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Draft Document for Review

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

ENERGY PROGRAMME

Prepared by

Dr. Thomas Stauffer, Consultant

with Substantive Officers of UNIDO

Anthony J. ...

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UNIDO ENERGY PROGRAMME

Executive Summary

Identify "Niches of Opportunity"

- o Special energy needs of the DC's
- o Market gaps to be filled ("appropriate technology")
- o UNIDO's special expertise and experience

Recognize limited options imposed by energy markets

- o Oil prices likely to be constant
- o Conventional energy resources abundant
- o Need to delimit feasible energy options based on low prices and indigenous resources

Focus upon "Replicability" and indigenous resources

- o NRSE's, but subject to economic tests
- o Low-grade coal resources
- o Base priorities upon two tests:
 - Near-term commercializability
 - Maximum prospects for replicability

Foster environmental protection by promoting energy conservation

- o Review successful projects to date
- o Survey "Conservation Gap" (conservation opportunities constrained by capital scarcity)
- o Work with donors to evolve investment packages
- o Encourage realistic pricing policies as prerequisite

Assume active role in promoting "appropriate technologies"

- o Review own experience including difficulties in propagating results
- o Develop roster of successful model projects along with list of prospective beneficiaries
- o Actively promote successful models in future programming exercises

UNIDO ENERGY PROGRAMME

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Section I

INTRODUCTION

The Director General presents here a discussion draft of UNIDO's proposed Energy Programme. While energy activities are not new to UNIDO, this new programme is designed to strengthen those ongoing activities by focusing UNIDO's efforts on key "niches of opportunity"

The broad objective of the Programme is to ensure that UNIDO's future activities impinging upon energy do properly reflect two related concerns. First, the Programme shall embody the increasing concerns worldwide for environmental protection. Second, it shall reflect the basic links between energy supply, economic growth, and the environment.

Specifically, the Programme is designed to fill several recognizable niches. First, within the UN system several specialised agencies are concerned with various aspects of energy, but there thus far is no coherent programme spanning those agencies.

This Programme proposes integrated priorities for UNIDO's own future activities relating to energy. It is also designed to provide the basis for coordinating UNIDO's energy activities with UNIDO's Environmental Programme, enunciated last year, and for cooperation with other agencies with respect to both energy and environmental issues.

Second, the Programme addresses the "opportunity niches". UNIDO's energy activities shall become more selective and more focused. UNIDO shall marry need with capability, and it will identify those energy areas where its expertise best matches the special energy needs of the developing countries.

A principle guideline shall be the emphasis upon indigenous energy resources. UNIDO will concentrate on promoting the economically feasible energy options which make best use of each country's own resources.

Priority shall be given to the energy options which minimise capital costs and which maximize the savings of foreign exchange. This involves emphasizing and adapting technologies which rely upon local natural resources. These include such NRSE's as wind but also depletable energy resources, such as low-quality coal. It also involves emphasis upon those options using local manufacturing capability.

A parallel guideline shall be priority for energy projects which are "commercializable" and "replicable". Preferred projects must both be economically feasible and also admit of ready propagation and dissemination. The multiplier effect is critical: projects must be chosen so that the experience can be promulgated in order that the demonstration effect must be maximised.

A further niche is energy conservation. It is clear that energy conservation projects can be doubly beneficial: economical projects reduce real energy costs while simultaneously reducing environmental impacts as well.

But there is a "conservation gap" in the developing countries. On one hand energy conservation - like energy production - requires capital, yet, on the other hand, financing for such projects is rarely available.

Energy conservation hitherto has fallen between the cracks in the structure of development assistance. Such projects involved are typically too small to attract finance - no matter how feasible they may be. They are usually below the size threshold for financing institutions, such as the World Bank, the IFC, or the regional banks.

UNIDO proposes to fill this gap by innovating in the identification of candidate projects, the packaging of sets of such projects, and the development of financing mechanisms. It shall undertake to join adaptive technology with adaptive financing.

The Programme recognises two key constraints. First, energy prices are likely to rise little, if at all, during the planning period. The Programme proposes careful feasibility tests, so that expensive renewable resources, such as photovoltaics, deserve low priority.

Second, environmental protection measures compete with energy production for scarce capital - both are expensive, especially for developing countries, so that projects require a careful balancing of indigenous options and real costs to guarantee energy supply while minimizing environmental impact.

This document summarizes the considerations which are central to the design of an effective energy programme. The programme is designed to mesh the past experience of UNIDO with those aspects of energy markets and the developing economies which have created the particular needs for assistance in energy supply and energy conservation to which UNIDO proposes to respond.

