Overall Image of Renewable Energy in 2010

1. Comparative information on alternative energy development

Electricity generated from natural energy	2009	2010	△%
• Hydro	52.29 MW	58.85 MW	+12.5%
• Wind	5.10 MW	5.74 MW	+12.0%
• Solar	38.6 MW	49.35 MW	+27.8%
Electricity generated from bio-energy			
• Biomass	1,544 MW	1,610 MW	+4.3%
• Biological	79.6 MW	103.4 MW	+29.9%
Electricity generated from waste	5.6 MW	13.13 MW	+134.5%
Heat produced from bio-energy			
• Biomass	3,071 ktoe	3,136 ktoe	+2.1%
• Biological	201 ktoe	311 ktoe	+54.7%
Heat produced from waste	1.09 ktoe	1.09 ktoe	0.0%
Promotion of biofuel utilization			
• **Ethanol**	1.25 ML/day	1.23 ML/day	-1.3%
• **Biodiesel**	1.66 ML/day	1.73 ML/day	+4.1%
Promotion of NGV utilization in transport sector			
• **NGV utilization quantity**	4,000 tons/day	4,900 tons/day	+22.5%
• **Number of vehicles**	162,023	211,368	+30.46%
• **Number of service stations**	386	420	+8.0%
1. Bangkok and adjacent provinces	194	214	+10.31%
2. Outside Bangkok	192	206	+7.29%
• **Oil substitution**	6.24%	7.25%	+1.01%

Notes: ML = Million Litres

2. Progress of Alternative Energy Promotion

2.1) Solar Energy: Targeted promotion 500 MW

- At present, a great number of private agencies apply for 'adder' promotion, more than 700 projects (VSPP 699 projects, and SPP 8 projects), with the installed capacity at the maximum of 3,581 MW. This causes the 3 electricity authorities to slow down temporarily the purchasing agreement of electricity generated from solar energy.
- The Ministry of Energy tends to focus more on the promotion of Roof-Top PV installation in the future, which is now under the consideration of feed-in tariff. The Ministry also has the idea to merge this measure with the Building Energy Code that, in the future, may enforce the new big-sized building and high-price housing compound to install solar cell power generation system.
- As for solar farm installation, the small-sized solar farm which is not located in the agricultural areas will be promoted with new feed-in tariff calculation.

2.2) Wind Energy: Targeted promotion 800 MW. At present, the installed capacity and the capacity under installation (within 2012) are totally 420 MW.

- At present, a great number of private agencies are also interested in the wind farm investment, more than 1,400 MW. But they still have some troubles to ask permission for area use from the government agencies involved because the areas with high potential of wind energy are usually located in the conserved highland and forest, etc.
- The Ministry of Energy has worked in cooperation with many agencies involved to solve the problem of the area use permission. Currently, the Ministry can come to the conclusion with the Agricultural Land Reform Office (ALRO) that has given permission for wind farm development in the areas with the rental rate of 35,000 Baht/rai/year. ALRO has also issued promotion rules, for example, the period of ALRO area tenancy for wind power generation according to the project period specified by those who ask for permission, but not over 27 years. Moreover, they can also ask for permission to use the areas of the Self-Help Land Settlement, public assets, and forest area for wind farm development investment.
- DEDE has finished making the wind map to show the wind velocity in Thailand at the level of 90 meters high. This will help support the private sector to consider investing in the development of wind power generation project.
- It is found that the areas in the southern part of Thailand, like Surat Thani, Nakhon Sithammarat, Songkhla, Yala, and Pattani have wind energy potential pertaining to the investment.

