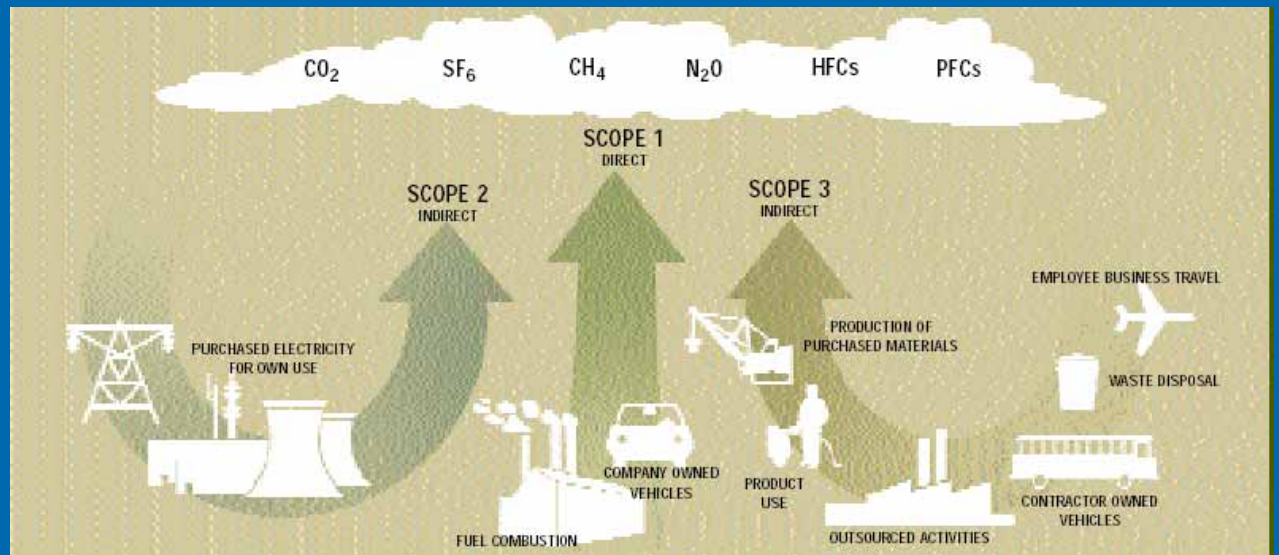
Agri. Eng. R&D for Environmentally Friendly in Thailand

Viboon Thepent

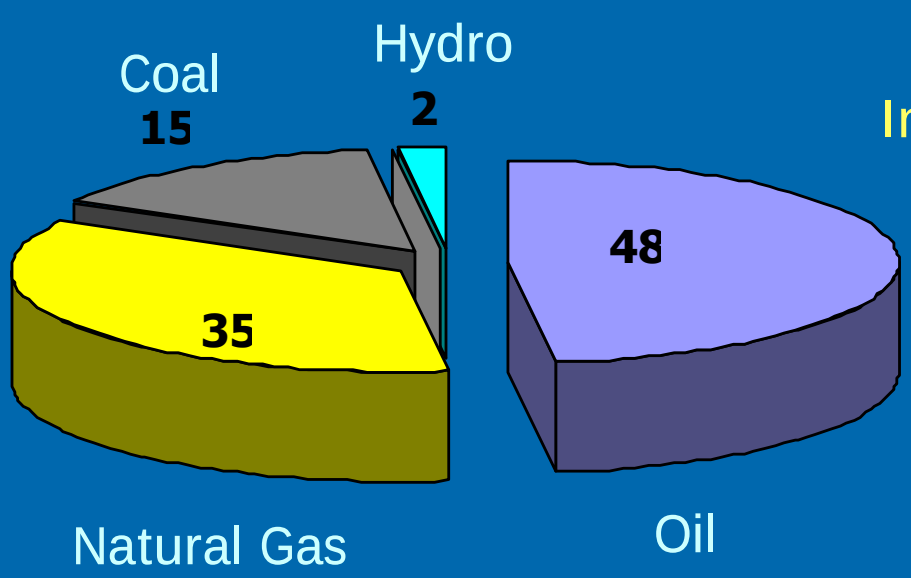


Presentation Outlines

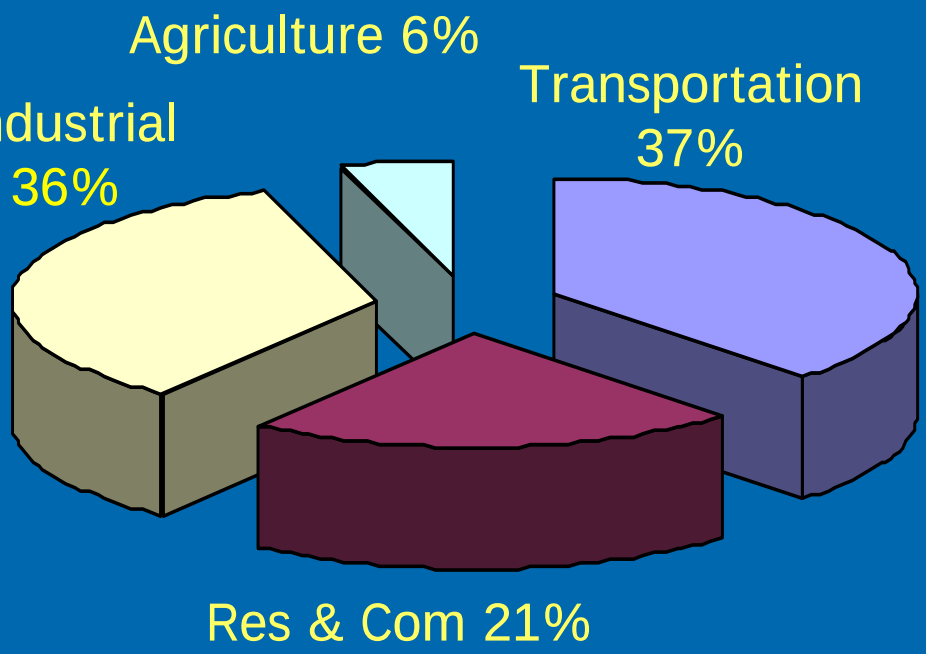
- Introduction
- Biomass energy
- Solar energy
- Wind energy
- Geothermal Energy
- Energy Conservation Program
- Conclusion

Energy Demand Profile 2004

Thailand consumes energy about 1.45 million barrel of oil equivalent per day , 15% of GDP



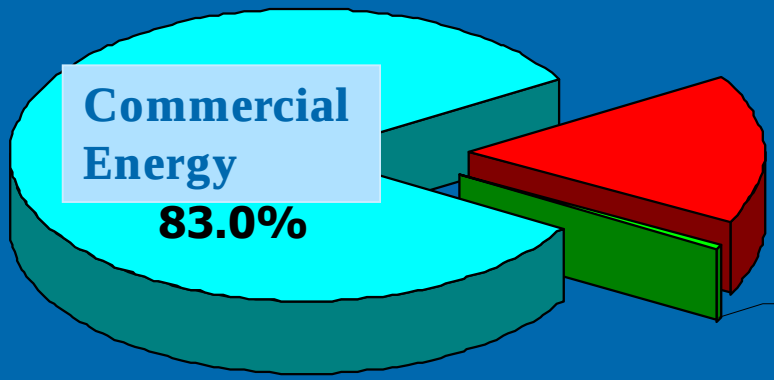
Primary Energy consumption



Consumption by Sector*

*2003 Figures

Strategy for Renewable Energy Development



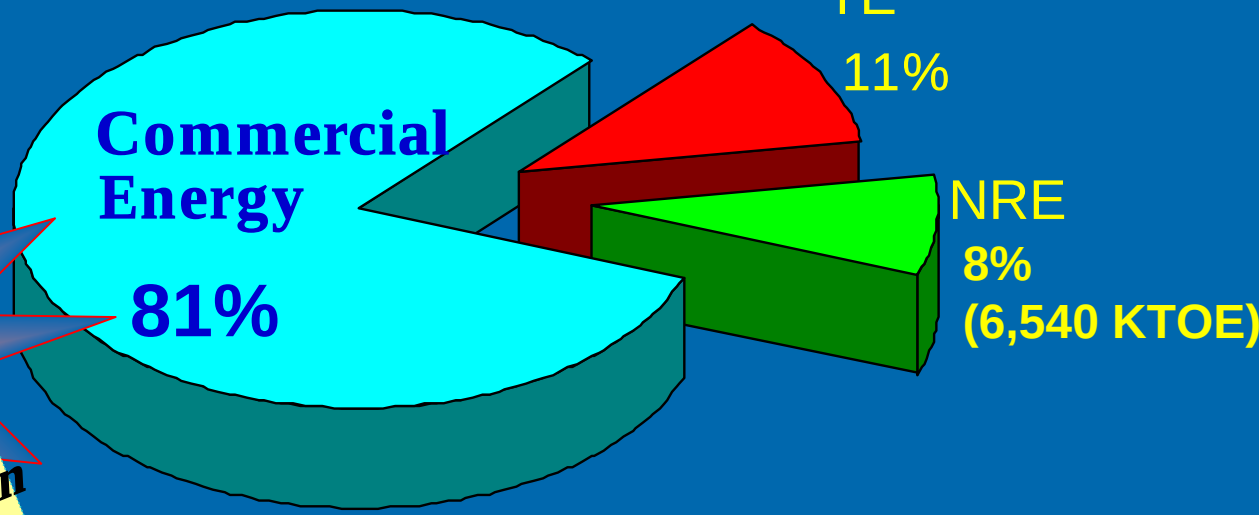
TE = Traditional Energy

NRE = New & Renewable Energy

2003

52,939 KTOE

(265 ktoe)