Section II recapitulates objectives of the programme, as related to the requirements of the DC's which UNIDO is best able to address.

Section III sketches the wide-ranging activities of UNIDO in the energy area up to the present time.

Section IV identifies the interrelation between energy and economic development, with particular emphasis upon the "niches" where UNIDO's mandate and expertise are most applicable.

Section V identifies those features of energy markets and the dimensions of energy resources which are most important in the framing of UNIDO's energy policy - - the limits as well as the opportunities.

Section VI presents the specific directions for UNIDO's prospective energy activities, as outlined in the earlier sections.

Section II

PROGRAMME OBJECTIVES

The overall objective of the UNIDO energy programme is to provide a new focus for the ongoing activities relating to energy and also to ensure the careful coordination of energy projects with their environmental aspects.

Within that broad objective, the programme has identified a set of guidelines and subsidiary objectives which will be incorporated in the planning and execution of future projects impinging on energy.

{NOTE: the following points should be reordered better to reflect internal priorities.}

1. Coordination of energy projects within UNIDO (including both production and conservation).

Since energy activities are spread across different divisions and departments, it will be useful to provide a mechanism so that information can be systematically exchanged.

2. Cooperation in energy activities with other agencies including the UNDP, UNEP, ESMAP, the World Bank, the DCTC, and the IAEA.

Activities of other international and multilateral agencies also touch upon the energy sector and upon energy use, and UNIDO shall endeavour to strengthen its operational links with those entities.

3. Focus on the technologies or options where markets are least able to develop the "appropriate" solutions.

There is a clear niche for UNIDO and other UN agencies in catalyzing the development or adaption of technological options which are better suited to the needs of the DC's than those generally available from the traditional suppliers of equipment.

4. Emphasis upon those projects with the most promising near-term prospects for commercialization. Given that basic energy research is especially expensive and in view of the limited resources at UNIDO's disposal, the energy programme will give priorities to these projects which most quickly can add to energy supply or result in real conservation.

5. Concentration upon methods for more systematically demonstrating and promulgating appropriate technologies in order to maximize the "multiplier" or "demonstration" effects.

Again, given the limited resources of UNIDO but in view of its established expertise in diffusing technologies, the maximum benefits can be obtained from energy projects for which the experience can be disseminated, i.e. where the potential carry-over impacts are the greatest, in contrast to "one-off" projects.

6. Promotion of energy efficiency, including assisting the DC's in implementing pricing policies which provide ongoing incentives to all users for conservation.

Low energy prices are persistent disincentives for energy efficiency, and the effectiveness of conservation projects can be undercut or severely limited when pricing policies do not support conservation.

7. Reconciliation of environmental and energetic trade offs.

Both the environmental impacts and the costs of environmental protection shall be articulated in energy-related projects.

Section III

BACKGROUND: UNIDO ENERGY ACTIVITIES

Energy has long been an important aspect of UNIDO's activities. Its share of UNIDO's annual delivery of technical assistance to Developing Countries has increased steadily throughout the 1980's, doubling from US\$5.0 million in 1980 to US\$10.0 million in 1987, or about 10% of the Organizations' total delivery.

Consequently an energy programme will not introduce any major new elements to what is already an important component of UNIDO's work. Rather it constitutes a redirection of effort for the purpose of increasing efficiency and maximizing impact.

UNIDO's energy activities have spanned different sectors, have involved the production, upgrading, and conservation of energy and have included most of the member countries. A comprehensive list of the projects related to energy undertaken in recent years is appended to this proposed Energy Programme, and some of the areas of activity are sketched below.

New and Renewable Sources of Energy, (NRSE's) have loomed larger, and their share in UNIDO's total technical assistance delivery increased from 0.5% in 1980 to 3% in 1987, now amounting to almost one-third of overall energy activity. Areas of concentration are biomass, minihydro, solar and wind.

The Department for Industrial Promotion, Consultations and Technology and the Department of Industrial Operations have jointly run a long-term programme on small hydropower in Asia/Pacific. This project has established a Network that has now been running for the last 7/8 years with over 20 member countries. The Network's activities cover information exchange, co-operative research and development, training and the provision of consultancy services. The Network has a Centre in Hanzhou, China, which is staffed and funded by the Chinese Government. Other sources of funds for the Network's activities include the Regional Energy Development Programme of UNDP.

