

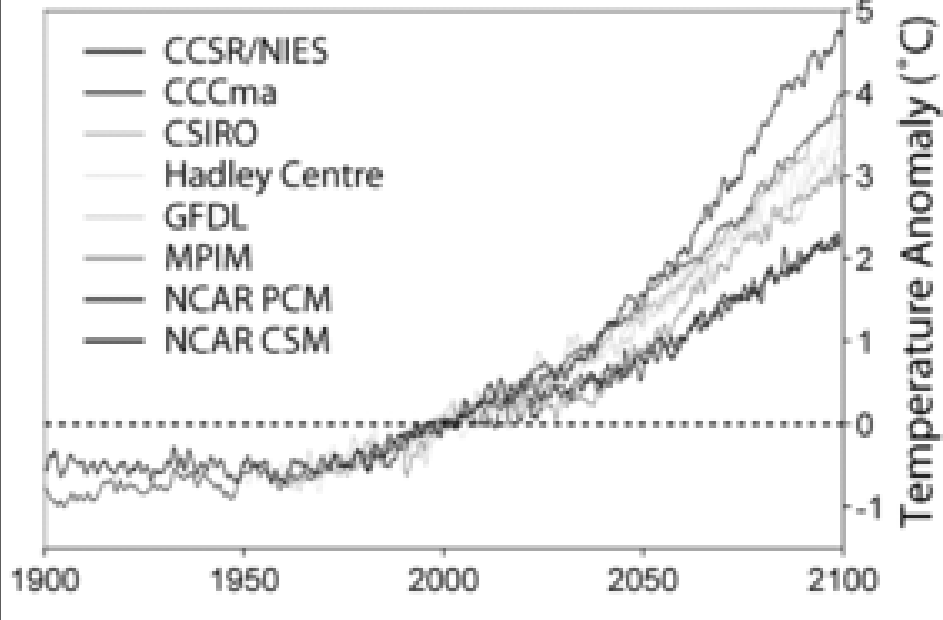
Sustainable Energy Implementation

**Challenge of the 21st Century
and 3rd Millennium**

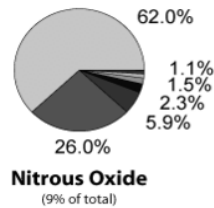
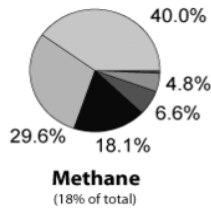
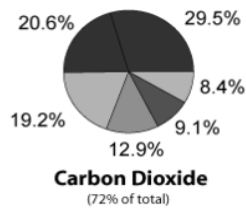
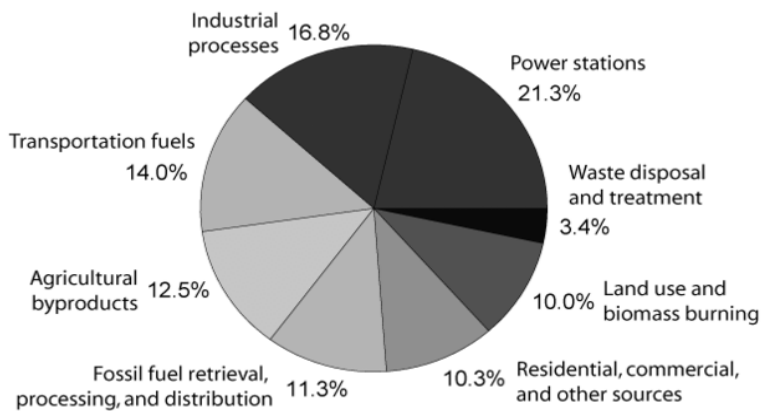
**Gustav R. Grob
International Sustainable Energy Organization ISEO
Chairman ISO Committee on Energy Systems Analyses**