National Agenda

Cabinet Resolution on June 8, 2004

2011
81,763 kTOE

Thailand Energy Strategies
for Economic Development and Regional Integration

- **Strategy for Efficient Use of Energy**

  Reduce Energy Elasticity from 1.4:1 to 1:1 by 2007

- **Strategy for Renewable Energy Development**

  Increase share of RE from 0.5% to 8% of total final energy by 2011

- **Strategy for Energy Security**

  Ensure sufficient and reliable energy supply for at least 30 yrs

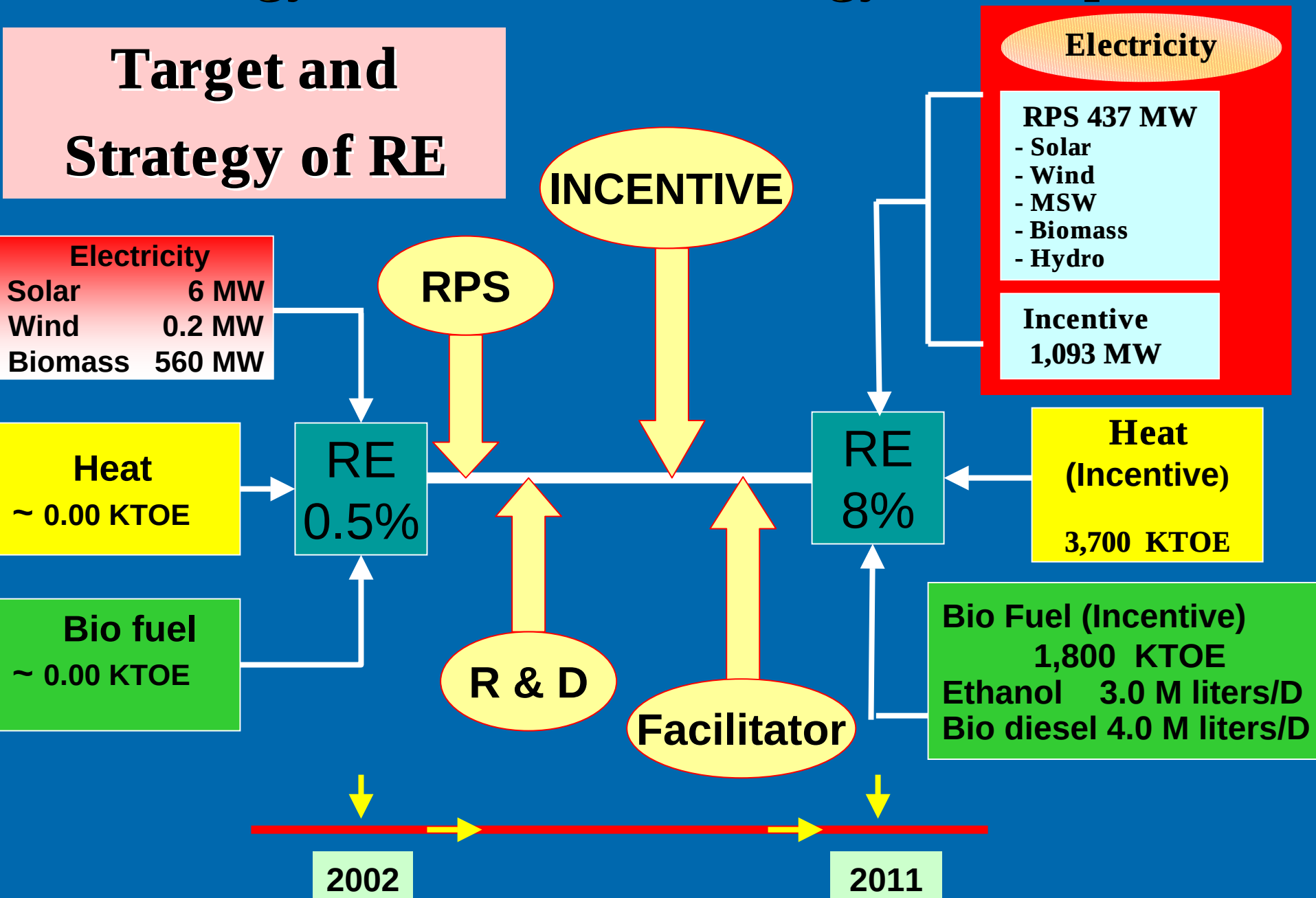
- **Strategy for Thailand as a Regional Energy Center**

  Develop Strategic Energy Land Bridge and Energy Hub

Cabinet Resolution on September 2, 2003

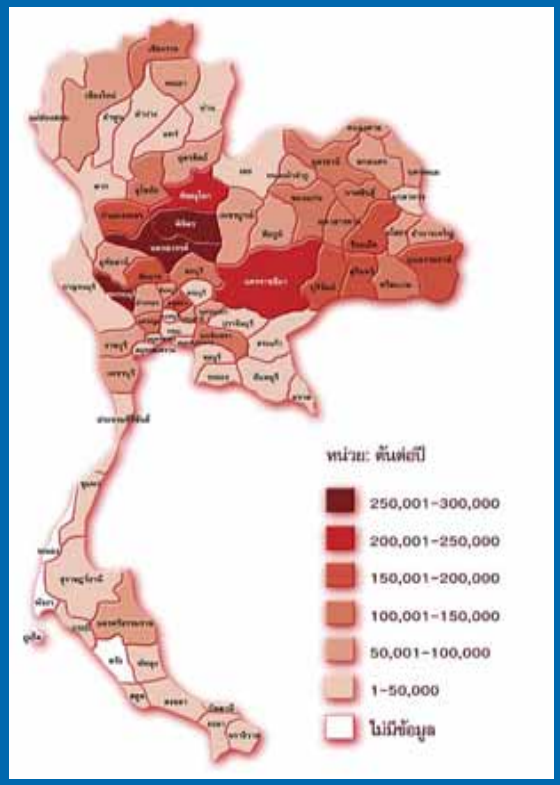
Strategy for Renewable Energy Development

Target and Strategy of RE

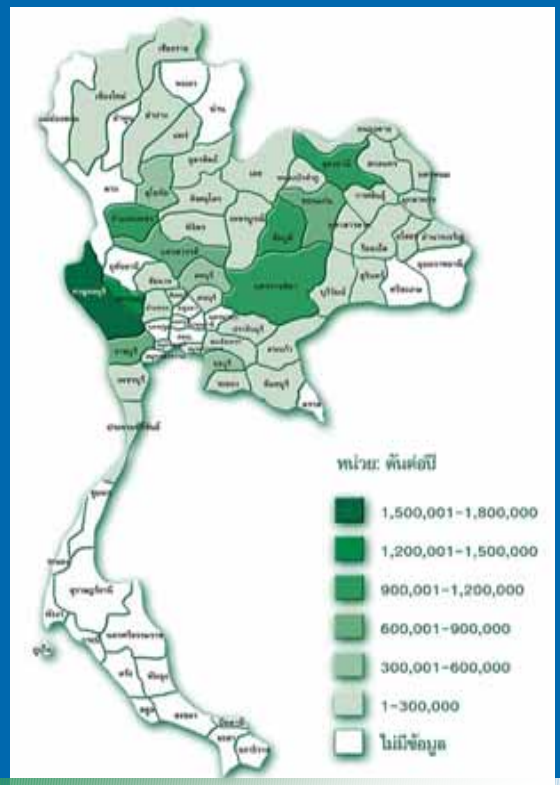


Biomass Potential

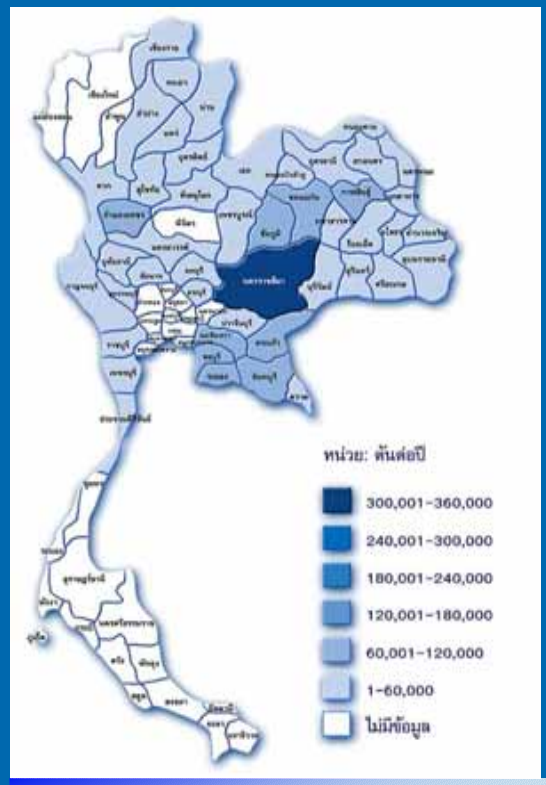
Major agricultural residues in 2002/2003



