

"Financing Geothermal Development— What are the options? "

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(World Bank)

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- Global Environment Facility (GEF)
- Barriers and Driving Forces for the Introduction of Geothermal Energy
- The Europe and Central Asia (ECA) Geothermal Umbrella Project
- Geothermal Energy Development Fund (GeoFund)
- Portfolio Development for the GeoFund
- Another Source of Funding: Carbon Finance



Global Environment Facility (GEF)



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- Trust Fund was established in 1990, replenished in 1994, 1998, 2003
- Provides grants and concessional funding to support measures to achieve global environmental benefits in the following focal areas:
 - biological diversity;
 - climate change;
 - international waters; and
 - ozone layer depletion.
- Land degradation issues (primarily desertification and deforestation), as they relate to the four focal areas are also addressed.
- Currently US\$3.2 billion are available for support of initiatives, projects etc. with some 50% of these funds going to climate change



Climate Change Focal Area



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- Climate change projects are designed to reduce the risks of global climate change while providing energy supplies for sustainable development; a major focus is here on the introduction of renewable energies
- As the financial mechanism for the United Nations Framework Convention on Climate Change (UNFCCC), GEF receives guidance from the Council of Parties (more than 100 countries) on policy, program priorities, and eligibility criteria related to the Convention
- Under the climate change focal area, during the last decade, GEF has provided financial support
 - for more than 270 projects
 - for a total GEF allocation of over one billion US Dollars
 - in 120 countries



Barriers to Geothermal Energy Development



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- Major barriers to the development of renewable energies in ECA countries:
 - Lack of expertise and know-how about renewable energies among energy sector decision makers
 - Issues of ECA countries' energy markets, incl. poor energy policies, inadequate legal, regulatory and institutional frameworks, leading to uncertainties in the industry and a bias in favor of fossil fuels
 - High relative transaction costs due to typically small size of renewable projects as compared to large fossil-fuel-based projects
- Key technology-inherent barriers to development of geothermal energies:
 - High up-front costs relative to conventional technologies (high drilling and re-injection costs)
 - Associated geological risks (different than expected yield, volume, temperature, geo-physical and geo-chemical parameters; problems of re-injection, etc.)



The ECA Geothermal Umbrella Project Overview



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- Designed with the common goal to systematically promote the use of geothermal energy in the Region through assistance in barrier removal, provision of financial support, and provision of technical assistance in project preparation and implementation
- Involves:
 - Provision of technical assistance and capacity building to transfer know-how and to establish a geothermal data base and capacities to develop and implement geothermal energy projects
 - Support of capital investments in geothermal energy projects
 - Development of reforms of energy market related policies, legal, regulatory and institutional framework
 - Monitoring of trends of use of geothermal energy/renewable energy during the period of 2001-2010 in participating ECA countries



Objectives



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- Primary global objective:
 - Reduce emissions of greenhouse gases through implementation of geothermal projects
- Parallel national and local objectives:
 - Change the current unfavorable investment and incentive conditions and create an enabling environment in participating ECA countries that fosters the development of geothermal energy utilization for heating and power generation applications
 - Promote an indigenous, sustainable, and clean energy resource
 - Foster reduction of local and regional pollution from district heating systems and combined heat and power plants



Partners and Roles



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- **Participating client countries in the ECA Region:** Project identification and preparation, local financing (grant or subsidized loan) to support monetization of local environmental and indirect economic benefits
- **The World Bank:** Set up and – initially – supervise the GeoFund and coordinate early project work; provide long-term financing
- **GEF:** Technical Assistance and risk coverage under the GeoFund
- **UNDP and UNEP:** Assist to remove barriers, increase awareness, assist in preparation of geological databases and identify potential projects
- **Other International Financial Institutions** (IFC, EBRD, etc.): Provide long-term financing
- **Multilateral and bilateral donors and other institutions** (Utilities, Investors, Commercial Banks, Carbon Finance Institutions, etc.)



Innovative Financing of Projects



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Two types of mechanisms:

- World Bank-Global Environment Facility Geothermal Energy Development Fund (**GeoFund**) to provide:
 - A **Technical Assistance Window** for geothermal project identification and preparation
 - A **Partial Risk Guarantee Window** to mitigate against geological risks
 - An **Investment Funding Window** with contingent grants or low cost funding to help monetize externalities
- Investment Mechanisms in participating ECA Countries to help fund geothermal projects