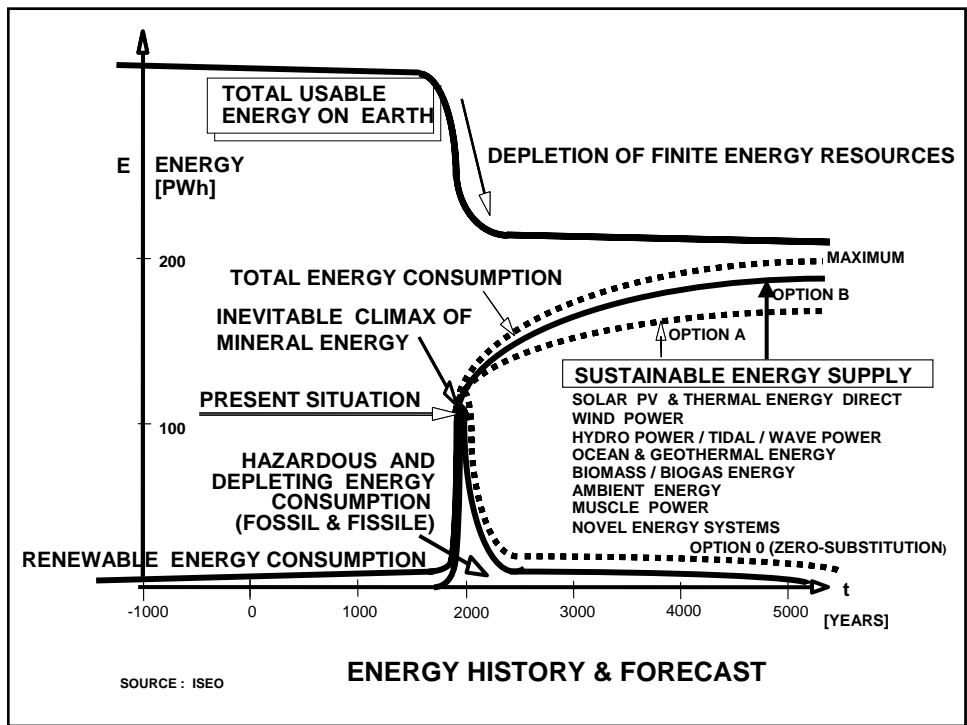
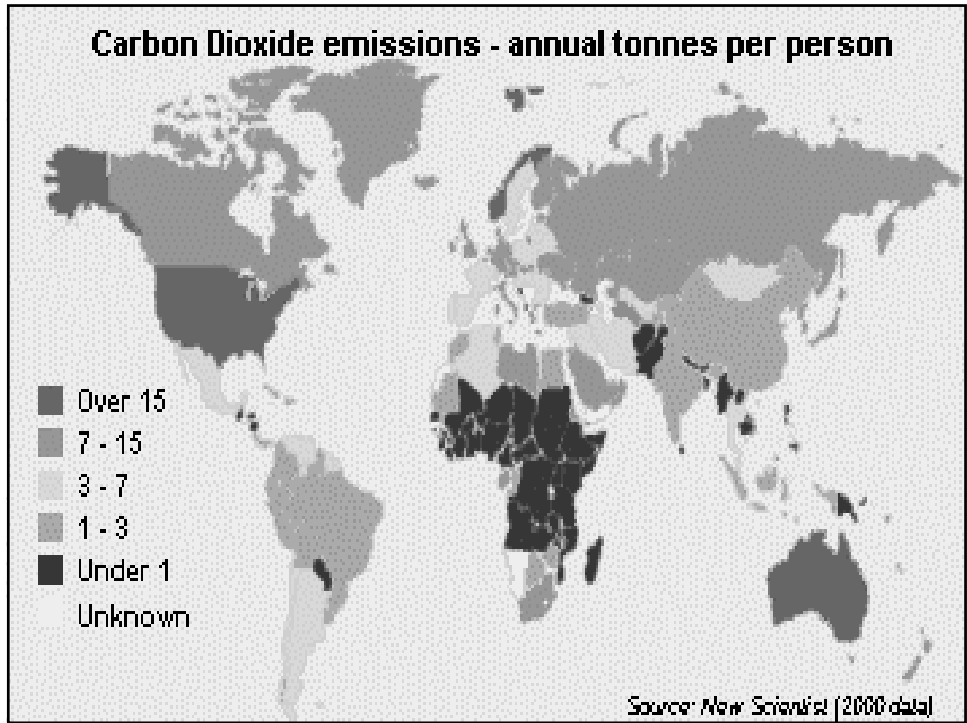