Rice husk 5.5 M tons/yr
Power potential 560 MW



Bagasse 20 M tons/yr
Power potential 1400 MW



Rhizomes 1.6 M tons/yr
Power potential 110 MW


Rhizomes

Branch of palm oil

Corn cob

Biomass are utilized as fuel for industrial' heat

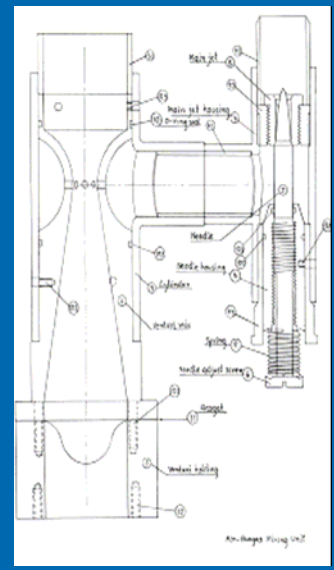
Gasifier

Korat Waste to Energy - biogas

- Uses waste water from cassava to make methane
- Produces gas for all factory heat (30 MW thermal) + 3 MW of electricity
- Earns high market returns
- Developer estimates 300 MW from waste water + 800 MW from wet cake

Korat Waste to Energy - biogas

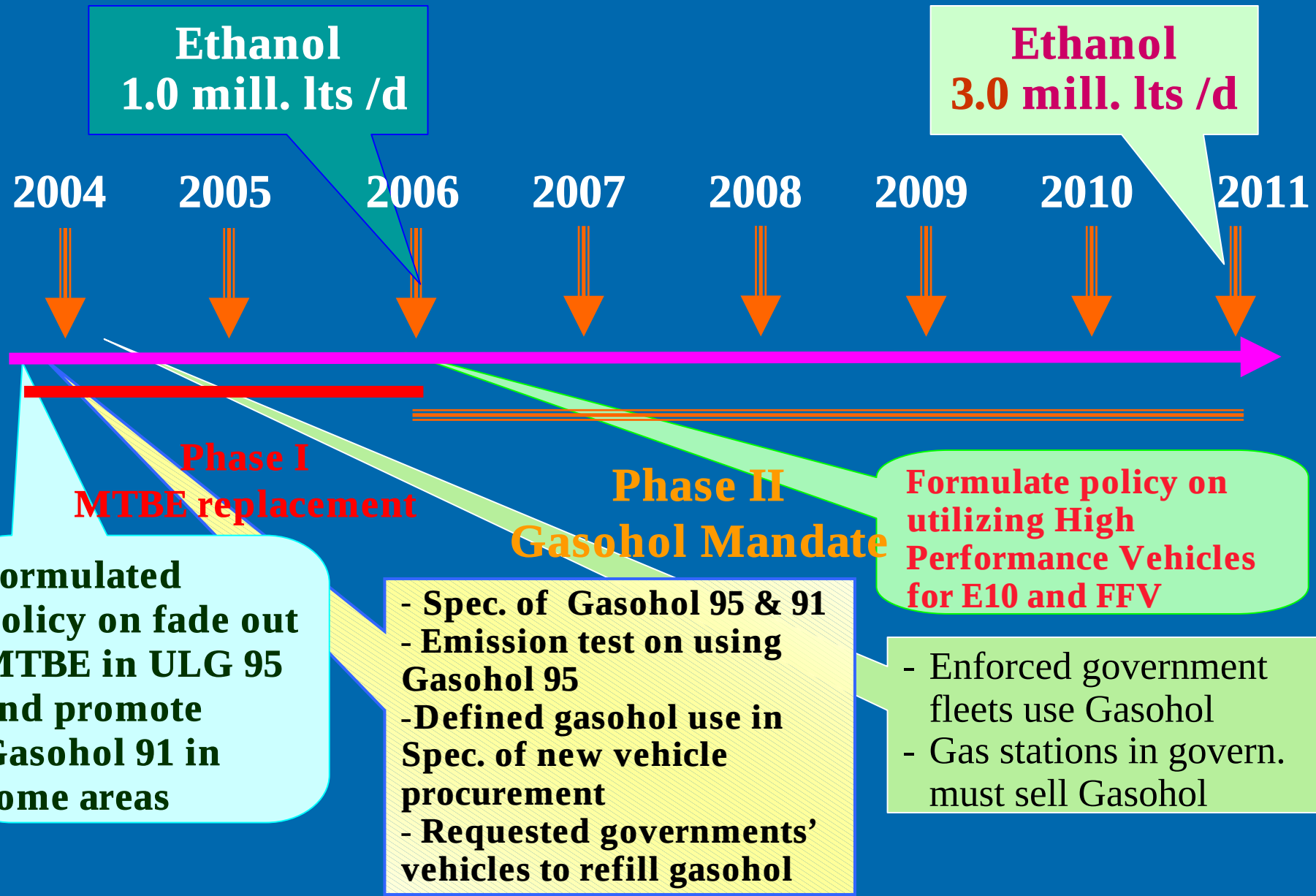
- 3 x 1 MW Jenbacher gas generators


Main jet
Main jet housing
O-ring jet
Needle
Needle housing
Cylinder
Jet set nut
Spring
Needle adjust screw
Gasket
Venturi tubing

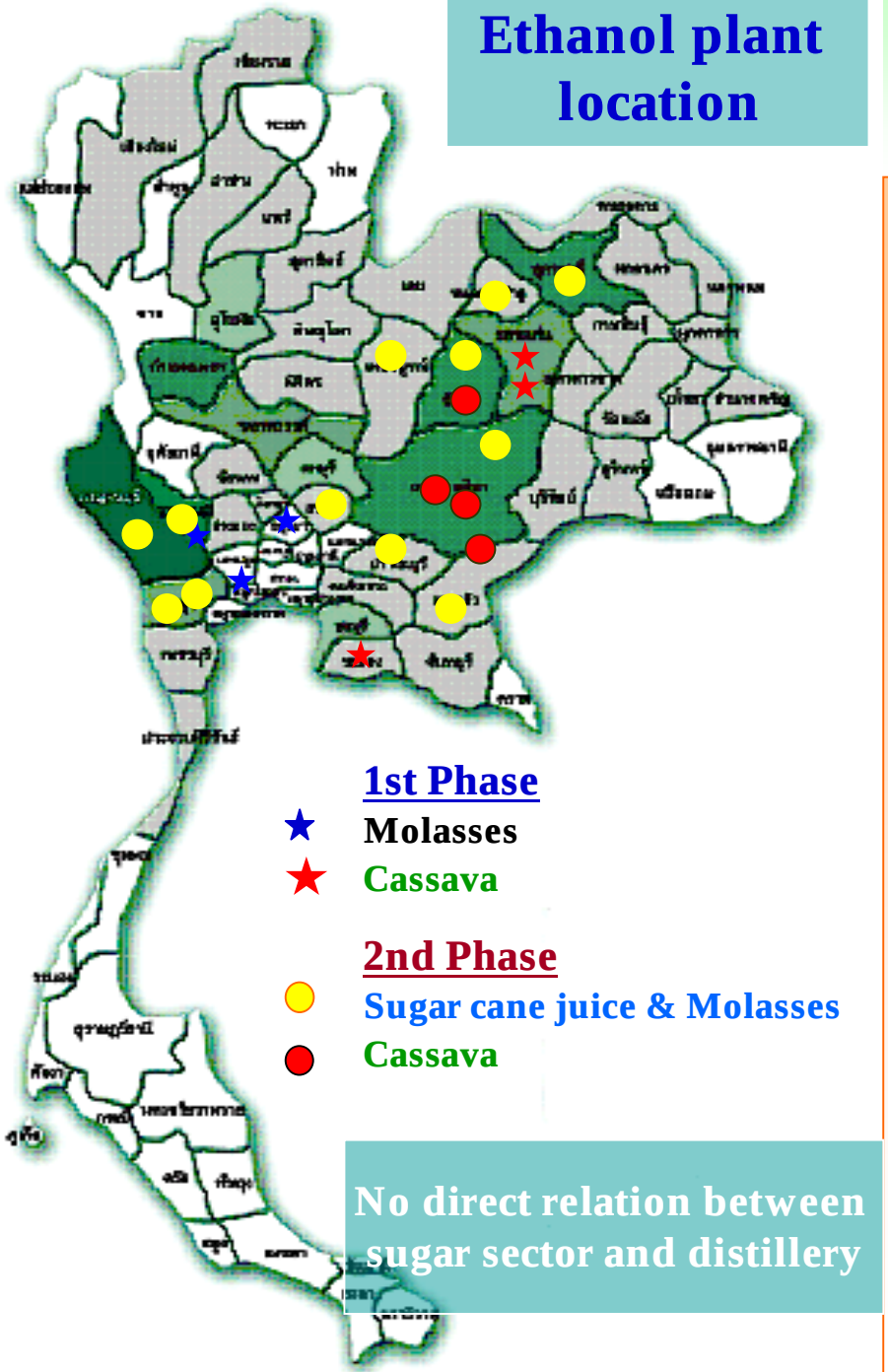
Royal ChitraladaProjects

- 1985 : Ethanol from Molasses Unit
- 1995 : Expansion
- 2001 : Dehydration Units
- 2001 : Diesel-Palm (Refined)
- Several RD&D, Product Dev.,Information Campaigns.
- Fleet Trials since 1986
- 19.09.2000 : National Ethanol Policy
- 2001 : His Majesty the King Bhumiphol of Thailand graciously took out a patent for the use of pure palm oil as fuel for diesel engines
- 2007 : Gasohol 95 / Gasohol 91 in > 4000 Stations

