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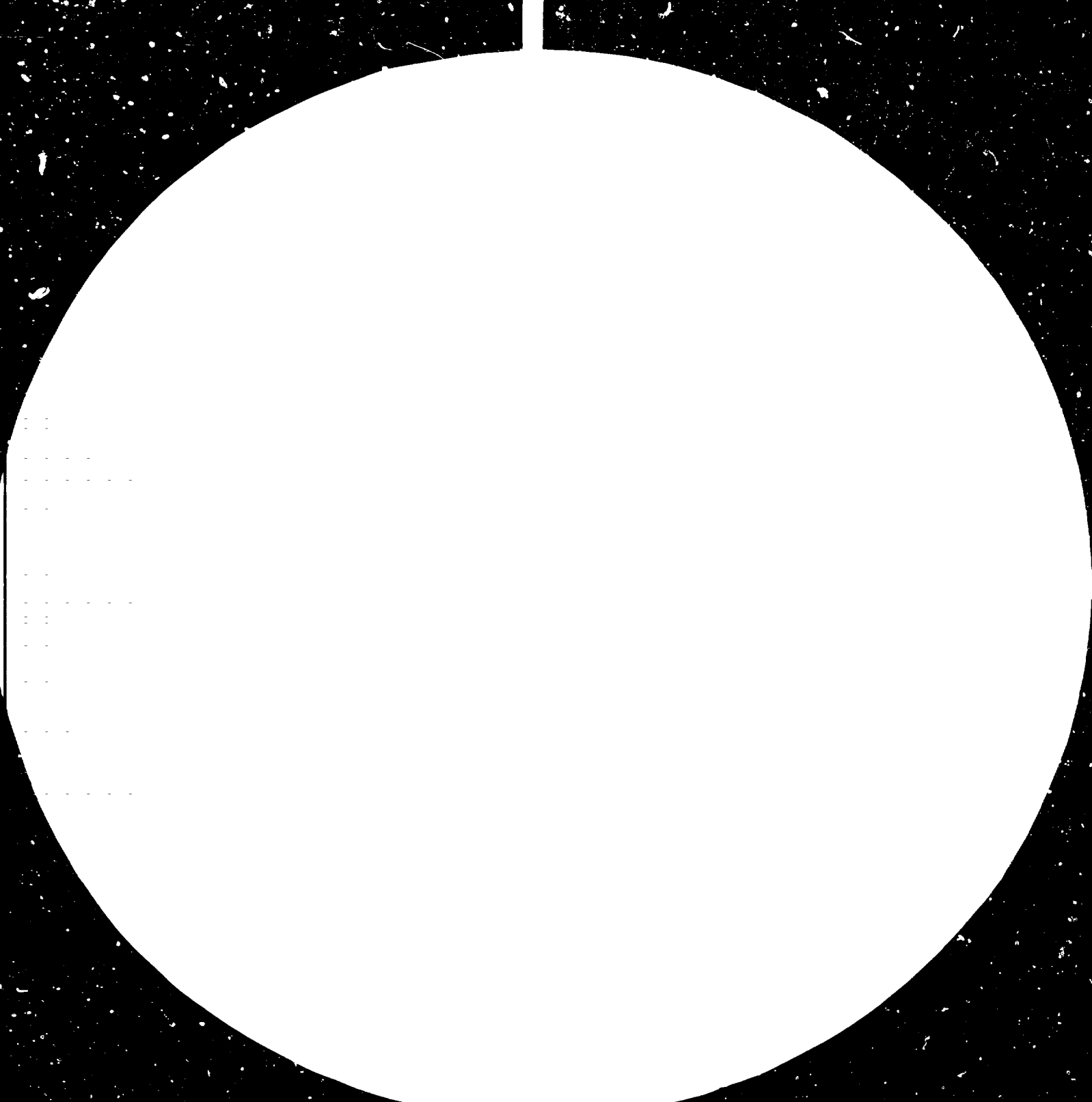

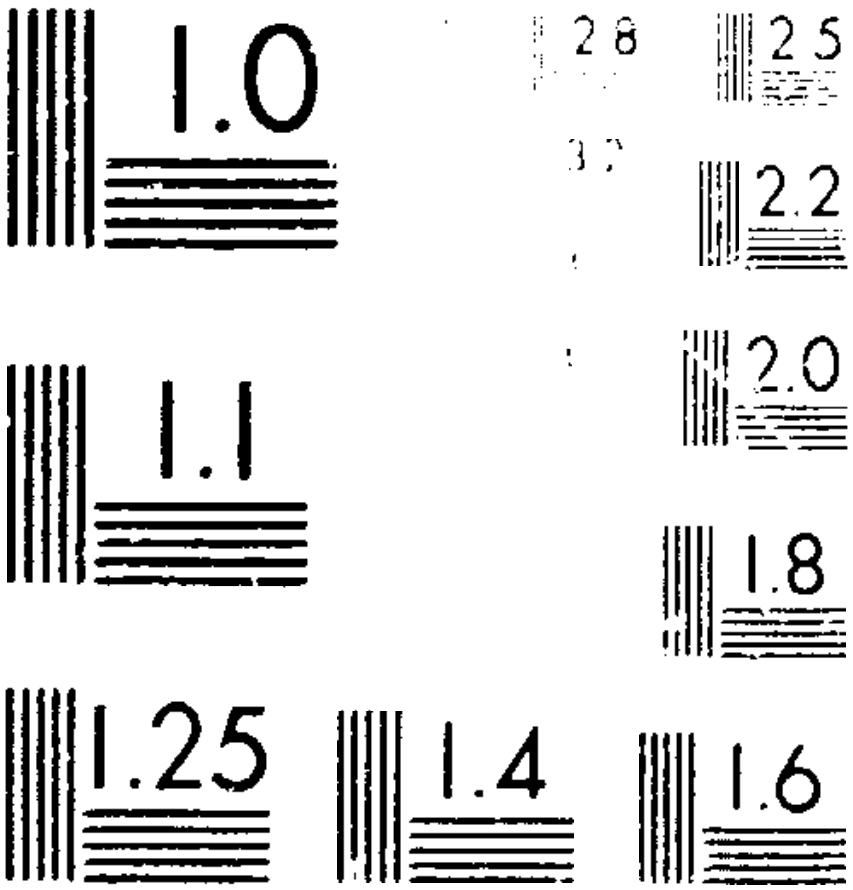
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J. Baranson
13 May 1982

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ISSUES PAPER

NEGOTIATING FOR IRON AND STEEL INDUSTRIES: THE CENTRAL ROLE OF FINANCE

CONTENTS

In order to consider the issues involved in negotiations in the iron and steel industry for operational technology and financing, it is essential to know who are the players, what is the nature of the "game," and what are the rules of the "game." The "game" also varies depending upon the type (category) of industry. Accordingly, the following elements are examined: (a) the categories of projects (large-scale/complex, direct reduction, or mini-steel plants); (b) the objectives and strategies of involved parties (purchasers, suppliers, and financial sources); and (c) the negotiable variables (such as raw materials and energy, capital equipment, and training).

Traditionally, the financing component of industrial "packages" have been considered as an addendum -- after the fact, so to speak. But in fact, financing is an integral part of the financing package - both as one of the involved actors who play an important role in determining whether there is to be a package at all and, if there is to be one, often to have a determining influence on its contents.