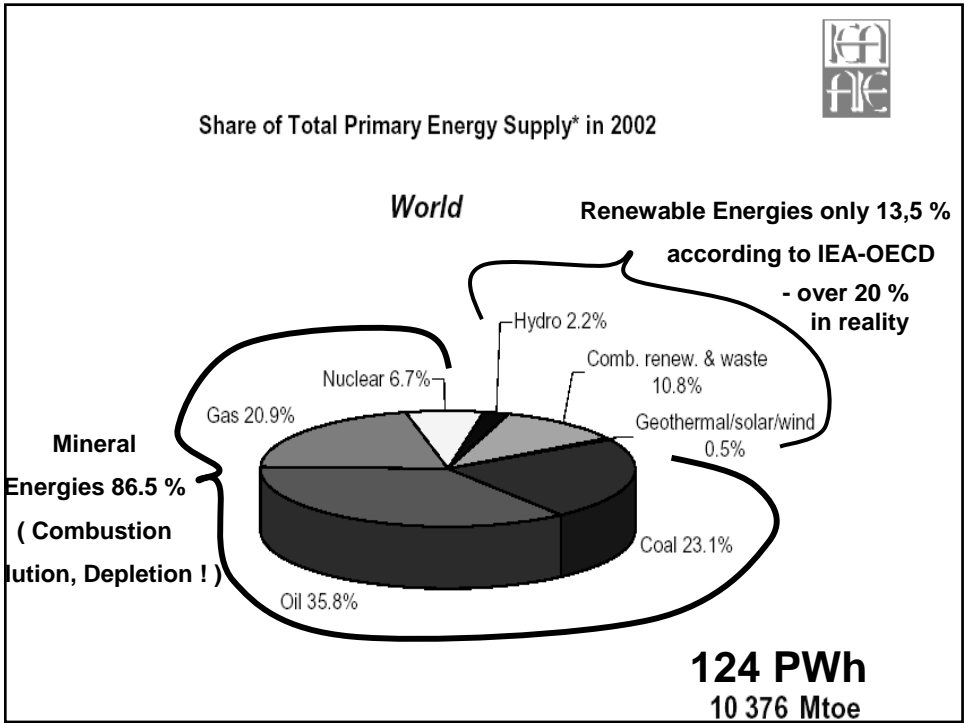
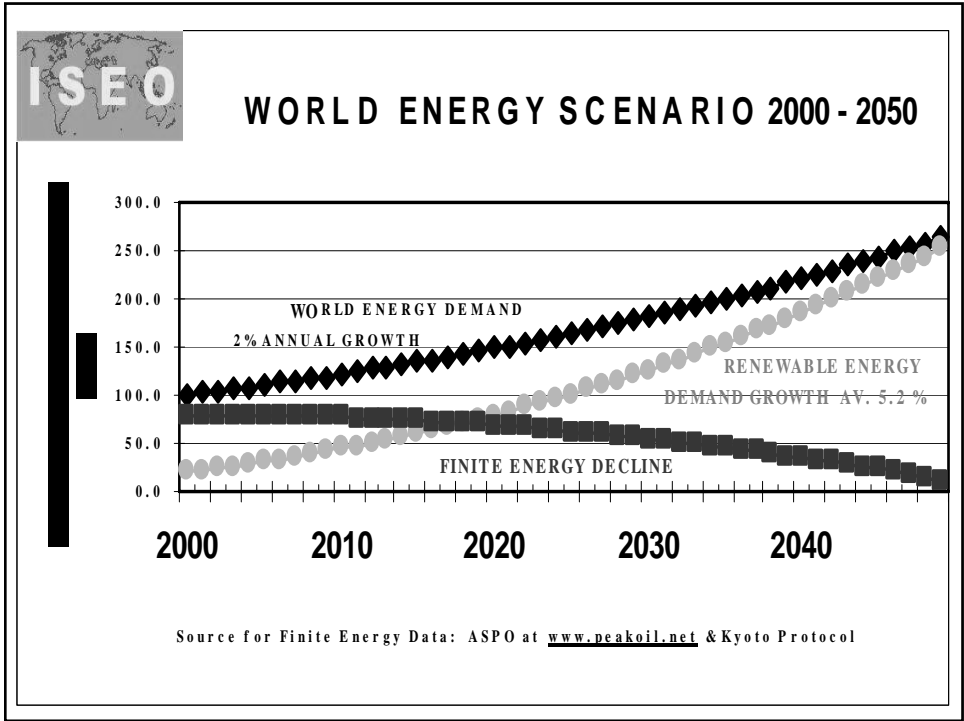
Global Warming Projections



