

T.R. FINN & CO.

**Alternative Energy Investments in Thailand**

The Privatization Was Here

Bangkok, 10<sup>th</sup> July 2006



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## EXECUTIVE SUMMARY

Several trends are currently giving the world-wide energy market a new focus. Central to this change are the high oil prices, the liberalization of electricity and gas markets, the increasing importance of environmental awareness and climate policy, and the growing demand for energy in emerging economies.

The challenge to companies lies in responding promptly to the new requirements, perceiving them as an opportunity and offering innovative sustainable technologies and services on the alternative energy. We identify four market areas that are profiting from these trends and can be expected to grow at an attractive rate – renewable energy, distributed energy systems, natural gas and demand-side energy efficiency.

**Renewable energy sources** are practically CO<sub>2</sub>-free and available in large quantities. While today we use mainly hydropower world-wide as a commercially viable source of renewable energy, wind energy, bio energy and geothermal energy are also advancing towards competitiveness. With regard to photovoltaics (solar energy), the challenge lies in reducing costs. Wind and solar energy are experiencing the highest growth rates of around 25% p.a. Finland has the highest portion of renewable energy on its total energy supply portfolio, currently counting more than 15%.

**Distributed energy systems** will replace more and more of today's centralized supply structure as a result of the break-up of monopolies. Certain technologies are also suitable for energy supply in emerging economies without any existing grid infrastructure. Thus electricity production is moving closer to users, allowing for additional use of heat and increasing security of supply. In addition to micro

turbines and fuel cells, new storage technologies and power electronics systems will also profit.

**Natural gas** will play an important role in the medium term as it is the least CO<sub>2</sub>-intensive fossil fuel. Replacing coal with natural gas is therefore an effective step towards reducing climate problems. In addition, natural gas is the fuel of choice for many distributed energy technologies. World-wide consumption of natural gas will rise by more than 35% by 2010.

**Demand-side energy efficiency** is the fourth field offering sustainable growth opportunities. Attractive investment opportunities are to be found in Facility Management, i.e. innovative technologies (heating systems, new materials) and services (contracting, energy management systems) for the efficient use of energy in buildings. The mobility sector also offers opportunities to increase energy efficiency profitably, in particular in the context of new vehicle concepts such as fuel cell and hybrid electric vehicles.

By focusing on these four sustainability clusters and analyzing the value chain within the clusters, T.R. Finn & Co. has developed an innovative and comprehensive investment strategy for sustainable energy. Selected companies in these four emerging fields stand out as they simultaneously create added economic, environmental and social value, the basis for long-term success.

### “VALUE CHAIN” DIMENSION

We believe that the key to successful investments in sustainable energy lies in focusing on these four clusters. Within each cluster we need to identify the segments with the greatest growth potential. In order to do this, we need to answer a number of questions such as:



- Which competing technologies and services are able to meet the same customer demands in this segment?
- Which complementary technologies and services will profit from any growth in this segment, and which enabling technologies in turn support them?
- What are the competitive advantages of the individual technologies and services? When will they reach market maturity?
- In which target markets are conditions particularly favorable for the rapid diffusion of technologies and services? How large is the market potential?
- Who are the players in these segments?

An important element of the investment philosophy is the analysis of the entire value chain. Promising investment opportunities can be found not only at the level of the core product (e.g. fuel cells), but often also at upstream and downstream stages of the value chain (e.g. hydrogen processing using reformers). Often, products and technologies that enable the success of a core product (enabling technologies, e.g. catalyst and membrane materials) and can be used in a wide range of applications, are particularly attractive. Therefore, an investment portfolio that is attractively structured from this perspective requires not only an in-depth knowledge of the core product and its players but also knowledge of a broad field of interrelationships between technologies and markets.

### **OPPORTUNITY IN THAILAND**

The efficient use of renewable energy sources offers considerable long-term market potential from a financial, environmental and social perspective. They have an advantage over fossil fuels in that they have significantly smaller negative effect on humankind and the environment. However, only 2.7% of worldwide demand

for energy is currently met using renewable energy sources, of which hydropower represents 90%. The reason for this slow market diffusion is that many of the technologies have not yet or are only just reaching maturity and initial costs are relatively high. However, costs will continue to fall sharply in the coming years and competitiveness will grow as a result of increasing research and development efforts and achieving economies of scale as production volumes rise. The competitiveness is achieved earlier on in regions without an existing electricity grid. These are mainly regions in emerging economies in which electricity is currently produced using energy-inefficient diesel engines.

From the beginning of 1960s, Thailand has had rapid economical growth with only few years of decline. Between 1987-1997, "Thailand's Golden Era", the country experienced an average growth rate of 9%, the highest in the world.

Throughout the last three decades this transformation has put a dramatic pressure on natural resources in Thailand, such as water, forest and land. The population growth, rapid urbanization and industrial development has led to many environmental problems, such as increased water and air pollution, increased solid waste generation, as well as growing need for energy services. All of which have had negative environmental impacts. The need for the energy services are forecasted to grow dramatically from 13,311 MW in 1997 to 30,557 MW in 2001 (National Power Development Plan, 1999-2011, EGAT 1999). Currently, Thailand's energy services are primarily produced by big centralized power producing facilities based on fossil fuels.

The operation environment in energy sector is fairly open and transparent. The privatization of a state power producing assets (EGAT) was postponed in the last



minute in 2005. The liberalization drivers were active earlier and the government have issued 45 IPP (Independent Power Producer) and SPP (Small Power Producer) licenses. Compared to its regional peers Thailand's existing operating infrastructure for renewable energy investments is most supportive.

The main dynamic in renewable energy cluster in Thailand can be sum up as follows:

- Strategic industries are energy intensive.
- Total bio waste water 205 million M3/year (high BOD).
- Biomass potential power over 3000 MW.
- Waste to Energy technologies are available.
- Importation of crude oil 111.3 million liters/day.

Thailand's target on Renewable energy on the total energy supply for 2012 is 8%. The most exciting alternative energy opportunities in Thailand are in biomass and biogas sub-sectors in SPP niche.

The existing use on biomass for energy purposes are quite inefficient and based mainly on inappropriate technologies. The

market dynamics are changing rapidly though. The price of the most popular raw material for biomass plants, risk husk, has been on increase the last two years. Securing the supply of the raw material has turned to be the main problem for SPPs. There have been few initiatives for massive energy plantations, but we do not expect these projects to materialize in a short term.

Biogas offers business models with more stable cash flows. The new enabling technologies are also more efficient and the CDM/CER impact on the models is larger than on the any other renewable energy sub-sector.

The underlying issue on the most of the business models in biomass and biogas is still namely the fact that the CDM/CER is not yet operational in Thailand. The CDM/CER is a pact mechanism designed to help industrialized countries reach their targets for reducing greenhouse gas emissions by investing in clean technology or afforestation projects, known as carbon sinks, in developing countries in exchange for carbon credits. We expect first that Thai certificate to be verified and issued in 2007.