The last section examines in detail the negotiation framework, including (a) the objectives and strategies of involved parties and their relative bargaining positions; (b) the trade-offs between the negotiable variables and cost, risk and operational efficiencies; and (c) the particular cost-risk-efficiency trade-offs according to the three categories of projects.

I. CATEGORIES OF PROJECTS

The three principal categories of iron and steel projects are: (A) large-scale and complex plants, (B) direct reduction plants, and (C) mini-steel plants. An overview of the technical constraints for each category follows:

A. Large-scale and complex plants

1. Relatively high capital investment costs (including investments in supporting infrastructure) requiring an extended period for project payback.

2. Relatively complex technology that requires extensive and sustained foreign technical support and assistance to design and engineer facilities, train indigenous managerial and operational personnel, and to bring facilities to economically viable levels of operational efficiency. Economic viability of a project depends upon targeted levels of capacity utilization, and sustained technical difficulties can seriously undermine economic operation levels.

3. Requires extensive transport and other infrastructural development to supply required raw materials and energy inputs and to distribute voluminous and varied end-products.

4. Long gestation periods, during which time changes in world market prices and conditions affect the costs of construction and the ultimate cost and revenue structure of the project. Delays in construction, in the development of supporting infrastructure, or other concomitant factors affecting time and cost factors, also have a critical impact upon capital investment costs, financial charges (interest), and debt servicing load, which in turn may have a critical impact upon economic viability of the projects.

5. Dependence upon external (to project) economic conditions which can critically affect project payback and its ability to service the incurred (particularly foreign) debt. Included here are changes in raw material and energy prices, shifts in the market prices, and level and mix of demand for steel products.

B. Direct reduction plants

1. Moderate capital investment requirements with medium-term periods.
2. Moderately complex technology requiring substantial foreign technical support for design engineering, construction, and training of operator and managerial personnel. Economic viability and commercial rate of return dependent upon adequate use of installed capacities and minimizing incurrence of technical difficulties.
3. Adequate and uninterrupted supplies of energy and raw materials critical to efficient operaiton.
4. Moderate gestation period. Delays in construction or provision of supporting infrastructure undermine economic viability of project.
5. Changes in external environment, including changes in energy or raw material costs or shifts in market demand and prices for end products, affect economic viability of project.

C. Mini-steel plants

1. Technology may require scaling down of certain equipment normally used for larger-scale facilities.
2. Changes in economic environment affecting prices of raw materials, energy, and end products can affect economic viability of project (but to a much lesser extent than either of the other two categories).
3. Technical assistance requirements much more moderate than either of above categories, but marketing of specialized steel products may be critical to commercial viability of projects.

II. INVOLVED PARTIES (See Chart 1)

The involved parties are (a) purchasers, (b) suppliers, and (c) financial sources.

Purchaser Groups

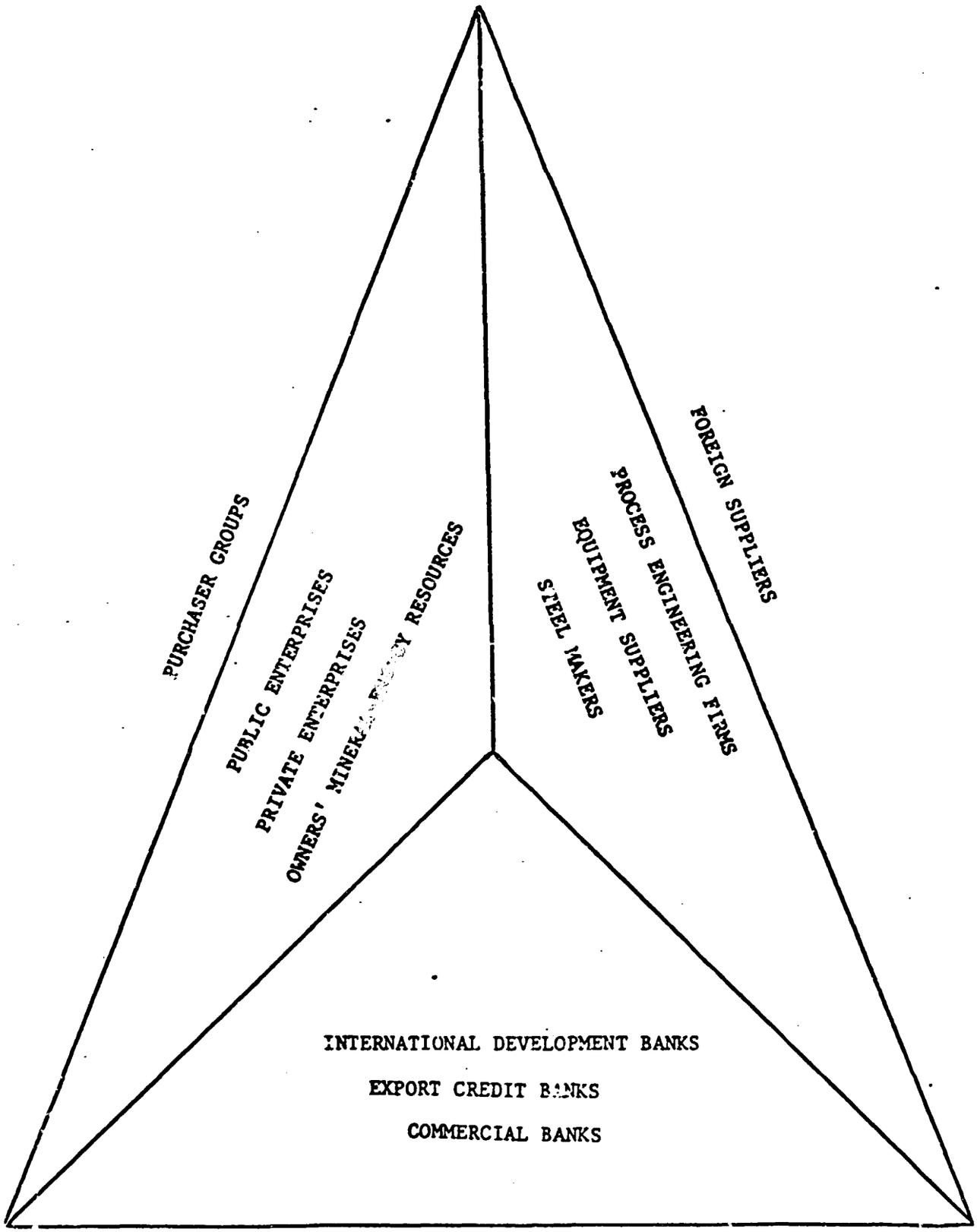
Developing country purchaser groups may be private or public sector enterprises and are often a combination of the two. They may also involve domestic owners of mineral and energy resources relevant to steel making. The proportion of government participation in iron and steel industry projects is large and growing, especially in the NIC's.[1] State participation may be direct (often as a majority shareholder) or indirect (as the developer of supporting infrastructure and increasingly as loan guarantor to obtain international financial credits).

The principal objective of iron and steel projects in developing countries has traditionally been to supply the local market. This is true even in countries that have achieved some success in exporting their

[1] Currently more than 80% of the iron and steel projects launched in the developing countries result from the initiative of the state or from state ownership. See UNIDO, 1990 Scenarios for the Iron and Steel Industry - Part One (Document #IS 213/Rev. 2, 15 December 1981), p. 26.