Annual Greenhouse Gas Emissions by Sector



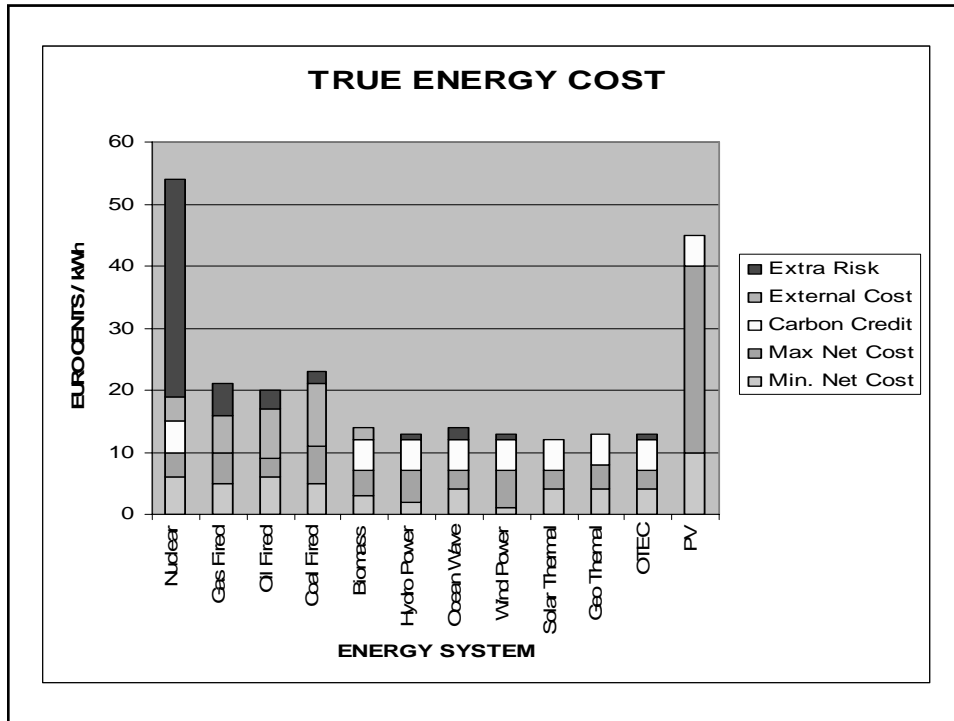




<u>Renewable Energy Option</u>	<u>Immediately Feasible</u>	<u>Theor. Potential</u>
- Bio energy	50	<u>PWh/year</u> 78
- Hydropower	8	14
- Geothermal Electricity Conventional	2	} 388
- Geothermal Electricity / Hot Dry Rock	20	
- Geothermal Heat	4	
- Wind Power	53	160
- Solar PV Power	6	} 435
- Solar Thermal Power	40	
- Solar Active Heat	20	
- Solar Passive Heat (Buildings)	10	
- Ocean Energy (Waves and Tides)	15	202
- Heat Pumps	10	50
- Muscle Energy (Food Chain)	1	10
- Novel Energy Technologies (R&D)	<u>100</u>	<u>200</u>
Total RE potential	339	<u>PWh/year</u> 1537