2.3 Hydropower: Targeted promotion 324 MW. At present, the installed capacity is totally 58.85 MW

- There are 3 hydropower development programs.
    - Small hydropower development (200 KW-6 MW) – DEDE has implemented 7 hydropower plants with totally 26.1 MW, but not yet completed. There are still backup plan for the implementation of 35 hydropower plants more, making the total of 42 hydropower plants with the installed capacity of more than 95.6 MW in 15 years.
    - Village hydropower development (20-200 MW) – This focuses on the 3 partner cooperation. The local administrative organization or the private sector is invited to work together as partners, and the villagers, as the area owners, will assist in the construction or supply the materials available in the rural area for use in the construction. At the initial stage, 50-60 villages have been surveyed, and the implementation of 56 villages has already been completed with the total installed capacity of 2.4 MW.
    - Irrigation hydropower development – EGAT has started the construction of the first 6 irrigations with the installed capacity of 78.7 MW. DEDE and EGAT have planned for the implementation of totally 48 irrigations with 155.6 MW (EGAT 25 irrigations, and DEDE 23 irrigations with 20.8 MW in total).

2.4) Biomass: Targeted promotion 3,700 MW. At present, the installed capacity is totally 1,610 MW.

- Promotion of the uncommon biomass which have not been used much for power generation, such as
    - Straw, with the appropriate capacity of 1,200 MW
    - Sugarcane leaves-sugarcane top, with the appropriate capacity of 560 MW
    - Cassava finger root and trunk, with the appropriate capacity of 170 MW
    - Oil palm leaf and empty bunch, with the appropriate capacity of 150 MW
    - Corncob and corn trunk, with the appropriate capacity of 100 MW
    - Wood scrap, with the appropriate capacity of 60 MW
- In addition, there will be the measures to promote the plantation of fast-growing trees for power generation, and processed biomass production, such as biomass pallets, or new technologies, for example, grass plantation and fermentation to get biogas for power generation, etc.

- As for chaff and bagasse which are originally biomass for power generation, it is expected that they have less potential and may not be promoted anymore.

2.5) Biogas: Targeted promotion 120 MW. At present, the installed capacity is totally 103.4 MW.

- At present, 2 main target groups are promoted, comprising the livestock farm, especially large and medium-sized pig farms, slaughter, and processed agriculture industrial factory, for example, tapioca flour factory, palm oil extraction factory, sugar factory, and ethanol factory. It is expected that the targeted promotion of 120 MW will certainly be reached in 2011.
- The future promotion will focus on biogas production by household and community.
- As for the research work, it will accelerate the utilization of biogas in the transport sector or bio-methane technology that DEDE, in collaboration with EPPO and PTT, has implemented the pilot projects in Ubon Ratchatani, and Chiangmai.

2.6) Energy from waste: Targeted promotion 160 MW.

- The private sector is encouraged to invest and the local administrative organization to pay for waste disposal, or the local administrative organization can join the investment.
- The 15-Year Alternative Energy Development Plan has specified the target that the 160 MW electricity has to be generated from waste by 2022. It is found from the study that only 13 MW is actually generated from waste even though the public sector has issued the measures to promote and support the case. Moreover, many investors and entrepreneurs are interested in the investment, but they have encountered various problems, for example, the community opposition, related rules and regulations, loan, irrational benefit sharing between the investors and waste owners, etc. So, the implementation is obstructed by these problems although the private sector is interested in getting the adder for their investment of more than 35 projects, equivalent to the installed capacity of 554 MW.
- In addition, the Ministry of Energy promotes the research on the transformation of plastic to oil with the floor price support mechanism of approximately 85 USD/BBL or approximately 18 Baht/litre, etc.

2.7) Ethanol: Targeted promotion is 9 million litres/day (in 2022). At present, ethanol utilization is 1.27 million litres/day (as of November 2010)

- Focus on the promotion of vehicles using high proportion of ethanol mix such as E85 and E20 by supporting the car manufacturers to produce FFV in the country, and the oil traders to increase the number of E20 and E85 service stations.

- As for the FFV using E85, the announcement has been issued to reduce 3% excise tax for the car of 1,780-3,000 C.C. (It is now under the consideration to adjust the whole system of car tax structure.)
- Promote gasohol consumption for motorcycles (by Suranaree University).
- Study the measures to expedite the cancellation of benzene 91 (EPPO)
- Solve the problem of ethanol export and promote the ethanol produced in the country for use in the industrial sector, also amend the law of spirits 3/ and related rules (Excise Department).
- Promote the research on new energy plants such as sweet sorghum (DEDE).