Participants and Components



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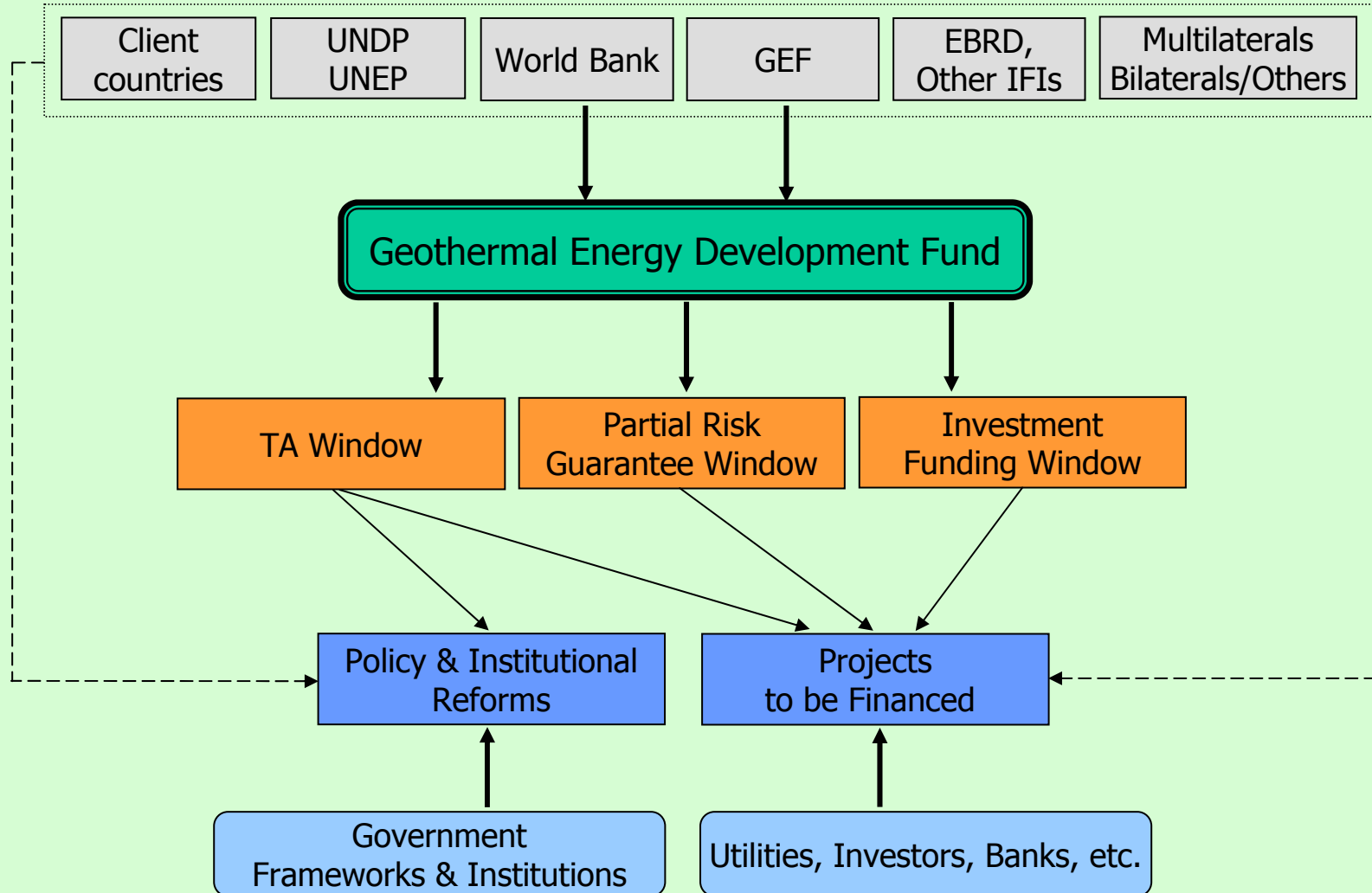
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Geothermal Energy Development Fund



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- Designed under the ECA Geothermal Umbrella Project as a market intervention responsive to medium-/ long-term market conditions existing in the participating countries
- Objective: to build sustained market capacity to develop and finance geothermal projects on commercial terms using local private capital
 - To be funded with ca. US\$25million
 - Aggregated overall program leverage ratio: 1 to 8
 - Total US\$200million to finance about 10 projects over a five to eight year period



Geothermal Energy Development Fund Components



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- **Technical Assistance Window** (US\$ 5 million):
 - Addresses barriers to the use of renewable energies and geothermal energy
 - Help set up geothermal databases and atlases, and will identify and prepare/implement geothermal projects
- **Partial Risk Guarantee** (PRG) Facility with well-defined risk coverage (US\$12 million):
 - Partially insure project promoters/investors against short-term, up-front exploration and/or long-term geological risk
 - Provide help to project promoters to obtain adequate commercial lending
- **Investment Funding Window** (US\$8 million):
 - Provide contingent grants, low cost loans, covering part of the project cost through monetization of external benefits
 - Four types of countries for Investment Funding Window support: (i) EU accession, (ii) second round EU accession, (iii) Russia and Ukraine, (iv) Other Commonwealth of Independent States countries



