



Global Environment Facility

Monique Barbut
Chief Executive Officer
and Chairperson

1818 H Street, NW
Washington, DC 20433 USA
Tel: 202.473.3202
Fax: 202.522.3240/3245
Email: mbarbut@TheGEF.org

October 07, 2009

Dear Council Member,

I am writing to notify you that we have today posted on the GEF's website at www.TheGEF.org, a medium-sized project proposal from UNIDO entitled ***Global: Global Energy Assessment: Developing Policy Tools for Jointly Reducing Energy Poverty and Greenhouse Gas Emissions***, to be funded under the GEF Trust Fund (GEFTF).

The project will support the development of policy options and analytical tools aimed at informed decision-making and scaling up low carbon energy technologies besides reducing energy poverty and achieving reductions in GHG emissions.

The project proposal is being posted for your review. We would welcome any comments you may wish to provide by October 21, 2009, in accordance with the new procedures approved by the Council. You may send your comments to gcoordination@TheGEF.org.

If you do not have access to the Web, you may request the local field office of the World Bank or UNDP to download the document for you. Alternatively, you may request a copy of the document from the Secretariat. If you make such a request, please confirm for us your current mailing address.

Sincerely,

Attachment: Project document

Copy to: Country Operational Focal Point
GEF Agencies, STAP, Trustee



REQUEST FOR CEO ENDORSEMENT/APPROVAL

PROJECT TYPE: Medium-sized Project

THE GEF TRUST FUND

Submission Date: 5 October 2009

PART I: PROJECT INFORMATION

GEFSEC PROJECT ID: 3928

GEF AGENCY PROJECT ID: XX/GLO/09/XXX

COUNTRY(IES): Global

PROJECT TITLE: Global Energy Assessment: Developing Policy Tools for Jointly Reducing Energy Poverty and Greenhouse Gas Emissions

GEF AGENCY(IES): UNIDO, (select), (select)

OTHER EXECUTING PARTNER(S): International Institute for Applied Systems Analysis (IIASA)

GEF FOCAL AREA(S): Climate Change

GEF-4 STRATEGIC PROGRAM(S): CC-SP1, CC-SP2, CC-SP3, CC-SP4, CC-SP5 (see preparation guidelines section on exactly what to write)

NAME OF PARENT PROGRAM/UMBRELLA PROJECT: N/A

Expected Calendar (mm/dd/yy)	
Milestones	Dates
Work Program (for FSPs only)	
Agency Approval date	10/06/2009
Implementation Start	10/07/2009
Mid-term Evaluation (if planned)	
Project Closing Date	05/01/2011

A. PROJECT FRAMEWORK (Expand table as necessary)

Project Objective: Development of policy options and analytical tools aimed at informed decision-making to support the scaling-up of low carbon energy technologies, achievement of reductions in greenhouse gas emissions, and the reduction of energy poverty.

Project Components	Indicate whether Investment, TA, or STA ²	Expected Outcomes	Expected Outputs	GEF Financing ¹		Co-Financing ¹		Total (\$) c=a+ b
				(\$ a)	%	(\$ b)	%	
1. Improving access: policy tools	STA	1.1. Analytical tools generated by GEA are known to and used by decision-makers in most LDCs and by foreign aid agencies in developed countries; 1.2. Use of GEA results in the forging of multi-lateral environmental agreements (e.g., UNFCCC)	Web-based and computer-based quantitative tools, translated into major LDC languages and supported by workshops	312,500	50	312,500	50	625,000
2. Improving access: technical analysis	STA	2.1. Better understanding by decision makers of key technologies, technology transfer issues, policy instrument choice and major sustainable development issues; 2.2. Increased	Chapters on energy access of the major analytical report of the GEA, translated into major LDC languages	312,500	50	312,500	50	625,000

		welfare of people in LDCs; and 2.3. Future GEF programming considers GEA outcome						
3. Interactions with Policy-makers in developing countries	STA/TA	3.1. Improved understanding among decisionmakers of policies and market instruments that are enabling sustainable energy systems; 3.2. Increased investment by industry and governments in sustainable solutions for LDCs; and 3.3. Measurable reduction of energy poverty: better access to modern energy by the poor	Chapter on policy portfolios of the major analytical report; written products for dissemination, translated into major LDC languages	375,000	50	375,000	50	750,000
4. Other GEA activities	STA/TA	Development of 23 other knowledge modules				3,107,000		3,107,000
Total Project Costs				A1,000,000		4,107,000		5,107,000

¹ List the \$ by project components. The percentage is the share of GEF and Co-financing respectively of the total amount for the component. TOTAL funding for the GEA is shown in Table I.B. and is much greater.

² TA = Technical Assistance; STA = Scientific & Technical Analysis.

B. SOURCES OF CONFIRMED CO-FINANCING FOR THE PROJECT (expand the table line items as necessary)

<i>Name of Co-financier (source)</i>	<i>Classification</i>	<i>Type</i>	<i>GEF-Related</i>	<i>Total Project</i>	<i>%*</i>
Sweden, Italy, USA	Nat'l Gov't	Grant	250,000	1,259,000	30
UNIDO	Multilat. Agency	Grant		500,000	12
Austrian Development Agency	Bilat. Agency	Grant	312,500	1,088,000	26
Petrobras, World Energy Council, First Solar	Private Sector	Grant	62,500	313,000	8
UN Found., ClimateWorks	Others (specify)	Grant	200,000	400,000	10
UNDP	Multilat. Agency	Grant		89,000	2
UNEP	Multilat. Agency	Grant		60,000	2
The World Bank/ESMAP	Multilat. Agency	Grant	175,000	398,000	10
	(select)	(select)			
Total Co-financing			1,000,000	B4,107,000	100%

* Percentage of each co-financier's contribution at CEO endorsement to total co-financing.

NOTE: Co-financing related to the tasks in Table A ("GEF-related") and that of the total project are shown in separate columns.

C. FINANCING PLAN SUMMARY FOR THE PROJECT (\$)

	<i>Project Preparation a</i>	<i>Project b</i>	<i>Total c = a + b</i>	<i>Agency Fee</i>	<i>For comparison: GEF and Co- financing at PIF</i>
GEF financing		A1,000,000	1,000,000	100,000	1,000,000
Co-financing		B4,107,000	4,107,000		3,458,000
Total		5,107,000	5,107,000	100,000	4,458,000

D. GEF RESOURCES REQUESTED BY AGENCY(IES), FOCAL AREA(S) AND COUNTRY(IES)¹

<i>GEF Agency</i>	<i>Focal Area</i>	<i>Country Name/ Global</i>	<i>(in \$)</i>		
			<i>Project (a)</i>	<i>Agency Fee (b)²</i>	<i>Total c=a+b</i>
UNIDO	Climate Change	Global	1,000,000	100,000	1,100,000
(select)	(select)				
(select)	(select)				
(select)	(select)				
(select)	(select)				
(select)	(select)				
(select)	(select)				
(select)	(select)				
Total GEF Resources			1,000,000	100,000	1,100,000

¹ No need to provide information for this table if it is a single focal area, single country and single GEF Agency project.

² Relates to the project and any previous project preparation funding that have been provided and for which no Agency fee has been requested from Trustee.

E. CONSULTANTS WORKING FOR TECHNICAL ASSISTANCE COMPONENTS:

<i>Component</i>	<i>Estimated person weeks</i>	<i>GEF amount(\$)</i>	<i>Co-financing (\$)</i>	<i>Project total (\$)</i>
Local consultants*				
International consultants*		1,000,000		1,000,000
Total		1,000,000		1,000,000

* Details to be provided in Annex C.

F. PROJECT MANAGEMENT BUDGET/COST

<i>Cost Items</i>	<i>Total Estimated person weeks/months</i>	<i>GEF amount (\$)</i>	<i>Co-financing (\$)</i>	<i>Project total (\$)</i>
Local consultants*				
International consultants*				
Office facilities, equipment, vehicles and communications*				
Travel*				
Others**				
Total				

* Details to be provided in Annex C. ** For others, it has to clearly specify what type of expenses here in a footnote.

G. DOES THE PROJECT INCLUDE A “NON-GRANT” INSTRUMENT? yes no
(If non-grant instruments are used, provide in Annex E an indicative calendar of expected reflows to your agency and to the GEF Trust Fund).

H. DESCRIBE THE BUDGETED M & E PLAN: Not applicable

PART II: PROJECT JUSTIFICATION: In addition to the following questions, please ensure that the project design incorporates key GEF operational principles, including sustainability of global environmental benefits, institutional continuity and replicability, keeping in mind that these principles will be monitored rigorously in the annual Project Implementation Review and other Review stages.

A. STATE THE ISSUE, HOW THE PROJECT SEEKS TO ADDRESS IT, AND THE EXPECTED GLOBAL ENVIRONMENTAL BENEFITS TO BE DELIVERED: **THE ISSUE:** Today’s energy systems critically affect economic and social development and poverty alleviation but continue to face the challenge of delivering these services in an affordable, reliable and secure fashion that minimizes environmental and health impacts. In developing countries, rapid economic development, so crucial to poverty alleviation, must be matched with a desire to mitigate climate change and other environmental externalities. Energy decisions are complex and decision tools can help decision makers to make better decisions. This includes basic data regarding energy use and efficiency today, technology status and prospects in terms of feasibility, cost and availability, multi-criteria decision making and an assessment of the effectiveness and efficiency of policy instruments. The outcome of this study will accelerate the transition to low carbon technologies. The focus on LDCs is crucial as the majority of the growth in the coming decades will be concentrated in these countries. This poses an enormous challenge but at the same time a great opportunity to leapfrog the developments of the more mature economies.

THE PROPOSED PROJECT: UNIDO and its executing partner, International Institute for Applied Systems Analysis (IIASA), will utilize the Global Energy Assessment (GEA) as the ‘platform’ on which to base the present project. Specifically, the GEA platform will be expanded to include: 1) explicit project components on improving access to energy that emphasize both policy tools and technical analysis; and 2) interactions with policy-makers in developing countries. At the same time, the project will provide data on effective policies and programs that will help GEF establish decision criteria for its own project selection. Consultations with decision makers and regional workshops will ensure that GEA will aim at answering the key questions of greatest urgency to the decision makers while at the same time building the capacity for effective policy and investment. The GEA Council includes representatives from UNEP, WBCSD, UNDP, the World Energy Council, the World Bank and other organizations with mission elements related to sustainable development. The GEA Council will continue to assist in the consultative process, guide the analytical work and ensure high-level decision maker attention for the outcome of this project. The timeline for the project is as follows:

Consultations with decisionmakers	ongoing thru Dec 2009
Conduct analyses and writing	ongoing thru Dec 2009
Regional workshops	Oct/Nov 2009
External peer review	Jan/Feb 2010
Initial release of report	Sep 2010
Outreach, dissemination and policy dialogue	Sep 2010 to Apr 2011

The GEF support will greatly accelerate the ongoing work and will permit an expansion of scope to include greater engagement with developing countries. This will facilitate the development of new and novel policy tools for alleviation of energy poverty that minimize GHGs. The policy tools will be operationalized by the dissemination process, which will be an extension of the consultative process already underway and which has included side events in numerous international forums such as COP-14. It is envisaged that decision-makers will understand better the various global challenges and how to design a portfolio of policies that can address them simultaneously. The GEA will provide examples of such portfolios and in addition will present case studies of successful policies.

THE GLOBAL ENVIRONMENTAL BENEFITS: Once successfully implemented, the project would have considerable global environmental benefits in terms of reduction in GHG emissions through informed decision

making that results on more efficient and cost-effective solutions.

B. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH NATIONAL AND/OR REGIONAL PRIORITIES/PLANS:

The project will support GEA exercise that will provide analytical support for national commitments to the reduction of greenhouse gas (GHG) emissions. The GEA will consider emission targets and timetables vis-à-vis the costs and risks of various choices of clean energy technologies, which among others, would include: 1) the increased use of coal, tar sands and oil shale, which could exacerbate unacceptable environmental impacts, including a further rise in CO₂ emissions; 2) the production of biofuels in an environmentally sound manner without jeopardizing the availability of affordable supplies of food, particularly for the poor; 3) the deployment of renewable electricity systems including those based on wind and hydropower, which need to be stored and transported to consumption centers, and solar photovoltaic systems, which require large improvements in their economics; 4) the requirement for large, upfront investments in order to improve energy systems efficiencies and achieve low-carbon intensities including at the point of end-use, and through technological learning reduce the long-term investment requirements; and 5) the major shift in consumer aspirations and behaviour that would be required to reduce overall energy demands while maintaining and improving energy services and human well being. The environmental benefits resulting from the project and its support of national commitments will thus encompass all aspects of energy supply and demand related to a number of key energy resources.

C. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH [GEF STRATEGIES](#) AND STRATEGIC PROGRAMS: The project will support the Climate Change Focal Area Strategy of GEF-4, including strategic programs CC-SP1 through CC-SP5. The analysis will cull insights on new and alternative energy supply and end-use technologies that will be of relevance to the assessment of potential GEF projects. With respect to CC-SP1 (Promoting Energy Efficiency in Residential and Commercial Buildings) and CC-SP 2 (Promoting Energy Efficiency in the Industrial Sector), the GEA will examine the technology and other issues associated with providing energy services from final energy carriers in the following steps: 1) Assess the status of cost, thermodynamic efficiency, technical capabilities, and applications of currently available and next-generation energy efficiency/end-use technologies; 2) Provide forward-looking assessments of relevant technology innovations, potentials and buy-down possibilities; 3) Seek rigorous benefit-cost (life-cycle based) analysis of energy services and technologies (incorporating their impact on social conditions, especially poverty and the situation of women, the impact on the local, regional and global environment, broader economic benefits, subsidies, etc.); 4) Define potential economic benefits associated with energy end-use options, e.g., improved technologies, market development, increased manufacturing capacity, trade opportunities; 5) Assess potential opportunities, barriers and associated benefits of technological leapfrogging by developing countries; and 6) Evaluate lessons learned from pilot projects including those by multilateral donors such as GEF. All told, the analytical insights provided by the project will illuminate possible combinations of resources and technologies that will contribute toward global environmental benefits through decarbonization (lower GHG emissions per unit of economic output) of the global energy system. In addition, the project will create a policy environment that is enabling of climate mitigation measures.

With respect to CC-SP3 (Promoting Market Approaches for Renewable Energy), the GEA will examine the role of public policy in achieving a renewable electricity system. The GEA will explore issues of governance, related to the specific ways in which governments can regulate markets across a continuum of policy instruments ranging from command-and-control regulations (technology-focused versus firm- or plant-focused), to financial incentives/disincentives and market oriented regulation, to voluntary mechanisms. In addition, the project will conduct analysis aimed at illuminating the current and potential competitiveness of renewable electricity systems, including an assessment of the cost, efficiency, technical capabilities, and possible applications of technologies - both currently available and next-generation—as well as the potential for lower emissions of pollutants and GHGs.

