QUANTIFYING ENVIRONMENTAL EXTERNALITIES AND ITS IMPACT ON ELECTRICAL ENERGY PLANNING IN EGYPT

Submitted By

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B.Sc. of Engineering (Electric Power), Faculty of Engineering, Cairo University, 1997

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A thesis submitted in Partial Fulfilment
Of
The Requirement for the Doctor of Philosophy Degree
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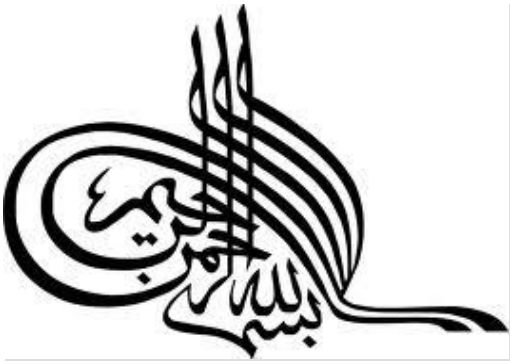
بسم الله الرحمن الرحيم

To the Great Magda, My Wife and Mother of my three beautiful daughters: Maryam, Mira & Mirette for her utmost love, great faithfulness and honest dedication..

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ABSTRACT

The supply and use of energy causes damage to a wide range of receptors, including human health, natural ecosystems, and the built environment. Such damages are referred to as external costs, as they are not reflected in the market price of energy. In the absence of systematic information based on quantifying externalities of competing energy sources and technologies, the Government of Egypt can not take necessary action for achieving optimal allocation of resources through market forces. Also, the need to avoid market distortions, caused by ignoring social & environmental externalities, is becoming a necessity in day-to-day practice.

Taking account of these impacts in energy policy, planning and operation could alter the magnitude and mix of resources used to meet energy demand with salutary effects for the environment, public health and long-term ecological and economic sustainability.

The main objective of this thesis is to establish externalities assessment on national level via using new methodological elements for integration into the existing cost accounting framework that reflects the new developments in the assessment of external costs. This Work contains the following procedures:

1. Develop an effective "bottom-up" methodology.
2. Assess fuel cycles utilized in Egypt consistently (the entire cycle for each fuel type and technology).
3. Perform reliable assessments of marginal costs.
4. Identify key externality issues for future policies.

Impact assessment and valuation is performed using the "damage function" or "impact pathway" approach. This approach assesses impacts in a logical manner, using the most appropriate models and data available.

The acquired conclusions interpret the externalities significance, which enhances the use of alternative power generation options, particularly renewables and climate-friendly power production, such as nuclear power and cleaner fossil technologies.

The research considered here calls for transformative change from conventional power sector planning to integrated resource planning, which makes it possible to explore linkages, evaluate trade-offs, internalize externalities and compare consequences, thereby help develop an effective energy/ power strategy that supports national sustainable development goals.

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