung and Svay Rieng	2015

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# Implementation and Power Transmission Development in 2020

No	Power Transmission Line	Operated years
11	Will operate 230kV transmission line connected from Steung Tatay hydropower to O'Som substation	2015
12	Substation GS4 in South of Phnom Penh(SPP) and Transmission Line 115kV connected to West of Phnom Penh(WPP)	2015
13	Additional Transmission Line 230kV Phnom Penh-Kampong Cham on the existing pole in order to Transmit Power from Lower Sesan II and Lower Srepok II Hydro Power Plant to supply Phnom Penh	2017
14	Transmission Line 230kV connect from Cheay Areng Hydro Power Plant to Osom substation	2017
15	Transmission Line 230kV connect from Kampong Cham-Kampong Thom-Siem Reap and build substation in Kampong Thom	2019

### III. Plan of Royal Government

- Royal Government of Cambodia Electrification Targets. Rural electrification offers major social and economic benefits. These are recognized in the establishment by the Royal Government of Cambodia (RGC) of targets for expanding electrification to 100% of villages by 2020 and 70% of rural households by 2030.
- Current electrification rates in Cambodia are very low. According to the 2008 Census, only around 26% of households have access to grid electricity supplies. Most of these households are in urban areas and the rural grid electrification rate is only about 12% of rural households.
- By 2030, IED estimated is less at just over 1 million. It is proposed that the funding targets be that estimated by IED as EDC has already secured funding from the World Bank, ADB and China EXIM Bank of 130 million for rural grid extension from its high voltage network. The IED Sustainable Rural Electrification Plans (SREP) for Cambodia is also much more detailed in terms of specifying on grid and off grid technologies than the AECOM report and therefore its estimated cost is used as the guide on funding required to 2030

### III. Plan of Royal Government (Cont)

- SREP: Sustainable Rural Electrification Plans for Cambodia plan was specified using software that access information provided by satellite images of the layout of rural towns and villages and based on these images training of provincial energy official and also field work specifying the technology and their estimated cost to achieve the electrification targets.

#### Estimated Investment Cost and Technology to meet Cambodian Electrification

Investment costs in rural areas (MUSD, constant price)	2011-2015	2016-2020	2021-2030
Sub-transmission network (MV lines)	143.4	118.2	83.3
Distribution (transformers, LV, meters)	184.0	158.7	203.5
<b>Subtotal grid extension</b>	<b>327.4</b>	<b>276.9</b>	<b>286.8</b>
Hydro mini-grid	31.5	0.9	0.2
Biomass mini-grid	16.4	0.6	0.2
New diesel mini-grid	23.9	2.4	0.4
<b>Subtotal mini-grid projects</b>	<b>71.8</b>	<b>3.8</b>	<b>0.8</b>
Solar home systems	6.7	8.3	0.0
Community PV	2.2	2.2	0.0
Solar battery charging stations	10.4	10.6	0.0
<b>Subtotal stand-alone systems</b>	<b>19.3</b>	<b>21.0</b>	<b>0.0</b>
<b>Total</b>	<b>418.4</b>	<b>301.8</b>	<b>287.6</b>



### III. Plan of Royal Government (Cont)

These investments allow us to reach the following coverage rates in terms of electrified village and connected households:

Coverage for rural areas		2010	2015	2020	2030
Connected households	National grid	6.9%	29.1%	47.4%	66.2%
	Hydro mini-grid	0.0%	0.6%	0.3%	0.1%
	Biomass mini-grid	0.0%	0.4%	0.3%	0.0%
	Existing diesel mini-grid	4.4%	1.9%	1.4%	0.6%
	New diesel mini-grid	0.0%	1.9%	1.2%	0.1%
	Solar home systems	0.0%	0.7%	1.4%	0.2%
	<b>Total percentage of rural households</b>	<b>11%</b>	<b>34%</b>	<b>52%</b>	<b>67%</b>
Electrified villages	National grid	10.9%	46.1%	78.3%	94.8%
	Hydro mini-grid	0.0%	1.5%	0.6%	0.2%
	Biomass mini-grid	0.0%	1.2%	0.7%	0.1%
	Existing diesel mini-grid	11.9%	5.4%	2.7%	0.9%
	New diesel mini-grid	0.0%	5.1%	1.9%	0.1%
	Existing battery charging stations	34.7%	14.3%	6.8%	1.3%
	Solar battery charging stations	0.0%	4.5%	9.0%	2.6%
	<b>Total percentage of rural villages</b>	<b>57%</b>	<b>78%</b>	<b>100%</b>	<b>100%</b>