With respect to CC-SP4 (Promoting Sustainable Energy Production from Biomass), the GEA will consider energy crops from the standpoint of land-use requirements, competition of land for other uses (food, fibre), and global environmental benefits, including through lowered GHG emissions, on a life-cycle basis. The GEA will synthesize life-cycle based benefit-cost analysis of biomass resources, technologies and systems, incorporating their impact on social, environmental (local, regional and global) and economic factors such as investment, subsidies, etc. Also evaluated will be policies for biomass-intensive energy systems.

With respect to CC-SP5 (Promoting Sustainable Innovative Systems for Urban Transport), the GEA will consider urban transport options, differentiating between infrastructure-intensive versus "orgware"-intensive, for example, between light rail/metro versus rapid transit bus systems versus parking/congestion charges for car mobility. The GEA will analyze options with respect to their ease of implementation, acceptability, energy use, and capital requirements. This analysis will be set within a comprehensive overview of urban energy use and of the specifics of urban energy demand and supply. Global and regional coverage of the chapter will be complemented by case studies of selected cities including a basic energy profile and summarizing positive experiences in sustainable urban design, energy demand, transportation management, and energy supply systems integration.

In general, these findings will contribute to the knowledge base for future GEF decisionmaking. The project will provide data that will help GEF establish decision criteria for future project selection. For example, by assessing the cost, efficiency, technical capabilities, and possible applications of technologies - both currently available and next-generation - the project will clarify which technologies are best suited to GEF interventions and elucidate what are some of the barriers to deployment of new energy technologies. In addition, the GEA will highlight effective policies and programs with valuable lessons-learned that will be of interest to GEF. These and other insights will comprise a useful take on what tools are currently available for sustainable development in energy.

- D. JUSTIFY THE TYPE OF FINANCING SUPPORT PROVIDED WITH THE GEF RESOURCES.** The GEA process began in 2007 and, it is anticipated that the rollout of the major analytical report will take place at the World Energy Congress in September 2010, with final dissemination activities to continue into 2011. The GEF contribution is essential to enable a regional and national government dialogue with LDCs. Without the GEF contribution, the buy-in from LDCs will be less satisfactory and the policies and analytical tools that are developed will be less relevant to local factors. The process will be delayed, and some products may not be delivered and the depth of the analysis will not reach the same level. The GEA is being funded by direct and in-kind contributions from the governments of Sweden, Austria, Italy and the United States; the World Bank; the World Energy Council; Petrobras; the UNDP, UNEP, and UNIDO; and the UN and ClimateWorks Foundations.

The GEF funds will be provided as a grant to support the GEA process and activities including development of analytical tools, policy options and documentation of case studies for informed decision making by the Governments, Multi/ Bilateral Agencies and regional / global resource institutions and networks. The preference for grant-based versus loan-based support is appropriate for the analytical 'software' character of the project as opposed to that of the 'hardware' infrastructure projects supported by loans. Through GEF support, GEA exercise will provide a normative perspective illustrating the low carbon pathways along which a future, more sustainable world may be realized.

- E. OUTLINE THE COORDINATION WITH OTHER RELATED INITIATIVES:** The GEA will build on and leverage the findings from other assessments, such as the Millennium Ecosystems Assessment (MEA), the International Assessment of Agricultural Science and Technology for Development (IAASTD), Assessment Reports from the Intergovernmental Panel on Climate Change (IPCC), the UN SIGMA XI report and the Inter Academy Council study on transitions to sustainable energy. Whereas these studies have approached energy from various standpoints - climate change, ecosystems, or agriculture - the specific focus of GEA is on energy. GEA will glean insights from these earlier studies to present a unified picture of all the global challenges related to energy, including the global environmental benefits that could be achieved through deployment of advanced energy systems. Further, many of the experts participating in GEA were authors of these earlier studies, and in addition, many are heavily engaged in research on energy and economic development. The GEA will complement other energy studies such as the World Energy Outlook and the Energy Technology Perspectives. The unique feature of GEA is a rigid scientific process, development of new publicly available analytical tools that consider energy and poverty alleviation issues, and a comprehensive assessment of different steps in the systems design (technology, finance, policy instruments). The GEA is an open process being produced by a global network of region and country experts constructing internally consistent effective and efficient normative scenarios and strategies out to 2050 and 2100. The main goal is to help LDC in their development and in achieving their policy goals. The GEA is also taking part in the follow-up to the Stern Review into the Economics of Climate Change, and participated in Lord Stern's roundtable on the Regional Economics of Climate Change Study in Hong Kong in October 2008. The GEA will also support initiatives of the Commission on Sustainable Development (CSD) and the work of UN Energy and other UN agencies as well as contribute to other multilateral partnerships such as the EU Energy Initiative for Poverty Eradication and

Sustainable Development. The comparative advantage of the GEA is in its unified treatment of the energy-linked global challenges such as poverty alleviation, mitigation of environmental impacts, and energy security, whereas many of the studies and initiatives listed consider energy in relation to one particular global challenge (e.g., climate change).

- F. DISCUSS THE VALUE-ADDED OF GEF INVOLVEMENT IN THE PROJECT DEMONSTRATED THROUGH INCREMENTAL REASONING :** The main value addition of the contribution will be to support the regional and country-level dialogue with decisionmakers in order to increase the penetration of policies and interventions that are enabling of sustainable energy systems. The feedback received from these dialogues will enhance the quality and relevance of the policy tools being developed by the GEA including those aimed at improving access to energy. The stakeholders targeted by the GEA include decision makers in the GEF and in national governments and private investors who must provide needed capital. The analysis will make use of various sustainability indicators to quantify the relative impact of options for addressing: climate change mitigation; energy equity and meeting the needs of the two billion people who are without access to affordable modern forms of energy; and a range of other global challenges. As such, the GEA will provide an estimate of the incremental gain versus business-as-usual. The integrative scenarios will illustrate how the energy system components, technologies and resources can be combined to address the challenges and realize the global environmental benefits (e.g., of lowered GHG emissions and pollutants). Achieving these multiple goals will include various combinations of policy measures and instruments as well as lifestyle and value changes.
- G. INDICATE RISKS, INCLUDING CLIMATE CHANGE RISKS, THAT MIGHT PREVENT THE PROJECT OBJECTIVE(S) FROM BEING ACHIEVED AND OUTLINE RISK MANAGEMENT MEASURES:** Project risks include the possibility that the larger GEA, which is the ‘platform’ supporting the proposed project, will not receive funding consistent with its scope and ambition and thus would have difficulty achieving the desired outputs. Furthermore, the degree to which GEA exercise is able to create a conducive policy environment or build capacity for energy investments will be affected by political and institutional obstacles. These include: the lack of willingness on the part of governments to intervene in the energy sector; the failure to secure sufficient financing and attract private capital for the huge investments needed in energy infrastructure; and the challenge of international cooperation on environmental agreements. The purpose of GEF support, in part, will be to fund a regional and country-level dialogue to move toward consensus on adoption of policies and market instruments that are enabling of sustainable energy systems. Although every effort will be made to convince decision makers of the benefits of adopting GEA-recommended policies, compliance with the GEA recommendations will ultimately be voluntary. These risks are summarized in the Table below.

Nature of Risk	Parties Involved	Impact
Insufficient funding of the GEA ‘platform’ on which the GEF project is to be situated	Potential funders (foundations, national governments)	Project outputs cover energy access but have less analytical richness in treating ancillary but related issues
Low uptake of GEA recommendations	Decisionmakers in LDCs; Capital markets	Reduced deployment of sustainable energy; reduced global environmental benefits

- H. EXPLAIN HOW COST-EFFECTIVENESS IS REFLECTED IN THE PROJECT DESIGN:** Although not amenable to quantitative cost-effectiveness analysis, the GEA exercise can be compared vis-à-vis alternate project approaches in a qualitative fashion. One such alternate approach would be to use the funds for smaller, more numerous independent research projects on issues germane to the transition to sustainable energy. Such projects could include several of the key components of the GEA such as the construction of policy portfolios. Crucially, this would circumvent the value-added of the GEA, which is its ability to treat all the global challenges in an integrated fashion. GEA will seek out ‘win-win’ strategies and policy interventions that simultaenously meet the goals of economic development, mitigation of environmental impacts, and the provision of secure energy supplies. Another alternative would be the ‘no-action’ option, which means

no GEA but the international negotiation processes would remain. For example, this would include the UNFCCC Bali Roadmap and beyond and the UN Commission on Sustainable Development. While these activities are informed by a number of analyses within the UN (e.g., IPCC special reports and assessment reports) and outside (e.g., the InterAcademy Council report on energy transitions), what would be missing is the value-added of the GEA in providing the integrated view of all issues touching upon energy and in developing win-win solutions that jointly deliver economic development and poverty alleviation together with global environmental benefits deriving from the deployment of advanced energy technologies.

PART III: INSTITUTIONAL COORDINATION AND SUPPORT

A. INSTITUTIONAL ARRANGEMENT: N/A

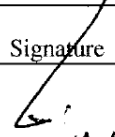
B. PROJECT IMPLEMENTATION ARRANGEMENT: The executing partner is the International Institute for Applied Systems Analysis (IIASA), an international research organization located in Laxenburg, Austria that conducts inter-disciplinary scientific studies on environmental, economic, technological, and social issues in the context of human dimensions of global change. IIASA is the host of the Secretariat of the Global Energy Assessment (GEA), the proposed project. GEA operates with a two-tiered governance structure including a Council that provides overall guidance as well as engagement with numerous constituencies with the transition to sustainable energy. The Council oversees the work of the Executive Committee, which is responsible for carry-out the analysis and developing the products of the GEA, including the major analytical report. The Council has held three meetings thus far (in July 2007, May 2008, and January 2009) to provide informal advice and feedback on the progress of the GEA. The assessment is divided by topic into 25 knowledge modules, each led by a convening lead analyst supported by a team of lead analysts (about six), with each such team responsible for a written contribution to the GEA report. The CLAs are members of the Executive Committee, which has held six meetings thus far aimed at coordinating the work. In addition, a meeting of 90 of the analysts was held in June 2009 in Vienna, Austria in order to provide a venue for coordinating the work and linking together the various themes and topics. To consult with a wide range of stakeholders, the principals of the GEA make frequent presentations on GEA including side events at UNFCCC COPs, in addition to one-on-one consultation with key officials in national governments and international organizations.

UNIDO is supporting the GEA financially and in-kind through its expertise in development and industrial energy use. In particular, UNIDO staff are involved directly in the knowledge module on industrial energy efficiency. In addition, DG Yumkellah is a member of the GEA Council, which provides overall guidance to the work of the GEA, in which capacity he has been instrumental in promoting awareness of GEA within the United Nations system and the broader development community and providing constructive feedback. The work with UNIDO and DG Yumkellah ties into the GEA the work of UN Energy. Areas of common interest include all three focal areas of UN Energy (i.e., energy efficiency, energy access, and renewable energy).

PART IV: EXPLAIN THE ALIGNMENT OF PROJECT DESIGN WITH THE ORIGINAL PIF: The project design is consistent with the PIF .

PART V: AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF policies and procedures and meets the GEF criteria for CEO Endorsement.

Agency Coordinator, Agency name	Signature	Date (Month, day, year)	Project Contact Person	Telephone	Email Address
A Dmitri Piskounov Managing Director UNIDO GEF Focal Point	 31/08/09		Dolf Gielen	+43 1 26026 3811	D.Gielen@unido.org

ANNEX A: PROJECT RESULTS FRAMEWORK

Interventions	Objectively Verifiable Indicators	Sources of Verification	Assumptions and Risks
Project Goal	Development of policy options and analytical tools aimed at informed decision-making to support the scaling-up of low carbon energy technologies, achievement of reductions in greenhouse gas emissions, and the reduction of energy poverty.	Progress reports completed, written and complementary products delivered	Project inputs will be adequate to accomplish stated objectives; project activities will be adequate to allow identified barriers to be overcome.
Task 1:	Improving access while minimizing GHGs: <i>policy tools</i>		
Outputs: Web-based and computer-based quantitative tools, translated into major LDC languages and supported by workshops Activities: 1.1 Research and analysis 1.2 Meetings of scenario team 1.3 Dissemination workshop and meetings	<ul style="list-style-type: none"> Dissemination workshops held Scenario team meetings held Adoption of tools by decision-makers 	<ul style="list-style-type: none"> Progress reports Workshop reports Website 	<ul style="list-style-type: none"> Lack of willingness on the part of governments to intervene in the energy sector; Failure by investors to secure sufficient financing and attract private capital; and Challenge of international cooperation on environmental agreements
Task 2:	Improving access while minimizing GHGs: <i>technical analysis</i>		
Outputs: Chapters on energy access of the major analytical report of the GEA, translated into major LDC languages Activities: 2.1 Meetings of Executive Committee 2.2 Meetings of KM writing teams on energy access	<ul style="list-style-type: none"> Better understanding by decision makers of key technologies, technology transfer issues, policy instrument choice and major sustainable development issues; Executive Committee and KM team meetings held Manuscripts of chapters 	<ul style="list-style-type: none"> Meeting proceedings Manuscript delivered 	<ul style="list-style-type: none"> Lack of willingness on the part of governments to intervene in the energy sector; Failure by investors to secure sufficient financing and attract private capital; and Challenge of international cooperation on environmental agreements
Task 3:	Interactions with Policy-makers in developing countries		
Outputs: Chapter on policy portfolios of the major analytical report; written products for dissemination, translated into major LDC languages Activities: 3 Workshop in Africa 3.1 Workshop in Asia 3.2 Workshop in Latin America/Caribbean 3.3 Writing sessions to develop dissemination products	<ul style="list-style-type: none"> Improved understanding among decisionmakers of policies and market instruments that are enabling sustainable energy systems; Manuscripts of chapters Written briefs for dissemination 	<ul style="list-style-type: none"> Manuscript delivered 	<ul style="list-style-type: none"> Lack of willingness on the part of governments to intervene in the energy sector; Failure by investors to secure sufficient financing and attract private capital; and Challenge of international cooperation on environmental agreements

ANNEX B: RESPONSES TO PROJECT REVIEWS (from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF)
SEE ATTACHED

ANNEX C: COSTS OF EXECUTING PARTNER (IIASA-GEA) TO BE HIRED FOR THE PROJECT USING GEF RESOURCES

<i>Position Titles</i>	<i>\$/ person week*</i>	<i>Estimated person weeks**</i>	<i>Tasks to be performed</i>
For Project Management			
Local			
International			
Justification for Travel, if any:			
For Technical Assistance			
Local			
International			
<i>GEA Council Co-President</i>	\$ 2,150/wk	8.00	Overall project governance
<i>GEA Council Co-President</i>	\$ 2,150/wk	8.00	Overall project governance
<i>Executive Committee Co-Chair</i>	\$ 2,150/wk	8.00	Coordination of research and writing (overall GEA)
<i>Senior Research Scholar</i>	\$ 1,400/wk	16.00	Coordinate energy access modules
<i>Research Scholar</i>	\$ 970/wk	36.00	Assist with data gathering and research
<i>Program administrator</i>	\$ 1,330/wk	10.00	General project administration
<i>Senior Program Officer</i>	\$ 1,430/wk	12.00	Technical coordination
Meetings	\$ 168,000 total		
Subcontracts	\$ 30,000/contract		
Travel and general expenses	\$ 50,480 total		
Justification for Travel, if any: 6 trips including flights and per diem for purpose of project coordination			

* Provide dollar rate per person week. ** Total person weeks needed to carry out the tasks.