Gasohol Strategic Plan



Ethanol plants



1st Phase (1.09 Mill. lts / day)

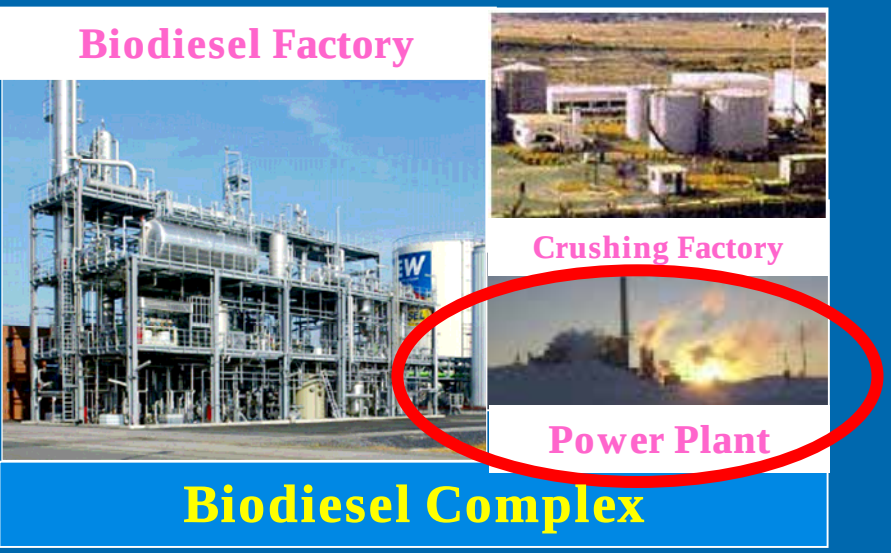
- 3 existing ethanol plants total production cap. 0.375 Mill. lts / day
- 3 plants under construction total cap. 0.715 Mill. lts/day

2nd Phase (3.2 Mill. lts / day)

18 plants were approved:

- 14 sugar mills &
- 4 cassava mills

Biodiesel and Communities



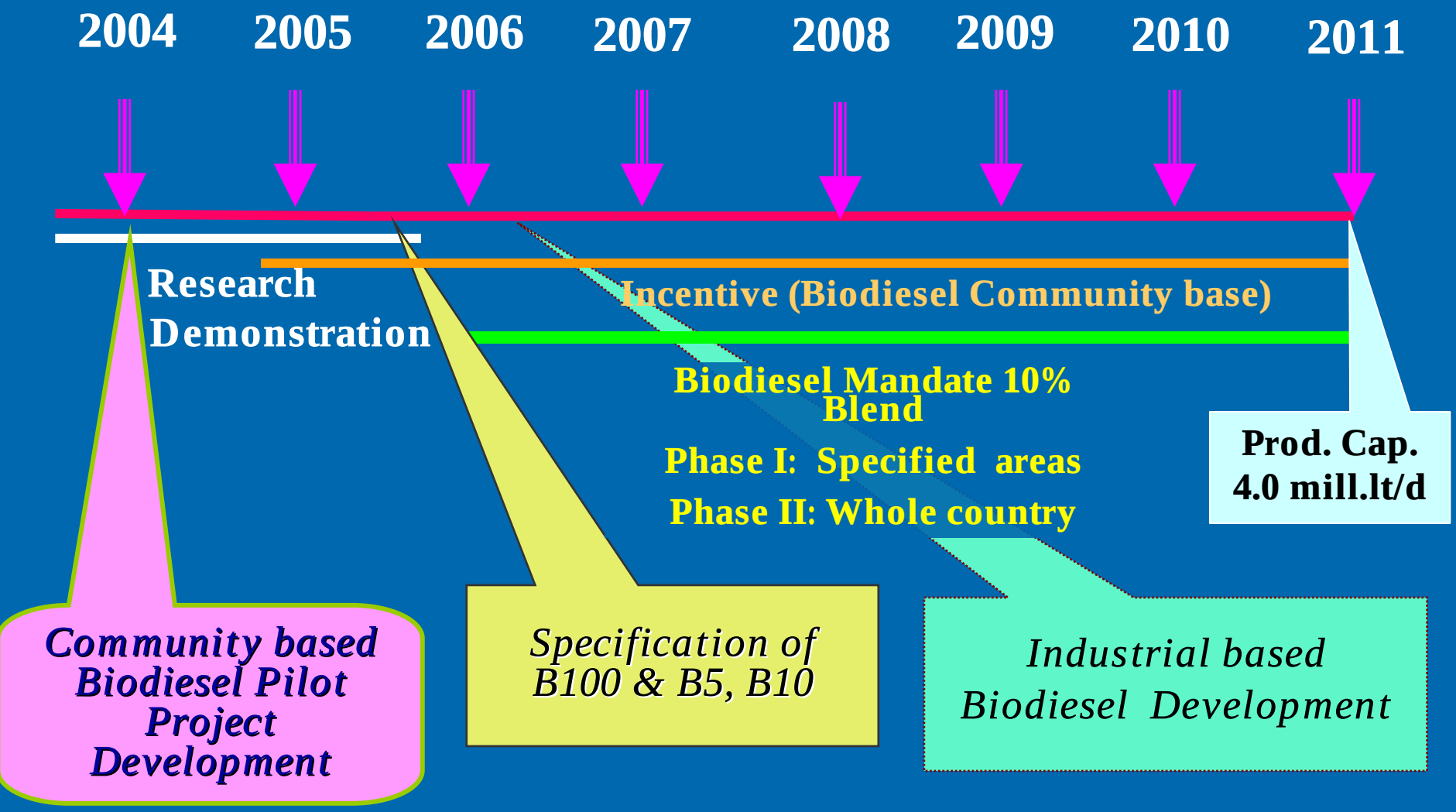
Electricity as Biofuels by-product

- Potential for rural off-grid electricification ➔ Distributed Generation
- Renewable energy source for power generation

