



Cambodia Country Report

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Overview

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- ▶ Target of RGC in Power Sector
- ▶ Electricity Sources
- ▶ Transmission System
- ▶ Distribution System Backbone
- ▶ Electricity Market Model
- ▶ Total Primary Energy Supply

Energy Policy

- ▶ To provide and adequate supply of energy throughout Cambodia at reasonable and affordable price.
- ▶ To ensure a reliable and secured electricity supply at reasonable price, which facilitates investment in Cambodia and development of national economy.
- ▶ To encourage exploration environmentally and socially acceptable development of energy resources needed for supply to all sectors of Cambodia economy.
- ▶ To encourage the efficient use of energy and to minimize the detrimental environmental affects resulted from energy supply and consumption.

Target of RGC in Power Sector

- ▶ All villages in the Kingdom of Cambodia have access to electricity of any type by the year 2020
- ▶ At least 70% of all households in the Kingdom of Cambodia have access to grid quality electricity by the year 2030

Electricity Sources

| Power Sources | 2016 | | | Estimated for 2017 | | |
|--|-----------------|-----------------|---------------|--------------------|-----------------|---------------|
| | MW | GWh | % | MW | GWh | % |
| 1. Domestic Generation | | | | | | |
| Coal | 368.00 | 2,551.17 | 35.56 | 538.00 | 2,829.58 | 35.51 |
| Hydro power | 927.00 | 2,619.11 | 36.50 | 929.70 | 3,217.79 | 40.39 |
| Fuel Oil | 218.00 | 362.13 | 5.05 | 251.33 | 260.43 | 2.87 |
| Renewable Energy | 39.27 | 43.35 | 0.60 | 72.27 | 48.61 | 0.61 |
| Captive Generation by Industry and Licensees | 39.79 | 16.44 | 0.23 | 13.19 | 9.59 | 0.12 |
| Total Domestic Generation | 1,592.06 | 5,592.20 | 77.94 | 2,201.93 | 7,559.00 | 83.26 |
| 2. Import Power Sources | | | | | | |
| Thailand | 135.50 | 346.19 | 4.82 | 135.50 | 269.56 | 3.38 |
| Vietnam | 277.00 | 1,201.78 | 16.75 | 277.00 | 1,153.85 | 14.48 |
| Lao | 4.00 | 34.88 | 0.49 | 4.00 | 56.52 | 0.71 |
| Total Import | 416.50 | 1,582.85 | 22.06 | 416.50 | 1,479.93 | 18.58 |
| 3. Total Power Sources | 2,008.56 | 7,175.05 | 100.00 | 2,220.93 | | 100.00 |