2.8) Biodiesel: Targeted promotion is 4.5 million litres/day. At present, ethanol utilization is 1.99 million litres/day (as of November 2010).

- Move up the compulsory mixture proportion from B2 to B3 on 1st June, 2009.
- In 2011, the biodiesel formula 'Green Diesel' will be enforced. If the quantity of palm oil in the country is sufficient, the maximum mixture will be 5% (B5), but if the quantity of palm oil is limited, the mixture may be adjusted with the flexibility between 4.5-5%.
- Increase the areas for oil palm plantation by supporting the Ministry of Agriculture and Cooperatives that has set the target to expand the areas for oil palm plantation from the present 4.2 million rai (fruit-produced oil palm 3.55 million rai) to 5.45 million rai by 2012.
- Promote the research on non-food oil plants such as algae.

Overall Image of Energy Efficiency in 2010

1. Policy and financial tools to support energy conservation and alternative energy projects

1.1 Law measures

- **Standards, criteria, and methods of building energy code**

Performance

- The Ministerial Regulations were promulgated on 20th February, 2009, and put into effect on 20th June, 2009.

- DEDE signed MOU on 5th November, 2009, with 5 local administrative organizations comprising BMA, Chiangmai City Municipality, Pattaya Town Municipality, Nakhon Ratchasima Municipality, and Hat Yai Municipality.

- Organize 5 seminars to launch the projects for the 5 municipalities with 1,600 participants.

- Organize 10 training courses throughout the country to give the knowledge on how to use the Building Energy Code Program to 570 trainees.

- Inspect and assess the pilot building construction models

- Establish a coordination center of the Building Energy Code Project to provide the information, news and advisory services.

- At present, it is under the consideration for approval of the Building Control Committee.

- **Standards, criteria, and methods of energy management in designated factories and buildings**

Performance

- The Ministerial Regulations were promulgated on 23rd July, 2009, and put into effect on 19th November, 2009.

- There are 3,600 designated factories and 2,000 designated buildings, making totally 5,600.

- 24 training courses are carried out for the designated factories with 2,400 trainees.

- 20 training courses are carried out for the designated buildings with 2,000 trainees.

- The entrepreneurs shall proceed on energy management according to the provisions specified in the Ministerial Regulations, and submit the report to DEDE by March every year.

- **Energy efficiency standards**

  Performance

  - DEDE has proved energy efficiency standard of 35 products.

  - High Energy Performance Standard (HEPS)
    - The high energy performance standard of 7 products has been promulgated in the Ministerial Regulations.
    - 1 product is under consideration relating to the laws.
    - The Energy Efficiency Standard Sub-Committee has approved 20 products.
    - The law of 7 products has been drafted to submit for approval of the Energy Efficiency Standard Sub-Committee.
  - Minimum Energy Performance Standard (MEPS)
    - The draft standard of 22 products has been submitted to the Thai Industrial Standard Institute (TISI).
    - TISI has announced Thai Industrial Standards for 6 products.
    - 16 products are under TISI process.

2.2 Management Standard

2.2.1 Revolving Fund

Performance

- The project started in 2003.
- At present, it is in the promotion phase 5.
- 11 financial institutions have participated in the project.
- The project has received the fund, amounting to 7,842.5 MB.
- DEDE has approved 6,964 MB for the project.
- 283 projects have been supported.
- The total investment is 14,562 MB.
- The saving value is 4,899 MB / year.
- The project helps reduce oil importation of 308.9 ktoe / year.

2.2.2 Energy Credit

Performance

- 15 institutiond have signed MOU.
- The project started in 2008.
- The financial institutions have given 182,084 MB of credit (It is expected that the total investment value is over 200,000 MB).
- The saving value is 60,695 MB / year.
- The project helps reduce oil importation of 2,428 ktoe / year.