In addition, UNIDO has a number of programmes for the establishment of pilot plants for small hydropower, in selected African countries. These programmes are funded by the Austrian and Swiss Governments and UNDP. The intention is that these pilot plant activities will provide a base for training programmes, local production facilities, etc.

In rural areas much of the population's energy needs is derived from biomass. UNIDO has emphasized efficient charcoal production from agricultural and wood wastes as a key part of its biomass energy programme which is designed to reflect both the need to alleviate acute fuel shortages and to contribute to reduction in the rate of loss of tropical forest.

UNIDO has carried out a large number of technical assistance projects on solar energy, mainly related to solar thermal applications. A major project has also been carried out on the establishment of solar energy testing facilities and the local manufacture of solar energy collectors in Jordan. As part of its promotional programme, UNIDO has established the Consultative Group for Solar Energy Research and Application (COSERA). COSERA is a high-level forum for identifying, through collective interaction of its members, the priority needs in research and application that would promote the widespread use of energy, as well as indicating possible donor sources for financing such activities. It would thus act as a catalyst to achieve optimum results from the multitude of efforts in many organizations in different countries. The first meeting of COSERA was held in Vienna in 1986. The second meeting was held in Beijing, China, from 11-15 December 1989.

UNIDO has paid considerable attention to the development of New and Renewable Sources of Energy (NRSE). This is being reflected in completed and ongoing projects promoting the use of NRSE and to initiate local low cost manufacture of relevant components.

As an example of this consequent policy an ongoing project for the manufacture of wind turbines for electricity generation in Egypt is to be mentioned.

Based on a national strategy to supply by the year 2000 5% of the national energy need through the application of renewable sources of energy (including wind power) this project was created and is still under implementation.

The project aims at establishing manufacturing and testing facilities for the local production of wind turbines with a capacity of 90 kw for the generation of electricity through the transfer of technology, to be adapted to local conditions, provision of expertise, training and supply of related equipment. It is expected that at the end of the project implementation a prototype of the wind turbine will be produced and successfully tested for application on wind farms.

In addition, a batch of 100 wind turbines will be manufactured and sited in groups for grid connection, and a full operational testing facility for electricity-generating wind turbines will be established in order to enable the New and Renewable Energy Authority (NREA) of Egypt to carry out a wide range of tests relevant to the introduction of wind energy technologies in the country.

In view of the extensive reserves of low-grade coal in many developing countries which are worth exploitation since they constitute useful indigenous energy resources, UNIDO has provided technical assistance to improve the efficiency, environmental acceptability and cost effectiveness of using low-grade coal.

Projects have been undertaken in Poland, Bulgaria, Yugoslavia, China, India and several countries in Asia and Latin America.

Through technical assistance UNIDO has been transferring the most recent developments in gasification, fluid bed combustion and direct liquefaction, which promise ways to minimize the environmental impacts of lower-quality coals. Assistance in monitoring pollution arising from coal combustion and recommending abatement options plays an increasingly important role in UNIDO's coal projects.

Utilization of low-grade coal requires the application of special technology so that international standards for atmospheric emissions can be met. Investment decisions are based on technical and economic feasibility and assurances of environmental acceptability. To facilitate such decisions UNIDO has upgraded the R & D capacity of National institutions working on low-grade coal utilization.

In the field of petroleum refining, UNIDO has organized 6 workshops in the area of maintenance, plant inspection and energy management in petroleum refineries and petrochemical plants. Special emphasis was put on energy savings and means of conservation. Some 120 participants from developing countries have attended these workshops since 1981 and 2 other workshops are planned for 1990. Technical assistance has been provided since 1985 to the Regional Petroleum Training Centre in Angola for all the SADCC countries. Some 600 trainees have been graduated in different disciplines of the petroleum sector.

Requests have been received for assistance in energy conservation in the petrochemical industry in Pancevo, Yugoslavia and cooperation given for a petroleum products pricing study in Ghana.

In association with other agencies, UNIDO is also involved in an energy conservation programme for cement plants in Pakistan.

Technical assistance has been recently provided to Vietnam for the Energy Plan for the Industrial sector. This will provide the Government of Vietnam with the basis of a framework for formulating the Energy Master Plan. The study tends to review and assess the current available statistical data and information in the energy sector and to identify the needs for the Government to develop the comprehensive development plan.

Computer software has been developed to assist industries identify the benefits of energy conservation.

Other projects are aimed at strengthening capability to promote the rational and efficient use of energy in local industrial sectors. A booklet, "Successful Cases of Energy Conservation", as a project output will be prepared and delivered to developing countries to disseminate practical know-how and experiences of energy conservation obtained by industrialized countries.