Chart 1

INVOLVED PARTIES



surplus products, such as Brazil and Korea. The viability of projects geared solely towards exports remains to be proven.[2]

Corollary economic objectives may include: net foreign exchange savings resulting from local production, as compared to the alternative of imports; forward linkage effects to iron and steel using industries; backward linkages to local raw materials and energy suppliers; the development of indigenous design-engineering, research and development, and industrial management capabilities; and regional development activated by the iron and steel industry.

The bargaining power of the purchaser group may be enhanced by the ownership of either abundant and/or high quality mineral or energy resources; or conversely, the purchaser can be disadvantaged by domestically available, low-grade mineral or energy resources, which it insists upon utilizing to develop a domestic steel industry.

Supplier Groups

The foreign technical group may be a single entity or a consortium of companies that will design and engineer the facility (technology and know-how), supply processing equipment, supervise or assist in plant run-in, train personnel locally or in home facilities, and assist in domestic or international marketing of end products. Suppliers may be classified into four main types whose objectives are outlined below:

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[2]For example, the ISCOTT project in Trinidad and Tobago is geared mainly to export markets in the Caribbean region.

1. Design-engineering firms. These are generally independent enterprises that offer services in planning, design and detailed engineering of iron and steel works, on a fee basis. Some may provide overall project management and supervision through startup and run-in. They generally do not participate in financing projects, nor do they get involved in construction, training, startup or maintenance (except in a supervisory role, as noted).

2. Equipment suppliers. Equipment for iron and steel projects is supplied by merchant vendors and by integrated steel producers. The objective of both is generally to sell as much as possible with minimum risk. The merchant vendor' involvement generally ends with delivery and acceptance by the purchaser, although many will provide erection, startup and training assistance if requested to do so. Some steelmakers supply equipment based on proprietary designs used in their own steelmaking operations, as noted below.

3. Steel producers. This category of technology supplier includes the larger integrated and semi-integrated steel producers located in the industrialized countries of east and west, and in those developing countries with advanced iron and steel industries such as Brazil and Mexico. Some large steel producers offer design, engineering, and management services directly or through a subsidiary or affiliated company. Many sell proprietary designs and equipment through subsidiaries and foreign licensees. This type of supplier is also more likely to accept a financial stake in the NIC project — either directly as a shareholder or indirectly as marketer or purchaser of the completed plant's output.

A design-engineering subsidiary of a steel producer may tend to specify the use of the parent company's proprietary technology. This may serve the commercial objective of an affiliated equipment manufacturer, or could be designed to defray the cost of R & D and engineering know-how that originally produced the technology. In negotiations involving such a subsidiary, it is important to assess the "arm's length" nature of its operation and willingness to use someone else's technology.

4. Combinations of the above supplier groups. A consortium of several suppliers may provide a mixture of any or all of the services and equipment for an iron or steel project. Negotiations with a consortium of this type are inevitably complicated unless one member is designated to represent the rest. In this case the purchaser should have a good understanding of the identity and role of all of the consortium members, since each of their separate objectives will be reflected (and perhaps hidden) in the negotiating position of their common representative.

Financial Sources (Foreign)[3]

Foreign financial sources may include international development banks, commercial banks, and export credit banks. Domestic banks and governmental agencies may have an ancillary role in financing the domestic component of a project, and foreign lenders often insist upon their participation to reinforce project viability potential. The nature and source of funding will impact upon the terms and conditions of lending, and the extent to which economic (as distinct from commercial rate

[3]Certain projects, or project components, may be financed in whole or in part from domestic banking sources. This may be the case with countries enjoying foreign exchange surpluses or those having domestic industrial banking facilities with foreign borrowing capabilities. See p. 12 on the role of domestic financial institutions in improving a country's bargaining position.

of return) criteria are applied.

1. Commercial and Investment Banks. These banks (often in consortia) are most interested in financial rate of return and minimizing risk. Their participation often depends upon that of the other financial sources listed below.

2. International Development Banks. Lenders such as the IBRD and IADB act as "lightning rods" to attract other sources of finance. In return for their seal of approval these agencies have emphasized the need for strong foreign technical assistance throughout the project, and commitment of host-country government resources and leadership, especially in the development of ancillary infrastructure.

3. Export Credit Banks. Credits from these eximbanks are linked to purchases of equipment and technology from national suppliers. Foreign aid agencies may provide ancillary funds for technical assistance or training in connection with particular projects.

III. NEGOTIABLE VARIABLES (See Chart 2)

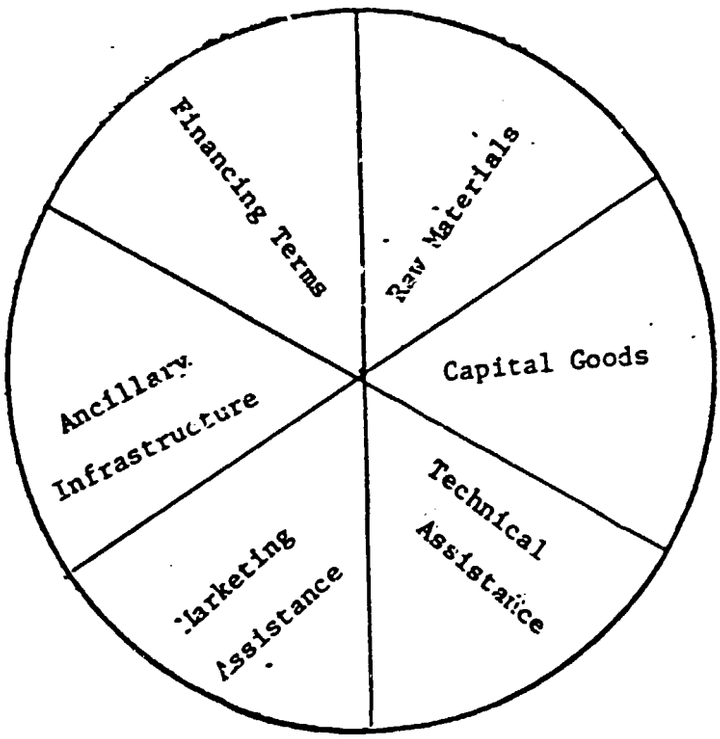
The negotiable variables include raw materials, capital goods technical and marketing assistance, ancillary infrastructure, and financing terms.

B. Negotiable Variables and Trade-Offs

In negotiating for iron and steel technologies, purchasers will have certain choices (and trade-offs) among alternative technologies and sub-components or inputs. The trade-offs are based upon often conflicting sets of objectives, principally a) minimizing capital outlay and subsequent operational costs (i.e., technical efficiencies of the operations); b) minimizing the risk and uncertainties of construction and eventual operation of the industrial facilities and c) the long-term economic and technological development goals of the host country. Sub-components of particular technology systems include the following:

Chart 2

NEGOTIATION VARIABLES



1. Raw materials. Mainly ferrous minerals, energy (and reductant) sources, including natural gas, coal, and other hydrocarbon sources. Choices include domestic versus foreign sources, and if the latter are used, the quality, abundance, and accessibility of local raw materials. The cost and efficiency of certain technologies are highly sensitive to the physical and chemical characteristics of mineral and energy inputs.