Transmission System



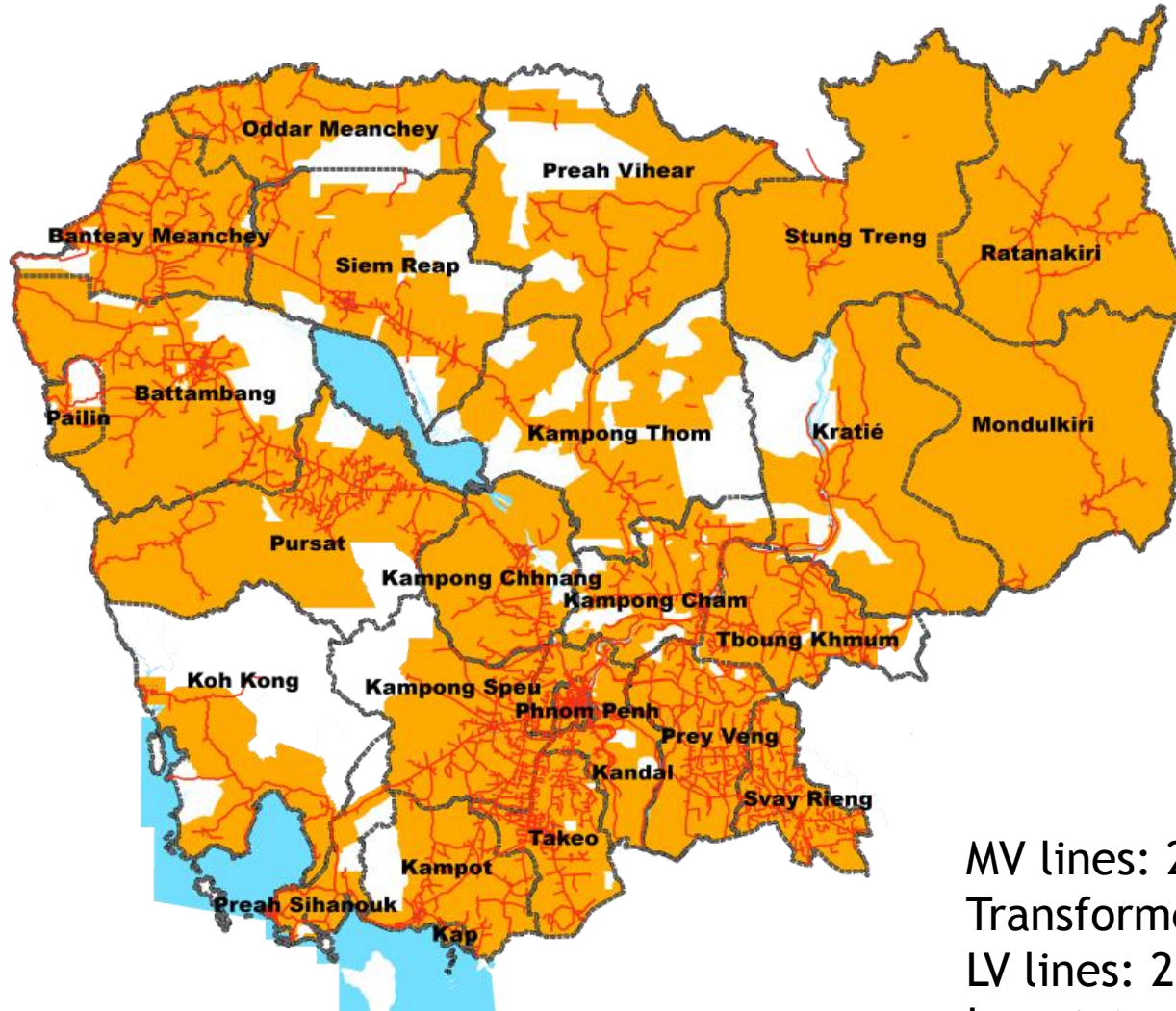
Details about Transmission System

| Project | Transmission Lines | Substations |
|---|---|---|
| 1. South Grid | 230kV : 271 km (x2) 115 kV:230 km (x1)+ 54 km (x2) | 12 Grid Substations |
| 2. West Grid | 115 kV : 230 km (x1) | 5 Grid Substations |
| 3. Connection between South and West Grid | 230 kV: 297 km (x2)+ 175 km (x2) + 79 km (x2) | 4 Grid Substations |
| 4. Phnom Penh– Kampong Cham | 230 kV : 126 km (x2) | 2 Grid Substations |
| 5. LPDR – Preah Vihear (Chheb) line | 115 kV : 55 km (x2) | 1 Grid Substation |
| 6. Phnom Penh – Prey Veng – Svay Rieng Grid | 115 kV : 155 km (x2) | 2 Grid Substations |
| 7. Kampong Cham –Kratie – Steung Treng Grid | 230kV : 240 km (x2) | 2 Grid Substations |
| 8. Battambang – Rattanak Mondul | 115kV : 34 km (x1); | 1 Grid Substations |
| Total Project | 115kv-230 kV = 1,957km | 30 substations can supply directly to 18 (+3) city/provinces |