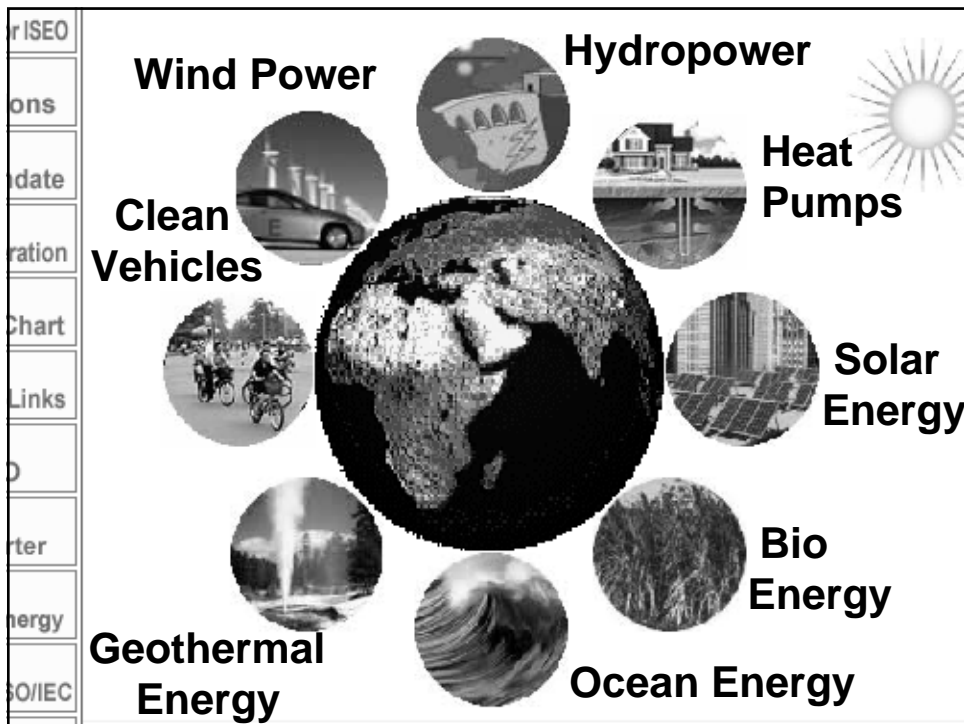
Factors affecting electricity generation cost

- Optimal system (type, size, location, taxes)
- Fuel prices (escalation, emission levies, taxes)
- Carbon Credits (EUR per saved Ton of CO₂)
- External Cost (environment, climate and health)
- Risks of disasters, wars, terror, contamination:
exposure of power plants to sabotage, tornados, earth quakes or meteorites causing radioactive catastrophes, epidemia, explosions, leaks, spills



Tools for Emission Reduction Incentives and Penalties

- **ISO 13602-1 Energy Systems Analyses Standard**
- **Global Energy Charter for Sustainable Development**
- **International Carbon Credit Mechanisms (Kyoto etc.)**
- **Polluters pay accounting principle (world-wide)**
- **Tax Reforms:**
more taxes on pollution – less on productive income



Conclusions

- The polluters pay principle is a **MUST**
- Abundant Renewable Energies are available
- All Finite Mineral concepts can be *abandoned*
- Evolution of Quality of Life becomes possible

**International Sustainable Energy Organisation
for Renewable Energy and Energy Efficiency**



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www.uniseo.org

Background & Reasons for ISEO

Appeal to all Nations

About the ISEO Mandate

Principles of ISEO Operation

ISEO Organization Chart

ISEO Network & Web-Links

Statute of ISEO

Global Energy Charter

Blueprint for Clean Energy

Implementation Tools-ISO/IEC

ISEO News and Events

Contact ISEO Secretariat

Application to ISEO



Hydropower	Wind Power	Biomass	Geothermal
Solar Energy	Ocean Power	Heat Pumps	Muscle Energy
Clean Transport	Statistics	Efficiency	Education
Architecture	Policy	Legal	Financing