ANNEX D: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS

- A. EXPLAIN IF THE PPG OBJECTIVE HAS BEEN ACHIEVED THROUGH THE PPG ACTIVITIES UNDERTAKEN. NO PPG WAS REQUESTED FOR THE PROPOSED PROJECT.**
- B. DESCRIBE FINDINGS THAT MIGHT AFFECT THE PROJECT DESIGN OR ANY CONCERNS ON PROJECT IMPLEMENTATION, IF ANY:**
- C. PROVIDE DETAILED FUNDING AMOUNT OF THE PPG ACTIVITIES AND THEIR IMPLEMENTATION STATUS IN THE TABLE BELOW:**

<i>Project Preparation Activities Approved</i>	<i>Implementation Status</i>	<i>GEF Amount (\$)</i>				<i>Co- financing (\$)</i>
		<i>Amount Approved</i>	<i>Amount Spent To date</i>	<i>Amount Committed</i>	<i>Uncommitted Amount*</i>	

	(Select)					
	(Select)					
	(Select)					
	(Select)					
	(Select)					
	(Select)					
	(Select)					
	(Select)					
Total						

* Any uncommitted amounts should be returned to the GEF Trust Fund. This is not a physical transfer of money, but achieved through reporting and netting out from disbursement request to Trustee. Please indicate expected date of refund transaction to Trustee.

ANNEX E: CALENDAR OF EXPECTED REFLOWS

Provide a calendar of expected reflows to the GEF Trust Fund or to your Agency (and/or revolving fund that will be set up)

GEF Trust Fund CEO Endorsement/Approval Template Preparation Guidelines
(This template applies to both FSPs and MSPs)

Unlock instruction: The template, by default, is locked to allow the pull-down menu to function. However, in order to access the various documents through the hyperlink, the template has to be in unlocked format. To unlock the template follow this path: Go to **View > Toolbars > Forms**. You will then see a pop up menu like this. Click on the right-most icon (a lock) to unlock.



When inputting information in the fields in the template, please use the “locked” mode.

Submission date: self-explanatory

PART I: PROJECT INFORMATION

The first part is the project core information and standard selections are provided to the extent possible for ease of preparation. The Strategic Programs for each focal area have to be filled in manually, due to limitations by Microsoft Word which prevented the provision of the full range selections for all focal areas through the pull-down menu. For convenience, the strategic programs (SP) in each focal area are listed below. Please write exactly as indicated below. For example, fill in **BD-SP1-PA**, not just SP1 or any other combination.

Biodiversity	Climate Change	International Waters	Land Degradation	POPs*	ODS*	SFM*
BD-SP1-PA Financing	CC-SP1- Building EE	IW-SP1- Coastal Marine Fisheries	LD-SP1- Agriculture	POPs-SP1- CapacityB	ODS- SP1	SFM-SP1- Financing
BD-SP2- Marine PA	CC-SP2- Industrial EE	IW-SP2- Nutrient Reduction	LD-SP2- Forest	POPs-SP2- Investment		SFM-SP2-PA Networks
BD-SP3-PA Networks	CC-SP3- RE	IW-SP3- Freshwater Basins	LD-SP3- Innovation	POPs-SP3- Demonstration		SFM-SP3- LULUCF
BD-SP4- Policy	CC-SP4- Biomass	IW-SP4- Toxics/Ice				SFM-SP4- Policy
BD-SP5- Markets	CC-SP5- Transport					SFM-SP5- Markets
BD-SP6- Biosafety	CC-SP6- LULUCF					SFM-SP6- Biomass
BD-SP7- Invasive Alien Species (IAS)						SFM-SP7- Forest
BD-SP8- ABS- Capacity Building						

* POPs = Persistent Organic Pollutants; ODS = Ozone Depleting Substance; SFM = Sustainable Forest Management

Indicative Calendar: Most dates are expected dates and may change as new developments unfold. The only date that is actual is the date that the project (in the form of PIF) was approved in a work program (Indicate the Council work program month, e.g. April 2008). The purpose of these dates is to see the implementation timeline of the project. For example, the Agency approval date will be included in the CEO Endorsement letter to the Agencies. The GEF Management Information System will be sending alerts to the Agencies about a month prior to the dates indicated in the letter to alert Agencies of the impending deadlines. It is therefore advisable that should there be any delay in the milestone dates in the endorsement/approval letter, Agencies should inform GEFSEC immediately and seek GEF CEO’s concurrence to the new dates/milestones. For all other dates on the template (i.e. Mid-term review, project grant closing date, etc.), Agencies should inform GEFSEC of any deviation from those indicated in the CEO Endorsement Request so that the GEFSEC database could be updated to reflect the changes. Agencies should also indicate any change in the milestone dates in its annual report submitted to GEFSEC. In order to have avoid confusion on the various terms under the Indicative Calendar section, please refer to the definitions below:

GEF Agency Approval - The date on which the GEF Agency Board or Management approves the Grant proposal. This is equivalent to the WB's Board approval date, UNDP's Project Document's signature date, or IFAD's approval date.

Implementation Start - The date on which project becomes effective and disbursement can be requested. This is the

equivalent to the WB's grant/legal agreement effectiveness date and UNDP's Project Document Signature Date. This is also the trigger date for the Trustee to allow Agencies to apply for disbursement.

Project Closing - This is the date when all project activities are financially committed, but not necessarily all disbursements completed. Generally, Agencies provide a grace period of 6 months, or more, for final disbursement after project closing, but the sums paid may not be increased from the amounts originally committed. Agencies should submit a report to GEFSEC and the Trustee on the financial closure of the project.

- A. *Project Framework*: The main objective of the section is to sketch out the overall design of the project and to provide information about what the GEF grant will finance in relation to other sources of funding.

Since many agencies utilize their own terminology for project design, it is important to clarify what the Secretariat is asking for under each heading. The definitions are based on those developed by OECD/DAC, *Glossary of Key Terms in Evaluation and Results-Based Management* (2002).¹

Project Objective (refers to OECD/DAC *development objective*): intended impact contributing to global environmental benefits via one or more development interventions.

Outcomes: The likely or achieved short-term and medium-term effects of an intervention's outputs (e.g. energy efficiency of existing heat and hot water supply companies in X city improved, new trust fund for the conservation of the PAs established, laws and bylaws approved to reduce impact of forestry practices on biodiversity)

Outputs: The products, capital goods and services which result from a development intervention relevant to the achievement of outcomes. At CEO Endorsement, outputs should be concrete and where applicable should reflect targets that have been established during project preparation (e.g. 10 staff trained to operate and maintain an early warning system, data capture in 5 regions of coastal lowlands).

The **Project Component** is the division of the project into its major parts; an aggregation of a set of concrete activities (e.g. strengthening regulatory and legal frameworks, introduction of innovative financial mechanisms, investment to overcome financial barriers, institutional capacity building)

The financing of the project should be broken down by Project Component. Indicate also for component whether it is of investment in nature, technical assistance, or scientific and technical analysis.

The percentage under the GEF and co-financing is the percentage of GEF or co-financing to the total amount for the component, i.e. the amount listed under GEF and Co-financing for a particular component will add up to 100% of the component total, i.e., calculate horizontally.

- B. *Sources of Confirmed Co-financing for the Project*: Indicate the sources of co-financing that are confirmed with the names of co-financiers in the first column, select co-financing classification in the second column (e.g. project government contribution, GEF Agencies, bilateral aid agencies, multilateral agencies, private sector, NGO and others). Select in the 3rd column the type of co-financing (whether it is a grant, guarantee, soft loan, hard loan or in-kind contribution). The commitment letters from all co-financiers should be submitted no later than the four-week Council circulation period and before GEFSEC issues CEO endorsement letter.
- C. *Financing Plan Summary for the Project (\$)*: Similarly, this will be an update of the table presented at PIF but with firm amounts at this stage. Please note that the co-financing amounts do not receive an Agency fee. Total in the Project column (3rd column, last row) should match the total project costs amount in Table A (the last column by last row). The project preparation column should include all the approved PDF-A/B/Cs and PPG. However, the amount of PDF-A/B/C that was approved under GEF-3 should clearly indicate in the footnote as this amount would not be counted against the GEF-4 resources allocated to the country/focal area. But this amount would be added to the total GEF grant provided for this project. In case there are uncommitted amount of PPG, this amount should be excluded. All uncommitted PPG amounts at the time of CEO endorsement should be returned to Trustee. Details of implementation of the PDF/PPG should be reported in Annex D. Project grant in the 3rd column included GEF

¹ The full glossary in English, French and Spanish is posted on the following website:
<http://www.oecd.org/dataoecd/29/21/2754804.pdf>

resource and co-financing at CEO endorsement while the project grant in the last column includes the GEF resources and co-financing at PIF stage.

- D. GEF Resources Requested by Agency (ies), Focal Area(s) and Country (ies): This table provides the share of the project and project preparation amounts by focal area, Agency and country. For biodiversity and climate change focal areas, this section provides the amount of resources used by the country from its RAF allocation. For single country, single focal area and single Agency implemented projects, this table could be skipped. In providing Agency fee amount, especially where there is split between/among Agencies, the rule is that total amount should not exceed 10% following the Fee Policy provisions. If for whatever reason the amount is less than 10%, please provide explanation since we will follow whatever amount Agency requested as long as it is within the 10% limit. The explanation should be included in the cover letter that accompanies the submission of Request for CEO Endorsement/Approval to GEFSEC.
- E. Consultants working for technical assistance components: If there are consultants who will work on technical assistance components in the project, list the total estimated person weeks/months needed for the GEF resources. Details of consultant information should be provided in Annex C.
- F. Project Management Budget/Cost: The main items supported by GEF as project management includes consultant services, travel and office facilities, etc. Provide the total estimated consultant person weeks/months needed and amount by sources (GEF and co-financing) for the project management with more detailed information to be included in Annex C. The issue of what could be included under project management budget is under review in the ongoing Administrative Cost Study. Once the study is completed, there will be more clarity on what items could be charged as project management budget/cost.
- G. Non-grant if there is non-grant elements included, check yes and complete Annex E to provide *Calendar of Expected Reflows*. If no non-grant instruments, continue to H.
- H. Describe the M&E plan with budgeted amount. Include a table as necessary.

PART II: PROJECT JUSTIFICATION:

Several questions in this section are similar to those at PIF stage. When it is the case (see questions B, C and D), you may just indicate something like "same as PIF" when no new information is available or relevant. Please note however that for other questions (for instance on cost-effectiveness and global environmental benefits), a more in-depth discussion of the issues is needed here than at the PIF stage.

In any case, if there are clear and specific answers to the questions of Part II in your project document, you may simply cite the relevant pages/paragraphs without having to cut and paste the text into the template.

- A. When discussing the issue, state the background and baseline, discuss how the project seeks to address it (GEF alternative), and the expected value added of GEF involvement and global environmental benefits to be delivered (incremental reasoning).
- B. State if the proposed project is consistent with country and/or regional priorities and how it builds on ongoing programs, policies and political commitments. Responding to this question will also show country ownership of this project.
- C. Describe the project's consistency with the GEF focal area strategies and strategic programs. All projects have to be consistent with the focal area strategies to be eligible for GEF financing.
- D. Justify the type of financing support with resources provided by the GEF. For instance, explain the rationale to provide a loan rather than a grant, or setting up of revolving funds, etc.
- E. Describe the coordination with other GEF agencies, organizations, and stakeholders involved in related initiatives; if similar projects exist in the same country/region, including GEF projects, report on synergies/complementarities with this proposal and demonstrate that there is no duplication.
- F. Refer to the June 2007 Council paper on incremental reasoning which is linked to this section. The objective is to describe the situation on what would happen without GEF support and what would be the expected change in global environmental benefits. This differs from Section A in the sense that the former describes what the project will

deliver while this section describes the question: what if there is no GEF support?

- G. The objective is to ensure that in designing the project, all risks, including climate change risk have been taken into consideration and that proper measures are in place and that the project is resilient to climate change. Please outline the risk management measures, including improving resilience to climate change that the project proposes to undertake.
- H. Demonstrate that the selected project design is the best use of the GEF funding for achieving the global environmental benefits described in the project (e.g. \$/ton of CO₂ abated). Show the proposed project is cost-effective through demonstration of alternatives that may not be as cost effective.

PART III: INSTITUTIONAL COORDINATION AND SUPPORT

- A. *Institutional Coordination*: if more than one GEF Agency is involved, discuss the responsibility and role of each Agency and how each will undertake the tasks in the project.
- B. *Project Implementation Arrangement*: Explain the roles of each GEF Agency, if this is a joint project, as well as role of executing partners, and how each Agency and executing partner(s) will undertake the project.

PART IV: EXPLAIN THE ALIGNMENT OF PROJECT DESIGN WITH THE ORIGINAL PIF: When discussing the alignment, you may like to consider the expected global environmental benefits, co-financing, GEF grant requested and incremental reasoning.

PART V: AGENCY(IES) CERTIFICATION: This section provides Agency(ies)' certification to the submission as well as contact information for project.

ANNEX A: PROJECT RESULTS FRAMEWORK: Self-explanatory

ANNEX B: RESPONSES TO PROJECT REVIEWS: Agencies' responses to comments received during PIF stage from Council, other Agencies, GEFSEC, Convention Secretariat and STAP. To the extent possible, the responses should be reflected in the Agency's project document as well as Request for CEO Endorsement. In this section, just highlight the responses and direct readers to how the comments have been incorporated into the documents. In some cases, comments may be responded through brief clarifications in this section.

After review of the Request for CEO Endorsement (RCE), GEFSEC may provide further comments on the RCE and Council may also provide comments when RCE is being circulated before CEO endorsement. These should be responded and RCE resubmitted to GEFSEC before final CEO endorsement.

ANNEX C: CONSULTANTS TO BE HIRED FOR THE PROJECT USING GEF RESOURCES: Provide all consultants to be hired for the project which may include those for project management and those for technical assistance. They may also be local or international consultants. This annex should provide unit cost for each consultant, their position titles, estimated person weeks needed for each consultant associated with the tasks to be performed in the last column and provide justification for travel, if applicable.

ANNEX D: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS: This annex should give a full picture of how preparation funding was used, and the activities financed. Respond the questions in A and B and provide figures in C. The important information in the table is to clearly indicate the funding utilization status. All uncommitted money will be returned to the GEF Trust Fund. Please provide the expected fund return date here, if available.

ANNEX E: CALENDAR OF EXPECTED REFLOWS: If non-grant instrument is included in the project, please provide calendar of expected reflows to GEF Trust Fund and/or GEF Agency.