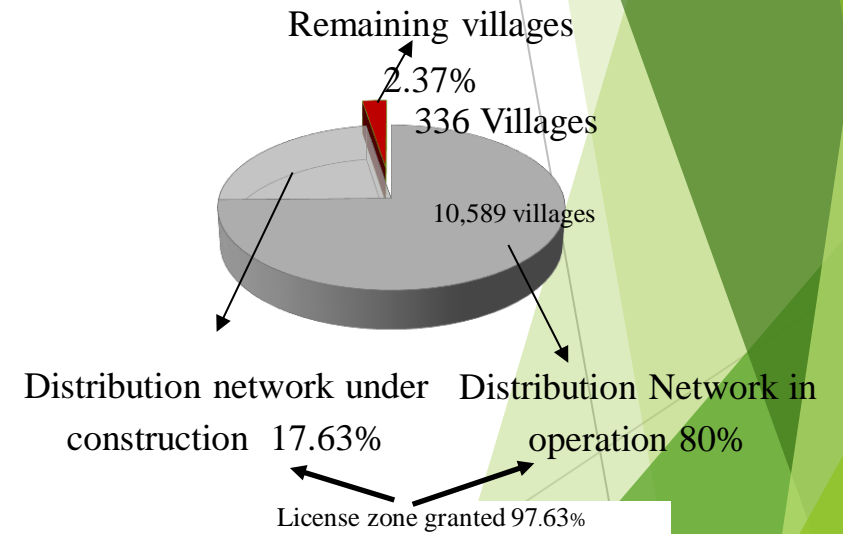
Project Of Transmission Lines

| Project | Transmission Lines | Substations |
|---|--|--|
| 1. Steung Treng – Rattanakiri Grid, and Kratie – Mondul Kiri Grid | 115 kV:105 km (x2)+ 140 km (x2) | construct 3 new substations in Rattanakiri, mining site, and in Mondul Kiri |
| 2. Preah Sihanouk-Chamkaloung Grid, Chamkaloung – Phnom Penh Grid | 230 kV : 50 km (x2) 500 kV : 140km (x2) | construct 1 new substation in Chamkaloung and a 500kV Substation in Bek Chan |
| 3. Prey Veng - Svay Antor – Suong Grid | 115 kV: 45 km (x2)+ 230 kV: 60 km (x1) | construct 1 new substations in Svay Antor |
| 4. Kampong Cham – Kampong Thom – Siem Reap – Battambang Grid | 230 kV : 326 km (x2) | construct 2 new substations: 1 in Kampong Thom, and 1 in Siem Reap |
| 5. Kampong Thom – Preah Vihear (Chheb) Grid | 115 kV : 138 km (x2) | |
| 6. Krolanh Siem Reap – Oddor Meanchey Grid | 115 kV : 75 km (x1) | construct a new substation in Oddor Meanchey |
| 7. Kampong Cham town – Prek Brosob (Kratie) Grid | 115 kV : 95 km | construct a new substation in Prek Brosob (Kratie) |
| 8. Sre Ombel – Botumsakor Grid, and additional Grid in Koh Kong Town Tatay – Phnom Penh | 115 kV : 27 km (x1); 230 kV : 71 km (x2); 230 kV : 220 km (x2) | construct 3 new substations in Koh Kong |
| 9. Rattanak Mondul – Pailin Grid | 115kV : 45 km (x1) | construct a new substation in Pailin |
| 10. Baek Chan – East PP – Suong Grid | 500kV : 135km (x2) | construct 2 new substation in East PP and Suong |
| Total Project | 115kv-230 kV-500kV = 1,672 km | add 16 new substations and NG can supply directly to whole country |

Distribution System Backbone



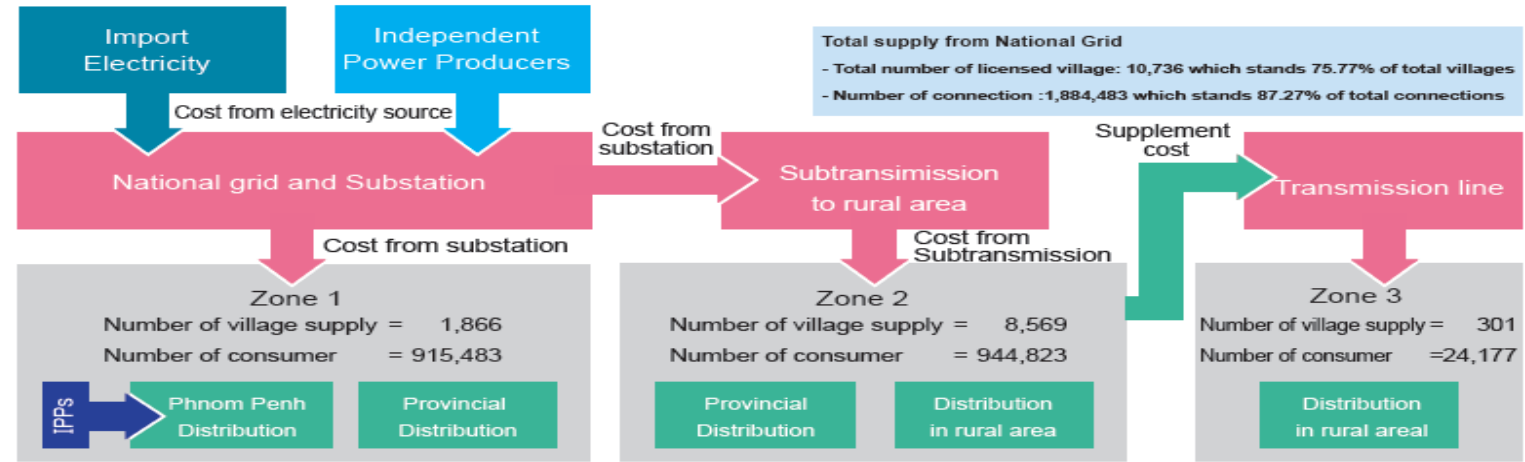
Situation of Electrification in Cambodia (City + Rural as at December 2016)



