Wind Energy Community of Practice (WECP)

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- **Objectives of the CP**

The objective of the Wind Energy Community of Practice (WECP) is to support GEOSS outcomes related to the application of Earth observation data and information toward advancing the siting, forecasting, integration and operation of wind energy. The wind energy community is interested not only in the energy component, but also in the weather and climate benefit areas. Some in the wind energy community are very involved with boundary layer meteorology (weather forecasting, topography, and land use data) and climate change.

The Wind Energy CP will directly contribute to the goals of the energy benefit area of GEOSS for improved management of energy resources. Specifically, *"GEOSS outcomes in the energy area will support: environmentally responsible and equitable energy management; better matching of supply and demand of energy; reduction of risks to energy infrastructure; more accurate inventories of greenhouse gases and pollutants; and a better understanding of renewable energy potential."*

The overall focus of our WECP will be on defining how to realize the benefits to wind energy that GEO is offering - "delivering on GEOSS". To accomplish this, the CP will:

1. Create a working group with broad representation to ensure that GEOSS is relevant and effective for the CP implementation. The intent is that this group will function as a steering committee with worldwide representation (rather than as a large user group), recognizing and building upon activities from GEOSS, ESA and others as they relate to wind energy.

2. Identify existing and anticipated new user requirements for the wind energy community. The community is end-to-end including system planners, modelers, financiers, manufacturers, users and those that interface with it.

3. Identify the present status and gaps in meeting the above requirements, particularly for earth observation data, information and systems.

4. Document and prioritize requirements of major stakeholders in wind energy for current and future earth observations.

5. Develop and act as a focal point for implementing a plan to address the needs of the wind energy community.

6. Work closely with other User Interface CP teams, the User Interface Committee and other GEO committees to link and

coordinate plans. Coordinate with CP teams where overlapping technical information is required for CP objectives and results.

7. Facilitate outreach in support of the above objectives, and implement a communications plan that will inform the wind energy community about GEOSS and provide opportunities for GEO leadership to interact with major stakeholders.

- **Societal Benefit Areas addressed by the CP**

  Wind energy is the fastest growing source of energy in the world today. Many countries have very substantial wind resources as well as large and growing demands for electricity. Yet, meeting wind energy goals will require intelligent siting of wind plants and advanced utility wind integration tools to minimize life cycle operations costs. For example, improved wind forecasting is crucial to the integration of wind into energy utilities and the major source of cost savings.

  The quality of a wind energy forecast depends on accurate weather data over a large area, knowledge of the local terrain, and modeling of local terrain effects. Predicting when a significant frontal system will pass and when extreme local weather events will occur are crucial for a power system operator who must prepare for changes in wind plant output. Predicting wind energy contributions to the system over the coming hours and days is critical to the efficient operation of the power system as a whole.

  For example, with a good wind forecasting system, the New York state utility grid is projected in 2008 to realize annual savings of $95 million. Just the forecasting component in the US can be projected in 2020 to save over one billion dollars annually. Even more savings are possible in China from state-of the-art wind forecasting. Extrapolating to worldwide wind capacity, the potential annual savings is $1.4 billion today and perhaps $34 billion in 2020. Depending on forecast location and on data quality and availability, current systems might capture half of that annual savings.

  Utility acceptance of wind technology could be strongly influenced by such projected annual savings. The Wind Force 12 document prepared by the Global Wind Energy Council provides a blueprint for achieving 12% of the world's electricity from wind power by 2020. This goal is almost twice as aggressive as figures given by groups in the US and China, but it are considered to be an achievable goal.

  GEOSS can help in the realization of these dramatic financial impacts by contributing to enhanced siting, forecasting, integration and operation of wind energy. These enhancements will follow from GEOSS helping in specific societal benefit areas such as improving weather forecasting and boundary layer meteorology, and improving the quality, timeliness, and accessibility of topography and land use data. The Wind Energy community

of practice, as part of the broader renewable energy CP, will provide a nucleus for users and developers to give inputs and gain understanding of GEOSS.