Small-scale Biodiesel Project

- Biodiesel production for using in community

Biodiesel Strategic Plan



Biodiesel : Business Model

Blending Facilities

Farmers 60,000 Rai

Business Feasibility

100,000 Liters/day

Will produce in the 4th year and last 21 years

Biodiesel Plant

Extraction Plant

Glycerin

Oleochemical

Vitamin A,E

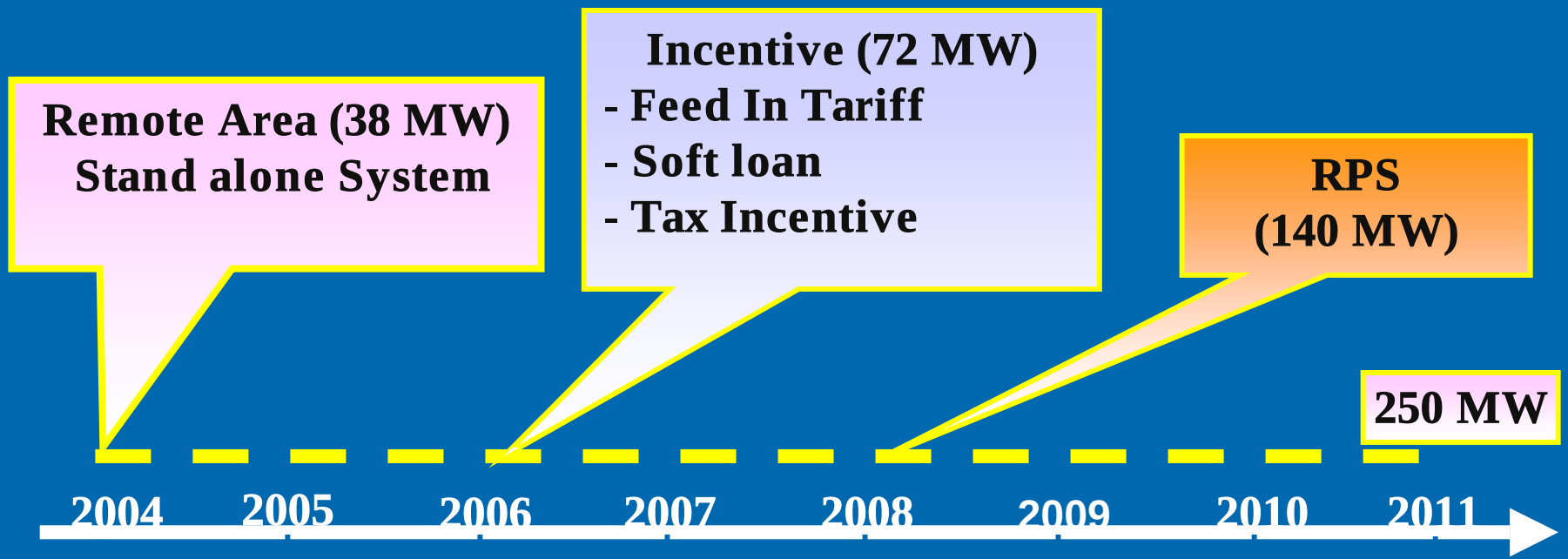
Value-added

Biodiesel Complex

Tool to Overcome Barriers

- **Need government strongly support and encouragement to drive ethanol market**
  - **Clear policy and target**
  - **Market drive;**
  - **Incentive;**
  - **Specification.**
- **Cooperation from all parties concerned**
  - **Car manufacturers;**
  - **Oil refineries and oil distributors;**
  - **Industries i.e. sugar mills, CPO mills, starch mills**
  - **Farmers and cooperatives.**