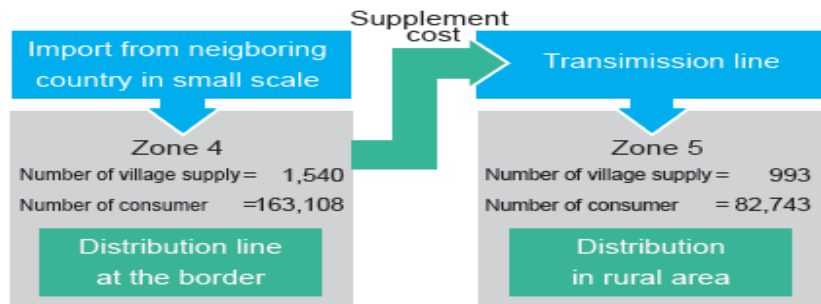
MV lines: 28,975km
Transformers: 13,695
LV lines: 27,862 km
Investment Cost: 1,217 mUSD

Electricity Market in Cambodia (2017)

1. Electricity supplies through National Grid



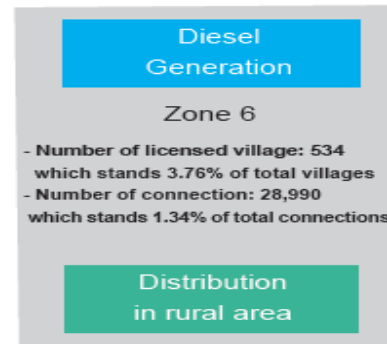
2. Import from neighboring Country in small scale



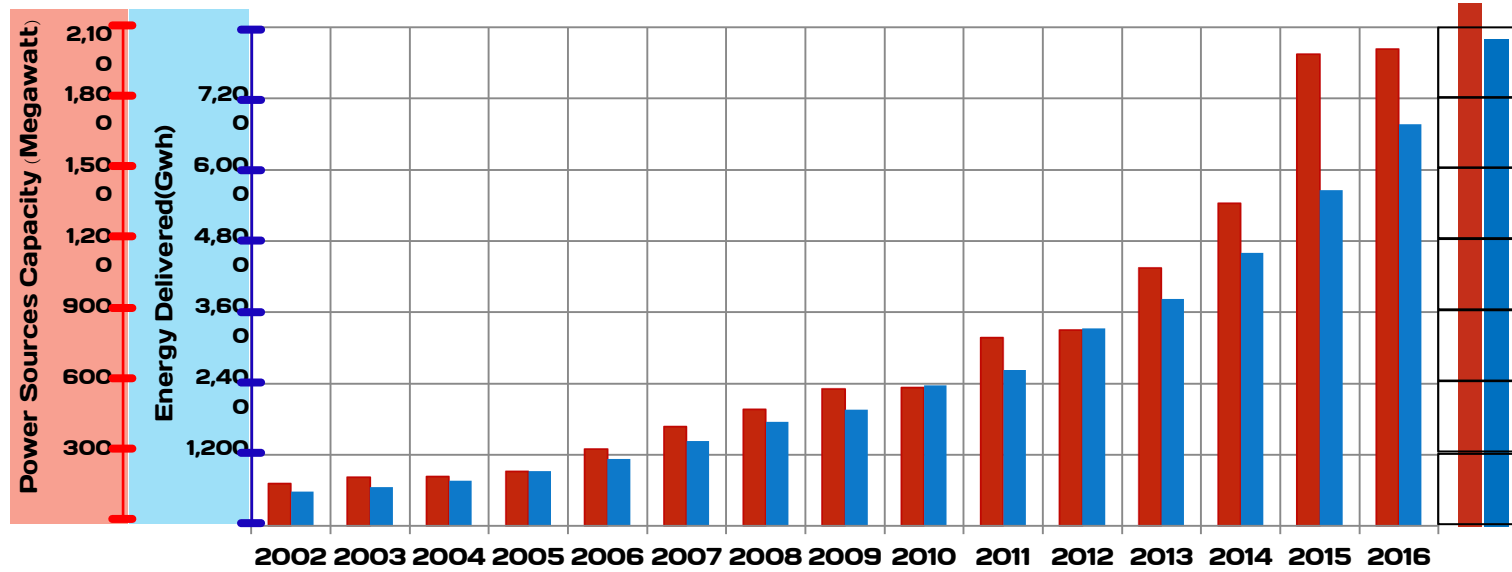
Total supply by importing from neighboring countries