- **Justification – Value of the CP over existing collaborative activities**

  Wind energy siting and operations require disparate information classes such as:

  - high-accuracy weather data archives for siting modelling;
  - weather forecasting in all timeframes (from "now-casting" through long-range forecasts);
  - boundary layer meteorology including the analysis and forecasting of low-level jets;
  - climate analysis of temporal and spatial variability;
  - extreme event analysis and temporal change; and
  - infrastructure GIS, land use and surface roughness data.

  Currently, wind project developers must typically collect onsite data with private meteorological towers for a year or more before they can finance or build their projects – a process that slows the implementation of wind energy and may not locate projects in an optimal way. While modelling for both large-scale wind mapping and high-resolution site assessment purposes is increasingly showing value, the wind energy community would directly benefit from improvements to the datasets that provide the raw materials for this wind energy-specific modelling. And most certainly, the use of large amounts of wind energy on utility systems will require ongoing improvements in wind and weather forecasting so that the energy can be scheduled into the utility system without imposing undue costs and operating impacts due to the variable nature of the weather.

- **Value of the CP – Creating a Common Voice for Advocating that Current Shortcomings are Addressed**

  The Global Earth Observation System of Systems (GEOSS) 10-Year Implementation Plan *(As adopted 16 February 2005 by the Ministers in Brussels, Belgium)*, the section #3 entitled "The Case for a Global Earth Observation System of Systems" noted the following shortcomings. The Wind Energy CP will serve as an ideal user community for GEOSS in this regard. The shortcomings…

  • For many users, appropriate data are hard or costly to access, or

are in a form that is difficult to interpret, or are of uncertain quality;

• There is inadequate involvement of data users in specifying the information requirements;

• Delays in data access sometimes prevent the timely use of information that could save lives or minimize loss of property;

• The generation and dissemination of products using large volumes of data often lags far behind the collection of observations;

• Spatial and temporal coverage is not optimized, leaving large parts of the globe under-sampled, diminishing the effectiveness of sampling systems in regions with adequate observations;

• Observations of the same variable in different places or by different agencies may not be able to be combined, because the methods used to measure it are different, do not follow agreed standards or are not adequately intercalibrated, or because the time and space resolution or the data structures in which the observations are stored have significant incompatibilities;

• There is redundancy in observation effort resulting from lack of coordination and an inability to use one observation to serve in a number of different users. Observation systems and networks are planned separately by different domains, and the economic and scientific benefits of co-location are rarely realized;

• Many observations derive from research projects lacking the long-term stable funding and staffing needed to collect and manage consistent observations over long periods of time;

- **Membership – Typology of members sought**

The Wind Energy CP will include:

End users (particularly national wind energy associations and operators) to support the requirements definition and assure a practical assessment of functional drivers;

Participants from the national programs to address government objectives and capabilities;

Members with meteorological, modelling and remote sensing (earth observation) expertise, including scientists with research and development expertise.

To limit the number of direct members, each of these three technical areas will be represented by one or two key individuals with substantial contacts and resources outside the Wind Energy CP. The target size of the Wind

Energy CP will be approximately twelve people, with others working with the CP in specific areas or actions.

- **Working methods – How this CP will operate**

  A core group of the Wind Energy CP will reach out to users to understand and compile a list of current and evolved requirements. This will be done through correspondence, contacts at topical meetings and selected interviews.

  A number of interactive computer/telecom meetings are planned on a routine basis (every 30-60 days) to assess issues and progress in developing the Wind Energy CP products. Workshops will be held at one or more international meetings of users during 2006 to provide a forum for discussion.

  The requirements developed through these interactions and consolidated by the Wind Energy CP will be vetted through the user and the science and technology communities. Selected members of the CP from these communities will facilitate access and interface. This step is to assure that the requirements are realistic within the time frame and capabilities of GEOSS and the national programs.

  A second parallel activity is to understand the benefits of improved earth observation data and information. The Wind Energy CP will look to the modelling community and operators to combine experience with sensitivity analyses. These will be drawn from national programs and participating organizations who will be invited to support this assessment. The combination of the gap analyses and this activity will form the basis for a recommendation for the longer term implementation plan.