Geothermal Energy Development Fund Phasing



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Funding of GeoFund to be provided in two tranches:

- **First tranche** ("pilot phase", 2004-2006) – US\$8 million:
 - Technical Assistance Window: with an initial amount of US\$3 million
 - Partial Risk Guarantee (PRG) Facility: with US\$5 million
 - Investment finance window (IFW): with no funding during the Pilot Phase
- **Second tranche** ("full implementation phase", 2006-2010) – US\$17 million:
 - Technical Assistance Window: \$2 million
 - Partial Risk Guarantee (PRG) Facility: \$7 million
 - Investment finance window (IFW): \$8 million



Types of Projects



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- **Fuel substitution projects** in existing **district heating facilities** (good potential throughout most of the ECA countries) (well over 60%)
- **Electricity generating projects** in places with sufficiently high temperature geothermal reservoirs (Russia/Kamchatka, Hungary, Turkey, possibly Romania, the Slovak Republic) (up to 20%)
- **Geothermal heating** of individual housing blocks, greenhouses, wood drying chambers, spas and other balneological facilities (up to 20%)



Country Eligibility



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Eligible countries:

- Subscribe to the objectives and mode of operation of the ECA Geothermal Umbrella Project and its GeoFund
- Are ready to review their barriers to renewable energy and geothermal energy utilization and commit to improving legal, regulatory and institutional frameworks in the interest of reducing those barriers
- Provide support in the establishment of geothermal data bases and atlases and are ready to provide concessions for accessing geothermal resources and permits for operating geothermal plants estimated to be feasible
- Encourage development of public and private geothermal investments and assist in the publicity and dissemination of project results



Project Eligibility



Eligible projects:

- Are in line with country energy sector priorities (GEF Focal Point endorsement)
- Meet relevant GEF Operational Program criteria
- Are based on a thorough geological investigation helping minimize up-front geological risk
- Demonstrate technical, economic and financial feasibility
- Have established a sound business plan, incl. compliance with the Bank's safeguard policies
- Have applied for additional financing to assure a complete financing plan
- Have signed a Power Purchase Agreement or heat off-take agreement of sufficiently long term nature
- Provide CO2 reductions of at least 5,000 tons of CO2 annually

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Project Pipeline Development



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- **Bulgaria:** Two projects under consideration, to substitute geothermal heat for coal/fuel oil firing in existing district heating systems in the cities of Velingrad and Separeva Bania
- **Czech Republic:** One project under advanced implementation in Decin, other projects under preparation
- **Hungary:** A number of very promising geothermal resources with temperatures suitable for electricity generation ($>130^{\circ}\text{C}$)
- **Poland:** Two projects under preparation or early implementation (Stargard and Kolo)
- **Slovak Republic:** Very promising geothermal deposit near the city of Kosice confirmed by initial exploratory drillings
- **Russia:** A number of promising geothermal deposits, some of which suitable for electricity generation



Carbon Finance

The Kyoto Protocol



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- The Kyoto Protocol (1997) commits developed countries and economies in transition to reduce their carbon emissions by an average of 5.2 percent below their 1990 levels in the period 2008-2012
- Most OECD countries are unlikely to meet their commitments under the Kyoto Protocol and emissions will exceed their commitments:
 - North America by 21% to 30%
 - Pacific OECD by 19% to 29%
 - Western Europe by 16% to 27%



Carbon Finance Business Flexible Instruments



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The Protocol defines two flexibility mechanisms to facilitate the meeting of obligations through projects generating emission reductions (ERs) in developing countries and transition economies:

1. Clean Development Mechanism (CDM)

- Credit for emission reduction investments in projects in developing countries

2. Joint Implementation (JI)

- Credit for emission reduction investments in projects in Economies in Transition (EIT; countries of Central and Eastern Europe and the Former Soviet Union)



Carbon Finance: Existing Programs



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- Prototype Carbon Fund (World Bank); US\$180million; operational;
- Netherlands ERUPT and CERUPT programs; ca. €300million; operational;
- Austrian Carbon Fund; €250million; start-up phase; projects can be submitted;
- Danish Carbon Fund; €30million per year; operational;
- German Carbon Fund, run by Kreditanstalt fuer Wiederaufbau; €60million; under preparation;
- Swedish support for Joint Implementation;
- Nordic support for Joint Implementation, managed by NEFCO;
- Japanese support for Joint Implementation from private companies; more than US\$100million in total; operational;
- European Union Carbon Trading Scheme; under preparation;
- Private Carbon Trading brokers; NATSOURCE and Global Evolutions



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**Thank you very much
for your attention and interest**