ANNEX 5: PROJECT DOCUMENT (BUDGET MORE THAN € 200,000)



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Project of (country)¹

Project number:

Project title: Global Energy Assessment: Developing Policy Tools for Jointly Reducing Energy Poverty and Greenhouse Gas Emissions

Relationship to integrated programme: N/A

Thematic area code

Starting date: October 2009

Duration: 18 months

Project site:

Government Co-ordinating agency: N/A

Counterpart: Executing agency/ cooperating agency: IIASA

Project Inputs:

- **UNIDO inputs:** -
- **Support costs (...%):** 10
- **Counterpart inputs:** USD 1,000,000
- **Grand Total:** USD 1,100,000

Brief description:

The objective of the project is the development of policy options and analytical tools aimed at informed decision-making to support the scaling-up of low carbon energy technologies, achievement of reductions in greenhouse gas emissions, and the reduction of energy poverty. UNIDO and its executing partner, International Institute for Applied Systems Analysis (IIASA), will utilize the Global Energy Assessment (GEA) as the 'platform' on which to base the present project. (The GEA is a multi-year and multi-stakeholder activity that aims to help decision makers address the challenges of providing energy services for sustainable development throughout the world. The GEA is bringing together approximately 200 analysts world-wide to contribute independent, scientifically based, integrated, policy-relevant analysis of current and emerging energy issues and options.) Specifically, the GEA platform will be expanded to include: 1) explicit project components on improving access to energy that emphasize both policy tools and technical analysis; and 2) interactions with policy-makers in developing countries. At the same time, the project will provide data on effective policies and programs that will help GEF establish decision criteria for its own project selection. The expected outcomes of the project all relate to building

¹ For regional, interregional and global projects, indicate the participating countries

the knowledge and capacity of decisionmakers on sustainable energy. Specifically, the expected outcomes would include better understanding among decision makers of key technologies, technology transfer issues, policy instrument choice and major sustainable development issues improved understanding among decisionmakers of policies and market instruments that are enabling sustainable energy systems. Analytical tools developed by the GEA will be known to and used by decision-makers. This will in turn lead to adoption of GEA-recommended policies in most LDCs and by foreign aid agencies in developed countries. Outputs will include: 1) interactive web- and computer-based tools that show the implications of various policy choices and energy-system characteristics; 2) the chapters on energy access and on policy portfolios of the major analytical report of the GEA; and 3) written products related to dissemination of the GEA, including: summary for policymakers; and white papers and policy briefs on energy access vis-à-vis climate change that will have the purpose of increasing the uptake of the tools and analysis.

The future growth of GHG emisisions will be concentrated in developing countries. Access is on the top of the agenda in many developing countries, well ahead of climate change mitigation. Therefore any sustainable GHG mitigation strategy must also solve the access problem. The project will focus on access to sustainable electricity, cooking and heating fuels for buildings and transportation. The challenge is how to achieve access while reducing GHG emissions. The project will explore how to meet this challenge with a combination of energy efficiency and renewable energy solutions. This includes solar, wind, biomass, geothermal and ocean energy for power generation, modern biofuels, solar heaters and heatpumps in the buildings sector, and modern public transportation and sustainable biofuels and other CO₂-free energy carriers for various local transportation modes.

Approved:

Signature:

Date:

Name and title:

On behalf of
.....:

**On behalf of
UNIDO:**

A. CONTEXT

The Problem or Challenge

Energy and the provision of energy services can be linked directly with many if not all of the key global challenges recognized by the international community such that taking action on energy will ameliorate any of a number of global challenges. These challenges will have to be addressed in a world undergoing rapid change in many other dimensions as well. Global population is expected to grow from 6.5 to 9 billion people by 2050. All people have ambitions for enhanced well-being and see economic growth as important for achieving this. Almost half the world's population lives in poverty, and close to 1 billion people live in abject poverty. Infrastructure investments are huge, urbanization is accelerating, and transportation systems are expanding rapidly. Land use constraints are becoming visible in many places. Given the competing requirements in economic and social development, environmental protection, and security, the challenge faced by decision-makers will be to construct a portfolio of policies for dealing with all of the energy-linked challenges simultaneously, adequately, and promptly.

However, with the emergence of the threat of climate change, among others, it has become increasingly clear that a new approach to energy is needed in order to meet wide range social,

economic, and environmental objectives simultaneously. This requires, in fact, a fundamental reorientation from strategies that focus on conventional supply expansion toward those that give greater emphasis to the provision of energy services, encompassing energy end-use efficiency improvements, increased use of non-fossil energy resources, and cleaner fossil fuel generation and use. The Global Energy Assessment (GEA) is a major initiative, established by the International Institute for Applied Systems Analysis (IIASA) and its partnering organizations, to help decision makers address the challenges of providing energy services for sustainable development. The GEA aims at redefining the energy policy agenda. It will address major contemporary energy challenges in an integrated and comprehensive fashion.

The Origin of the Project

The proposed project will be implemented using, as a 'platform,' the ongoing Global Energy Assessment (GEA). The GEA is a multi-year and multi-stakeholder activity that aims to help decision makers address the challenges of providing energy services for sustainable development throughout the world. The GEA was initiated at IIASA in December 2005 with the establishment of an Organizing Committee. The Organizing Committee subsequently conducted an extensive consultation process to identify potential candidates to become the two Co-Presidents of the GEA Council. Ged Davis (former Managing Director of the World Economic Forum) and Jose Goldemberg (chairman of Biomass Energy Commission of Sao Paulo, Brazil and former Environment Minister of Sao Paulo) were appointed Co-Presidents of the Council at the formal launch of the GEA in January 2007 by the IIASA Director, who is *ex officio* member of the Council. The Co-Presidents, in consultation with the Organizing Committee, invited prominent persons to fill the remaining positions on the Council. Members of the Council have been selected to provide a comprehensive range of stakeholders from business, NGOs, national governments, and the United Nations system.

The GEA has already received financial support from the governments of Austria, Italy and Sweden, and the United States. In addition, contracts were finalized and/or monies were received from Petrobras; First Solar, Inc.; ClimateWorks Foundation; the World Bank Group's ESMAP trust fund; the UN Industrial Development Organization; UN Environment Programme; the World Energy Council; the UN Foundation; UN Development Programme (UNDP); FORMAS and the Swedish Energy Agency.

Beneficiaries

The beneficiaries of the project will be decisionmakers and private investors in leading corporations, public institutions, governments at all levels including local, international organizations and key United Nations entities, and multilateral energy organizations such as IEA and WEC. The project will provide policy-relevant analysis and capacity-enhancing guidance to national governments and intergovernmental organizations, decision-support material to the commercial sector (energy service companies, investors and others), and analysis relevant to academic institutions. To the extent recommendations are implemented and are successful, the indirect beneficiaries will include populations currently without access to modern energy for basic needs who will gain access to cleaner, modern fuels.

Policies or Strategies in Place

Energy is a major component of a number of global challenges, but its cumulative potential to ameliorate these challenges is not always recognized. At present, energy is not *per se* one of the Millennium Development Goals (MDGs). The Global Energy Assessment will support policy formulation in the context of the competing requirements in economic and social development, environmental protection, and security, and will provide a sufficient level of regional focus and detail to provide relevant support to a range of global decision makers. To the extent there are interactions among the various policy interventions, attention must be paid to undesirable consequences. For example, policies

that discourage consumption may have regressive impacts on lower-income households. Similarly, policies not directly related to energy such as trade can have an impact (positive or negative) on efforts to achieve energy objectives.

B. REASONS FOR UNIDO ASSISTANCE

Why existing capacity is not sufficient

While there are a number of other projects that address global challenges related to energy, the proposed project is unique because it takes energy as the entry point vis-à-vis the global challenges that have been recognized by the international community. Other studies recently completed or now underway include: the Millennium Ecosystems Assessment (MEA); the International Assessment of Agricultural Science and Technology for Development (IAASTD); Assessment Reports from the Intergovernmental Panel on Climate Change (IPCC); the UN SIGMA XI report and the Inter Academy Council study on transitions to sustainable energy. Whereas these studies have approached energy from various standpoints - climate change, ecosystems, or agriculture - the specific focus of GEA is on energy.

How the project fits within UNIDO mandate

UNIDO's overall mandate is "the promotion and acceleration of industrial development in the developing countries." The GEA will address several aspects of industrial development vis-à-vis sustainability, including specific research focuses on industrial energy efficiency, capacity building, and investment. The objective of the project, which is to advise decision-makers and build capacity for energy policymaking, is aligned with UNIDO's mandate to focus on upstream activities such as policy advisory services and institutional capacity-building. UNIDO's thematic areas of emphasis, adopted by the General Conference in December 2005, include poverty reduction through productive activities, and to this end GEA will evaluate the need for and ways of providing access to modern forms of energy. A further thematic area is energy and environment, including de-linking intensity of energy from economic growth, which matches three focal areas of the GEA, specifically the three knowledge modules on energy efficiency (end-use): industrial, transport, and buildings.

Statement that assistance is not being given by another agency

A number of other agencies are supporting the larger GEA, however, the proposed assistance not duplicative. The support of other donors is detailed in Section D.1., below.

C. THE PROJECT

C.1. Objective of the project

The objective of the project is the development of policy options and analytical tools aimed at informed decision-making to support the scaling-up of low carbon energy technologies, achievement of reductions in greenhouse gas emissions, and the reduction of energy poverty.

C.2. The UNIDO approach

Overall Approach

To meet the objective of developing policy options and analytical tools, UNIDO and its executing partner, IIASA, will utilize the Global Energy Assessment (GEA) as the platform on which to base the present project. (The GEA is a multi-year initiative bringing together approximately 200 analysts world-

wide to contribute independent, scientifically based, integrated, policy-relevant analysis of current and emerging energy issues and options.) For purposes of the current project, the GEA platform will be expanded to include: 1) explicit project components on improving access to energy that emphasize both policy tools and technical analysis; and 2) interactions with policy-makers in developing countries. The activities this will entail are outlined in Section C.5.

The scope of the four GEA knowledge clusters is as follows: I) the major global challenges and their linkages to energy; II) the technologies and resources available for providing energy services; III) the future energy systems envisioned for addressing the major challenges; and IV) the requisite policies and measures designed to facilitate sustainable energy futures. Cluster I expands and disseminates the understanding of the nature and magnitude of the major challenges related to energy. Cluster II updates the knowledge in terms of resources availability as well as energy end-use and demand technology options identified to meet all the challenges. Cluster III seeks to illuminate the transition in terms of the energy systems that will be necessary to meet sustainability objectives. Cluster IV examines how such systems could be realized by identifying policy portfolios which simultaneously address multiple challenges.

The clusters themselves are further divided into knowledge modules as follows:

Cluster I: Major Global Issues and Energy

1. *An Introduction to Energy (Goals, Visions, Why?)*
2. *Social Issues, MDG and Energy*
3. *Environment and Energy*
4. *Health and Energy*
5. *Security, Interdependence, Markets and Energy*
6. *Energy, Economy and Investment*

Cluster II: Energy Resources and Technological Options

7. *Energy Resources (Fossil, Nuclear and Renewable)*

Sub-cluster IIa: End-use

8. *Energy End-Use (Efficiency): Industrial Sector*
9. *Energy End-Use (Efficiency): Transport and Urban Planning*
10. *Energy End-Use (Efficiency): Buildings (commercial and residential)*

Sub-cluster IIb: Supply

11. *Renewable Energy*
12. *Fossil Energy Systems (Conventional and Advanced)*
13. *Carbon Capture and Storage*
14. *Nuclear Energy*
15. *Energy Supply System and Operation*

Sub-cluster IIc: End-use and supply linkages

16. *Synthesis module: End-use and Supply linkages and synthesis*

Cluster III: Describing Possible Sustainable Futures

17. *Global and Regional Scenarios, Normative Futures, and Major Uncertainties*
18. *Urbanization*
19. *Rural Energy and increasing Access*
20. *Trade-offs, Land and Water*
21. *Energy Services and Human Well Being (Lifestyles, consumption patterns)*

Cluster IV: Realizing Sustainable Energy Futures

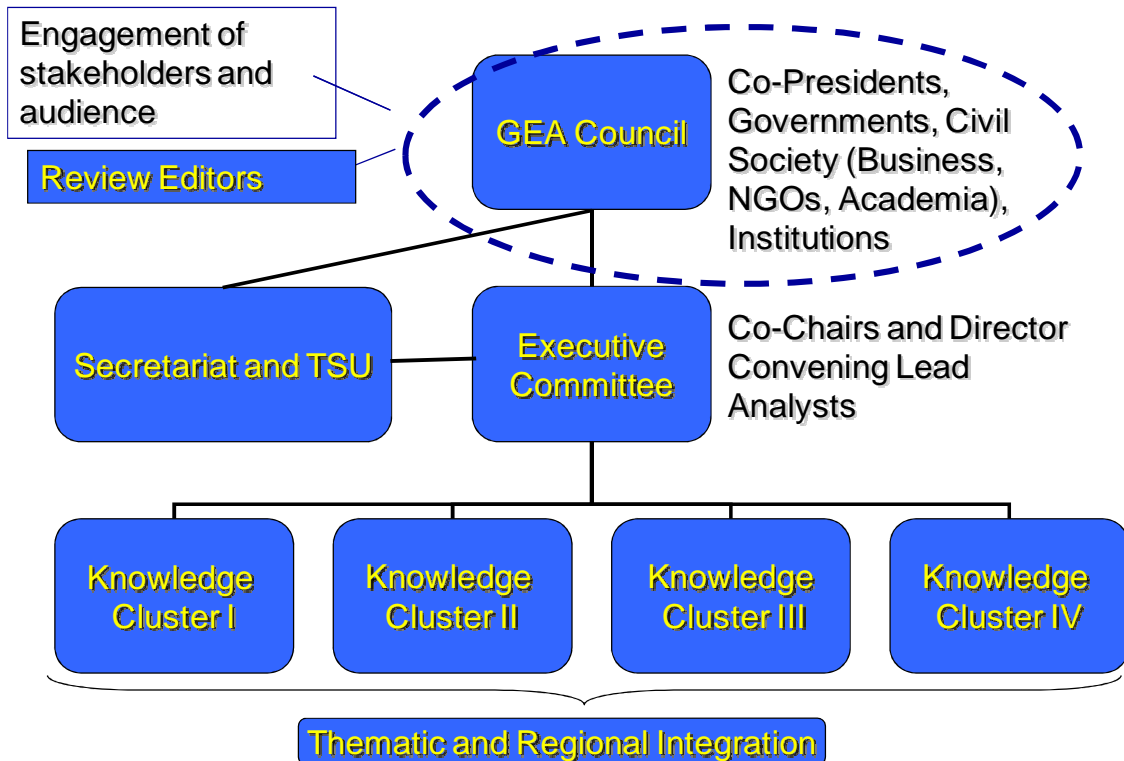
- 22. Energy Policy: Rationales and Mechanisms
- 23. Policies for Energy Access
- 24. Policies for Innovation
- 25. Policies for Capacity Building
- 26. Sustainable Energy Policy Portfolios

It is envisaged that the GEF funds will, in particular, support: KM 19, Rural Energy and increasing Access; and KM 23, Policies for Energy Access.