In view of the need to train plant managers in energy auditing, UNIDO has developed an energy diagnostics kit which has been already demonstrated in a few developing countries. This kit which costs about US\$ 20,000 can show how the thermal units in building material processing plants are deviating from normal/effective operational conditions and has been instrumental in introducing comprehensive energy management systems to the industry.

In addition to the above, UNIDO non-metallic minerals programme is continuously introducing new raw materials which may lower processing temperatures without adverse effect on the projections and quality of the products.

Egypt suffered two severe set-backs during last two decades, one during 1973/74 when the price of crude oil rose by approximately 200% and the other between 1978-1980 when a similar increase occurred. In line with the Government's strategy to utilize oil reserves in Egypt, UNIDO assisted Egypt during 1986/87 with specific focus on metallurgical and glass industries.

UNIDO assisted El Nasser Glass Company in improving the energy performance of a 60 tonne glass melting furnace in Mostorod Glass Factory. In this connection, UNIDO carried out an energy audit/energy balance study and introduced measures to reduce energy utilization. Within the project funds totalling US\$ 650,000, UNIDO provided necessary expertise to identify main problem areas to improve the technology to save energy. A metallic recuperator was installed and a few adjustments in batch composition, as well as in operational regime of the furnace was introduced. Above inputs generated 30% of energy saving in oil consumption.

Section IV

ENERGY NEEDS FOR ECONOMIC DEVELOPMENT

1. Critical Need for Energy

It is a truism that energy is indispensable for economic growth and industrial development, but the relationship between energy supply, energy use, and economic growth does need to be discussed in the context of UNIDO's Energy Programme because of the special problems facing the DC's with respect both to the use and the production of energy.

Demand for energy will grow most rapidly in the DC's, all the more so if their economic growth targets can be realized.

The DC's still require increasing amounts of energy in order to continue to grow economically, and conservation, while important, cannot be a substitute for new and increased energy supply.

2. Burden of Energy Costs

All costs related to energy loom large -- the costs of supply, the costs of conservation and -- especially -- the opportunity costs of inadequate energy.

Energy supply frequently involves a large fraction of the DC's import costs -- up to 40% in some cases -- and energy investments usually are the largest single component in total capital outlays in DC's, as well as industrial states.

Since capital is especially scarce in the DC's, the UNIDO programme must be mindful of the comparative costs of all the options, energy conservation or new energy supply. Over and above the cost burden, there are further special aspects of energy supply which govern the design of UNIDO's energy programme, as discussed below.

3. Conservation Potential

Conservation is only a limited option for the DC's. The experience of the industrial states with regard to the linkage between energy and growth is not directly transferable to the DC's. The industrial states were able to break that linkage for almost ten years by 'exporting' heavy industry, switching to smaller cars, or other measures suited to their own economies.

This model is inapplicable to the DC's, so that for them energy conservation cannot be an alternative to energy supply. It must be pursued, but only in conjunction with the sustained development of new supplies of energy, which, wherever feasible, should emphasize the promotion of indigenous energy supplies.

In particular, it must be recognized that conservation all too frequently competes with energy supply. Both require incremental investments, which are frequently comparable in magnitude. Conservation efforts typically might involve major capital outlays for regenerators or heat recovery systems or even replacing old, inefficient equipment such as boilers.

Both conservation and production of energy tend to be capital-intensive, so the DC's require special assistance in both areas in order to realize an efficient mix of options.

4. Foreign Exchange Costs and Indigenous Energy Resources

Foreign exchange, as well as capital, is scarce amongst the DC's, and most energy options, whether the importation of fuels or of fuel-related equipment, entail important FEX outlays.

Thus the DC's require assistance in identifying and developing energy options which rely as much as possible upon indigenous resources, such as agricultural wastes, thermal solar energy, wind power, or other renewable sources, as well as other local resources, such as low-grade coals, for which adaptive technological options may be critically needed.

Such options, where economically feasible and if properly promulgated, can substitute for imported fuels and also permit greater use of domestic manufactures in place of imported equipment. Promising examples are solar collectors for hot water or windpower for pumping water, where local conditions are favourable.

5. Appropriate Technologies

Another major disability is the lack of "appropriate technologies", This is an area where UNIDO has particular expertise and where there is a special need in the DC's because traditional equipment manufacturers and suppliers from the industrial countries do not routinely produce the types of equipment best suited for the DC's.

The "appropriateness gap" is particularly clear with respect to renewable energy sources, where research and development in the industrial countries has been directed towards the more complex, more sophisticated, and larger systems, which are not readily manufactured or operated in the DC's.

