Sustainability, Renewable Energy and Data Engineering

Manuel Pumar Pacheco[1]
Physicist
(Acciona Energía, S.A)

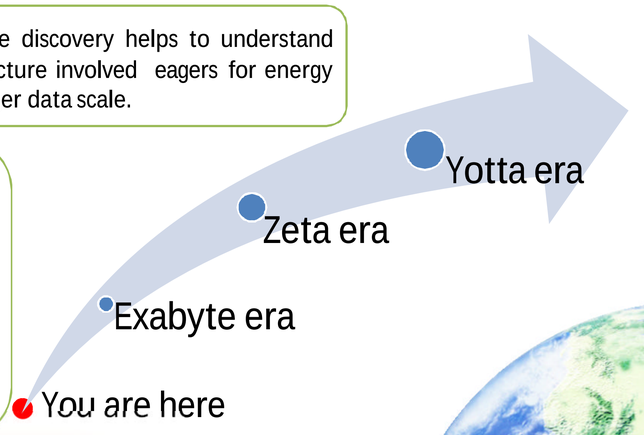
Abstract

Sustainability implies a balance in resource consumption and effortless environment integration. One of the first links in the chain is the energy resource. Renewable Energy represents an essential building block over which to support the rest of the construction. In an advanced Information Society, complex, distributed and multi format sources of information, necesarry to design, integrate and supervise such sustainable systems require front edge Information Techonology developments in order to intelligently and successfully analyze the big data scenery that present technology is able to produce. Lack of expertise and experience in new information paradigms presents an obstacle to overcome. Focus on particular information technologies adds a plus in rapid target achievement.

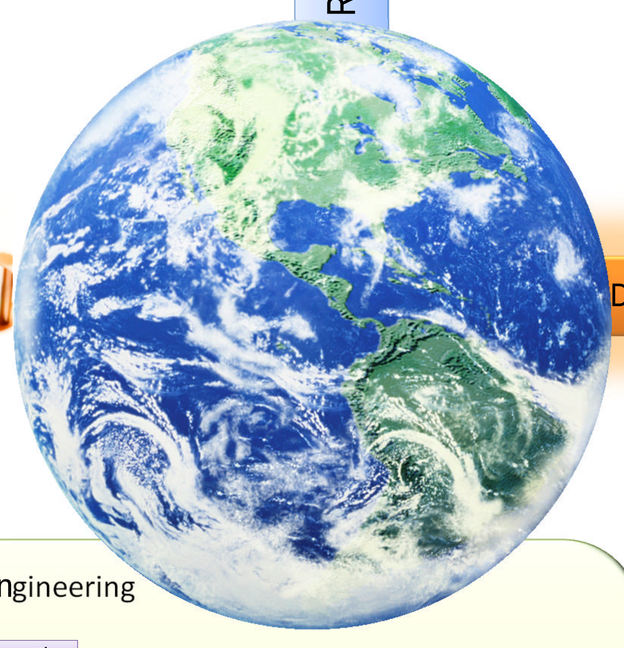
Sustainability (d*efinition*): The ability to extract a benefit from oscillating systems, by discovering their natural frequencies and coupling with them not damping excessively those systems in the long term. Benefit and long term are referenced to human beings conceptual framework.

Paradox: The new paradigm of knowledge discovery helps to understand sustainability but the present digital infrastructure involved eagers for energy and will divert from being sustainable with bigger data scale.

