

# Sustainable Energy: A Strategic View of Fuel Cells

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**Abstract-** Based on the model of the proton exchange fuel cell in a strategic context, this document develops the issue of energy as one of the pillars to achieve the sustainability of our planet, considering the future scenarios up to the year 2060 of the situation energy, hydrogen as a strategic vector and the contribution of the fuel cell in solving the serious problems of environmental pollution and economic inequity that humanity faces; for its application in the energy generation, telecommunications and vehicle manufacturing industries.

Abreviaturas

IEA Agencia Internacional para la Energía  
IPCC Panel Intergubernamental del Cambio Climático  
WEC Consejo Mundial de Energía  
WWF Fondo Mundial para la Naturaleza  
EEA Agencia Europea para el Ambiente  
WBG Grupo Banco Mundial

**Keywords-** Sustainability; energy; hydrogen economy; fuel cell.

## 1. Introduction

A comprehensive and detailed review of the concepts of the fuel cell as well as the design and development of products allow us to propose the following novel model at the system level (figure 1), where it is proposed [1,2]:

Level 1. Hydrogen economy. An analysis at strategic level to have a global vision, identifying three processes that are the top-level processes of the fuel cell (E1-E3).

Level 2. Fuel cell. Operational level that analyses in detail the operation of the fuel cell and identifies eight processes productive to optimize it (P1-P9).

Level 3. Applications. Operational level that analyses in detail, the processes that support the proper functioning of the battery (A1-A2).

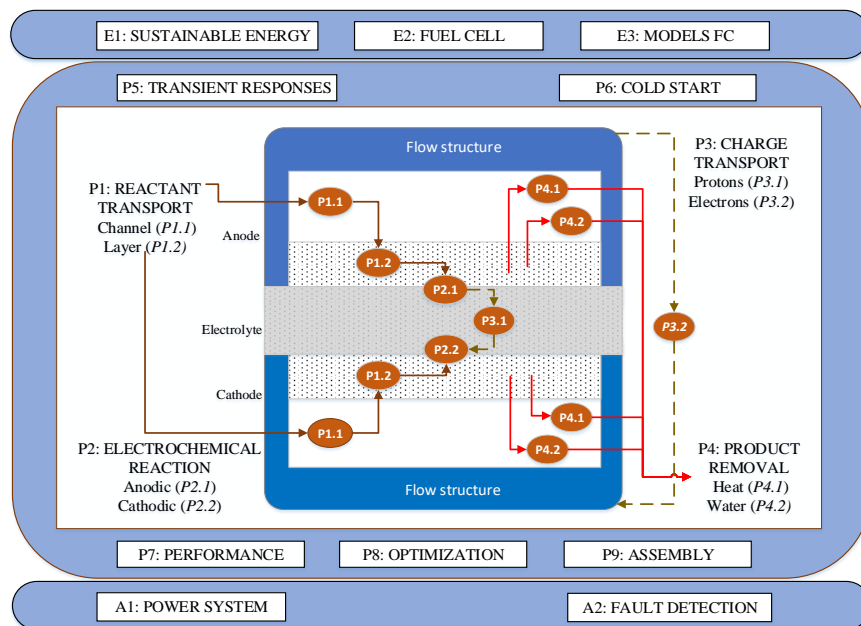


Figure 1. New system-level model for the fuel cell in a strategic context  
 1.1. A Strategic Vision of Hydrogen Economy: Sustainable Energy (E1)

To guarantee the sustainability of our planet, the great problems of today's society such as climate change, the reduction of the ozone layer, toxic pollution, among others; they must be confronted by the academy and in particular by the engineering sciences. The big problems can be grouped into three themes, environment, economy and energy; issues that are strongly connected and that are interdependent, so a holistic vision is necessary if you want to obtain good results.

Based on the reports presented by several internationally renowned organizations (IEA, IPCC, WEC, WWF, EEA, GWB, Shell), the following scenario for the future of the world energy situation has been raised. Graphing renewable energies (figure 2):

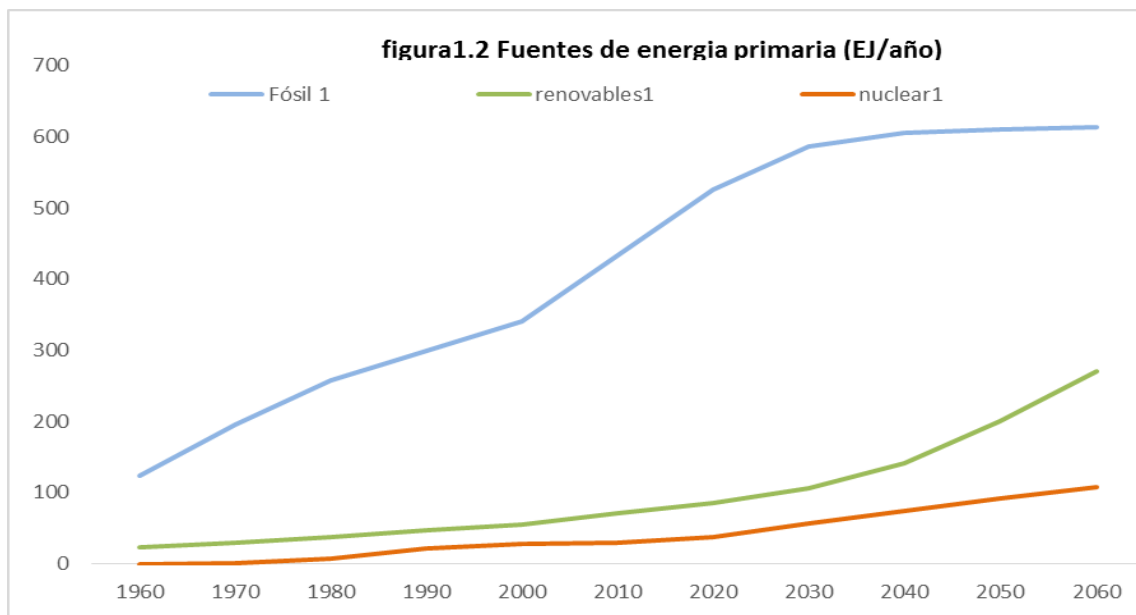


Figure 2. Future scenario of energy sources

Fossil energies tend to stabilize by the 600 EJ (and even decrease by the year 2060), and there is greater growth of renewable energy, compared with that provided by nuclear plants.

## **2. Conclusion**

They are presented as a result of the work:

➤ The model of the fuel cell from three points of view: 1) as a strategic element in the hydrogen economy, 2) as a productive element that generates sustainable electrical energy and 3) as an element supported by various sciences.

➤ The model would allow professionals trained in the engineering sciences to conceptualize the fuel cell issue from a holistic, strategic and process point of view; strengthening the dream of a sustainable land, where the energy generated by fuel cells is presented as an opportunity for fair economic growth.

➤ A better conceptualization and ordering of the concepts that have allowed the development of the fuel cell; concepts of engineering sciences, physics, chemistry, mathematics, administration and economics.

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