2.2.3 ESCO Fund

Performance

- The project started in 2009.
- At present, it is in the promotion phase 2.
- The project consists of 2 Fund Managers:
  - National Energy Conservation Foundation
  - Energy for Environment Foundation
- 500 MB of fund is allocated in Phase 1, and the approved budget of 500 MB is additionally provided in Phase 2.
- The investment of 33 projects has already been supported.
- The total investment is 328.8 MB.
- The investment of 3,309.7 MB has been stimulated.
- The saving value is 545.5 MB / year.
- The project helps reduce oil importation of 15.67 ktoe / year.

2.2.4 Income Tax Incentive from Revenue Department

Performance

- The project started in 2009.
- The criteria of equipment for energy saving have been specified for 19 types of equipment.
- 14 types of equipment with 4,000 models have passed HEPS criteria.
- At present, over 200,000 types of equipment have received this incentive.
- The electricity saving is approximately 7 million units/year, equivalent to 21 MB / year.
- CO_2 emission is reduced 4,000 ton / year.

1.3 Social Measures

- Change the light bulbs to the energy efficient ones
  - The existing light bulbs have already been changed to the energy efficient ones for 22 designated buildings, comprising 15 city halls, 4 ministry offices, 3 designated buildings, so making the total change of 51,800 light bulbs.
  - The energy saving is totally 1.68 MB/year, equivalent to 5.38 MB / year.
  - CO_2 emission is reduced 970 tons / year.
  - It is set as the target that the light bulbs have to be changed in all city halls and ministry offices in 2011.

- Energy saving equipment
  - DEDE has given 3.3 million High Energy Saving Label to 4 non-electrical products (gas stove, VCD glass, and insulator) from 2008 to 2011.

- EGAT has given 60 million No.5 Energy Saving Labels to electrical equipment from 2005 to present.
- The saving value is 4,216 MB / year.
- It helps reduce oil importation of 168.7 ktoe / year.

Overall Image of Clean Development Mechanism (CDM) in 2010

1. Clean Development Mechanism (CDM)

- To achieve scenario 450 ppm
  - GHG emission of the energy sector in 1990 — 80 million tons/year
  - GHG emission of the energy sector in 2008 — 204 million tons/year
  - BAU Case-projection in 2020 (3.5% CAGR) — 337 million tons/year
  - BAU Case-projection in 2020 (5.5% CAGR) — 410 million tons/year

- Initial target
  - Alternative energy, 2008-2022 — -42 million tons/year
    Equivalent to the value of GHG emission reduction — 21,000 MB
  - Energy efficiency — -30 million tons/year
    Equivalent to the value of GHG emission reduction — 15,000 MB
    *excluding energy saving in transport sector

- Totally 123 CDM projects have received LoA, and it is expected to reduce CO_2 emission 7.96 million tons/year.
  - Biomass power and heat generation — 18 projects
  - Biogas power and heat generation — 74 projects
  - Waste landfill power generation — 10 projects
  - Hydropower generation — 5 projects
  - Solar cell power generation — 2 projects
  - Waste heat power generation — 9 projects
  - Power/energy production efficiency — 2 projects
  - Biomass fertilizer production — 1 project
  - Nitrous oxide emission reduction — 1 project
  - Natural gas power generation — 1 project

- Totally 40 CDM projects have received CDM EB. And it is expected to reduce CO_2 emission 2.23 million tons/year.
  - Biomass power and heat generation — 7 projects
  - Biogas power and heat generation — 29 projects
  - Waste heat power generation — 3 projects
  - Nitrous oxide emission reduction — 1 project

- Totally 2 CDM projects have received the GHG reduction certificate. And it is expected to reduce CO_2 emission 815,224 tons/year.

  - The A.T. Biopower Rice Husk Power Project reduces CO_2 emission 100,678 tons/year
  - The Korat Waste to Energy Project reduces CO_2 emission 714,546 tons/year