Solution: The new paradigm allows faster and deeper scientific discovery. Energy consumption difficulties will be overcome by
-Post silitium era
-Nanotechnology
-Quantum optics
-Material science
(.....)
+ Renewable Energy



Renewable Energy (HPC prone)



Life Cycle of a Renewable Power Plant (Wind, Solar, Hydro, Ocean)

Resource Assessment | Design | Engineering and Construction | Operation and Maintenance | Decommissioning

Risk Analysis

Planet Earth Sciences:
Atmospheric and Space Weather & Climate, Oceanography, Hydrology, Geology (Forecasting)

Reanalysis | Decadal | Seasonal | Monthly | Daily | Hourly | Short Range

- Digital Manufacturing
- Remote Operation & Control
- Maintenance Programming
- Energy Dispatching
- Grid Integration
- Electricity Market Conditions

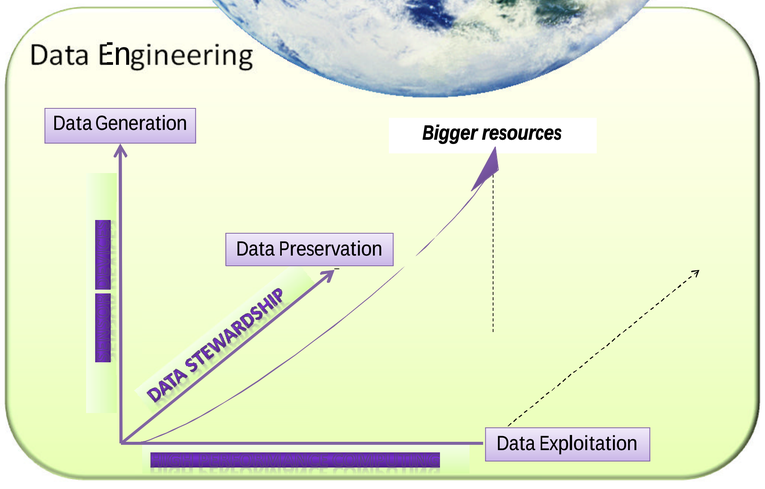
Renewable Energy Information Technology

Digital Earth + Digital Energy > Stream Energy Management

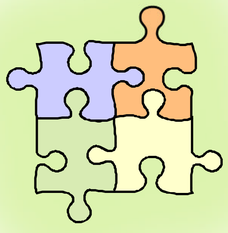
IT Concepts Catalog:

Virtualization	Error detection
Parallelism	Sensors fusion
Provenance	Tera Hertz electronics
Metada	Extreme computing
Visualization	Stream computing
Sensor web	Analysis of Big Data
Data formats	Local/Distributed Storage
Data search	CPU/GPU
Querying	Semantic web
Interoperatibility	Ontologies
Persistent/Transactional	.....
Resiliency	

Fundamental Ideas in QR Code



To achieve ***sustainability*** by efficiently matching the pieces that build up your system, ***complexity*** of that system must be fully understood.



<u>Strengthen and Foster these technologies</u>

- Interoperability
- High speed data technology
- Visual Computing

1st | 2nd | 3th

[1]Currently at Acciona Energía, Av. De Europa 6, 28108 Alcobendas, Madrid, España.
E-mail: mpumar@acciona.com
*The opinions stated here are those of the author, and do not represent opinions of Acciona Energía, S.A.

<u>Recommended reading</u>:
Big Data: The next frontier for innovation, competition and productivity. McKinsey Global Institute. James Manyika et al. May 2011.
Energy for a Sustainable Future. The Secretary-General's Advisory Group on Energy and Climate Change (AGECC). Summary Report and Recommendations. April 2010.
Managing the Risk in Renewable Energy. A report from the Economist Intelligence Unit. Sponsored by Swiss Re. October 2011.
Technology Roadmap. Smart Grids. International Energy Agency. OECD/IEA 2011. Drafted by the International Energy Agency's Energy Technology Policy Division.
The Fourth Paradigm. Data-Intensive Scientific Discovery. Edited by Tony Hey, Stewart Tansley and Kristin Tolle. Microsoft Research, Redmond, Washington.
The Future of the Electric Grid. An Interdisciplinary MIT Study. 2011
The International Exascale Software Project Roadmap. Jack Dongarra et al. Organized and Supported from a variety of National Agencies and Corporations.