2. Capital goods. The choice of capital equipment for iron and steel processing facilities may be among alternative foreign suppliers or from domestic capital goods industries (with many of the more advanced developing countries insisting upon maximizing local procurement in order to minimize foreign exchange costs and to reinforce the development of indigenous capital goods industries and design-engineering capabilities.) Once again, the cost and efficiency of certain industries may be highly sensitive to trade-offs in equipment design and construction (operating efficiencies).

3. Technical assistance. Choices and trade-offs in this area are between the nature and extent of foreign technical support (for planning, design, construction, start-up, trouble-shooting, run-in and subsequent maintenance and/or design changes), and the extent and timing of training for take-over by local people to carry out the foregoing functions.

4. Marketing assistance. In certain projects, there may be the need for assistance in domestic marketing of a diversified product line, or there may be opportunities for export of steel products or intermediaries. In the latter case, certain foreign consortia of companies may agree to take on the export function among its

diversified tasks.

5. Ancillary Infrastructure. Provision of ancillary infrastructure (such as township and port facilities) is often a key component of steel projects, especially large scale and greenfield projects (see Appendices A and B). Negotiable issues relate to the division of primary responsibility between contractors and host countries, and performance guarantees.

6. Financing Terms. The finance component will often make or break a steel project, from the buyer's point of view. Often equipment and technical services are financed separately, giving rise to problems (See Appendices A and B). The negotiable issues concern trade-offs between attractive financial terms (including desirable equity involvements) and other characteristics (e.g. supply of proprietary technology or marketing assistance) that meet purchaser country objectives.

IV. NEGOTIATON FRAMEWORK

Agreements for the purchase/sale of iron and steel technology and operational capabilities are the resultants of negotiations for technology and for financing between purchaser and supplier/financial groups. Implicit in these nogotiations are the respective objectives and strategies of the involved parties and their relative bargaining positions (see Chart 3).

Purchaser groups

From the purch ser's viewpoint, there are two fundamental sets

A. Strategic Considerations

From the purchaser's viewpoint, there are two fundamental sets of considerations in negotiating for technology acquisitions. One set concerns the type of technology sought and the side effects the purchaser enterprise or country seek to realize. There are three functional categories of technology packages in this regard: operational, duplicative, or innovative capabilities. Operational capabilities generally relate to turnkey packages, where the purchaser is primarily concerned with rapid and cost-efficient transfer and phase-in of operational technology. Duplicative capabilities involve the training of indigenous personnel and organizations to perform the complete array of activities normally carried out by foreign contractors (ranging from site selection and preparation to detail design engineering and construction). Innovative capabilities imply the development of indigenous process design and engineering competence to adjust to variables such as changes in scale, site selection, raw material and energy inputs, equipment utilized, and end-product mix.

Chart 3

NEGOTIATION PARAMETERS

Purchaser Groups	Industrial Package	Supplier/Financial Groups
*Enterprise strategies: Internationally competitive technology Duplicative and/or innovative design and engineering capabilities Training of technical managerial manpower Fast, efficient technology transplants Entry into export markets *Government objectives: Minimizing newly incurred foreign debt burden Developing indigneous capital goods and design-engineering industries Exports as offset to incurred foreign exchange costs *Bargaining power (enterprise): Absorptive capabilities Alternative sources of technology Astuteness in bargaining Financial resources and credit rating *Bargaining power (government): Debt-servicing capability Attractiveness of economy Strength of financial and technology negotiation institutions	* Technology -Quantum and complexity -Operative-duplicative-innovative -Stage in product/process cycle * Marketing - domestic specialized steels - export * Training - production - marketing - financial management * Infrastructure - transport - housing	*Enterprise strategies: Competitive product company, design engineering, management, or equipment supplier Willingness to assist purchaser to become internationally competitive Firm exiting from iron and steel business and willing to sell off technology *Country objectives: Interested in trading technology for access to purchaser country's mineral-energy resources Political interest in assisting purchaser country's economic development *Financial Group's Objectives & Strategies: Minimize risk of default on payback because of cost overruns, or diminishing profitability of project Insistence upon foreign technical equity and/or managerial control to insure project payback *Bargaining Power: Extent to which supplier/financial group offers unique technology or indispensable syndicating function in financing project

A second set of purchaser considerations relates to the need to develop an internationally competitive facility with high levels of quality standards and cost-effectiveness, or whether the facility is being constructed essentially to serve the internal market and can therefore tolerate products that are higher cost or of lower quality during the "learning period" of industrialization.

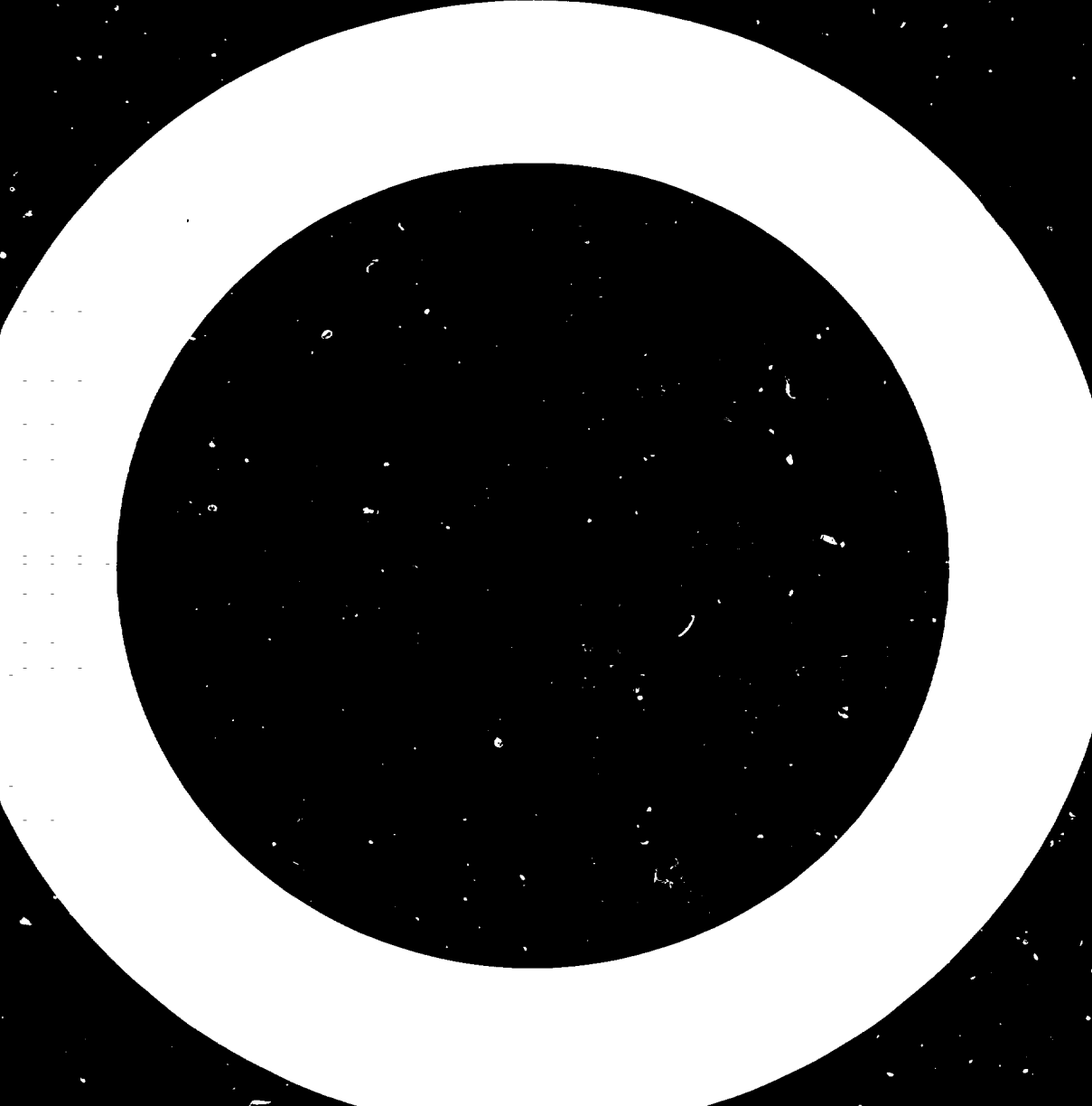
Purchasers' bargaining positions for technology are determined by a complex combination of factors, including the relative strengths vis-a-vis suppliers, the policies and attitudes of financial sources, and world market conditions. The bargaining elements may include the nature and content of the received technology and management support services, the price and credit terms of the received technology package (see below), and other related considerations such as assisting in international marketing of end products. The determinants of purchaser bargaining power derive from the institutional capabilities at the enterprise and governmental levels a) to make (and defend) technical judgments on the choice of technology (basic design and engineering parameters), b) to be able to negotiate with (and make choices among) alternative foreign technology sources, and c) to be capable of participating in technical adaptation and run-in of received technology.