- Total number of licensed village: 2,533 which stands 17.88% of total villages
- Number of connection: 254,851 which stands 11.39% of total connections

3. Mini-Grid

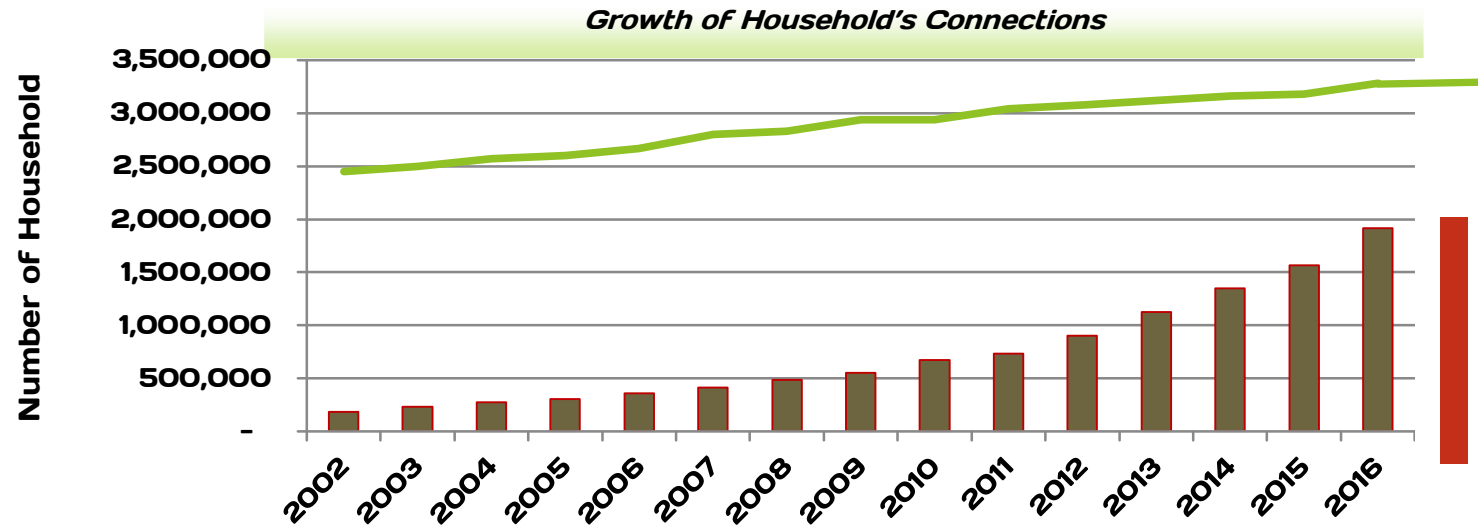


Growth of Power Sector



| | | | | | | | | | | | | | | | | |
|------------------------------------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Power Sources Capacity (MW) | 180 | 205 | 208 | 231 | 325 | 419 | 490 | 579 | 584 | 793 | 825 | 1,088 | 1,359 | 1,986 | 2,008 | 2,221 |
| Energy Delivered (GWh) | 614 | 693 | 814 | 977 | 1,203 | 1,517 | 1,858 | 2,077 | 2,515 | 2,788 | 3,527 | 4,051 | 4,713 | 5,990 | 7,175 | 7,966 |
| Energy Increase (%) | | 13.28 | 15.41 | 19.80 | 24.46 | 26.73 | 22.52 | 11.76 | 21.08 | 13.26 | 23.84 | 14.83 | 16.35 | 27.09 | 19.79 | 11.03 |

