

Potential Benefits in Solar Water Heating in South Eastern Countries



Slavoljub Mijovic
 Faculty of Sciences, University of Montenegro
 Cetinjski put bb, 81 000 Podgorica, Montenegro
 e-mail: slavom@rc.pmf.cg.ac.yu

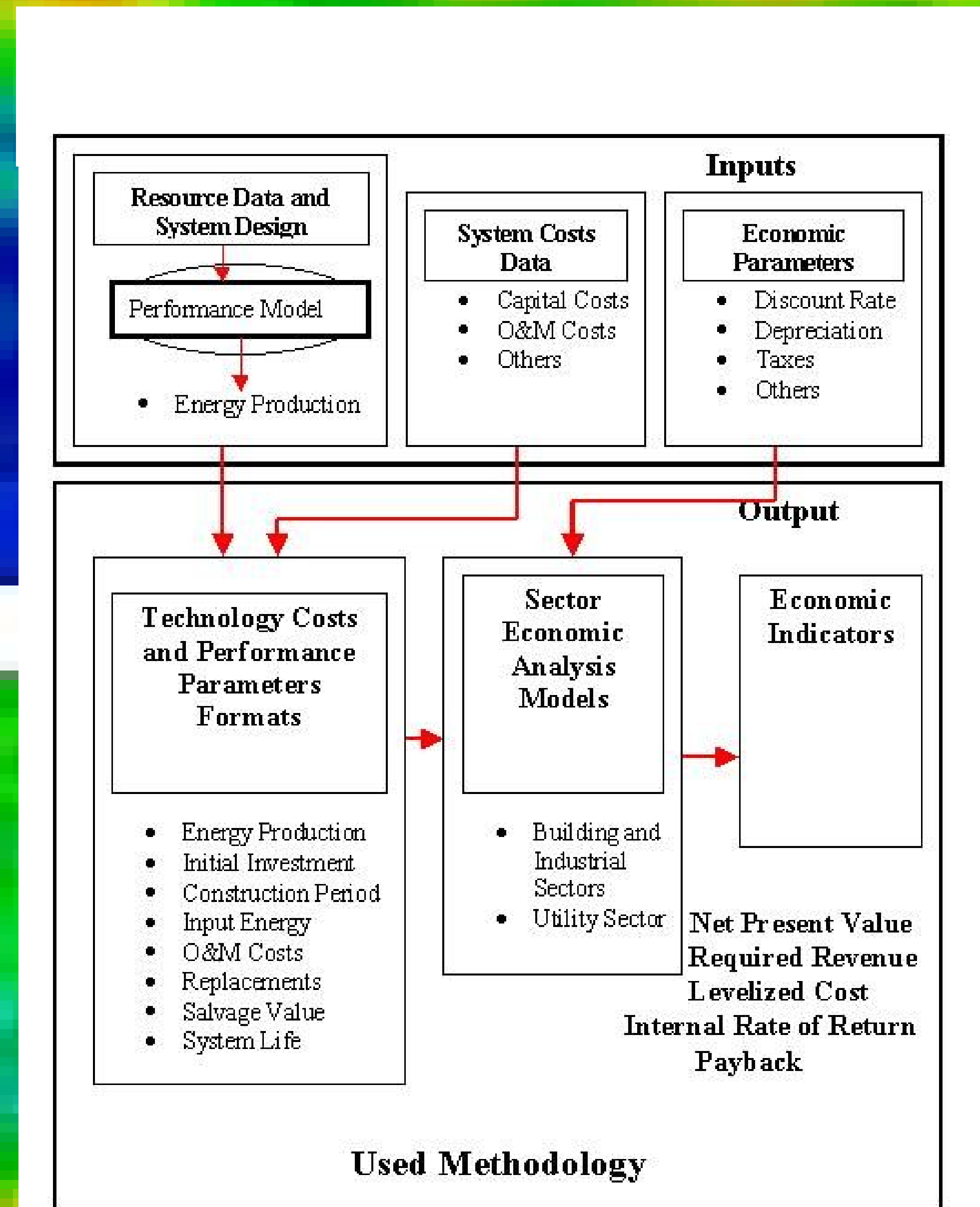


Abstract:

Many South Eastern countries like Montenegro are suffering from the lack of energy. The increasing demand for energy is a consequence of switching to the new political system, democracy and free market.

Solar water heating is a promise technology, where the price of saved electricity is comparable with the current price of electricity. The main reason for that is in simplicity of use such energy without its transformation.

The analysis are conducted in accordance to current trends in climate changes and prices for the new technologies.



Case study: multi apartment building in Bar (Adriatic coast)

* Annual Total Global Insolation 5.85GJ/m²-year

Assumptions

- Solar collector efficiency 40%
- Collector Area 200m²
- Net Annual Energy Production of Thermal Energy (E1) 468GJ/year
- Value of thermal energy produced in year zero (Ve1) 13.90;
- Back-up System Efficiency (C1) 100%;
- Annual real increase in price of saved thermal energy (er1) 3%;
- Annual amount of required input energy (L)-700kWh/year
- Price per unit of input energy purchased in year zero dollars (Pei) 0.05\$/kWh
- Annual real increase in input energy prices (e_{ie}) 3%
- Annual average operating and maintenance cost in year zero dollars (OM) 1000\$
- Equipment Replacements (Rmi) Year 10-Pumps/controls 1000\$
- Total Installed Investment Cost 60,000\$
- Nominal discount rate (kn) 10%
- General inflation rate (h) 0%

Expected system lifetime 30 years

$$\text{After Tax NPV} = (1-T)(Ve - Le - M - R + S) + (T)(D) - I$$

(T- marginal tax rate of the investor; Ve- discounted value of annual cost savings through energy production, savings, or displacements; Le- discounted value of annual expenses for input energy; M- discounted value of maintenance and operating costs; R-discounted value of replacement cost, S- discounted value of the salvage value in year n; D- discounted value of the series of depreciation terms; I- discounted cost of the investment)

The calculated economic indicators:

SIMPLE PAYBACK (SP)	10.9 years
AFTER TAX NET PRESENT VALUE (NPV)	12,530 \$
PROFITABILITY INDEX (PI)	1.2
INTERNAL RATE OF RETURN	12%

References

- Guidelines for the economic analysis of renewable energy technology applications 1991, Quebec Canada, 1991.
- S. Mijovic: Solar water heating analysis for Yugoslavia, Renewable Energy Journal, Vol. 17, No 1, 1999.

Workshop: Climate Change in South-Eastern European Countries: Causes, Impacts, Solutions

Monday, 26th March – Tuesday, 27th March 2007. Graz, Austria