Supplier Groups

On the supplier side, strategic considerations relate to the type of firm that is supplying the technology (design-engineering group, equipment manufacturer, or product company in the steelmaking business). The foreign suppliers' ability and willingness to accommodate purchaser strategies to move beyond operational capabilities (to assisting the purchaser enterprise to develop indigenous design-engineering capabilities) are contingent upon the type of business they are in. Japanese, U.S., and German enterprises cover a broad span of activities which are integrated back to mining operations and integrated forward to the manufacturing of steelmaking equipment and design-engineering groups in the steelmaking field. Individual firms that are in the design-engineering business exclusively may be anxious to build turn-key plants, but reluctant to teach a client enterprise group how to do their own design engineering.

The rising costs per ton of installed capacity coupled with a worldwide decline in the profitability of the industry have contributed to a willingness on the part of steelmaking complexes in industrialized countries (U.S., Japan and Western Europe) to earn profits through the sale of iron and steel technology.[1] Earnings derive from the sale of capital equipment, design-engineering services, and management support and training services. In many instances negotiations for steel complexes are part of larger trade negotiations involving access to minerals and energy resources in purchaser countries or other forms of offset trading.

[1] Between 1960 and 1975, capital costs per installed ton rose from an average of US $350 to US $1000 for integrated plants producing a million tons per year. With rising capital costs have come increased financial charges and rising energy and labor costs. The proliferation of steel production facilities (and the compulsion to maintain employment even when world demands exceed available supplies) have led to excess supply, intensive price competition, marginal pricing on world markets, and (particularly for Western Europe and the U.S.) declining profits.



Financial Groups

The institutional policies of financial sources influence the contents of agreements between purchasers and suppliers. Whereas commercial banks are narrowly concerned with payback on a loan, institutions such as The World Bank have to balance judgments between hard-headed appraisal of payback on the project and the impact on the economy at large, including the forward and backward industrial linkage effects.

Thirdly, The relative experience and astuteness of alternative supplier groups as transfer agents and negotiators is the other side of the coin. In iron and steel technology, commercially powerful groups from the major steel-producing countries are Commercially positioned to provide completely integrated technology transfer systems (design-engineering, construction, procurement of equipment, and training of operational personnel).

Financing sources can play a crucial role in the relative bargaining position of purchasers and suppliers. The World Bank has had a prominent role in this regard. They have generally insisted upon massive and comprehensive involvement of foreign technical support in the complete range of planning, engineering, construction, and run-in of iron and steel facilities and complexes. Their knowledge and experience in this field are legendary -- if not always completely welcome by purchaser nations -- who depend heavily upon them to obtain the necessary financial packages (see below).

Negotiations for financing

As in negotiations for technology, negotiations for financing are a function of the relative bargaining positions and strategic objectives of involved parties. Included in these negotiations are the obtaining of credits and/or foreign equity investment on favourable terms and conditions.

On the purchaser side, the elevant [illegible] factors include a) the country's debt servicing position; b) the enterprise group's credit rating; c) the access to foreign credit sources (i.e., extent of development of national banking institutions to assist them in packaging and negotiating international credits); and d) the attractiveness of the purchaser's economy as a market opportunity and a place to do business (particularly important in the case of equity participation).

On the supplier side, the purchaser's negotiating position is often reinforced (particularly in the case of Japan, Germany, the U.K., and France) by a phalanx of government agencies, trading companies, and banking institutions, that constitute a formidable body of knowledge and experience. But these enterprise groups and their supporting governments are anxious to promote the sale of capital goods and engineering services, and are intensely competitive in offering attractive financial packages to the purchaser's advantage).

International institutions, such as The World Bank, once again play a critical role in this financial arrangement -- as syndicators of comprehensive loan packages and as "honest broker" whose presence is desired by both purchaser and supplier groups for different reasons. Supplier groups consider World Bank approval critical to lend credibility to the project for purposes of involving

other foreign lenders. They also want The World Bank presence as insurance against unreasonable demands or unwarranted pressures being imposed upon them by host governments. Purchasers are ambivalent about The World Bank's role. On the one hand, they welcome the knowledge and experience of World Bank staff in formulating projects and in producing the exhaustive cost and feasibility studies needed to obtain international financing. On the other hand, they often object to what they consider the excessive role of foreign technicians in the design, construction, and run-in of facilities -- preferring to use larger numbers of their own nationals and engineering companies (particularly true of countries like Egypt, Brazil, Mexico and Korea).

Trade-offs in Negotiable Variables

There are certain trade-offs in terms of cost efficiencies and risk and uncertainty factors between the negotiable variables (III) and the purchaser's developmental objectives outline in IV (see Chart 6). Developmental objectives to a) utilize domestic resources (raw materials and energy), b) develop domestic equipment industries, c) train nationals in managerial and future developmental roles (beyond "operational" to "duplicative" and "innovative" capabilities) or d) earn foreign exchange through exports can impact upon the overall cost, efficiency and "risk factors" in a particular project. There are also significant trade-offs between efforts to reduce the financial burden of a project a) by economizing on investments in infrastructure, or b) by choosing a form of foreign participation which is attractive from a budgetary viewpoint but involves higher performance risks and uncertainties. The degree of "criticality" (or trade-off in terms of added cost, increased risk, or reduced operational efficiency) varies with the type of project and the nature and extent of desired trade-off (see Chart 7 for an overview of what follows).