Approximately 200 analysts, total, are working on the GEA, and are divided into teams led by convening lead analysts (CLAs) who are responsible for one of the knowledge modules of the Assessment. The CLAs, together with two co-chairs and the director, comprise the GEA Executive Committee, which is responsible for carry-out the analysis and developing the products of the GEA, including the major analytical report. The GEA Council oversees the work of the Executive Committee. A secretariat hosted at the International Institute for Applied Systems Analysis (IIASA) is responsible for day-to-day management of the GEA. (See Figure 1.)

The GEA was initiated at IIASA in December 2005 with the establishment of an Organizing Committee and was formally launched at IIASA in Laxenburg Austria in January 2007. Since that time, the Council has held three meetings (in July 2007, May 2008, and January 2009) to provide informal advice and feedback on the progress of the GEA. The Executive Committee has held six meetings thus far aimed at coordinating the work. In addition, a meeting of 90 of the analysts was held in June 2009 in Vienna, Austria in order to provide a venue for coordinating the work and linking together the various themes and topics.

Figure 1 GEA Structure



Institutional Arrangements

The executing agency for the project will be the International Institute for Applied Systems Analysis—a non-profit, multi-national, independent organization devoted to interdisciplinary, policy-oriented research focusing on selected aspects of environmental, economic, technological and social issues in the context of global change. IIASA's research is organized around fields of policy importance rather than academic disciplines and serves as a neutral forum for sustained investigation and discussion of global and international issues. On 4 October 1972, the Institute was officially constituted in London under the auspices of the Royal Society as the *International Institute for Applied Systems Analysis* (IIASA). Schloss Laxenburg was chosen as the site for the new Institute, located 16 kilometers south of Vienna. In 1994, a Ministerial Conference renewed the mandate for the Institute to conduct independent, scientific research with a global perspective; since then members from Asia and Africa have joined IIASA. Currently there are 18 National Member Organizations.

IIASA's mission is to conduct international and interdisciplinary scientific studies to provide timely and relevant information and options, addressing critical issues of global environmental, economic and social change, for the benefit of the public, the scientific community, and national and international institutions. In order for national and international policies to be effective in dealing with global change, decision- and policymakers must understand the complex problems associated with them. This is precisely the mission of IIASA – to provide science-based insight into complex global problems. IIASA investigators combine methods and models from the natural and social sciences in analyses that provide policy insight on global change issues. Since 2000, the Institute's research is carried out within three core themes: Environment and Natural Resources; Population and Society, and Energy and Technology. In addition to scientifically-sound, policy relevant findings, the Institute has made significant contributions to the methodologies of assessment and decision support, as well as to the development and refinement over three decades of global databases and analytical models. Within the themes are programs, which define the major research areas in which IIASA does it work. The first phase of energy research at IIASA culminated with *Energy in A Finite World* (1981), the first truly global study of the topic. Other key accomplishments have included publications on the economics of climate change, such as *Costs, Impacts, and Benefits of CO₂ Mitigation* (1993), and a major study, *Technology and Global Change* (1998). Working with the World Energy Council (WEC), the energy program was responsible for the policy-oriented study, *Global Energy Perspectives* (1998) and for the *World Energy Assessment (2000 and 2004)*, together with UNDP and UNDESA. Turning to another research theme at IIASA, work on climate change has included key reports such as *Mountain World in Danger – Climate Change in Forests and Mountains of Europe*, which led to a UN initiative. The Greenhouse Gas and Air Pollution Interactions and Synergies (GAINS) model addresses local health impacts associated with fine particulate matter and ozone, vegetation damage to natural ecosystems and agricultural crops, and greenhouse gas emissions. In the area of land use and agriculture, IIASA's report on "Climate Change and Agricultural Vulnerability," commissioned by the United Nations (UN), was distributed to all government delegations at the World Summit on Sustainable Development in Johannesburg. IIASA scientists have made significant contributions to several IPCC efforts including the Second, Third and Fourth Assessment Reports (1995, 2001, and 2007) and the *Special Report on Emissions Scenarios* (2000).

What the project will NOT do

The focus of the project is on providing analysis and tools to decisionmakers. The process (of meetings, dialogues, etc.) will entail some capacity development, but it will not include technical assistance, grants or other instruments needed to implement the policies recommended by the major analytical report of the GEA.

Parallel Activities

The project will, as noted, operate within the GEA platform. The GEA will leverage the findings from other assessments, such as the Millennium Ecosystems Assessment (MEA), the International Assessment of Agricultural Science and Technology for Development (IAASTD), Assessment Reports from the Intergovernmental Panel on Climate Change (IPCC), the UN SIGMA XI report and the Inter Academy Council study on transitions to sustainable energy. Whereas these studies have approached energy from various standpoints - climate change, ecosystems, or agriculture - the specific focus of GEA is on energy. GEA will glean insights from these earlier studies to present a unified picture of all the global challenges related to energy, including the global environmental benefits that could be achieved through deployment of advanced energy systems. Further, many of the experts participating in GEA were authors of these earlier studies, and in addition, many are heavily engaged in research on energy and economic development. The GEA will complement other energy studies such as the World Energy Outlook and the Energy Technology Perspectives. The unique feature of GEA is a rigid scientific process, development of new publicly available analytical tools that consider energy and poverty alleviation issues, and a comprehensive assessment of different steps in the systems design (technology, finance, policy instruments). The GEA is an open process being produced by a global network of region and country experts constructing internally consistent effective and efficient normative scenarios and strategies out to 2050 and 2100. The main goal is to help LDC in their development and in achieving their policy goals. The GEA is also taking part in the follow-up to the Stern Review into the Economics of Climate Change, and participated in Lord Stern's roundtable on the Regional Economics of Climate Change Study in Hong Kong in October 2008. The GEA will also support initiatives of the Commission on Sustainable Development (CSD) and the work of UN Energy and other UN agencies as well as contribute to other multilateral partnerships such as the EU Energy Initiative for Poverty Eradication and Sustainable Development. The comparative advantage of the GEA is in its unified treatment of the energy-linked global challenges such as poverty alleviation, mitigation of environmental impacts, and energy security, whereas many of the studies and initiatives listed consider energy in relation to one particular global challenge (e.g., climate change).

C.3 RBM code and thematic area code²

TCB

C.4. Expected outcomes

The expected outcomes of the project all relate to building the knowledge and capacity of decisionmakers on sustainable energy. The expected outcomes relate to the decisionmakers and private investors with responsibility for energy access. Specifically, the expected outcomes would include better understanding among decision makers of key technologies, technology transfer issues, policy instrument choice and major sustainable development issues improved understanding among decisionmakers of policies and market instruments that are enabling sustainable energy systems. Analytical tools developed by the GEA will be known to and used by decision-makers. This will in turn lead to adoption of GEA-recommended policies in most LDCs and by foreign aid agencies in developed countries. It is further envisaged that GEA results will be used in the forging of multi-lateral environmental agreements (e.g., UNFCCC). To the extent recommendation are implemented and are successful, the indirect beneficiaries will include populations currently without access to modern energy for basic needs who will gain access to cleaner, modern fuels. Additional detail is provided in the logical framework table on page 11.

² The theme codes are: EAE, PRP and TCB

C.5. Outputs and activities

The future growth of GHG emissions will be concentrated in developing countries. Access is on the top of the agenda in many developing countries, well ahead of climate change mitigation. Therefore any sustainable GHG mitigation strategy must also solve the access problem. The project will focus on access to sustainable electricity, cooking and heating fuels for buildings and transportation. The challenge is how to achieve access while reducing GHG emissions. The project will explore how to meet this challenge with a combination of energy efficiency and renewable energy solutions. This includes solar, wind, biomass, geothermal and ocean energy for power generation, modern biofuels, solar heaters and heatpumps in the buildings sector, and modern public transportation and sustainable biofuels and other CO₂-free energy carriers for various local transportation modes.

The first output (budget line of \$312,500) relates to policy tools that allow decision-makers to analyze the quantitative impacts of policies for energy access, including the secondary impact on GHG emissions. The output will take the form of web-based and computer-based quantitative tools and will be realized through a scenario exercise. This will entail an expansion of the ongoing GEA scenario exercise, which will now include more thorough consideration of energy access. The scenario exercise³ will envisage possible transitions to sustainable energy and the impact such transitions will have on a suite of indicators that measure the degree to which progress in the four domains of security, health and environment (including climate change), access, and social equity are being realized. Energy access will be included by use of quantitative indicators related to energy access such as numbers of persons without access to affordable electricity and numbers of persons without access to affordable clean cooking and heating services. (Other indicators include: land-use for bioenergy production, number of persons exposed to high indoor air pollution, diversity of primary energy supply, etc.) The tools that are envisaged are: 1) GEA scenario database, allowing policy makers to view the predictions for key energy variables (e.g., consumption by type of fuel in a given year) that correspond to his/her choice of geographic region and stabilization level (ppm CO₂ equivalents); and 2) an interactive PC-based tool designed to allow policymakers to 'dial-in' quantitative targets for energy access and see in real-time the implications for required funding and GHG emissions. Further outputs will include workshops and meetings with stakeholders aimed at improving the uptake of the project's findings and recommendations. Major reports and tools will be translated into major languages of the LDCs.

The second output (budget line of \$312,500) relates to technical analysis of policies for energy access, including the secondary impact on GHG emissions. The output will take the form of a written product, i.e., the specific chapters on energy access⁴ of the major analytical report of the GEA. The report will be translated into major languages of the LDCs. The GEF support will allow the GEA to conduct an analysis of past policies for energy access and their impact on GHG emissions in order to extract lessons-learned.

Also to be included in the second output will be information that can be used in the planning and execution of the GEF program itself. The GEA will provide GEF with tools and analysis they can use for:

³ The convening lead analyst with overall responsibility for the scenario exercise is Keywan Riahi (International Institute for Applied Systems Analysis (IIASA) and Technical University Graz, Austria).

⁴ The two knowledge modules treating the subject of energy access are: KM19, Rural energy and increasing access (CLA: Abeeku Brew-Hammond (The Energy Centre, KNUST, Ghana)); and KM23, Policies for Energy Access (CLA: Daniel Bouille (Bariloche Foundation, Argentina)).

- Selecting interventions for energy access that will lead to the least long-term expected impacts on the global environment;
- Establishing decision criteria for project selection;
- Choosing robust, measurable indicators for project outcomes;
- For future GEF replenishments, identifying focal areas related to energy where GEF resources might be applied; and
- Identifying complementarities between GEF resources and specific investments.

The third output (budget line of \$375,000) will be recommendations on policies for energy access set within larger policy portfolios and written outputs for dissemination of GEA results. These portfolios will be constructed utilizing the analysis of output two, above, so as to simultaneously address not only energy access but also the other global challenges linked to energy including climate change. The outputs related to these will take the form of the chapter on policy portfolios of the major analytical report, translated into major languages of the LDCs.. The activities will include three regional workshops (notionally, one each in Africa, Asia, and Latin America/Caribbean) aimed at both obtaining feedback and providing guidance on the changes in energy systems needed to simultaneously attend to the challenges of the 21st Century. To the greatest possible extent, GEA will partner with other organizations and initiatives in this process. Also for this output, there will in be a number of written products for dissemination, including: summary for policymakers; and white papers and policy briefs on energy access vis-à-vis climate change that will have the purpose of increasing the uptake of the tools and analysis. Activities associated with this last output will include writing sessions to develop these additional dissemination products.

Logical Framework

Project Component	Expected Outcomes	Outputs	Activities
Improving access while minimizing GHGs: <i>policy tools</i>	<ul style="list-style-type: none"> Analytical tools generated by GEA are known to and used by decision-makers in most LDCs and by foreign aid agencies in developed countries; Use of GEA results in the forging of multi-lateral environmental agreements (e.g., UNFCCC) 	Web-based and computer-based quantitative tools, translated into major LDC languages and supported by workshops	1.1 Research and analysis 1.2 Meetings of scenario team 1.3 Dissemination workshop and meetings
Improving access while minimizing GHGs: <i>technical analysis</i>	<ul style="list-style-type: none"> Better understanding by decision makers of key technologies, technology transfer issues, policy instrument choice and major sustainable development issues; Increased welfare of people in LDCs; and Future GEF programming considers GEA outcome 	Chapters on energy access of the major analytical report of the GEA, translated into major LDC languages	2.1 Meetings of Executive Committee 2.2 Meetings of KM writing teams on energy access
Interactions with Policy-makers in developing countries	<ul style="list-style-type: none"> Improved understanding among decisionmakers of policies and market instruments that are enabling sustainable energy systems; Increased investment by industry and governments in sustainable solutions for LDCs; and Measurable reduction of energy poverty: better access to modern energy by the poor 	Chapter on policy portfolios of the major analytical report; written products for dissemination, translated into major LDC languages	3.1 Workshop in Africa 3.2 Workshop in Asia 3.3 Workshop in Latin America/Caribbean 3.4 Writing sessions to develop dissemination products

C.6. Timeline of the activities

Activity	Months																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1.1 Research and analysis	■	■	■	■	■	■												
1.2 Meetings of scenario team	■	■	■	■														
1.3 Dissemination workshop and mtgs.															■	■	■	■
2.1 Meetings of Executive Cmty.	■	■	■	■	■	■	■	■	■									
2.2 Meetings of Writing Teams	■	■	■	■														
3.1 Workshop in Africa		■																
3.2 Workshop in Asia			■															
3.3 Workshop in Latin America/Caribbean				■														
3.4 Writing sessions										■	■	■	■	■				

C.7. Risks

The project risks are of two types: those related to, first, the risk of planned activities not leading to the planned outputs and, second, of planned outputs not leading to planned outcomes. With respect to the first of these categories, the risk relates to the GEA effort that is the platform for the proposed project. The GEA relies on contributions from donors in support of its numerous activities. There is the possibility that GEA will not receive funding consistent with its scope and ambition and thus would have difficulty achieving the desired outputs at the level of quality that is desired. (The proposed project, allowing the expansion of the GEA's consideration of energy access, is seen as mitigating this risk.)

In the second category are risks related to the adoption of GEA policies and recommendations by decisionmakers. Although every effort will be made to convince decision makers of the benefits of adopting GEA-recommended policies, compliance with the GEA recommendations will ultimately be voluntary. Specific risks include: the lack of willingness on the part of governments to intervene in the energy sector; the failure to secure sufficient financing and attract private capital for the huge investments needed in energy infrastructure; and the challenge of international cooperation on environmental agreements. In addition, there are the risks related to the implementation of these policies and the effectiveness and appropriateness of their design. One of the activities in the proposed project is to fund a regional and country-level dialogue to move toward consensus on adoption of policies and market instruments that are enabling of sustainable energy systems. This will help to mitigate risk by leading to policies and recommendations that are appropriately tailored to decisionmakers.