An important aspect of the DC's which must be recognized in the design of appropriate energy technologies is the different relationship between capital and labour costs. Cheaper labour means that the DC's can potentially exploit options which might be dismissed as un-economic in the industrial states, and this reinforces the need for assistance in identifying and adapting more appropriate technologies.

There is scope for major contributions to be made to the supply of indigenous energy, provided that such technologies can be promoted and propagated.

6. Energy Pricing and Taxation

Pricing and taxation policies are a further impediment to the efficient use of energy in many countries, but especially in the DC's.

If energy prices are set below market levels, then neither firms nor individuals perceive financial incentives to conserve energy, even when conservation otherwise would be economically desirable. For example it frequently occurs that foreign firms designing plants in the DC's misspecify insulation requirements or under-size recuperators because energy is not worthwhile saving when priced at the low levels stipulated in the design documents.

Such distortions are especially serious because it is then more difficult to develop conservation programmes which can be self-sustaining. If prices are artificially low, then conservation projects are less likely to succeed.

It will be important for UNIDO to assist the DC's in evolving more effective incentive structures because otherwise the exemplary value of demonstration projects in energy conservation can be lost.

7. Environmental Trade-offs

Lastly, environmental concerns are especially vexing for the DC's because virtually all energy options with lower environmental impacts are also substantially more costly. The direct trade-off between cost and environmental protection seriously limits the available options:

Furthermore, each country is constrained in terms of the economic resources that it can afford to devote to environmental protection."

GC.3/32, 29 September 1989

Thus cleaner energy means less energy, where investment resources are finite. If capital is diverted to cleaner energy production or cleaner energy use, then it follows that less energy can be produced, often by a substantial amount, or less capital is available for investment in industry.

It must be noted that conservation itself is a form of environmental protection: if less energy is used through efficiency gains, then less pollution is released,

Nonetheless, the differences are indeed large. Clean, low-sulphur coal, for example, can cost almost twice as much as the lower-quality varieties, or, alternatively, a coal-fired power plant, fully equipped with SO₂ scrubbers and filter systems, typically costs 50-85% more than the stripped-down plant with higher emissions.

Given the very limited financial resources of the DC's, it is therefore important that the environmental aspects of energy projects be weighed carefully, and UNIDO proposes to focus upon the ways to optimize that balance.

Section V.

ENERGY RESOURCES: PARAMETERS FOR POLICY

UNIDO has identified three basic considerations with respect to energy resources which are critical in the formulation of its energy programme:

- o Is there a relative scarcity of energy resources and potential supplies?
- o What are the prospects for higher energy costs in the medium-term?
- o How rapid might be the growth in the combined future demand for energy of the industrial states and the DC's?

These are the three most important aspects of energy markets which affected the design of UNIDO's energy programme. The choice of options for the DC's depends upon the resolution of the above questions.

If resources were scarce, or if the total demand for energy were to press upon available capacity, the potential energy options for the DC's would be wider, because then it would be economically practicable to look towards some of the more costly alternatives.

Conversely, if energy prices are likely to remain low, the options for the DC's -- indeed for all energy users -- are much more modest, and many of the renewable alternatives are much less attractive or would involve significant subsidies. The choice of options is sensitive to the energy price forecast.

1. Scarcity

Scarcity of energy is not a real issue. There is no global shortage of energy resources over any planning horizon used by governments. Hence, energy policies or programmes need not be predicated upon any presumption of scarcity over a 25-50 year period.

While it is true that energy resources will ultimately be depleted, that Malthusian spectre is remote, and there exist known, discovered, and economically developable energy resources from conventional sources which will suffice.

Low-cost energy resources are known and abundant in at least three areas:

1) Conventional oil reserves of the Middle East

These amount to more than 100 years' worth of current requirements. Even at that, they are understood to be understated, given that there has been little incentive to explore further for oil in the ME since current reserves are so very large.

2) Coal in Australia, China, India, the USSR, the United States, and many DC's.

These deposits aggregate to well over two trillion tonnes and also represent at least 100 years' worth of demand.

3) Gas in the USSR

Soviet gas deposits are also very large, and these can be expanded to serve both European and domestic markets. While transport costs are relatively high, Soviet gas, nonetheless, is expected to be competitive with ME oil for many decades.

Production from all three of these vast resource bases can be expanded as needed to meet any foreseeable demand at costs of less than \$20 per barrel of oil-equivalent energy.