Chart 6

TRADE-OFFS IN NEGOTIABLE VARIABLES

NEGOTIABLE VARIABLES	TRADE-OFF CONSIDERATIONS		
	Cost and Efficiency "Criticality"	Risk and Uncertainty "Risk Factor"	Developmental Objectives "Trade-Offs"
Raw Materials and Energy	Sensitivity to input variations	Input variations "Criticality" and "Trade-off" effects	Utilizing domestic resources
Capital Equipment	Sensitivity to input variations	Input variations "Criticality" and "Trade-off" effects	Develop domestic equipment industries
Technical Assistance — Production	Dependence on foreign technicians vs local training	Input variations "Criticality" and "Trade-off" effects	Train nationals
Technical Assistance — Marketing	Dependence on foreign technicians vs local training	Input variations "Criticality" and "Trade-off" effects	Offset exports Internal linkages
Ancillary Infrastructure	Sensitivity of project to logistical planning	Input variations "Criticality" and "Trade-off" effects	Budgetary burden
Financial Participation	Accessibility of project to low-cost foreign financing	Willingness of foreign lender/investor to tolerate performance risks	Resource-poor country dependence upon foreign exchange earnings

Chart 7. TRADE-OFFS AND CRITICALITIES (COSTS/RISKS)

	CATEGORY OF PROJECT		
	LARGE AND COMPLEX	DIRECT REDUCTION	MINI-STEEL
RAW MATERIALS AND ENERGY	. Delivered cost and quality of iron ore and reductant (energy source) critical to commercial viability of project.	. Quality (percentage iron impurities) critical. . Opportunity to use gas where coal/coke are scarce.	. Cost/efficiency/risk trade-offs in use of lower grades of iron ore and coal/coke as energy source.
CAPITAL EQUIPMENT	. Opportunities to procure required capital goods locally a function of stage of indigenous industrial development and sophistication of acquired technology.	. Tolerance of locally procured equipment varies with process.	. Wider opportunities for use of locally sourced equipment and components.
TECHNICAL ASSISTANCE (PRODUCTION MARKETING)	• Substantial trade-off between cost efficiencies/risk and need to phase-in indigenous personnel. • Marketing of specialized steels may be critical to high performance levels.	• Moderate trade-offs between cost/efficiency/risk and phase-in of indigenous personnel. (Possibility South/South assistance.) • Effective training generally linked to experienced steel-maker in particular process.	• Technical assistance critical in design construction/phase-in. . Technical assistance from experienced NICs feasible. • Possibility to master technology step by step.
ANCILLARY INFRASTRUCTURE	• Infrastructure critical--including transport and social services for labor force. • Financial institution concerned about time delays, cost overruns, and revenue losses due to low operational efficiency.	• For certain types of opportunities reliable source electrical power critical. • Criticality a function of scale and complexity of project.	• Reduced scale and complexity reduces infrastructure burden, but in cases of country's first steel mill, minimal infrastructure critical.
FINANCIAL PARTICIPATION	. Critical problem of foreign financing over extensive period. • Minimal equity position of foreign technology supplier important to assure adequate performance.	• Foreign equity likely to be linked to production/marketing performance. • Inclusion of product buy-backs may help ensure high quality and operational efficiency. • Financial requirements less stringent than large and complex projects.	• In cases of unproven technology, financing may be difficult to obtain. • Absence of foreign stake in project increases performance risks. • Financial requirements generally lower than direct-reduction projects.

A. Large-scale and complex projects

The trade-offs between operational efficiencies (and costs) and national objectives to train nationals, and to develop domestic equipment industries, are especially critical. The logistical problem of ancillary infrastructure and the related financial burden are also critical elements of operational and cost efficiencies. The advice and assistance of experienced and responsible supplier and financial groups are especially important in these larger and more complex projects. An analysis of the trade-offs and criticalities of negotiable variables follows:

1. Raw materials and energy

The delivered cost and quality of iron ore and energy sources (reductant) are critical to the commercial viability of projects in this category. Shifts in domestic and world market conditions affecting price of inputs (raw materials and energy) and the price and level of demand for plant products have an important bearing upon financial performance.

2. Capital equipment

Opportunities to procure required capital goods locally -- which do not at the same time impinge intolerably upon the cost/efficiency/risk factors of the project -- depend upon the stage of indigenous industrial development, on the one hand, and upon the technical tolerances of the steel-making process on the other. Involved considerations include both the possible increased costs of local procurement, as well as operational efficiencies and the sharing of responsibilities over performance guarantees. It is for this reason that financier and steel operators may require warranties on equipment or performance guaranties or changes in design-engineering characteristics, in order to assure anticipated performance results. Such guaranties may then increase capital costs to the purchaser.

3. Technical assistance

There may be substantial trade-offs between cost/efficiency/risk and the desire on the part of purchaser countries to phase-in indigenous personnel. The latter objective may run counter to financial source's concern with the commercial viability of the project and its ability to earn a rate of return that will service the incurred debt. For projects serving specialized customers in domestic markets or aimed at export markets, technical assistance in the marketing of specialized steels may be critical to the commercial viability of a project.

4. Ancillary infrastructure

Ancillary infrastructure critical to cost-effective construction and eventual operations. Infrastructure may include a) transport facilities to move in raw materials and energy and distribute plant products (railroad lines, port facilities, and pipelines); b) housing and other facilities for plant personnel (may be particularly important in "green-field" sites and for key foreign and indigenous personnel). From the supplier's viewpoint, efficient construction and run-in operations may depend heavily upon infrastructure being in place, when needed. Both purchaser and supplier have a shared responsibility and concern over capital costs to the project (principal and interest), which in turn may be augmented by cost overruns due to delays in construction or in supporting infrastructure, or the failure of the technical partner (supplier) and/or the local enterprise group (purchaser) to perform adequately or live up to contract obligations or agreed upon commitments (e.g., to construct required transport facilities). The financiersof a project are especially concerned to pinpoint technical responsibility for such elements as cost overruns and plant performance.

5. Financial participation

From the purchaser's standpoint, the central problem is one of debt-servicing over an extended period of time (12 years or more), both in local currencies and in foreign exchange -- the latter sensitive to fluctuations in world prices and exchange rates. These in turn can adversely affect the rate of return on a project and its ability to service external debt. The supplier of capital equipment and services has a short-term interest in payment, which may be contingent upon performance in the construction and run-in stages. Foreign equity participants have an interest in the long-term viability of a project. Financiers of a project are concerned with a) the commercial viability of the project over the debt repayment period and b) the borrowing economy's continuing ability to service external debt.

B. Direct reduction projects

In the direct-reduction field, technologies with broad-spectrum tolerances to variations in mineral, energy and equipment inputs are particularly attractive in terms of the lower risk factor and the accommodation of developmental objectives to utilize domestic materials and to source equipment or components from local sources. (In the mini-steel field there is the added problem of scaling down equipment to low-volume output requirements.) Technologies (and suppliers) that permit (with low risk and uncertainty) an efficient and rapid takeover by local personnel (and minimize foreign exchange costs for foreign technicians) in both the production and marketing of iron and steel products are advantageous in terms of national development of indigenous manpower, forward and backward linkages to domestic industries and the added exchange earnings from the agressive development of export markets. The external marketing function (for example, in specialized steels) may be critical

in particular projects. The trade-offs and criticalities for particular negotiable variables are as follows:

1. Raw materials and energy

In order to produce the highly metallized (90% plus), low (40% or less) gangue (stone and earth residue) content DRI used in electric furnace steelmaking, a high-grade iron ore of between 60% and 70% iron content is required. (Each DR process was initially developed to use a specific type of ore, prepared in a certain way.)

