

The Global Energy Observatory: A collaborative website for one-stop information on energy systems
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The energy-climate challenge—providing affordable energy to the global population and mitigating climate change and environmental degradation—is an urgent problem of unprecedented scale and complexity. Unaddressed, the many non-linear feedbacks with multiple timescales could lead to runaway solutions that would have very high impact for international security and human welfare at all scales. Addressing it requires technology innovation, the associated infrastructure the financial capacity for fast diffusion; resource management and optimization, and cooperative action based on the principal of shared fate and protecting common goods. Countless efforts in all parts of the world are underway to attack the problem on all fronts—from innovation, to creating new business opportunities to education and conservation. The proposed goal of our effort is to create an open collaborative data exchange framework to facilitate Volunteered Geographic Information. We are collecting and integrating open data existing in heterogeneous formats, and linking it with real-time analysis tools to understand the dynamics of change in energy systems, and the opportunities for accelerating development and the transition to carbon-neutral systems.

Energy systems form visible tangible networks that span the globe. To understand these requires real-time geo-spatial and time referenced analyses of both energy systems and their impacts. Given the scale of the networks, their complexity and often fast rate of change, and the large regional variations and options we wish to demonstrate that a system that incorporates Volunteered Information is a powerful tool and will provide a cost-effective solution. We have therefore built a web-based tool called the Global Energy Observatory (GEO) (<http://globalenergyobservatory.org/>) to provide a one-stop site for detailed unit-by-unit information on energy systems. This wiki-like framework is being enhanced with semi-automated tools to moderate and continuously validate and verify data for scientific integrity.

GEO is a relational database that houses geo-located and time referenced data on power plants, fuels and resources and energy transmission systems. It also includes a survey, still under development, called “Reducing Our CO₂ Footprint”, to study consumption at individual’s level whose growth will rely solely on volunteered information. The categories of infrastructure/use data being collected include:

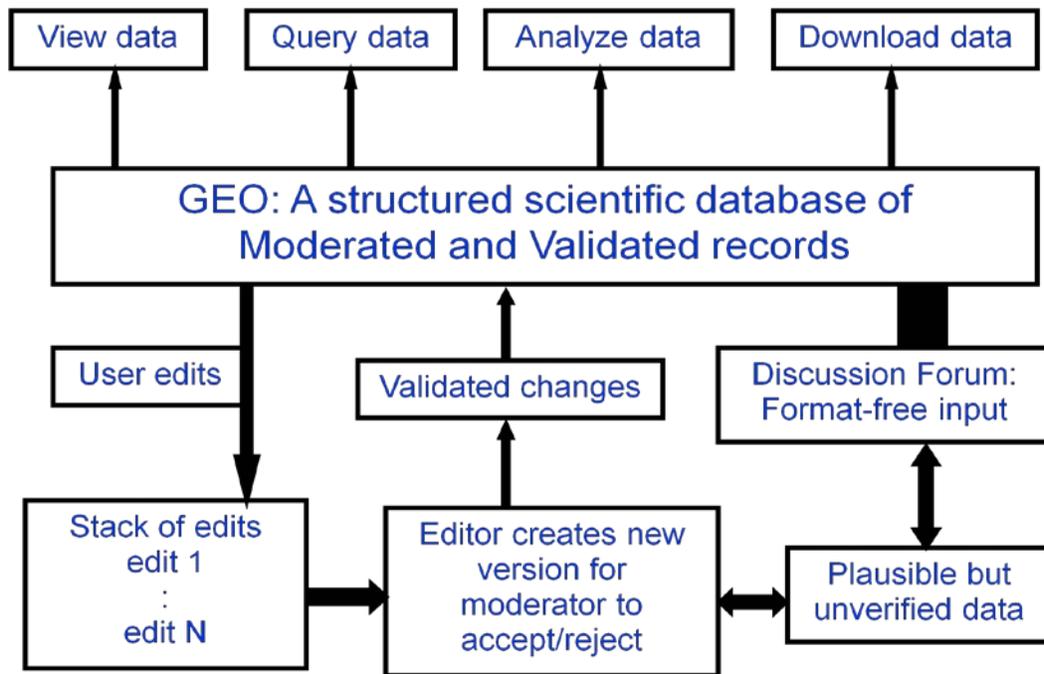
1. Power plants: Coal, gas, geothermal, hydro, nuclear, oil, solar PV, solar thermal, waste, and wind power plants. We impose no cut-offs on the size of plants included. Different sizes can be resolved easily by appropriately written queries.
2. Fuels and resources: Gas and oil fields, coal and uranium mines, crude oil refineries, solar and wind potential, CO₂ sequestration, and biomass (agricultural) and water resources.
3. Transmission Infrastructure: Gas and oil pipelines, coal, LNG and oil ports, rail and road links, shipping lanes and the electric transmission grid.
4. Carbon footprint of individual end-users, their understanding of the EEDC challenge and installations of distributed generation (solar, wind, heat pumps) and storage systems for individual homes, commercial buildings, institutions and communities.

For example, GEO contains detailed information on all grid-connected power plants in India and their geo-spatial relationships are displayed using APIs to Google Maps and Earth. It has been developed

using a traditional Web-based LAMP (Linux, Apache, MySQL and PHP). Analysis and data sharing tools to study the four types of energy infrastructure/use are being developed on top of this. Having developed GEO using open software, we have complete control over the software and can make changes and improvements quickly, including enhancements to open data exchange standards that are under development.

The GEO framework accepts contributions and edits from the public (Volunteered Information), i.e., GEO is functioning as a moderated wiki. Data contributed by the public is edited and moderated before inclusion into the scientific database. The moderation process mimics the peer review process followed by scientific journals. This is illustrated by the flow diagram below.

Flow Chart of the Global Energy Observatory



Extending the current system and data that has mostly been harvested from “official” sites to eventually creating and maintaining the global network of energy systems based on volunteering information, will require facilitating a collaborative effort on the part of the global community of internet users. For this reason we view GEO as a framework that we are seeding but whose success will be depend on VI.

Our presentation at the workshop will describe the status of the GEO project and the steps we are taking to facilitate Volunteered Geographical Information and engagement by the global community. We will present examples of how geographic information is being used to address the urgent energy-climate challenge. We will also discuss the interesting issues we have faced with respect to geographical information and maintaining data integrity within our moderated wiki that allows VI.