This potential supply of low-cost oil, coal, or gas from known areas is demand-limited; it is not constrained by resource considerations. Although there is little spare installed production capacity anywhere at the present time, there is no economic or technical constraint on the steady expansion of that production capacity to meet prospective demand.

Energy resources therefore are abundant even at today's prices. Moreover, if prices were to rise the energy resources would increase commensurately, so that scarcity as such is not a constraint upon energy policy.

2. Energy pricing

The price of energy is the key question, especially for the DC's, and thus the key parameter for planning is the forecast of oil prices.

The projection of oil prices is critical because oil prices have determined the overall level of energy prices for the past decades, and there is every reason to believe that they will continue to do so for the foreseeable future.

A constant real oil price is the reference scenario upon which the Energy Programme is based. At most this reference scenario admits for a very slow increase in prices over the next 10-15 years.

The reference scenario itself is based upon the avowed price strategy of the largest OPEC oil producers. The major oil producers of the Gulf have articulated a policy of maintaining "low" prices, i.e. a weighted average maximum price for OPEC oil equal to of \$18 per barrel.

This policy, the "market share strategy", is expressly designed to price OPEC oil below the level of most potentially competing sources or alternatives in order that OPEC over the longer run can maximize its revenues through increasing total output.

There is no reason at present to expect the major producers to deviate from this policy. They believe that it has proved to be successful; as witnessed by the fact that OPEC production now increases each year, while prices do not fall significantly below the target maximum.

Continuation of the low-price strategy is probable because the largest producers are cognizant of how rapidly they lost their markets after the price increases of 1978-80, and they do not wish to repeat that experience. Low prices promise higher long-term revenues.

The producers also have the market power to implement that policy because the key players can increase output essentially at will in order to cap the price. Oil output in Iraq, Saudi Arabia, and Kuwait in particular could be increased by a factor of two or more over a ten-year period without undue technical difficulty, since current reserve to-production ratios are well in excess of 100-to-one.

It is therefore credible that this policy will continue because:

- o Their proven, underdeveloped reserves are high.
- o Capacity can be expanded at low cost.
- o Producers fear the loss of markets if prices rise significantly.
- o Major producers view low prices as maximizing revenue.

3. Demand Pressures

It is therefore unlikely that the demand for oil or energy could outstrip supply over UNIDO's planning period. It is true that the DC's may grow more rapidly than the industrial countries, but their current consumption is so small by comparison that even rapid growth does not tighten the balance.

Rapid economic growth in the DC's, together with historical growth rates in the OECD states, implies an overall annual increase of 2-3.5% in energy consumption, which is less than the rates observed earlier and which therefore can be accommodated.

Robust economies worldwide will thus require growing supply of energy. Some of the increased need will be met by the slow growth of nuclear electricity generation and coal production world wide, but, otherwise, it is to be expected -- at low oil prices -- that oil and gas production outside of the OPEC states will rise at best very slowly and may well decline.

Thus the growing demand for energy will necessarily be met by an increased call upon OPEC's oil production, but this should precipitate no substantial increase in energy prices, since the most probable scenario foresees that the Gulf producers will increase their capacity as required in order to contain the oil price -- absent new wars or revolutions or political disturbances in the region.

4. Conclusion

Global energy balances, together with the realities of OPEC pricing and production policies, imply that the needed energy can be supplied at essentially constant prices.

Even though energy prices may not increase, there is an important need among the DC's for facilitative assistance in adapting technologies to their indigenous energy resources.

There thus is a niche for UNIDO to aid the DC's in identifying and exploiting their own, domestic energy resources.

Some DC's do indeed still have undeveloped opportunities to exploit their own NRSE's (biomass, thermal solar energy), where the technology gap still must be bridged. Other small hydro plants or wind energy DC's have under-exploited deposits of low-grade coals, for which extensive technical assistance will be needed.

Energy is indeed abundant, but nonetheless there still are important areas where local energy sources can be exploited efficiently and economically, and these shall be the option upon which UNIDO shall concentrate.

Section VI

UNIDO ENERGY PROGRAMME: OPERATIONAL MODELS

INTRODUCTION

UNIDO's energy programme is designed to meet the special needs of the DC's with respect to the supply and use of energy. It is based upon adapting UNIDO's current capabilities to those energy issues which are special to the DC's. In particular it addresses the trade-offs between environmental concerns and the compelling need for energy to fuel economic growth.

The programme has been crafted to meet the perceived needs of the DC's and to capitalize upon the many years of experience within UNIDO in dealing with issues of energy and industrial development.