Solar Cell Strategic Plan

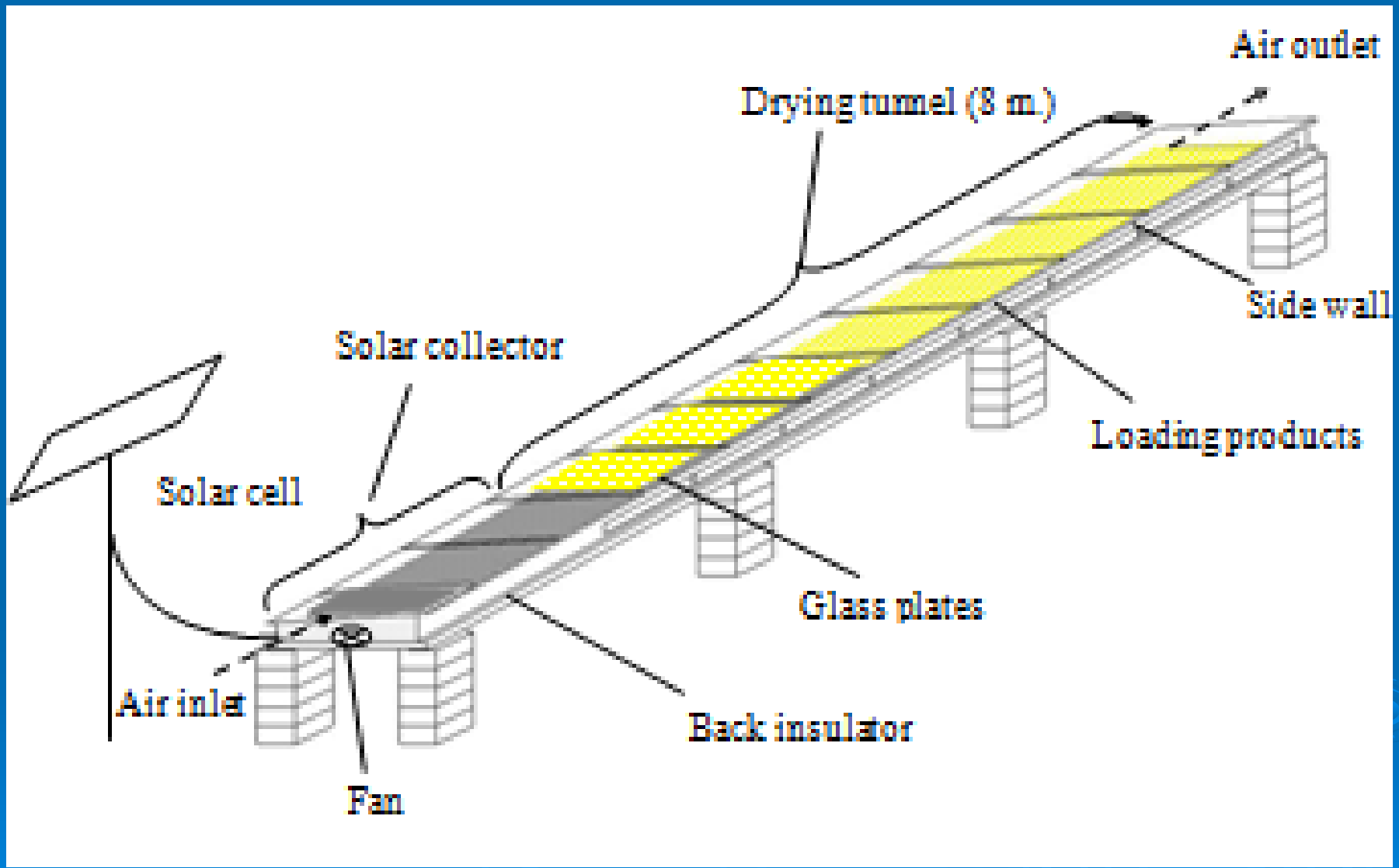


Solar Cell Industry

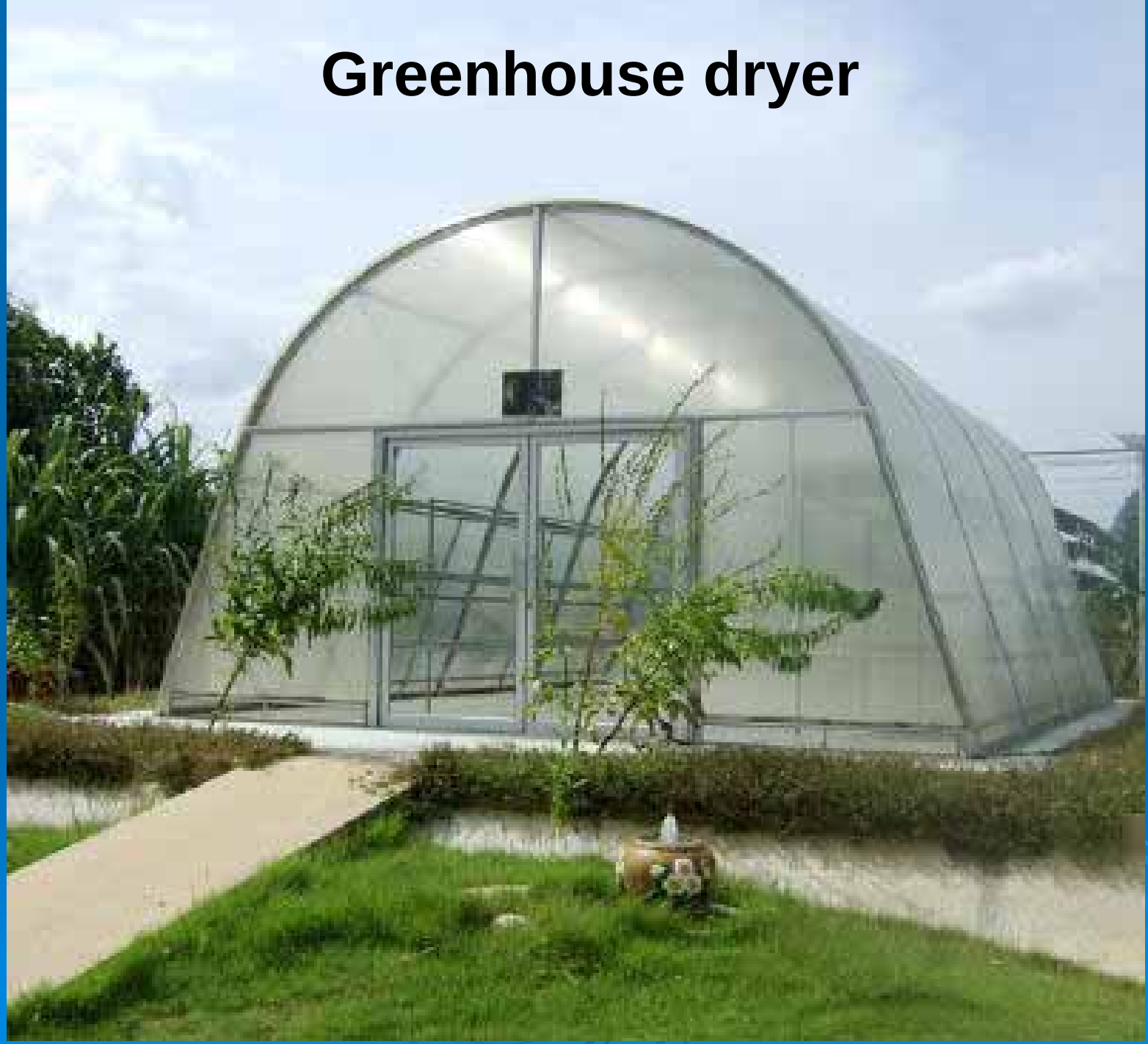
R&D

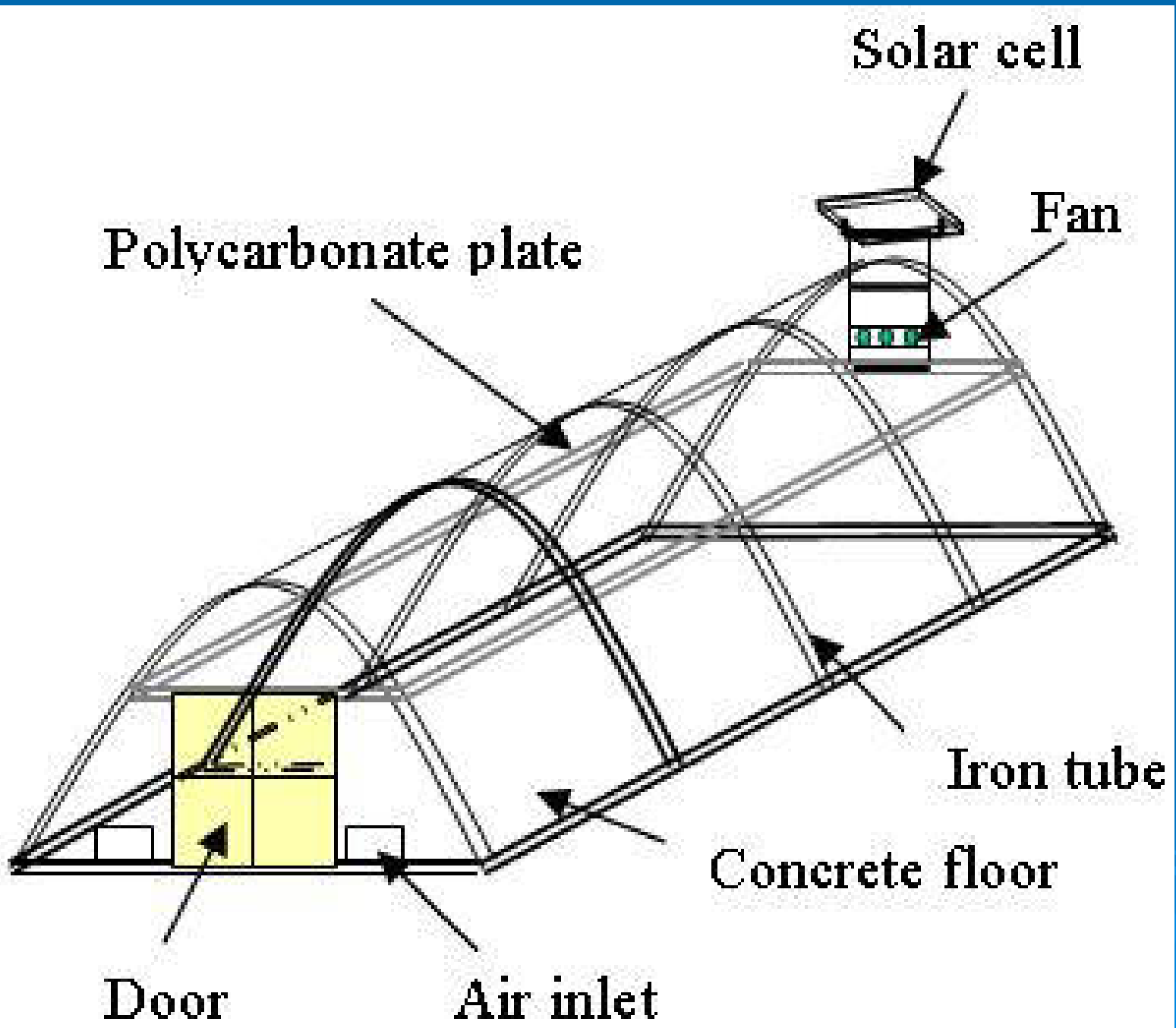
- Increase Local Content Percentage
- Reduce PV System Price


Solar tunnel dryer

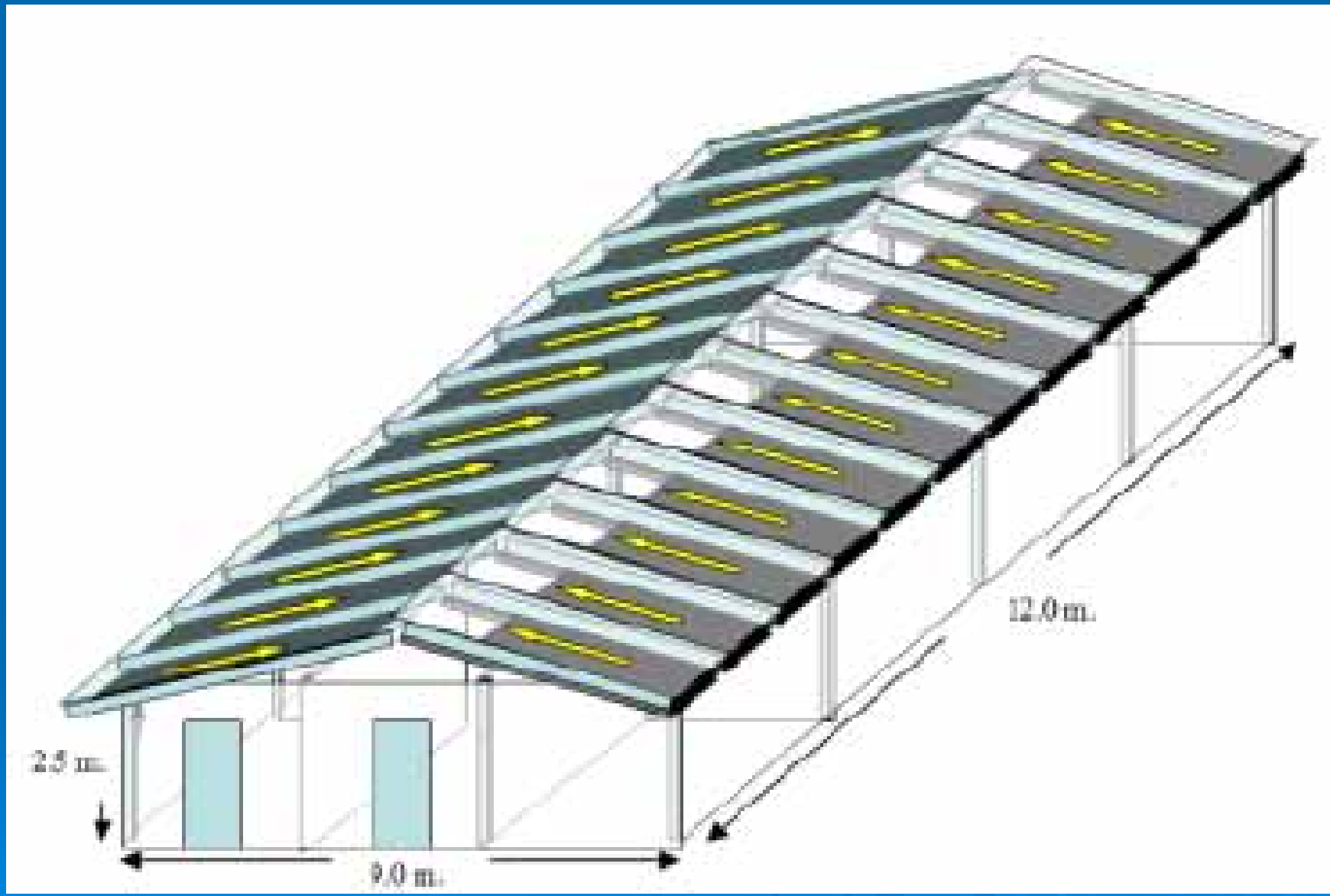

Air outlet
Drying tunnel (8 m.)
Side wall
Solar collector
Loading products
Solar cell
Glass plates
Air inlet
Back insulator
Fan