While many of the processes are adaptable to different iron-bearing inputs, the cost of preparing local ores (via beneficiation and pelletization) to the required degree needs to be taken into account. Furthermore, the cost in terms of reduced productivity must be considered where the DR process is modified to use less than optimum local inputs.

The lack of high grade iron ore is often not a critical factor if the purchaser group has other important resources to compensate, such as energy, capital, skilled labor and strong markets. The highly

developed worldwide trade and distribution system has contributed to a relatively low and stable price for iron ore. While this situation is subject to change (especially as transport costs rise), many NIC's are in a position to establish iron and steel industries based on imported ore. The Iron and Steel Company of Trinidad and Tobago (ISCOTT) is an example of this type of development.

While raw materials are an important factor, the nature of the locally available fuel has the greatest influence on the choice and economics of a particular direct-reduction process. From the viewpoint of energy, DR processes can be divided into those which use a gaseous reductant and those which use a solid reductant.

DR processes using natural gas, such as HyL, Midrex and Purofer are currently the most advanced and are backed by substantial commercial experience. These processes are still undergoing development and improvement in terms of efficiencies in energy consumption, module capacity and product quality. A purchaser must evaluate the competitiveness of particular DR processes (gas and solid reductant) based upon estimated operating costs at the projected site, as reflected in contract bids and performance guarantees.

A purchaser negotiating for gas-based (as distinct from solid-fueled) DR processes may benefit from the reduced uncertainty and greater efficiency they embody. Solid reductant processes, on the other hand, have not achieved comparable levels of technical development and commercial acceptance. They are <u>potentially</u> more attractive than gas-based DR processess since deposits of non-coking coals and lignite are more widespread than natural gas fields. In the long term, a sharp competition should develop between suppliers of solid-reductant DR

plants and those of gaseous DR plants, who will try to base their processes on coal gasification as natural gas supplies diminish. This will work to the advantage of the NIC's with low grade coal deposits.

2. Capital Goods Procurement

Competitive DR processes must be evaluated in terms of the percentage of capital goods that can be procured locally, compared to that which must be imported. With capital costs for a 1 million ton per year integrated DR/EF steel plant in the area of $500 million, most NIC governments want to use local procurement as much as possible. Some DR processes (and suppliers) will tolerate the use of locally produced capital goods more than others.

3. Technical Assistance

High performance levels and related cost effectiveness depend critically upon the technical support component. Reference has been made elsewhere to the insistence of foreign lenders upon the extensive involvement of foreign technical assistance as a loan condition (in order to assure project viability and loan payback as scheduled). In the DR process, where technical proficiencies are critical to cost effectiveness, the opportunities to substitute local personnel for foreign technicians will depend, on the one hand, upon the level of development of human resources in a particular country and, on the other hand, the degree of sophistication of the particular process. Inevitably there will be trade-offs between the benefits of training and using nationals and the added cost and time delays of replacing (in some cases) more proficient foreign technicians.

In Mexico, the Hylsa Division of the Alpha Group is an outstanding example of success in training and developing indigenous cadres

not only to successfully operate DR facilities, but to design and engineer follow-on generations of the DR process which have been increasingly energy efficient. But even Hylsa has found it necessary to associate with foreign licensors of established reputation (Dravo, Pullman-Swindell, Kawasaki) to achieve international acceptance.

In the case of the SICARTSA project in Mexico, efforts to replace foreign personnel with Mexican technicians resulted in considerable delays and construction cost overruns.

The value and extent of replacement (and the consequent trade-offs) also depends upon the particular capabilities of a chosen technology supplier. An independent process engineering firm may be expert at choosing between competitive DR processes, but unable or unwilling to provide assistance in operator training and maintenance. Once a particular process is chosen, however, a foreign steel producer may provide the most effective assistance in implementation and operations. The creation (by purchaser groups) of adequate provisions to accept and absorb technical assistance must also be stressed. Experienced and qualified operators can bring a new DR unit up to rated production levels in a matter of days. On the other hand, years may elapse before output exceeds 75% of rated capacity, due to problems in operating a well constructed plant.

4. Product Marketing

A DR/EF steel plant produces an intermediate product, DRI, as well as long and flat steel products. A foreign supplier, especially a large steel producer, may be willing and able to offer marketing assistance to a newly established NIC steelmaker. Such assistance is more likely if the foreign supplier is an equity partner in the project.

In the current depressed world steel market, foreign equity participation is waning, and a large DR/EF steel plant is unlikely to be built unless an adequate market for its products exists. Yet such a plant can be envisioned in certain nations whose domestic steel market is small, but whose surplus natural gas resources encourage construction of a larger direct reduction plant than would be needed to supply the domestic market alone.

The ISCOTT project (in Trinidad and Tobago) was originally structured as a joint venture with the participation of Japanese and Dutch steelmakers to produce 1.2 million tons per year of steel in a DR/EF plant. The foreign partners withdrew because of the downturn in the world steel market and the project was scaled down subsequently. Still, only three-fourths of the DRI output can be used in ISCOTT's own melt shop, and the rest must be exported. The help of foreign partners in marketing this surplus product is invaluable in such a case.

5. Ancillary Infrastructure

Infrastructure development can be crucial to the success of any steel project, as noted in the case of SICARTSA appended herein. DR/EF steel plants are no different from other plants of similar size in this regard, except perhaps their increased dependence on a reliable supply of electric power for EF steelmaking. The infrastructural dimensions of the project place an added burden on overall project logistics and the need for competent personnel to manage the project effectively.

6. Financing

A greenfield DR/EF steelworks with annual production of 1 million tons will require an investment on the order of $500 million. As noted,

during the currently depressed world steel market, (significant minority) equity participation by a foreign supplier of technology is unlikely. In the past, controlling equity positions by foreign groups have been resisted, even though they sometimes brought with them the advantages of greater and more effective technical assistance.

Foreign steel producers are more likely than other types of suppliers (i.e.,equipment suppliers and process engineering firms) to accept equity participation in NIC direct-reduction plants. The developers and licensors of competitive DR processes may see equity participation in NIC steelworks as a method of insuring commercial success of their process. Given the strong competition among rival processes, the purchaser is in a position to benefit by negotiating favorable terms from foreign shareholders.

Foreign technology suppliers can also indirectly finance NIC steelplants through agreements to purchase a portion of the plants' output. Such "buyback" arrangements are possible where a plant is designed to produce for export (e.g., ISCOTT), or with temporary overcapacity in anticipation of an expanding local market. For such cases, the foreign supplier has an interest in making sure that the product (DRI or finished steel) it buys back is of high quality, and the technical assistance provided (especially in the areas of operations and maintenance) may be particularly good. On the other hand, a supplier group participating in a buyback agreement could concentrate on those aspects of the project that are in its own self interest to the detriment of the purchaser group's other marketing and production needs and objectives.

C. Mini-steel projects

One of the attractions of mini-steel plants is that they do not require anywhere near the level of logistical planning, for ancillary infrastructure that larger scale projects (one million tons and over) demand. This reduces considerably the budgetary burden, the risk and uncertainty of time delays and cost overruns during project phase-in. The extent to which foreign financial participants (lenders and investors) are willing to tolerate performance risks implicit in a particular technology package can assist resource-poor countries in minimizing the foreign exchange burden of external financing. The trade-offs and criticalities for particular negotiable variables are as follows.