D. INPUTS

D.1. Counterpart inputs

The executing partner, IIASA, as host of the Secretariat of the GEA, provides the following inputs:

- *GEA Council*: The Council is responsible for ensuring the integrity, credibility, legitimacy, and relevance of the GEA. There are currently 20 members of the Council comprising a geographically diverse membership from a broad cross-section of governments, parliaments, multilateral organizations, academia and civil society, including business, NGOs, consumer and producer groups and eminent persons from throughout the world.
- *Executive Committee*: The Executive Committee has the main responsibility for carrying out the analysis and producing the written products. There are 27 members from a regionally diverse background including the convening lead analysts responsible for the knowledge modules, two co-chairs and the GEA Director. Members are subject matter experts in their respective fields.
- *Analysts*: In addition to the convening lead analysts of the Executive Committee, there are approximately 200 lead analysts and contributing analysts working on the GEA.
- *Secretariat*: IIASA has committed a number of staff to the project since launching the GEA in January 2007. This includes the two co-presidents of the GEA Council, the two co-chairs of the GEA Executive Committee, and the Director of the GEA. (Biosketches of these five individuals appear below.) IIASA is hosting the Secretariat, including three IIASA staff members. IIASA is, in addition, one of the financial contributors to the Assessment, as detailed in the table below listing funding received and/or pledged to date. Most of the listed support is programmatic in that it covers all GEA activities. Some support is focused on specific topics or themes of GEA. Support from Italy's Ministry of the Environment and Territories is directed toward work on transportation and biofuels. Support from the World Bank, in part, is directed toward work on capacity development. Most of the support from the United States is focused on energy resources.

Category (Source)	Amount pledged or contributed
National Governments (Italy, Sweden, United States)	1,259,000
Bilateral Aid Agencies (Austrian Development Agency)	1,088,000
NGOs and Foundations (ClimateWorks, UN Foundation)	400,000
Industry (Petrobras, WEC, First Solar)	313,000
Multilateral Agencies (UNIDO, World Bank, UNDP, UNEP)	1,047,000
TOTAL	\$ 4,107,000

D.2. UNIDO inputs

E. BUDGET

The following budget is planned for the requested support through the completion of the project in April 2011.

Project Component	Budget in USD
Improving access while minimizing GHGs: <i>policy tools</i>	312,500
Improving access while minimizing GHGs: <i>technical analysis</i>	312,500
Interactions with Policy-makers in developing countries	375,000
TOTAL	1,000,000

F. MONITORING, REPORTING AND EVALUATION

Reporting

The reporting will consist of two chapters (reports) for GEA and web based and computer based tools. In addition, a final progress report will be prepared that includes a review of the project activities including workshops and meetings.

Monitoring

IIASA will report its progress on a quarterly basis to UNIDO. A meeting will be held to discuss this progress and to suggest adjustments to the project execution, if needed.

Evaluation

The project will be ex-ante and ex-post evaluated by the UNIDO Quality Assurance Group.

Self-evaluation of the GEA is of two kinds. First, the governance structure of the GEA includes a Council, responsible for ensuring the integrity, credibility, legitimacy, and relevance of the GEA. The Council provides informal feedback to the Executive Committee as the latter develops the written products the GEA and will endorse the final report and summary for policymakers. The Council is constituted so as to ensure that at the highest level a comprehensive range of energy interests and concerns are represented, ensuring ownership of the Assessment process and products by all key stakeholders. The Council includes a geographically diverse membership from a broad cross-section of governments, parliaments, multilateral organizations, academia and civil society, including business, NGOs, consumer and producer groups and eminent persons from throughout the world.

Second, there will be a formal peer review in the first quarter of 2010. The review process will be an independent, refereed review with the goal of ensuring quality and relevance of the scientific and technical advice in the written GEA products. The Council Co-Presidents will appoint expert reviewers with the needed expertise to provide comments on specific knowledge modules of the report. The Executive Committee will appoint the Review Editors whose task it will be to ensure that all review comments have been appropriately reflected in the revised report.

G. PRIOR OBLIGATIONS AND PREREQUISITES

NONE

H. LEGAL CONTEXT

N/A

ANNEX ONE

Project Document for the Overall GEA

BACKGROUND

Motivation

Energy services are essential for sustainable development, yet energy systems today face major challenges in relation to: security of supply; access to modern forms of energy; local, regional and global environmental impacts; and securing sufficient investment. Addressing these issues simultaneously to achieve the multiple objectives of sustainable development in both developing and industrialized countries requires detailed knowledge based on comprehensive and integrated analysis of energy challenges. While each potential solution has its opportunities and barriers, the challenge faced by overall energy system is to evolve the portfolio of energy resources and technologies so as to enable conditions to meet the energy service needs of the 21st century. In addition, energy choices will be constrained by the large embodied capital investments and long turnover times that characterize the energy industry and energy end use, and limit the pace of possible transformation.

A number of recent studies have illuminated various facets of these current energy issues and challenges (UNDESA, UNDP and WEC, 2000 and 2004; NCEP, 2004; IAC, 2007; ICSU, 2007; IPCC, 2007; Sigma Xi, 2007; UN Foundation, 2007). The Global Energy Assessment (GEA) will build on these studies in an integrative fashion, providing a comprehensive novel perspective and reviewing all relevant challenges related to energy from both a global and place-based perspective while highlighting challenges, synergies and tradeoffs. The GEA will develop regional and global scenarios to explore how options can be combined into systems that support sustainability. These will be policy-relevant—providing a vision of how to resolve the challenges simultaneously and new insights into potential leverage points for achieving more sustainable energy futures.

Project Initiation

The GEA was initiated by IIASA in December 2005 with the establishment of an Organizing Committee and Secretariat. The Organizing Committee, listed in Appendix A, subsequently conducted an extensive consultation process to identify potential candidates to become the two Co-President of the GEA Council. Ged Davis (former Managing Director of the World Economic Forum) and Jose Goldemberg (chairman of Biomass Energy Commission of Sao Paulo, Brazil and former Environment Minister of Sao Paulo) were appointed Co-Presidents of the Council at the Launch of the GEA in January 2007 by the IIASA Director, who is *ex officio* member of the Council. The Co-Presidents, in consultation with the Organizing Committee, invited prominent persons to fill the remaining positions on the Council. A list of council members is included as Appendix B.

Sponsorship

The GEA is being sponsored by the following organizations:

- Austrian Development Cooperation
- ClimateWorks Foundation
- Italian Ministry for the Environment and Territory
- Petrobras

- Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (FORMAS) and the Swedish Energy Agency
- United Nations Development Programme
- United Nations Environment Programme
- United Nations Foundation
- United Nations Industrial Development Organization
- World Bank
- World Energy Council

The financial management of the GEA is being undertaken by IIASA, per resolution at the first GEA Council meeting in July 2007.

CONCEPTUAL STRUCTURE

Clusters

The Global Energy Assessment (GEA) seeks to examine: the major global challenges and their linkages to energy; the technologies and resources available for providing energy services; future energy systems that address the major challenges; and the policies and other measures to realize sustainable energy futures. Given the linkages between these objectives, the GEA will necessarily adopt an integrated and holistic approach structured into four main clusters reflecting the main objectives. The clusters, which will be subdivided into knowledge modules, are as follows:

Cluster I: Major Global Issues and Energy

1. *An Introduction to Energy (Goals, Visions, Why?)*
2. *Social Issues, MDG and Energy*
3. *Environment and Energy*
4. *Health and Energy*
5. *Security, Interdependence, Markets and Energy*
6. *Energy, Economy and Investment*

Cluster II: Energy Resources and Technological Options

7. *Energy Resources (Fossil, Nuclear and Renewable)*
8. *Energy End-Use (Efficiency): Industrial Sector*
9. *Energy End-Use (Efficiency): Transport and Urban Planning*
10. *Energy End-Use (Efficiency): Buildings (commercial and residential)*
11. *Renewable Energy*
12. *Fossil Energy Systems (Conventional and Advanced)*
13. *Carbon Capture and Storage*
14. *Nuclear Energy*
15. *Energy supply system operation*
16. *Synthesis module: End-use and Supply linkages and synthesis*

Cluster III: Describing Possible Sustainable Futures

17. *Global and Regional Scenarios, Normative Futures, and Major Uncertainties*
18. *Urbanization*
19. *Rural Energy and increasing Access*
20. *Trade-offs, land and water*
21. *Energy Services and Human Well Being (Lifestyles, consumption patterns)*

Cluster IV: Policies Advancing Energy for Sustainable Development

22. *Energy Policy: Rationales and Mechanisms*
23. *Policies for Energy Access*
24. *Policies for Innovation*
25. *Policies for Capacity Building*
26. *Sustainable Energy Policy Portfolios*

ORGANIZATIONAL STRUCTURE

The organizational structure of GEA is modeled after a number of earlier and current studies, including the Millennium Ecosystem Assessment (MEA), the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD), and the International Panel on Climate Change (IPCC). Accordingly, overall guidance of the GEA will be provided by a Council, and analytical responsibility will rest with an Executive Committee (see Figure 1).

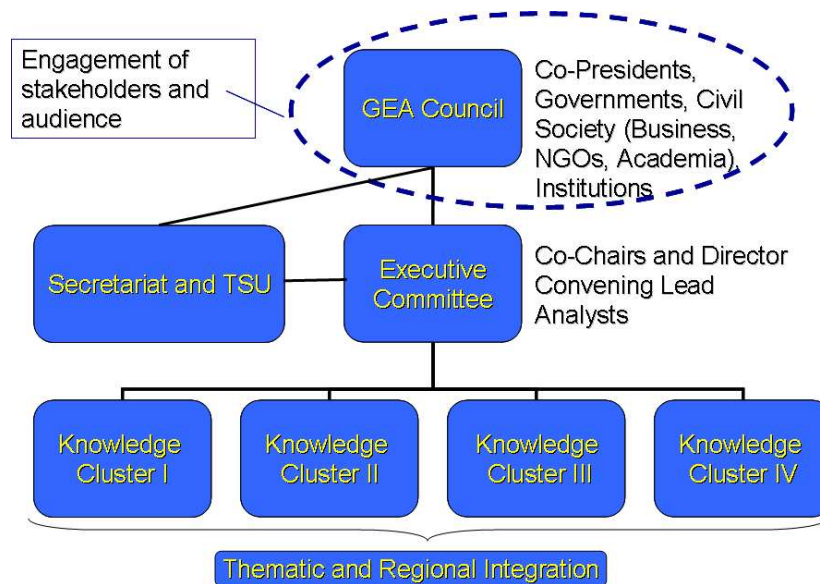


Figure 2: GEA Organizational Structure

Council

Responsibilities

The governance of the GEA is the responsibility of a Council representing high-level stakeholders. The Council is responsible for ensuring the integrity, credibility, legitimacy, and relevance of the GEA. The Council also provides a forum for constructive exchanges and ensures the Assessment is directed in a way that addresses the needs and interests of a broad cross-section of decision makers. Moreover, the Council will play a critical role in outreach and dissemination.

The Council adopts the detailed rules and procedures for the work to produce the Assessment. The Council is responsible for endorsing the scope, mission, and structure,

governance and management of the Assessment presented in the Outline, strategy and Terms of Reference prepared by the Organizing Committee.

At the conclusion of the Assessment process, the Council will be responsible for accepting the Final Report and other major publications, and for conducting a line-by-line approval process for the main summary documents. In all decisions the Council will strive for unanimity, but will have the option of accepting dissent and adopting majority decisions where differences cannot be resolved.

Composition

The Council is constituted so as to ensure that at the highest level a comprehensive range of energy interests and concerns are represented, ensuring ownership of the Assessment process and products by all key stakeholders. The Council includes a geographically diverse membership from a broad cross-section of governments, parliaments, multilateral organizations, academia and civil society, including business, NGOs, consumer and producer groups and eminent persons from throughout the world. The Council's membership will expand as the Co-Presidents invite additional institutions and individuals in consultation with the Executive Committees.

At its discretion, the Council may form subcommittees to facilitate decision making on substantive, procedural, and operational issues. The subcommittees will serve the Council in an advisory capacity.

The Council will meet twice per year. The Council will be convened by the two Co-Presidents.

Executive Committee

Responsibilities

The Executive Committee (EC) has the main responsibility for carrying out the analysis and producing the written products. The EC works in an integrated manner to ensure that the GEA presents a coherent and complete analysis of the issues and options, and what can be said from a scientific and analytical perspective.

The EC organizes extensive consultation activities, including a scientific and governmental review process. The EC will also provide general direction of the work to be carried out by the individuals responsible for drafting the Assessment. (See section below on Analysts.)

The Executive Committee will oversee the review process for the various assessment products.

Composition

The EC is headed by two Co-Chairpersons, appointed by the Council. The Council, on recommendation from the EC, appoints a Director who, in consultation with the Co-Chairpersons is responsible for the overall management of technical and scientific organizational issues.

At their discretion, the Co-Chairpersons may appoint from within the EC cluster lead analysts responsible for one of the four knowledge clusters of the GEA.

It is anticipated that the EC will comprise a total of fifteen to twenty members, including the Co-Chairs and Director, from a regionally diverse background. A list of EC personnel is included as Appendix C.

Analysts

Convening Lead Analysts

The Convening Lead Analysts (CLAs) each are responsible for one (or in some instances more than one) knowledge module. The CLAs will establish ad hoc working groups of lead analysts and consulting analysts to carry out the analysis for their knowledge module(s) and to develop the various written and other types of products. It is expected that such working groups would meet several times per year.

Lead Analysts

Lead Analysts (LAs) are leading scientists and technical experts on various aspects of sustainable energy.

Consulting Analysts

Consulting analysts (CAs) are being tasked with preparing short, specialized contributions to the assessment products, such as technical information in the form of text, graphs or data.

Secretariat

The Secretariat serves the Council and the EC on all aspects of their work. It is hosted by IIASA and led by the Director of the GEA. (See Appendix D for a list of staff). The tasks of the Secretariat include:

- Convening meetings of the Council and EC as requested by the Co-Presidents and Co-Chairs,
- Keep track of drafts, minutes and other relevant material, collate review comments, and
- Responsibility for the outreach efforts, under the guidance of the EC.

The Director of the GEA leads the day-to-day work. Responsibilities include:

- Overall management of technical and scientific organizational issues, in consultation with the Co-Chairs,
- Contacts with lead Analysts, contributors, reviewers, etc.
- Contacts with stakeholder and advisory groups,
- Lead the production process of the GEA and supportive material,
- Lead the outreach efforts, and
- Financial responsibility.

Review Editors

Review Editors will ensure that all review comments have been appropriately reflected in the Assessment.

ASSESSMENT PROCESS

Overview

The work of the assessment is being carried out by an appointed group of analysts. The various assessment products (or outputs) are being developed following a set of interim and final project milestones. In particular, the final report of the assessment will be developed in several stages. Among these are a review process involving review editors and expert reviewers. In parallel with the publication of the final report, the secretariat will coordinate an outreach effort to disseminate the report's findings and conclusions.

