

**Pakistan Council of Renewable Energy Technologies**  
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**Concept Paper for  
Solar Water Heating**

**For further information**

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# **Concept Paper for Solar Water Heating**

## **The Energy Challenge**

Fuel prices have gone up drastically in recent years, triggering a decay effect in the growth of industrial sector. Industry in Pakistan has also been severely hit by this price hike. Textile industry, which contributes a 37% in exports, the worst affected of all. Other than high process, energy availability has also become one of the prime issues in Pakistan. Other countries in the region like China, India and Bangladesh are giving substantial incentives and subsidies to their industrial sector; the requisite is not happening in Pakistan. Even natural gas, which is a domestic product, has its resources depleting very quickly. SNGPL and SSGCL have issued repeated warnings against large consumption of natural gas saying that, by 2015, gas supply will not be available for domestic consumers. It is the responsibility of all stakeholders to prevent such a situation, Measures need to be taken to induce change in this whole scenario and the mindset of all stakeholders, so that Pakistan does not come to such a state of energy depreciation. We believe that these challenges can be adequately met by the use of alternate energy, such as solar power.

## **The Opportunity in Water Heating**

Hot Water s a major cause of energy consumption in the industry, it has varied usage in different industries. For example:

- Leather Processing; in leather industry
- Washing and recycling of bottles; in beverage industry
- Medicine production; in pharmaceutical industry
- Dying process; in textile industry
- Swimming Pool: in house and hotels

These examples show, but a very limited view of the broad range of applications of hot water in the industry. All water heating is based on the boiler is stem .The boilers are usually run on natural gas, because of its cheap price in recent years. A large part of the industry also utilizes HFO, which s three times more expensive then natural gas.

## **Solar Based Industrial Water Heating System: The Energy Solution**

Keeping in view this simple, yet important requirement of hot water, Solar Based Swimming pool Water Heating System has a huge utility when integrated to run in hybrid with the existing boiler system. The system is an innovative and prolific design which consists of the following components:

- **Evacuated Tube Collectors / Heat Pipe Tubes**
- **Heat Exchanger**
- **Circulating Pump**
- **Storage Tank**

These components are integrated to design an optimum system which could generate the requisite amount of thermal energy, which can be transported to the water storage tank to raise the water temperature from 20 degrees Celsius (room temperature) to 80 degrees Celsius (hot water temperature). The overall system efficiency is around 50 % which is equivalent to the system efficiency of an average boiler system. With the integration of this system into the existing boiler system, natural gas consumption is reduced from 50-70%

Hot Water Requirement **30,000 Gallon or 1, 350, 00 liters of hot water per day**

**Amount of Heat Required to Rise Temperature for  
135000 liters / day**

**53613225 BTU or  
56.564941 GJ or  
53.613225 MMBTU**

Energy Supplied in Boiler system for heating  
**1, 350, 00 liter of water (@ 50% Efficiency system)**  
Amount required per year

**107.22645 MMBTU  
11.5804 Million Rs. per year**

Cost of Natural Gas for Boiler System (per month)  
Cost of Natural Gas fro Boiler System (per year)

**0.965 Mil Rs.  
11.5804 Mill Rs.**

Cost of Solar Water Heating System for heating  
1, 350, 00 liters of water / day (@ of 200 / liter)

**27 Mil Rs.**

**Collector Area for the system**

**1350 square meters**

Operating Cost of Solar Water Heating Pump per Year  
Payback period  
System life

**10,000 Rs.  
3 Years  
10 years.**

### **Carbon Credit**

Other than the savings in energy cost, this solution is compliant with the Clean Development Mechanism employed by Kyoto Protocol. The carbon offset produced by this system can be converted in Carbon Emission Reduction units and sold to large scale funding agencies and corporations in Europe or other developed regions. Following are some indicative figures.

Carbon Credit for Natural Gas /day

1072.2645 x 117.6

126098.3052 Ibs /day

Carbon Credit for Natural Gas/year

126098.3052 x 365 =

46025881.398 Ibs year /2.5

1,841,035.25592 Kg

1841 Tones

Carbon credit for 1841 Tons in US \$

3.16652 \$ US

Ref: Indicative Cost of one carbon Credit according  
to current rates **20\$/Ton), (Exchange rate 1 \$ = 86 Rs)**

Indicative Cost of 18410 Tons in Pak Rs.

3.16652 Mill Rs. / year