The energy requirements of the DC's are indeed special, as are the capabilities of UNIDO, and the energy programme emphasizes those complementarities consistent with three broad principles:

1) **Compatibility**

Ensure that projects are proposed and reviewed with respect to both their energy and environmental aspects.

2) **Identify Niches**

Identify those special areas, or niches, where UNIDO enjoys the greatest comparative advantage -- those uses or forms of energy where existing technologies must be adapted and transferred.

3) **Maximize transferability**

Focus on those projects which offer the best prospects for transference, i.e. where the demonstration effect is maximized, so that projects then can serve as models for application elsewhere.

SUB-PROGRAMMES

The programme involves reconciling the objectives with the opportunities and constraints, as discussed earlier, and consists of 5 identifiable sub-programmes which can be executed in parallel.

A. Internal Priorities and Coordination

UNIDO will establish new guidelines for energy projects and also strengthen the mechanisms for coordinating energy activities across departmental lines.

Coordination among the different groups involved with energy issues shall be improved by creating ad hoc working groups, but without adding any new reporting structure. Models for such information exchanges exist and will be exploited.

In the selection and implementation of projects relating to energy priority shall be given to those which meet the following tests:

1. Near-term commerciality

UNIDO can achieve the greatest impact by concentrating upon those projects which are potentially closest to commercial feasibility.

2. Economic Tests

Projects shall be assessed for economic feasibility using local prices for fuel or major inputs and also using "border" or market prices as well.

3. Favourable environment

Host country conditions will be reviewed to ensure that the projects enjoy reasonable prospects for catalyzing wider acceptance.

B. Prepare inventory of high-impact projects:
Actively promote replication in other countries.

UNIDO shall assume an active role in expanding and disseminating its present experience, especially with NRSE's.

UNIDO shall review its prior energy-related projects, identify those which most readily might be applied in other DC's, and develop an inventory of promotable experience to be coupled with a matching inventory of prospective beneficiaries.

UNIDO hitherto has primarily responded to requests from member states. In the energy area it shall hereafter actively propose to members projects which UNIDO determines to be potentially useful in energy conservation or production based upon prior successful models or demonstrations.

It shall refocus project appraisals and evaluations with two operational objectives:

1. Ensure that the assessments are fed back to the project officers.
2. Actively integrate successful projects into the programming exercises.

This will maximize future benefits from the accumulated institutional experience. It shall undertake studies to establish the scope of such opportunities and to investigate possible financing instruments.

Two areas shall be emphasized, reflecting the energy endowments of most DC's. First, NRSE's will continue to be pursued, and second the options for developing low-grade coal resources will be pursued more intently, because the technology gap there looms especially important.

C. Center for the Demonstration and Promulgation of Appropriate Technologies

UNIDO shall explore, possibly in conjunction with other agencies, the creation of a center which would promote the development of prototypes for "appropriate technologies" not otherwise on the market or readily manufactured.

Such a centre could enable UNIDO to "multiply" the impact of its experience by facilitating the transfer of successes in specific locations to a much broader potential clientele:

1. Catalyze the dissemination of manufacturing know-how and experience with such technologies.
2. Establish procedures for demonstrating both their use and local manufacture.
3. Provide a facility with "hands on" capability for training cadres in the manufacture, installation, and maintenance of such units.
4. Offer the ability to certify and prove marketable technologies.

UNIDO shall explore whether such a demonstration centre could best be established in conjunction with existing specialized research and development centers in DC's.

Training is an indispensable part of this effort, and UNIDO will strengthen and focus its training activities with respect to energy management, conservation, and technology implementation. Training programme to be most valuable must be tied closely to implementable projects and coordinated with project objectives.

D. Environmental Protection and Energy Conservation

Environmental and conservation issues, with respect to energy, shall be addressed in parallel because energy conservation is such an important means for reducing the environmental impact of any form of energy use or energy production.

UNIDO activities and plans specific to environmental protection have been addressed in the Environmental Programme and reference is made to that document.

With respect to energy, however, ad hoc groups shall be established at working level to ensure that the environmental impacts of projects are understood.

UNIDO shall also address the "conservation gap". Most conservation projects require capital for implementation - yet most are too small to attract donor country interest.

The groups shall identify and promote projects which promise significant energy conservation potential. Where the collateral results are reduction in emissions or pollutants, such projects shall be emphasized in order to maximize joint benefits. The focus shall be at the sectoral level, where maximum impact can be expected.

Sectors of interest include the metallurgical, cement, fertilizer and building materials industries.