Appointment of Convening Lead Analysts, Lead Analysts, and Consulting Analysts

Convening Lead Analysts

The Co-Presidents of the Council, in consultation with the Co-Chairs and the Director, identifies and appoints the CLAs with a view to achieving an adequate representation of men and women whose expertise qualifies them to serve in the respective functions, and to cover regional issues adequately. The CLAs for the Assessment are selected by the Council on the basis of their demonstrated expertise and intellectual leadership on global energy topics, including linkages between energy and:

- Social issues, economy, environment, and security;
- Investment and financing;
- Governance and institutions;
- Resource issues;
- Sustainable energy technologies (for energy end-use efficiency, renewable energy, and other advanced energy technologies);
- Energy scenario analysis; and
- Energy policies.

Lead Analysts

The Executive Committee identifies and appoints a core group of experts to contribute to the substantive work of the Assessment as Lead Analysts (LA). Once the experts have been identified and brought into the process, they will develop the various drafts of the assessment report. The same criteria for selection of CLAs shall apply to LAs. It is anticipated that those participating in the initial phase of the process will be drawn from organizations such as:

- Reputable policy and development institutes
- Experts in the relevant fields Academic and research institutions
- Business community, incl. the energy industry

The choice of the individuals and institutions to be involved is critical in to ensuring a high quality and credible product, which accurately reflects a wide range of perspectives and is relevant to a global audience, including regional and national aspects.

Consulting Analysts

Consulting analysts (CAs) will be appointed by CLAs on an as-needed basis.

Development of the Zero-Order Draft

The zero-order draft will follow the outline of Knowledge Modules (KM) in Appendix E. In broad terms, a zero-order draft should include the questions which need to be addressed. It need not contain a full text, yet some substance should be included, together with key figures and tables. The zero-order draft documents should represent a collective thinking, including inputs from stakeholder consultations. The LAs should be involved in the process as soon as possible. The EC will present the zero-order draft to stakeholders upon completion to solicit comment.

The process of developing the zero-order draft and assembling it from its various components is as follows:

- For each KM, CLAs will produce a *scoping text* and an *extended text*. The scoping text is an introduction to the KM laying out the policy-relevant questions related to the KM. The extended text comprises the headings, the key figures and tables, as well as insights in regard to the stakeholder consultation.
- An *engagement section* drafted by the EC presenting the overall introduction. It will incorporate some material from the scoping sections prepared for each KM, but build primarily upon the GEA Issues Paper.

Development of the First-Order Draft

The CLAs (along with LAs and CAs) will prepare a first draft of the Assessment under the general guidance of the full Executive Committee. This EC-approved draft will be widely circulated for review and comment from a diverse audience, with the inputs to the review process incorporated by the LAs into the Assessment and a final draft produced.

The first order draft will in essence be a completion of the zero-order draft to the extent that the full text needs to be completed. In addition, the comments of stakeholders will be considered and acted upon, to include both revising sections of the zero-order draft and adding new sections based on new analysis, as necessary.

Review

Appointment of Expert Reviewers and Review Editors

Review Editors. The Executive Committee shall appoint between two and four Review Editors per Cluster. These should be selected from among candidates in developed and developing countries and countries with economies in transition. In the aggregate, the list of editors should achieve a balanced representation of scientific, technical, and socio-economic views. The Review Editors should have demonstrated expertise on global energy topics, with advanced knowledge related to a particular Cluster, and should have an understanding of the linkages between energy and:

- Social issues, economy, environment, and security;
- Investment and financing;
- Governance and institutions;
- Resource issues;
- Sustainable energy technologies (for energy end-use efficiency, renewable energy, and other advanced energy technologies);
- Energy scenario analysis;
- Energy policies;

Expert Reviewers. The Expert Reviewers are appointed by the GEA Council Co-Presidents and should have demonstrated expertise in the areas noted above for Review Editors.

Collectively, the appointed Expert Reviewers shall have expertise spanning the full range of subjects analyzed in the Assessment. The Expert Reviewers shall be chosen from among the following:

- Experts who have significant expertise and/or publications in particular areas covered by the Report; and
- Experts previously suggested as Convening Lead Authors, Lead Authors, contributing authors or expert reviewers.

Expert Review Process

The second order draft (SOD) is to be circulated by the Secretariat for comment by Expert Reviewers. The Council Co-Presidents will have appointed Review Editors whose task it will be to ensure that all review comments have been appropriately reflected in the Assessment. The CLAs should make available to reviewers and the Secretariat on request during the review process specific material referenced in the document being reviewed, which is not available in the international published literature. Expert reviewers should provide the comments to the CLAs via the GEA Secretariat. CLAs, in consultation with the Review Editors and in coordination with the Secretariat, are encouraged to organize meetings with LAs, CAs, and expert reviewers during the GEA LA meeting (if time and funding permit) in order to pay special attention to particular points of assessment or areas of major differences. The responses of the CLAs need to be documented and the reasons given for rejecting the reviewer's suggestions and in case of acceptance it should be stated how the KM has been modified in order to reflect the review's suggestions. The review process shall be deemed finished when the Review Editors have given their written concurrence. In the event that a Review Editor is unable to concur and the differences remain unresolved, the GEA Council shall be the final authority.

Final Draft and Acceptance of Report by GEA Council

Preparation of Final Draft

The Executive Committee will oversee the preparation of the final draft. CLAs shall work in consultation with review editors in developing the final draft in response to review.

Acceptance

The Final draft shall be presented by the EC to the GEA Council. The acceptance of the report by the GEA Council signifies that the material presents a comprehensive, objective and balanced view of the subject matter, although it has not been subject to line by line discussion and agreement.

PRODUCTS

Overview

The GEA seeks to provide highly policy relevant step-by-step advice for the short, medium and long term. The GEA is seeking to respond to the needs of policy makers to develop solutions despite incomplete data associated with some significant energy issues (such as access and poverty).

These outputs will be produced and disseminated throughout the period from 2007 to 2011, using a range of media, including interactive information and communication tools, supporting analytical, policy and outreach activities.

Final Report

The GEA will culminate with the preparation and publication of final report, synthesizing the knowledge clusters and modules outlined above.

Complementary Products

The GEA will include the preparation and publication of a number of key products, synthesizing the knowledge clusters and modules outlined above, including:

- Web-based information packages comprising databases (including spatial information), reports, and other multimedia products covering the GEA knowledge landscape
- Targeted reports, CD-ROMs, presentations etc. for different stakeholders, such as:
 - Policy makers; providing a policy-relevant summary and a set of Frequently Asked Questions (FAQs) and GEA responses (with specific material for national, regional and global policy makers);
 - Business and investment decision makers; providing decision support material, market-relevant analysis, and technology strategy information; and
 - Researchers and academics; providing peer-reviewed scientific and technical analysis, and resources supporting further analysis and teaching;
- Specific white papers on high-profile issues, challenges and opportunities for targeted near-term action: possible headings could cover resource issues ('peak oil'), end-use sectors ('transport'), supply technologies ('nuclear energy'), or policy questions ('effectiveness of offsets/subsidies/ R&D')

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Appendix A: GEA Organizing Committee

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Appendix A
GEA Organizing Committee

Prof. Bert Bolin (Stockholm University)
Prof. Ogunlade Davidson (University of Sierra Leone)
Mr. Ged Davis (World Economic Forum)
Dr. Irene Freudenschuss-Reichl (Foreign Ministry of Austria)
Prof. José Goldemberg (Secretary of the Environment, State of Sao Paulo)
Prof. Thomas B. Johansson (University of Lund)
Mr. Stephen Karekezi (African Energy Policy Research Network)
Prof. Yuri Kononov (Russian Academy of Sciences)
Prof. Nebojsa Nakicenovic (IIASA, Vienna University of Technology)
Mr. Mark Radka (UNEP)
Mr. Jamal Saghir (World Bank)
Dr. Robert Schock (World Energy Council)
Dr. Minoru Takada (UNDP)
Prof. Wim Turkenburg (University of Utrecht)
Dr. David Victor (Stanford University)
Dr. Zhou Dadi (State Development Planning Commission, China)

Appendix B
GEA Council

Ged Davis*, International Institute for Applied Systems Analysis

José Goldemberg*, University of São Paulo, International Institute for Applied Systems Analysis

Michael Ahearne, First Solar Inc.

Dan Arvizu, National Renewable Energy Laboratory (NREL)

Tariq Banuri – Director of the Division for Sustainable Development of the UN Department of Economic and Social Affairs (UN-DESA)

Corrado Clini, Italian Ministry for the Environment and Territory

Robert Corell, Global Environment and Technology Foundation

Bo Diczfalusy, Ministry of Enterprise, Energy and Communications, Swedish Government Offices

Christoph Frei, World Energy Council

Irene Freudenschuss-Reichl, Austrian Ministry for Foreign Affairs

Olav Kjørven, United Nations Development Programme

Celso Fernando Lucchesi, Petrobras

Jamal Saghir, World Bank

John Schellhuber, Potsdam Institute for Climate Impact Research (PIK)

Achim Steiner, United Nations Environment Programme

Björn Stigson, World Business Council for Sustainable Development

Detlof von Winterfeldt, International Institute for Applied Systems Analysis

Robert Watson, Department for Environment Food and Rural Affairs and Tyndall Centre at the University of East Anglia

Timothy E. Wirth – President, United Nations Foundation

Kandeh Yumkella, United Nations Industrial Development Organization

Zhou Dadi, National Development and Reform Commission, China

* GEA Council Co-President

Appendix C
Executive Committee

Thomas B. Johansson*, International Institute for Industrial Environmental Economics at the University of Lund, Sweden

Feng Fei*, Development Research Center (DRC) of the State Council of People's Republic of China

Nebojsa Nakicenovic^o, International Institute for Applied Systems Analysis and the Vienna University of Technology, Austria

Rangan Banerjee, Indian Institute of Technology Bombay, India

Sally Benson, Stanford University, United States

Daniel Bouille, Bariloche Foundation, Argentina

Abeeku Brew Hammond, College of Engineering, Kwame Nkrumah University of Science and Technology, Ghana

Aleh Cherp, Central European University, Hungary

Suani Coehlo, CENBIO-Brazilian Reference Center on Biomass, Brazil

Arnulf Grübler, International Institute for Applied Systems Analysis and Yale University, Austria and United States

Kebin He, Tsinghua University, China

Mark Jaccard, Simon Fraser University, Canada

Suzana Kahn Ribeiro, Federal University of Rio de Janeiro, Brazil

Stephen Karekezi, African Energy Policy Research Network, Kenya

Zheng Li, Tsinghua University, China

Lynn K. Mytelka, UNU-MERIT, The Netherlands

Anand Patwardhan, Technology Information, Forecasting and Assessment Council, India

Keywan Riahi, International Institute for Applied Systems Analysis and Technical University Graz, Austria

Hans-Holger Rogner, International Atomic Energy Agency, Austria

Joyashree Roy, Jadavpur University, India

Robert N. Schock, World Energy Council and Center for Global Security Research, United Kingdom

Kirk Smith, University of California, Berkeley, United States

Wim C. Turkenburg, Utrecht University, Netherlands

Diana Urge-Vorsatz, Central European University, Hungary

Frank N. von Hippel, Princeton University, United States

Kurt Yeager, Electric Power Research Institute and Galvin Electricity Initiative

* GEA Executive Committee Co-Chair

^o GEA Director

Appendix D

GEA Secretariat

Nebojsa Nakicenovic

Deputy Director of the International Institute for Applied Systems Analysis (IIASA), Director of the Global Energy Assessment (GEA) and Professor of Energy Economics at the Vienna University of Technology

Luis Gomez-Echeverri

Associate Director of the Global Energy Assessment (GEA)

Martin Offutt

Senior Program Officer, Energy (ENE) Program

Pat Wagner

Energy (ENE) Program

Contact Information:

Global Energy Assessment (GEA)
International Institute for Applied Systems Analysis (IIASA)
Schlossplatz 1
A-2361 Laxenburg
AUSTRIA
Tel: +43-2236-807-244
Fax: +43-2236-807-488
gea@iiasa.ac.at

Appendix E

Outline of Knowledge Modules

The Global Energy Assessment (GEA) seeks to examine: the major global challenges and their linkages to energy; the technologies and resources available for providing energy services; future energy systems that address the major challenges; and the policies and other measures to realize sustainable energy futures. Given the linkages between these objectives, the GEA will necessarily adopt an integrated and holistic approach structured into four main Clusters reflecting the main objectives:

Cluster I: Major Global Issues and Energy

(assessment of the **Challenges**)

Cluster II: Energy Resources and Technological Options

(assessment of the **Components** available to build future energy systems)

Cluster III: Describing Possible Sustainable Futures

(assessment of how to combine the Components to create **Systems** that address the Challenges)

Cluster IV: Realizing Energy for Sustainable Development

(assessment of the **Policies** needed to address the Challenges and realize the Systems)

KNOWLEDGE MODULE HEADINGS AND OUTLINES

The specific areas included in the assessment have been determined through a consultative process. It is possible that the following organizational structure will evolve as the GEA develops further. Some headings and brief descriptions of GEA knowledge modules are outlined below (headings are italicized, and section headings are in bold). It should be explicitly noted that the knowledge modules will be tightly integrated, and the sequential numbering of the modules does not imply a sequential or linear approach within the GEA.

1. An Introduction to Energy (Goals, Visions, Why?)

- "An Energy Primer"
- Energy services, energy systems,
 - Basics: production, supply, conversion, storage/distribution, final end-use, trade; prices; taxes; investments;
- Sustainability: features of sustainable energy systems
- Energy system evolution and development, transitions, historical developments, the current situation

Cluster I: Major Global Issues and Energy (the Challenges)

Cluster I will examine major global issues and challenges, and their linkages with energy. Some of the issues to be examined, from a **global, regional and national perspective**, include social and economic development (and equity), the Millennium Development Goals (MDGs), environmental protection, climate change mitigation, governance and security. Cluster I of the GEA will seek to define the key problems, establish what is known and not known, and synthesize scientific and technical knowledge with respect to **today's challenges and emerging issues**

for the short, medium and longer term; including defining some of the key questions asked by today's energy decision makers. Some of the questions that the GEA will seek to answer are discussed in the GEA [Issues paper](#).

It is anticipated that this Cluster will be structure into around five modules that will discuss **what is required** for realizing sustainable development in terms of **key indicators/parameters**, including **targets, timelines**,⁵ and uncertainties.

2. Social Issues, MDGs, and Energy

CLA: Stephen Karekezi (AFREPREN/FWD)

- Social and intra-generational issues (including energy access, poverty alleviation, health conditions, employment and income generation, population, food security, and nutrition);
- Gender and inter-generational issues (including time and effort spent to supply household energy, and the need for access to modern energy services for income-generating purposes);
- Energy and lifestyles; energy and urbanization; energy and population
- Analysis of linkages between energy issues and development, including energy and the MDGs.