1. Raw Materials and Energy

A purchaser that has high grade ore resources will be able to consider DR/EF steelmaking, while one with low grade ore will be more interested in one of the blast furnace routes. This initial choice brings up the closely related factor of energy.

Both EF and oxygen steelmaking require electrical energy (for arc furnaces and oxygen production, respectively). But energy really becomes a critical factor in ironmaking. Blast furnaces must have coke or charcoal, while DR processes use gaseous or solid reductants.

As in the DR process, there are cost and efficiency trade offs related to the physical properties and quality of iron ore and energy sources utilized.

A purchaser that has resources of coking coal benefits because suppliers and financiers are familiar with it and its role in ironmaking. Coke can also be formed from different coals, but this process is still uncertain and less efficient. Charcoal has also been used in blast furnace ironmaking. This process is developing in areas with tropical forest resources (Malaysia, Brazil), specifically for small scale steel plant applications.

2. Capital Goods Procurement

Opportunities for local procurement of capital goods for mini-steel plants are more extensive than for large steel works, which are more sophisticated and require more advanced machinery built to stringent technical standards. Much depends upon the extent of development and the degree of sophistication of the local capital goods industry.

3. Technical Assistance

Mini-steel plants will require relatively less technical assistance than large plants, because of their reduced size and complexity. The quality and effectiveness of technology transfer, especailly in the design, construction and run-in phases is crucial, however, since mini-plants may be built and operated under tighter economic and financial constraints than larger plants. Intensive international price competition in the type of simple products a mini-plant produces means it must be well engineered and operate efficiently to compete with imports. These objectives may be realized by negotiating beforehand for effective technical assistance and training of nationals.

As noted, successful experience in small scale steelmaking will be at a premium. Relatively advanced developing countries (e.g. Brazil and India) with recent experience in this area may well be more appropriate suppliers of ideas and equipment in this regard than the traditional industrialized country sources, and NIC purchasers may be in a position to participate more in R & D on small scale steelmaking.

4. Product Marketing

As indicated earlier, mini-steel plant products are destined largely for the local market. When such a plant is the first of its kind in that market, product marketing assistance from a foreign advisor

may be (at least for some initial period) indispensable to the financial health of the project.

5. Ancillary Infrastructure

Compared to a large steel project, infrastructure requirements for a mini-steel plant will be reduced in size but perhaps more critical to the project's success. This particularly may be the case where the mini-plant is the country's first and supporting infrastructure is absent at the project's start.

6. Financing

The reduced investment cost required for mini-steel plants does not imply an easy time in arranging financing. International credits may be hard to attract since mini-steel plants often represent unproven technology (or proven technology scalled down to inefficient levels), small markets, and stringent conditions for viability. Foreign equity participation is unlikely for the same reasons. A purchaser group may have to take unusual steps to minimize these risks if foreign capital and credits are desired. Import restrictions and tariffs are the usual (but uneconomic) expedients resorted to, in order to assure the commercial viability of a project. The smaller capital investment required for a mini-plant may permit local enterprise groups to "go it alone" as far as equity participation is concerned. This course brings the problem of assuring adequate commitment to the project by foreign suppliers who have no "stake" in it. It also heightens the foreign debt requirement to cover foreign exchange costs.

V. MAIN QUESTIONS

Consultations may proceed along two paths. One is to seek to optimize opportunities within the existing rules of the game. The other is to consider certain marginal changes in the rules and practices that would be mutually acceptable to concerned parties (purchasers, suppliers, and financers). Within the latter area, it will probably prove most productive to appeal to the commercial self-interests of involved (foreign enterprises) and to the economic interests of supplier countries and their financial sources.

Two major areas are explored in what follows. One is on the availability of funds to finance iron and steel projects. The other relates to extending the range of training to developing country client enterprises.

1. Availability of funds

The realities of the current situation and the outlook for the foreseeable future over the next year or two are (a) continuing curtailment of availabilities of funds on preferential terms; (b) little if any lowering of the commercial interest rates; and (c) continuing policy to avoid over-capacity in the steel industry of developed countries; and (d) a reluctance on the part of donor countries to justify investments in iron and steel on economic grounds (other than the sale of technology and equipment).

The realities of World Bank lending policies are (a) to inhibit lending beyond a country's debt-servicing limits (reinforced by IMF constraints), and (b) to limit capital expansion in industries the IBRD considers uneconomic [1]. These policies apply to most other sources of preferential lending, such as the U.S. Export-Import Bank.

1/ In the case of iron and steel industries, Bank economists not only look at the economics of the project itself, but beyond that to resulting uneconomic secondary industries (fabrication of industrial steel products) and tertiary industries, utilizing fabricated steel (refrigerators, automobiles, etc.)

Questions for further consideration:

(1) Are the foregoing observations in fact valid or subject to qualification?

(2) To what extent would donor governments consider extending loan payment guaranties to their commercial banks for lending at commercial rates?

(3) To what extent would developmental capital be made available from OPEC country sources for capital expansion projects under borrower government guaranties? 2/

2. Extending range of training

The current world market situation of over-capacity in the iron and steel industry reinforces the need for upgrading the quality of steel production and improving cost efficiency in order to withstand the forces of intensified world competition in this field - hence the need for an increased plan of training and technical assistance to newly industrializing countries to (a) train or retrain operational and managerial cadres in the steel-making facilities, and (b) upgrade the technical efficiency of existing or newly expanded facilities.

For the more advanced developing countries, many enterprise groups are ready to move beyond operational capabilities into design-engineering and international marketing capabilities aimed at improving international competitiveness and the technological and commercial (marketing) dynamics of ongoing enterprises.

For the "technical assistance market", the supply outlook appears to be

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2/ A year ago, funds were being offered (in minimum amounts of US$ 250 million from private sources in Kuwait and Saudi Arabia at interest rates well below the London rate (10 per cent for ten year periods), provided adequate government guarantees for repayment were given.

better in Japan and Western Europe than in the United States. In the United States, cutbacks in the domestic steel industry have led to the release of large numbers of technical personnel, who might otherwise be available for overseas assignments - if the U.S. firms were more actively interested in this type of business. The dearth of export credits for this purpose from U.S. services strongly inhibits U.S.-based firms' activities in this field.

The situation is different in Western Europe, where there has not been a massive release of technical personnel because of social legislation which inhibits (or, at least, considerably slows down) such action. The situation in Japan and Eastern Europe needs to be examined in this regard.

Questions for further consideration

(1) To what extent would firms in developed countries market economies with appropriate public or private loan payment guarantees or insurance?

(2) To what extent would consortia of U.S. and European or U.S. and Japanese firms be able to provide the training and technical support services (and associated export financing) needed by NIC/LDC enterprises? 3/

(3) To what extent would financial institutions in centrally planned economies be prepared to give preferred treatment to the training component of steel projects in developing countries?

(4) To what extent are smaller donor countries (such as Austria and Finland) or other more advanced NICs (such as Brazil, Mexico, Korea, and India) in a position to offer the training (and international marketing) perhaps that enterprises in industrialized countries may be reluctant to provide?

3/ There are already in existence some U.S.-German and U.S.-Japanese consortia. They use non-U.S. export financing for developing country steel projects.