The newly developed processes of low energy production of Ammonia, besides enabling developing countries to preserve their natural resources and thereby the environment, allows a substantial decrease in the emission of gaseous pollutants into the atmosphere. The transfer of technology from process developers to developing countries would considerably contribute to resolving the problems of energy conservation and pollution. Due to relatively higher costs of know-how, the process is especially promising and advantageous for industrialized developing countries (Arab countries, India, Mexico, Brazil, Indonesia, Malaysia, etc.).

In China UNIDO will demonstrate techniques of energy auditing and identify the level of expertise in energy management as well as the technological shortcomings. From the above activity brick making and ceramic industries are expected to benefit. Furthermore, data and information generated through above expertise will help UNIDO/UNDP in defining new technical assistance programmes specifically oriented towards energy conservations.

In this area UNIDO shall endeavour to promote investment in conservation, and in cooperation with UNDP and UNEP try to develop pilot projects. UNIDO shall also approach the IBRD and the ADB to develop ways of "packaging" energy conservation projects so that they may more readily be financed, since there is presently no established mechanism for funding or aiding small and medium-sized conservation investments, even when clearly economic.

E. Promote the Use of Indigenous Energy Resources

UNIDO will assist the development of energy alternatives based on locally available resources. Biomass energy, particularly the use of agricultural and forest industry wastes constitutes a useful fuel resource for rural, agro industry. Simple wind pumps, where locally manufactured, should be promoted. In view of the significant deposits of low-grade coal which in many developing countries constitute a valuable source of indigenous fuel, UNIDO has an extensive programme on coal utilization. Experience gained through implementing large scale projects in Poland, Bulgaria, China and India combined with the well-established R+D capabilities in these countries, gives a good basis for UNIDO to promote and extend this activity to other developing countries with such resources and also use existing institutions for training and demonstration. This will facilitate more economically feasible solutions to the problem of how best to use low-grade coal in developing countries.

F. Consolidate Data Base on "Appropriate Energy" Technologies

UNIDO shall extend its earlier efforts in assembling a data and information base on the "appropriate" energy technologies, both for production as well as for conservation of energy.

It shall systematically review those energy technologies which are known to be feasible using indigenous resources, but where technical assistance is necessary to facilitate broader implementation.

As part of that effort it will assemble UNIDO's in-house experience, collect the experience of other agencies as appropriate (such as USAID, GTZ, etc.) and establish a clearing house for operational data on those "appropriate" energy technologies, including files or case studies.

This will emphasise the new and renewable sources of energy but will also include those adaptations of conventional energy technologies appropriate to the circumstances of the DC's. In particular, given the existence of low-grade coal and lignite deposits in many DC's, the information base shall give new emphasis to identifying and assessing such options.

UNIDO must strengthen its engineering capabilities to support the technical character of those programmes, and it will also expand its roster of experts and firms in these areas.

G. Process Selection from the Energy Standpoint

Selection of technologies and processes which use less energy i.e. which are more energy efficient. This will contribute to sustainable development through reduction of pressure on primary energy resources. Reinforces need for data base. UNIDO will offer advisory services in evaluation of tenders. Also UNIDO can enhance the capability of existing industrial R & D Centres to develop and promote low energy consuming processes.

H. Collaboration

UNIDO shall also undertake further discussions with related international or multilateral agencies to establish the areas of complementary and to avoid duplication of effort.

A review shall be undertaken to establish where such opportunities might exist, and then contacts shall be developed at the working level to determine what operational links might be pursued.

The agencies to be contacted include those with specifically energy and environment related mandates - the IAEA, ESMAP, and the UNEP - as well as those whose involvements with energy are less direct, such as the IBRD or the UNDP.

One such collaborative enquiry should include the IAEA, where UNIDO, and IAEA shall establish ad hoc working groups to explore each others activities and capabilities in the energy area.

In that case, for example, there are possible complementarities with regard to environmental assessments, where the IAEA has established expertise, and analyses of the industrial impacts and infrastructural requirements of nuclear programmes, where UNIDO in turn could support IAEA studies.

I. Energy Resource Assessment

Selection of optimum mix of energy resources for the various industrial sectors from the available options. This is a critical step in industrial development particularly as regards the location of new industries and constitutes a vital input to energy resource planning.

Projects such as the current energy planning exercise being undertaken for Vietnam with Japanese financing, will be expanded in scope and executed in other countries in cooperation with UNTCD and ESMAP. This exercise will lead to the formulation of projects which focuss on specific industrial sectors.