Growth of Household Connections



| | | | | | | | | | | | | | | | | |
|-----------------------------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| Total Household (M) | 2.45 | 2.50 | 2.57 | 2.60 | 2.67 | 2.80 | 2.83 | 2.94 | 2.94 | 3.04 | 3.08 | 3.12 | 3.16 | 3.18 | 3.28 | 3.3 |
| # of Household's connection | 0.18 | 0.23 | 0.27 | 0.30 | 0.35 | 0.41 | 0.48 | 0.55 | 0.67 | 0.81 | 0.99 | 1.19 | 1.35 | 1.57 | 1.91 | 2.43 |
| % of Household's connection | 7.47 | 9.28 | 10.61 | 11.78 | 13.42 | 14.83 | 17.22 | 18.79 | 22.88 | 24.17 | 29.25 | 38.14 | 42.72 | 49.37 | 58.23 | 65.0 |

End User Tariff

| No. | Electricity Tariff Riel per Kilowatthour | License Granted | Num. of Villages | Electricity Sale kWh | % | Num. of Consumers | % |
|--------------|---|--------------------|---------------------|-------------------------|-------------|----------------------|-------------|
| 1 | below or equal 800R | 280 | 11,675 | 5,513,871,387 | 96.84% | 1,991,553 | 92.23% |
| 2 | range of 850R to 980R | 15 | 818 | 119,976,979 | 2.04% | 67,238 | 3.11% |
| 3 | range of 1,000R to 1,200R | 18 | 478 | 35,361,551 | 0.65% | 52,812 | 2.45% |
| 4 | range of 1,300R to 1,500R | 13 | 298 | 15,852,543 | 0.28% | 18,731 | 0.87% |
| 5 | range of 1,600R to 2,700R | 24 | 336 | 8,884,903 | 0.15% | 20,569 | 0.95% |
| 6 | range of 2,800R to 3,000R | 8 | 198 | 2,520,279 | 0.04% | 8,421 | 0.39% |
| 8 | range of 3,100R to 3,700R | no longer exist | | | | | |
| Total | | 342* | 13,803 | 5,696,467,642 | 100% | 2,159,324 | 100% |

Non official note:

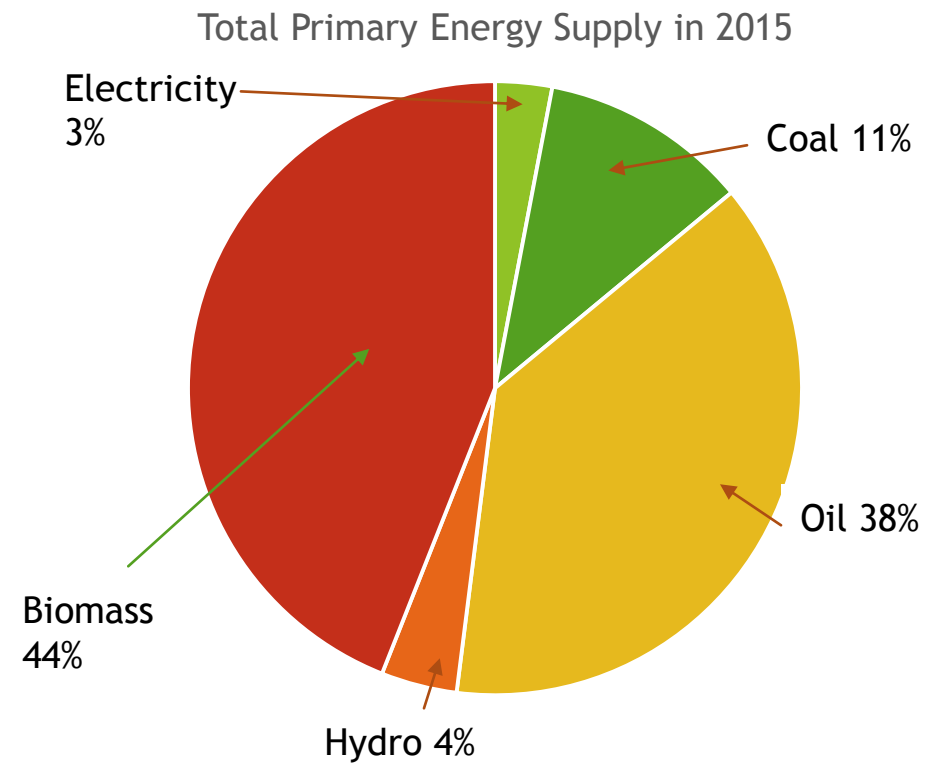
1UScent = 400 Riels

By Planning : 750Riels at year 2020.

Expected to lower the tariff at

680Riels/kWh at year 2025

Total Primary Energy Supply in 2015



THANK YOU!