### III. Plan of Royal Government (Cont)

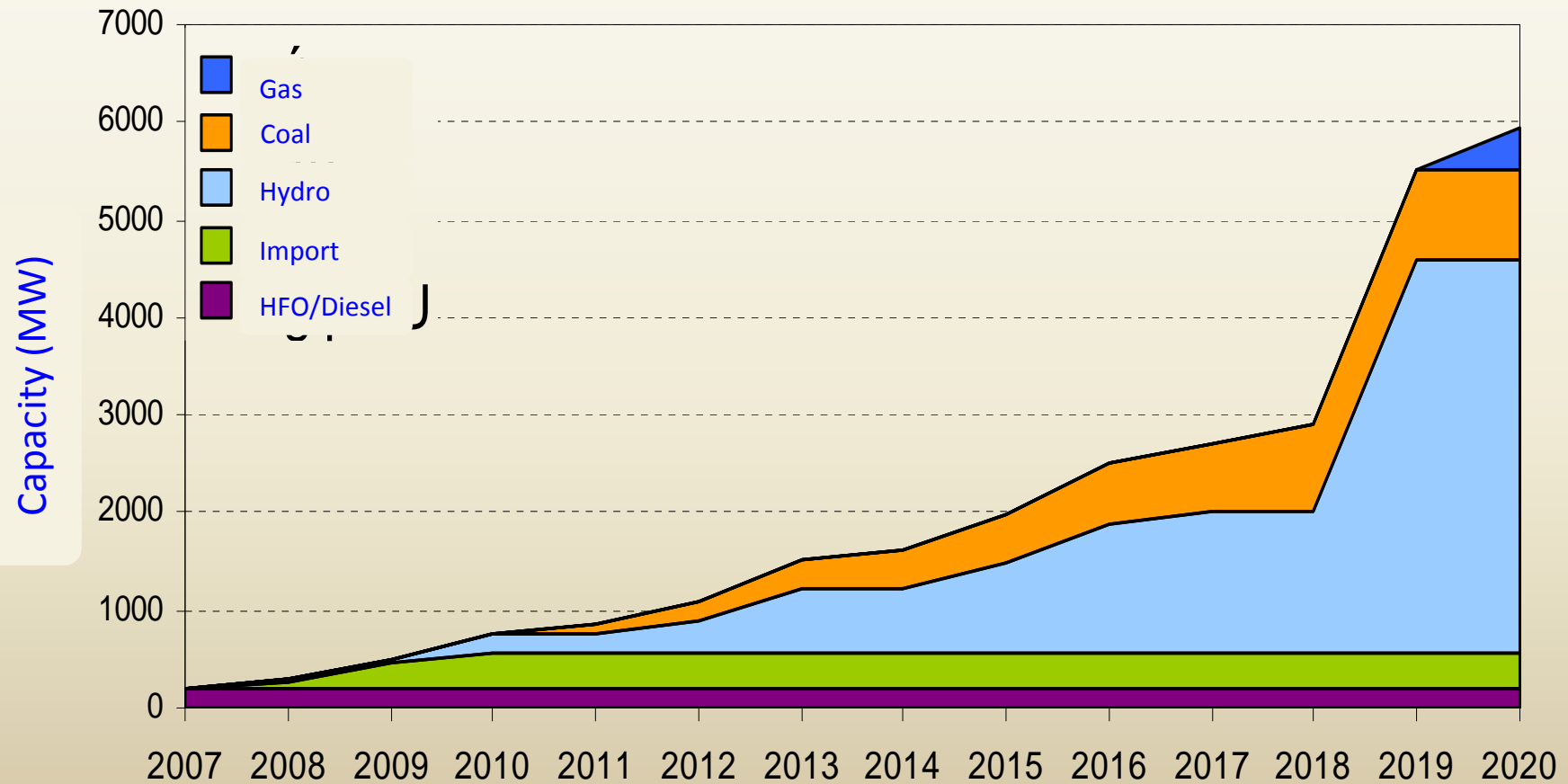
The resulting investment costs and levelized cost of kWh for each technology are presented below:

	No villages <sup>1</sup>	000 HH	Invest (MUSD)	Inv. cost/ village ('000 USD)	Inv. cost /HH (USD)	kWh cost (USDc)	
Grid	10 572	1 838	891	84.3	485	21.0	
Mini-grids	Hydro	193	15	33	168.8	2 244	26.3
	Biomass	157	9	17	109.0	1 853	24.2
	Diesel	643	47	27	41.5	565	38.4
Stand-alone	Solar BCS	1 138	131	20.9	18.4	160	36.3
	Community PV	1 994	-	4.4	2.2	-	-
	SHS	-	37	15,0	-	400	39.7



# Cambodia Power Development Plan

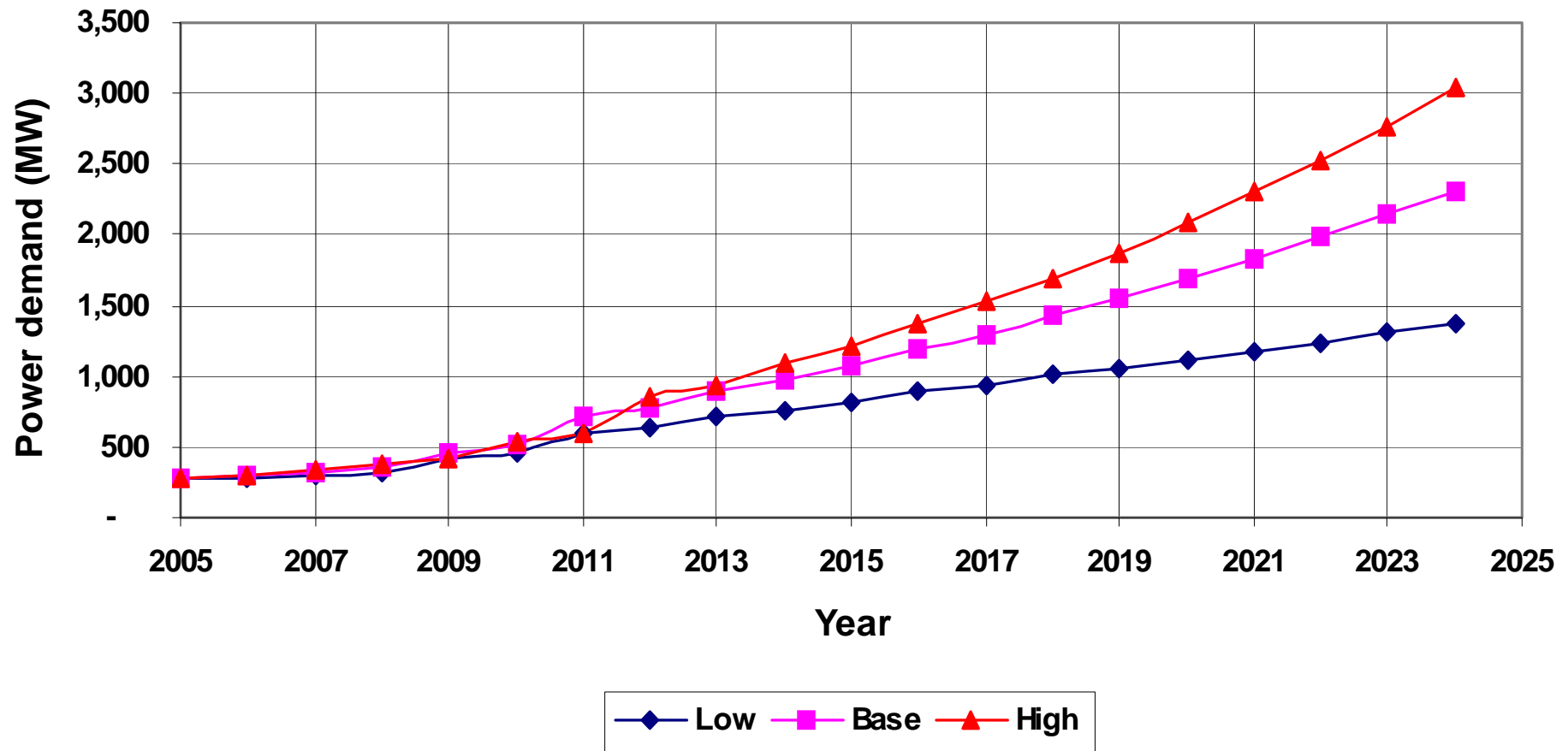
## Energy Supply Plan 2007-2020





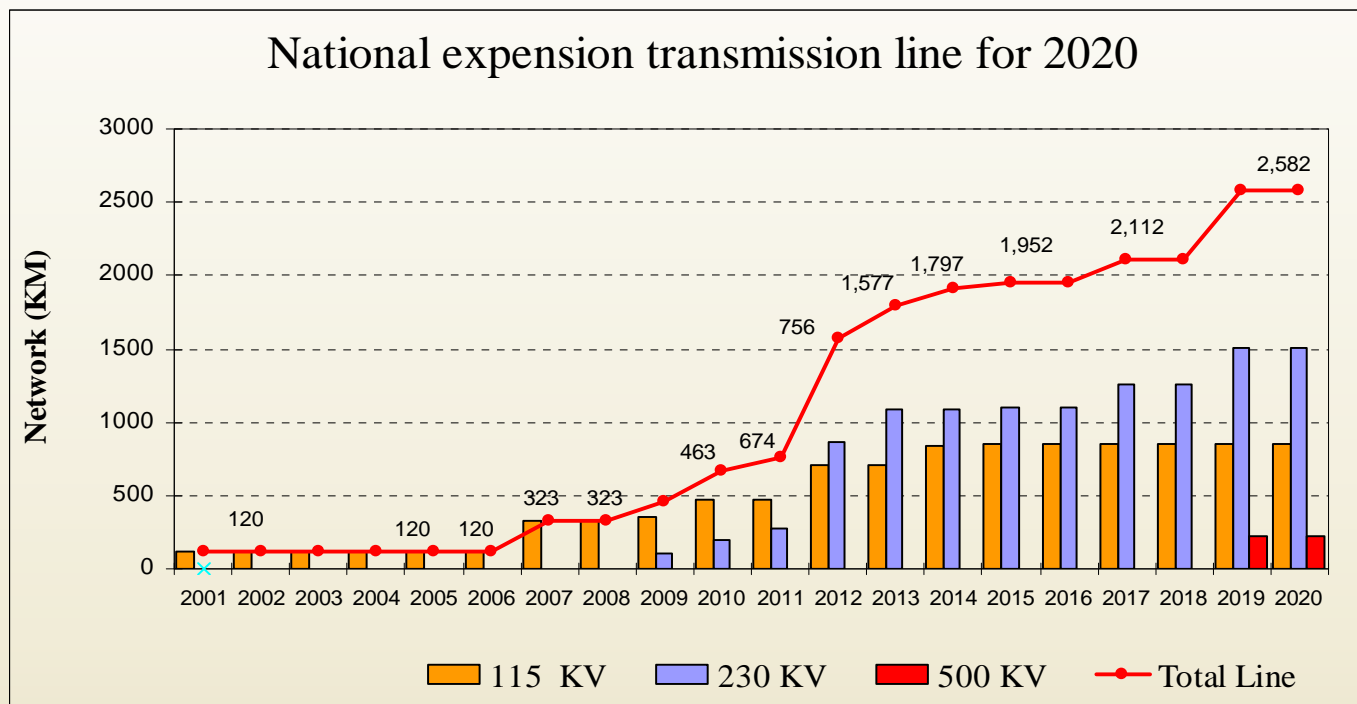
# Cambodia Power Development Plan

## Power Demand in Cambodia (in Power Grid)





# Cambodia Power Development Plan



Line	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
115 kV	120	120	120	120	120	120	323	323	353	477	477	713	713	833	853	853	853	853	853	853
230 kV	0	0	0	0	0	0	0	0	110	197	279	864	1084	1084	1099	1099	1259	1259	1509	1509
500 kV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	220	220
total	120	120	120	120	120	120	323	323	463	674	756	1577	1797	1917	1952	1952	2112	2112	2582	2582



Thank you very much for your attention!