Greenhouse dryer

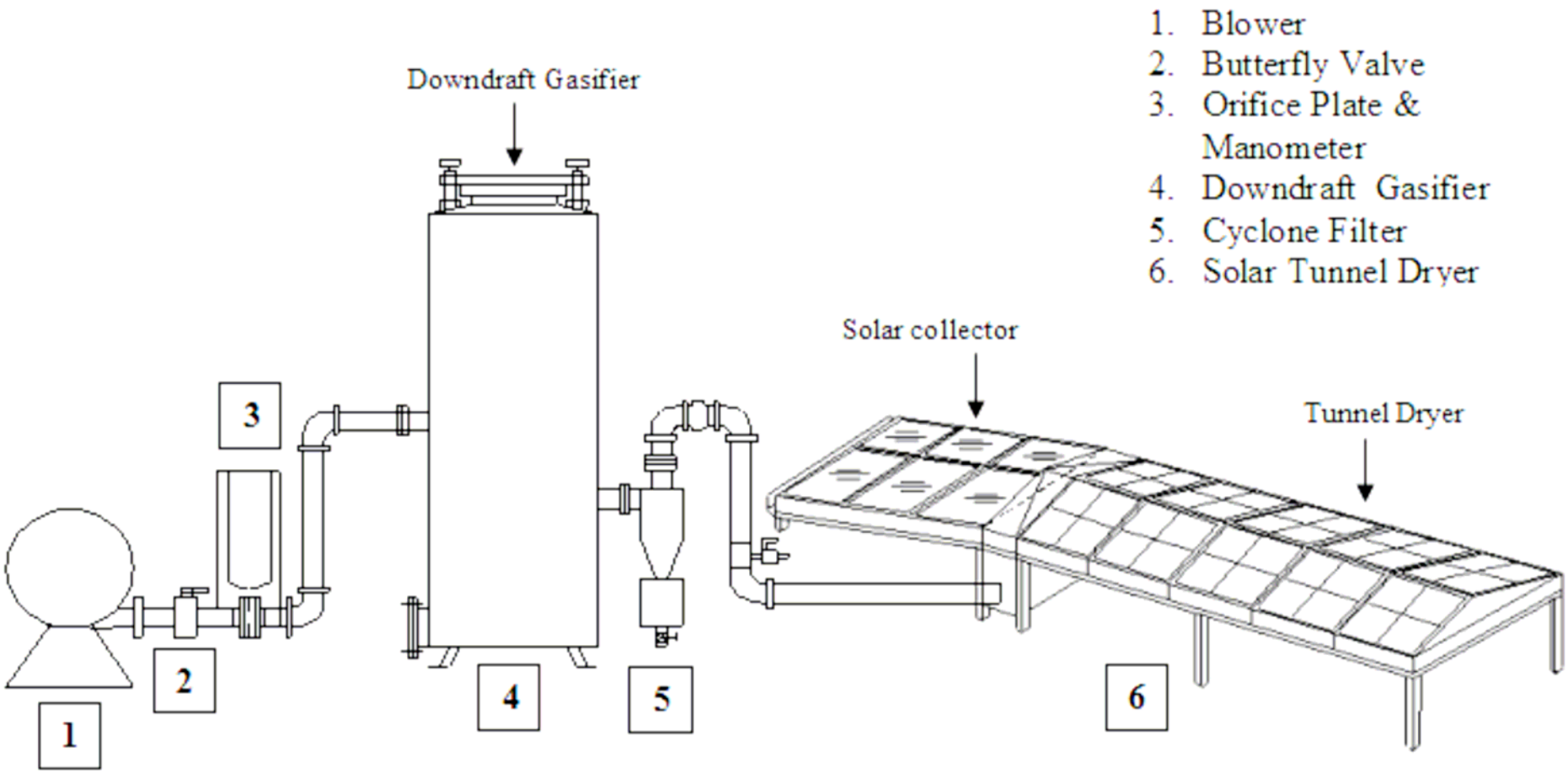



Solar cell
Fan
Polycarbonate plate
Iron tube
Concrete floor
Door
Air inlet

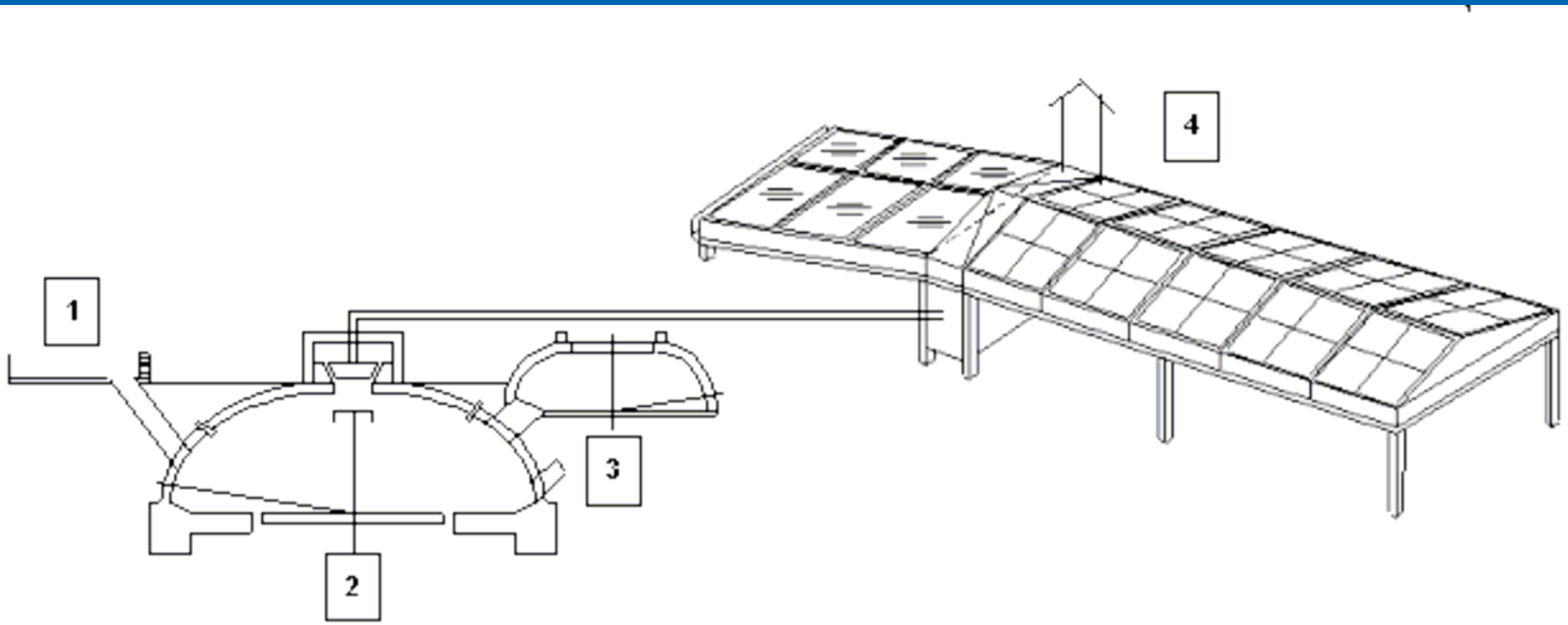
Roof integrated solar dryer


12.0 m.
2.5 m.
9.0 m.