  An integrated document will be provided to both the user and provider communities for confirmation of priorities and as part of an interface with other applicable societal benefit areas such as those related to weather, climate and energy. From this review, gaps will be identified and addressed.

- **Plan of Activities – To contribute to the GEOSS implementation in relation to the targets set out by the 10 Year Implementation Plan**

  The GEO User Interface Mechanism will be consistent with the GEOSS Implementation Plan endorsed at Earth Observation Summit III. The following excerpts were considered particularly relevant for this proposal:

  - GEOSS benefits will be realized by a broad range of user communities, including managers and policy makers in the targeted societal benefit areas, scientific researchers and engineers, civil society, governmental and non-governmental organizations and international bodies.

    - We will be developing a core working group with an advisory panel representing various power energy user communities, utilities, science and engineering practitioners and oversight bodies.

- Engagement of users in developing countries will maximize their opportunities to derive benefits from GEOSS.
    - We will conduct a series of outreach workshops held in concert with scheduled conferences for the potentially interested parties in developing countries in a manner similar to that of the GEOSS Architecture workshop at the GIS conference in South Africa, October, 2005
- GEO will perform a coordination role to address the adequacy, efficiency, and integrative way user requirements are being met and transmit recommendations for improvements to the relevant contributing systems.
    - We will work with the IEEE and other standards societies to ensure support of appropriate user communities and exchange of technical information
- GEO will make use of user communities where they exist and catalyze the formation of new ones where they do not.
    - Through our workshops held in conjunction with existing conferences, we will build upon existing user networks and will develop incubation centers where such networks do not exist
- GEO will work among and within societal benefit areas or sub-areas; and will, within 2 years, establish a mechanism for coordinating user requirements across societal benefit areas.
    - We will work with end users, government networks, NGO's and the above cited incubator centers to reach the users of the renewable energy grids.
- For information needs common to many societal benefit areas, GEOSS will facilitate the development and provision of common products.
    - Outreach will be an important component of this Community of Practice and this will involve networking between the technology builders of developed economies and the start-up groups in developing economies to ensure technology transfer and implementation
- GEO will facilitate the development and maintenance of a distinct and common user requirements database for GEOSS, building on and linking to existing user requirements databases.
    - Through expertise in IEEE, we will assist with developing of networks of databases using standard metadata protocols and outreach

activities

- Within 2 years GEO will develop a network of experts involved in existing capacity building initiatives related to Earth observation, and encourage users to access this knowledge base.
- Within 2 years GEO will encourage, in each societal benefit area, the development of capacity building components as a requirement to any network, project, activity, or User Fora that will be a component of GEOSS.
- The Secretariat, led by the Director, will facilitate and support GEO activities.

  The COP will develop a secretariat with a clearly established communication network between established power organizations and NGO's in developing economies to ensure successful outreach activities and capacity building.

- **Schedule of proposed activities**
  - Identify key user community representatives & organize group participation
  - Draft Terms of Reference of CP - November 2005
  - Approval of Terms of Reference (TOR) and CP - December 2005
  - Confirm CP schedule - initiate planning for 2006 workshops/meetings –Jan 2006
  - Initiate monthly telecon meetings
  - Create funding strategy: identify sponsors and submit proposals for funding
  - Initiate User survey – Feb 2006
  - Draft Plan for review - February 2006
  - Support interfaces with broader renewable energy CP - 2006
  - Workshop 1 (TBD) coordinated with international wind energy conference
  - Workshop 2 (TBD) coordinated with international wind energy conference
  - Draft report and recommendations - July 2006
  - Report to User Interface Committee and GEO - December 2006
  - Initiate Incubation Centers as part of continued outreach in 2007
  - Coordinate developing networks of databases using standard metadata protocols and outreach activities – 2007
  - Continue outreach activities with workshops - 2007
  - Demonstrate the leverage provided by the WECP and GEOSS – 2007