3. Environment and Energy

CLA: Kebin He (Tsinghua University)

- Environmental issues including direct energy issues:
 - local and regional
 - urban and regional air pollution, acidification,
 - land degradation from energy production; water and air pollution from energy production, processing, transport, use, waste disposal etc.
 - water quality (mining, hydroelectricity)
 - global
 - impacts of climate change
 - impacts of responses to climate change
 - impacts on major chemical cycles

4. Health and Energy

CLA: Kirk Smith (University of California Berkeley)

- Health issues including direct energy issues:
 - household
 - health impacts and energy (cooking and heating)
 - local and regional
 - urban and regional air pollution
 - health impacts from energy production, processing, transport, waste disposal and so on, including also impacts on health from:
 - land degradation from energy production, including impacts on food production
 - ionizing and non-ionizing radiation

⁵ For example, a sustainable outcome in terms of energy and climate change may require a specific parameter target (e.g., X degrees warming, Y ppmv atmospheric CO₂), and a particular timeframe (e.g., 2050, 2100, etc.).

- water quality (mining, hydroelectricity)
- global
 - health impacts of climate change
- economic costs of energy-related health issues
- potentially harmful emerging energy systems (Synfuels, large-scale solar and wind power systems, geo-engineering schemes, etc)

5. Security, Interdependence, Markets, and Energy

CLA: Aleh Cherp (Central European University)

- Trade interdependency, energy supply and demand security, including shortage and disruption
- Resource, infrastructure adequacy and system resilience
- International relations and geopolitics
 - Regional cooperation and interdependence
 - trade relations (the roles of OPEC, NOCs, IOCs),
 - global private sector dynamics
 - peace, conflict and terrorism.

6. Energy, Economy and Investment

CLA: Sujata Gupta (Asian Development Bank)

- Energy and economic growth and industrialization, trade
- The energy industry as an economic sector
- Energy markets, market institutions, issues and failures
 - practical operation of energy markets (oil, gas, coal, electricity)
- Financing, availability of hard currency, pricing, access to investment capital; capital flows; and
- Institutional issues; governance.
- Innovation, drivers and barriers
- Investment
 - investment needs:
 - R&D
 - Deployment and diffusion of technologies and systems compatible with sustainable development
 - financing mechanisms;
 - Governments, aid, private equity, FDI,
 - and policies and institutional frameworks to facilitate energy investment for sustainable development, including issues such as:
 - options to facilitate technology transfer, and technology absorption capacity.

It should be noted that the assessment will be organized on a global level, and on typological level on the basis of the challenges facing different countries and regions. In Cluster I, the main energy issues and linkages will be described and objectives identified. Further, in exploring these major issues, the Assessment will necessarily adopt an approach recognizing that the above linkages often manifests through an underlying demand for energy services by people and social and economic systems. Moreover, these linkages will be explored on both short- and long-term bases, including how they affect demand for energy services, and investment in the energy supply chain.

Cluster II: Energy Resources and Technological Options

The scope of Cluster II is to explore the range of technologies, resources and systems available for providing energy services while addressing the challenges and issues identified in Cluster I. Resource and technology issues, including reduced energy intensities, increased use of appropriate non-fossil sources of energy, increased development and use of new technologies, and their economics as relevant to the challenges confronting **developed and developing countries** will be examined.

7. Energy Resources (Hydrocarbon, Nuclear and Renewable)

CLA: Hans-Holger Rogner (IAEA)

- Assess the status of reserves and resources of
 - fossil fuels (conventional and unconventional)
 - nuclear (fissile),
 - renewables (hydroelectric, geothermal, biomass, wind, solar, others) in terms of magnitude (total resource, extraction rates), extraction costs, challenges to other elements of sustainability etc.
- Re-evaluate and review the status of global energy and related resources in the context of the role of technology in realizing the commercial viability of conventional, unconventional and alternative sources of energy.

Modules 8-16 (Technology review)

8. Energy End-Use (Efficiency): Industrial Sector

CLA: Rangan Banerjee (Indian Institute of Technology Bombay)

- Analyze industrial energy use trends
- Assess the consumption and opportunities of end uses
- Assess the consumption and opportunities in key sectors
- Describe the policies and programs opportunities
- Define the thermodynamic limits

9. Energy End-Use (Efficiency): Transport

CLA: Suzana Kahn Ribeiro (Federal University of Rio de Janeiro)

10. Energy End-Use (Efficiency): Buildings

CLA: Diana Urge-Vorsatz (Central European University)

- Describe sustainability challenges related to energy services in buildings
- Discuss strategies towards a low-energy building stock
- Assess technological and non-technological options to reduce energy use in buildings
- Analyze the barriers towards improved energy-efficiency and distributed generation in buildings
- Assess the potential, costs, and benefits of energy conservation in buildings
- Describe sector-specific policies to foster sustainable energy solutions in buildings

Modules 8-10 will examine the technology and other issues associated with providing energy services from final energy carriers. These modules will evaluate energy services and end-use as follows:

- Assess the status of cost, thermodynamic efficiency, technical capabilities, and applications of currently available and next-generation energy efficiency/end-use technologies;

- Provide forward-looking assessment of relevant technology innovations, potentials and buy-down possibilities;
- Seek rigorous benefit-cost (life-cycle based) analysis of energy services and technologies (incorporating their impact on social conditions, esp. poverty and the situation of women, the impact on the local, regional and global environment, broader economic benefits, subsidies, etc.);
- Define potential economic benefits associated with energy end-use options
 - e.g., improved technologies, market development, increased manufacturing capacity, trade opportunities;
- Assess potential opportunities, barriers and associated benefits of technological leapfrogging by developing countries;
- Evaluate lessons learned from pilot projects.

Modules 11-16 will examine the technology and other issues associated with supplying final energy carriers from primary resources (which are covered in Module 7). The contents of these modules will be based on the list presented below.

11. Renewable Energy

CLA: Wim Turkenburg (Utrecht University)

- Bioenergy
- Hydropower
- Geothermal
- Wind,
- Solar photovoltaic
- High- and low-temperature thermal
- Marine
- System integration, renewable energy development and deployment, financing and policy instruments

12. Fossil Energy Systems (conventional and advanced)

CLA: Zheng Li (Tsinghua University)

- Assess the status of cost, efficiency, technical capabilities, and applications of currently available and next-generation fossil energy/non-fossil energy technologies;
 - Assess potential technology innovations, future potentials of existing technologies (including buy-down potentials) and their implications for energy for sustainable development;
- Estimate potential economic benefits of sustainable energy technologies and systems additional to those associated with reduced emissions (e.g., manufacturing capacity-building in sustainable energy technology development, market development, additional products (e.g. bio-products), international trade opportunities);
- Assess risks associated with different technologies and systems, including vulnerability to physical and other disruptions. This will be particularly pertinent to KMs 13, 14 and 15.
- Synthesize life-cycle based benefit-cost analysis of energy sources, technologies and systems (incorporating their impact on social, environmental (local, regional and global) and economic factors (investment, subsidies, etc.). In the case of Module 14, this will necessitate a wider system boundary encompassing issues of reactor safety, proliferation etc.;
- Assess potential opportunities and barriers to technological leapfrogging by developing countries, and associated benefits and threats to achieving sustainable development;

- Evaluate lessons learned from pilot projects.

13. Carbon Capture and Storage

CLA: Sally Benson (Stanford University)

- Overview of Carbon Dioxide Capture and Storage Technology
- Carbon Dioxide Transport
- Technical Potential for Carbon Capture and Storage
- Economic Potential for Carbon Capture and Storage
- Energy Systems Synergies and Tradeoffs Influencing CCS Deployment

14. Nuclear Energy (fission, fusion)

CLA: Frank von Hippel (Princeton University)

- Fission Power
 - Cost
 - Capacity to expand
 - New types of reactors
 - Accidents/terrorism
 - Radioactive waste
 - Proliferation
- Fusion Power

15. Energy Supply System Operation (electricity, gas, liquid fuels, hydrogen, etc.)

CLA: Robert Schock (WEC)

- Transformation, carriers and storage
- System infrastructure, including transmission and distribution
- Energy and power markets

Each module will, for the corresponding energy technology systems:

- Assess the status of cost, efficiency, technical capabilities, and applications of currently available and next-generation fossil energy/non-fossil energy technologies;
 - Assess potential technology innovations, future potentials of existing technologies (including buy-down potentials) and their implications for energy for sustainable development;
- Estimate potential economic benefits of sustainable energy technologies and systems additional to those associated with reduced emissions (e.g., manufacturing capacity-building in sustainable energy technology development, market development, additional products (e.g. bio-products), international trade opportunities);
- Assess risks associated with different technologies and systems, including vulnerability to physical and other disruptions. This will be particularly pertinent to KMs 13, 14 and 15.
- Synthesize life-cycle based benefit-cost analysis of energy sources, technologies and systems (incorporating their impact on social, environmental (local, regional and global) and economic factors (investment, subsidies, etc.). In the case of Module 14, this will necessitate a wider system boundary encompassing issues of reactor safety, proliferation etc.;
- Assess potential opportunities and barriers to technological leapfrogging by developing countries, and associated benefits and threats to achieving sustainable development;
- Evaluate lessons learned from pilot projects.

16. Synthesis Module: End-use and Supply Linkages and Synthesis
CLA: Anand Patwardhan (TIFAC)

- Assessment of end-use and energy supply linkages, complementary systems and integrated supply-service-demand technology options;
- Assessment of changes in energy system technology regimes and the set of issues associated with transitions;
- Discussion of the emerging forms of energy systems, including new intermediaries and new business models;
- Where appropriate, the frameworks described above for modules 8-15 will be applied.

Cluster III: Describing Possible Sustainable Futures

Cluster III will assess how the technology and other components described in Cluster II can be combined in a future energy system that addresses the challenges outlined in Cluster I. Within this context, a number of issues will be examined related to realizing the objectives of sustainable development in specific contexts (e.g., developed/developing countries, urban/peri-urban/rural settings), accounting for cross-sectoral spillovers and synergies and trade-offs between different objectives (including the implications of prioritizing competing objectives). This will include a synthesis of scenario-analytic findings exploring a range of sustainable energy futures.

17. Global and Regional Scenarios, Normative Futures, and Major Uncertainties
CLA: Keywan Riahi (IIASA)

- Assessment of the literature on energy and more general system transitions
 - Review existing alternative scenarios on how sustainable energy options will address concerns identified in Cluster I, and draw out their policy implications and consequences.
- Through a participatory process, **develop** and **analyze** integrated scenarios on a **regional** and **global level** to shed light on the question: how can energy systems for a sustainable future be realized?
- Possible constraints on future energy system, whether related to resources, investment, technological limits, or the need to control emissions of greenhouse gases from fossil fuel combustion, among others.
- The role of “physical uncertainties” (e.g. climate sensitivity, total oil resource availability) and “human uncertainties” related to policy and development (e.g. future human population, economic growth etc.); and
- Assess capacity-building and investment needs for infrastructure development and technology innovation.

18. Urbanization
CLA: Arnulf Grubler (IIASA and Yale)

- Overview of urbanization, past and scenario trends
- Urban energy use
- Urban energy challenges
- Scenario of urban energy use

19. Rural Energy and Increasing Access
CLA: Abeeku Brew Hammond (The Energy Centre, KNUST)

- Energy for integrated rural development

- Access (e.g. electrification, reticulation); leapfrogging; affordability
- Identify potential opportunities for employment generation, esp. in rural areas;
- Capacity; decision-making; gender issues; scale-up and replication:
- Regional reviews;
- Rural energy technology;
- Policy challenges.

20. Trade-offs, land and water

CLA: Suani T. Coelho (CENBIO-Brazilian Reference Center on Biomass)

- Evaluate land-use requirements, competition for other uses (food, fibre), environmental implications, and policies for biomass-intensive energy systems, and hydropower;
- Analyze relationships between energy and energy-intensive economic sectors such as basic materials industries, and transport;
- Land-use and energy system waste disposal and risks (e.g. climate change and terrestrial carbon sequestration/sinks).

21. Energy Services and Human Well Being (Lifestyles, consumption patterns)

CLA: Joyashree Roy (Jadavpur University)

- Assess potential impact of a sustainable energy future on economies now dependent on imports/exports of fossil fuels;
- Explore how sustainable futures can be realized under different future lifestyle and consumption scenarios; including evaluation of energy service consumption patterns consistent with sustainable futures, accounting for advanced end-use and supply opportunities;
- Preliminary assessment of the role of public and private sector policies, including community-level action, across a range of areas to promote and adopt energy options for sustainable development.

Cluster IV: Realizing Energy for Sustainable Development

Cluster IV will seek to examine what **policies and other actions** (including instruments, institutions and mechanisms) are available on a **global, regional and national level** to realize the sustainable energy systems identified from the assessment activities in Cluster III, thereby addressing the challenges presented in Cluster I. This Cluster will present **regional and national applications** of specific policy and other actions for providing energy for sustainable development, including case studies, recommendations and results of country-specific analysis that are applicable to a broader set of countries.

22. Energy Policy: Rationales and Mechanisms

CLA: Mark Jaccard (Simon Fraser University)

- Survey the major rationales for government interventions in the energy sector and describe the policy mechanisms available, including in regard to concerns and issues related to:
 - Energy access;
 - Energy security;
 - Monopolistic forces and tendencies;
 - Resource endowments; and
 - Environmental impacts and risks.

- Describe the realities of Governments and discuss the challenges of policy making, including the influence of interest groups, the principal-agent problems, corruption, transaction costs, unclear property rights, etc.
- Analyze institutional issues at different levels of governance
- Complement the theoretical description and analysis with illustrative case studies

23. Policies for Energy Access

CLA: Daniel Bouille (Bariloche Foundation)

- Policies for realizing development objectives (incl. MDGs) in the context of energy
 - Domestic/regional development strategies and policies
 - International development co-operation, [including review of existing co-operations/programs/etc.]

24. Policies for Innovation

CLA: Arnulf Grubler (IIASA and Yale)

- Drivers in technological change and elements/actors in innovation web
- Quantitative overview of the energy innovation web
- Problems, barriers, opportunities
- Innovation histories

25. Policies for Capacity Building

CLA: Lynn Mytelka (University of Maastricht)

- Capacity building for the formulation of legal and institutional frameworks;
- Human capacity-building and access to information; and
- Technology transfer.

26. Sustainable Energy Policy Portfolios

CLA: David Victor (Stanford University)

- Regulatory frameworks and standards, and market operations (including energy market regulation and deregulation) (national, global);
- Design and operation of markets, including energy and related markets that affect innovation, technology deployment (incl. technology leapfrogging) and decisions related to consumption and production;
 - Energy market interactions (e.g. gas-oil)
- Economic instruments and other market-based policy instruments;
- Standards for technologies (e.g. end-use appliance efficiency standards) or other activities (e.g. land-use);
- Evaluate policies that have proved to be effective in promoting deployment of sustainable energy systems (e.g., Feed-in-Tariffs, Non Fossil Fuel Obligation, Renewable Portfolio Standards, System Benefit Charges, Public Utility Regulatory Policy Act, etc.);
- Policy portfolio for addressing multiple objectives.

27. Epilogue