Solar Tunnel Dryer for Agricultural Products Combined with Biomass Gasifier



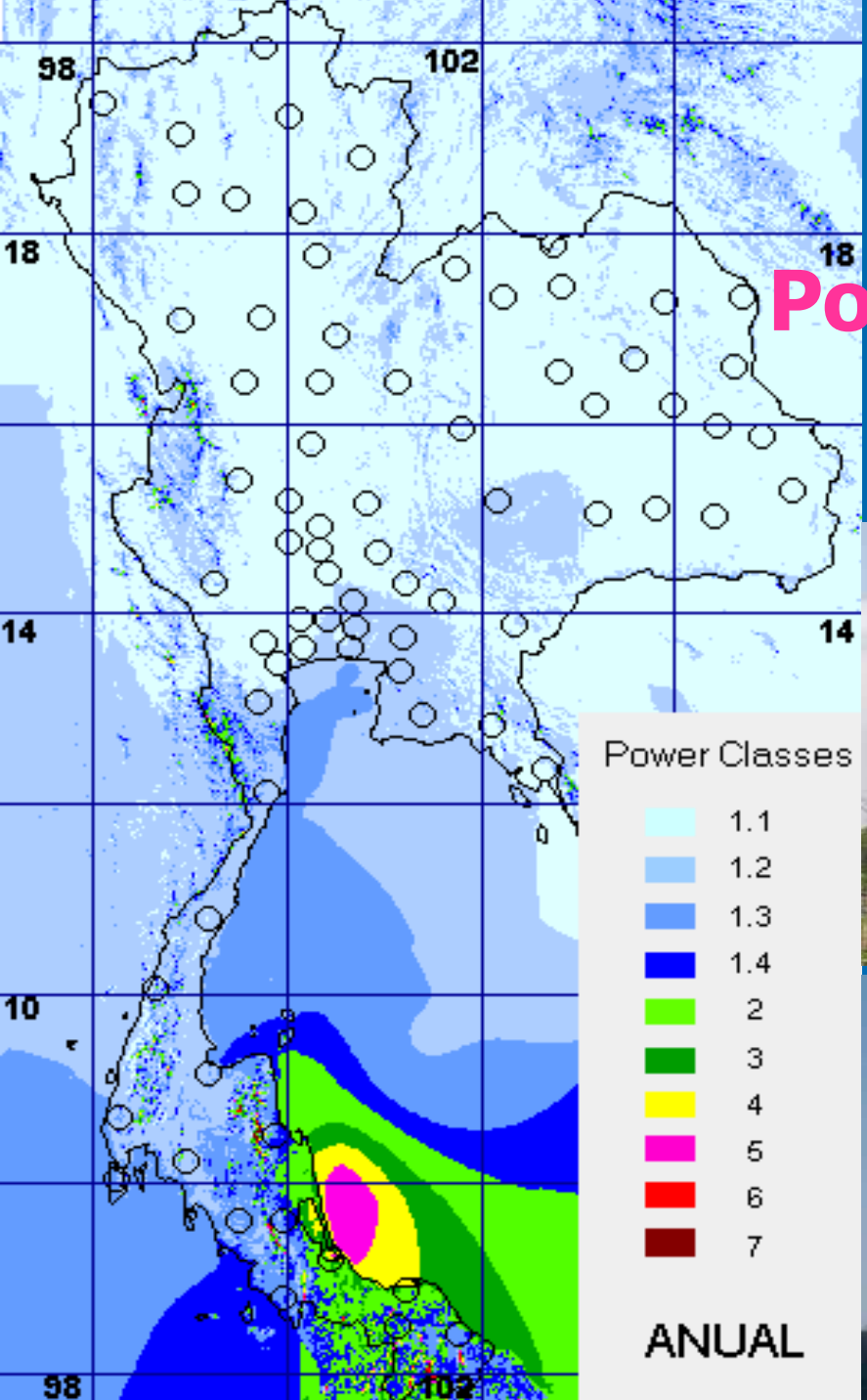
Solar Dryer Combined with Biogas

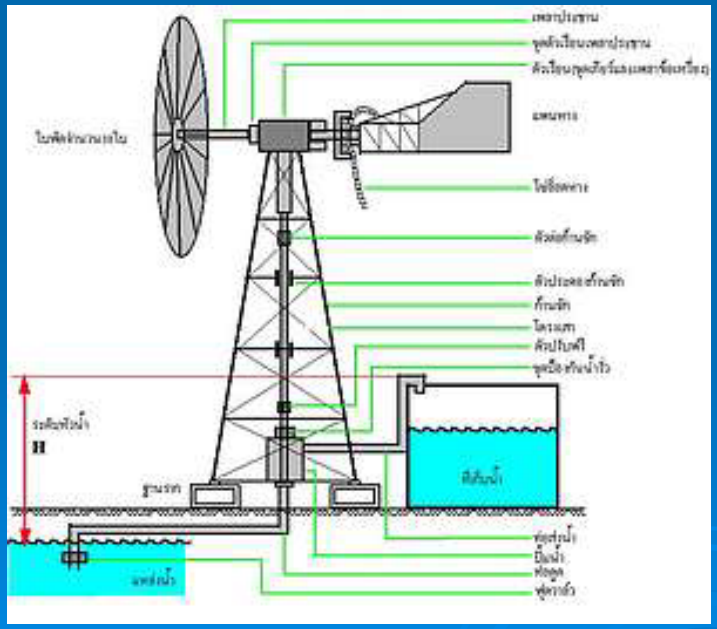


Wind Energy Potential Map

Average speed 4.4 - 6.4 m/sec

Power Potential 1,600 MW





constraints affecting wind energy in Thailand

-the absence of specific financing schemes designed to support wind energy development

-the absence of grid for connection in many rural areas

-the lack of wind data which is sufficiently accurate and industry standards to allow wind site identification

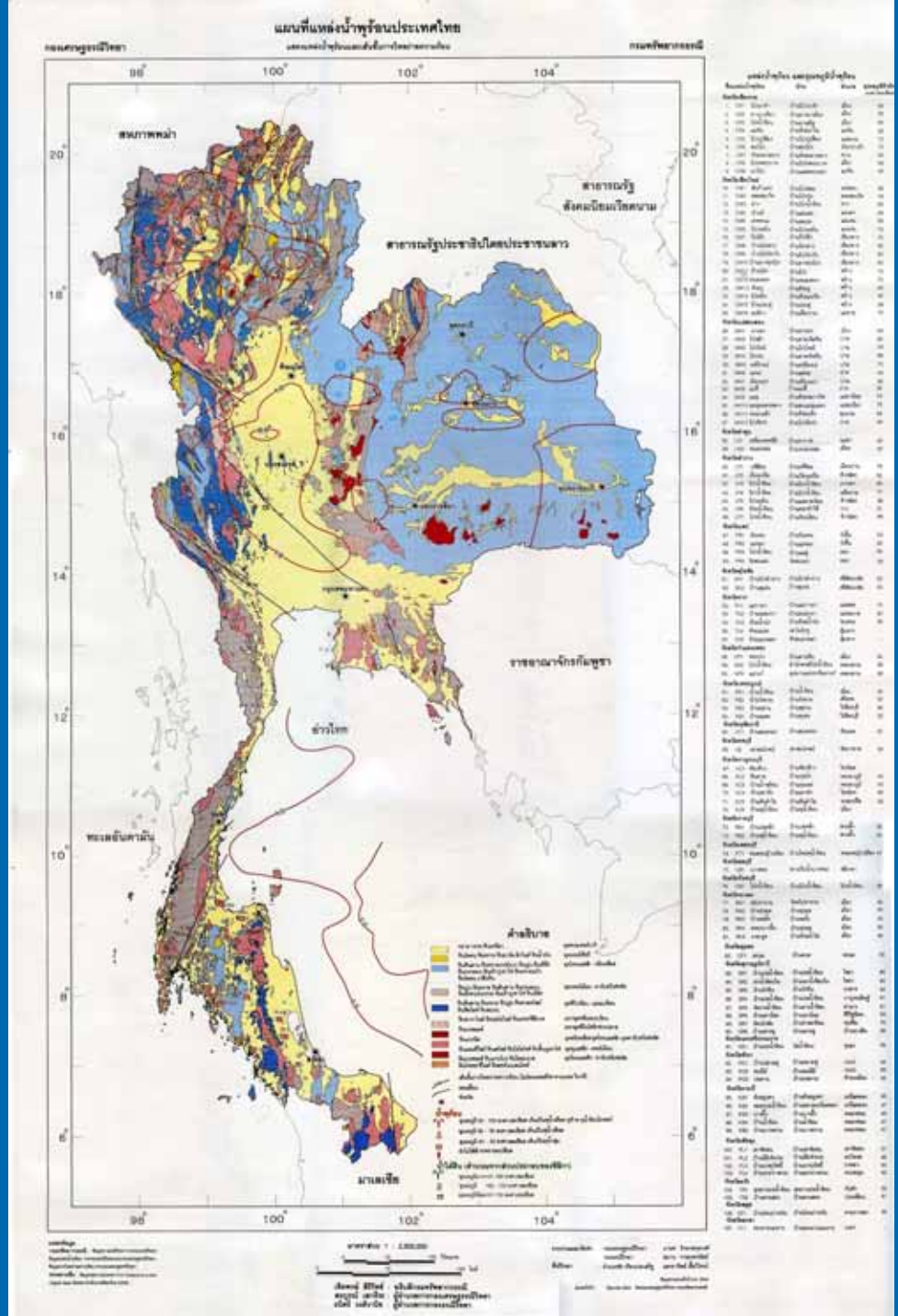
-the fact that some existing wind turbines are not functioning, which provides a negative reinforcement of the effectiveness of wind installations

- a low level of technology capacity in wind energy and no local manufacturing or distribution capacity

GEOTHERMAL ENERGY

Direct Uses

- Balneology (hot spring and spa bathing)
- Agriculture (greenhouse and soil warming)
- Aquaculture (fish, prawn, and alligator farming)
- Industrial Uses (product drying and warming)
- Residential and District Heating


แผนที่แหล่งน้ำผุร้อนประเทศไทย
สหภาพพม่า
สาธารณรัฐ
สังคมนิยมเวียดนาม
สาธารณรัฐประชาธิปไตยประชาชนลาว
ราชอาณาจักรกัมพูชา
อ่าวไทย
ทะเลอันดามัน
มาเลเซีย
คำอธิบาย
98°
100°
102°
104°
20°
18°
16°
14°
12°
10°
8°
6°

Energy conservation Strategies and Programs

- Energy Intensity
- Target of Energy Efficiency
- Highlighted Programs
  - Compulsory Program
  - Cooperative Efforts
  - Revolving Fund
  - Tax Incentives

Conclusion

Renewable/alternative energy will be the main energy resource next to fossil energy. Biomass, which has been mostly used as fuel in rural households and industries, will have a greater role as fuel in power generation and as an energy source for bio-liquid fuel production for vehicles.
Most of the renewable energy types have proved to be environmentally friendly. Therefore, promotion of renewable energy technology research and development is considered to be of great importance and will continue to be supported by the government.