Economic and Legal Aspects of Utility Consortiums for Heliostat Purchase

July 1982

Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830

Pacific Northwest Laboratory
Operated for the U.S. Department of Energy
by Battelle Memorial Institute

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PACIFIC NORTHWEST LABORATORY
operated by
BATTELLE
for the
UNITED STATES DEPARTMENT OF ENERGY
under Contract DE-AC06-76RLO 1830

Printed in the United States of America
Available from
National Technical Information Service
United States Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22151

NTIS Price Codes
Microfiche A01

Printed Copy

Pages	Price Codes
001-025	A02
026-050	A03
051-075	A04
076-100	A05
101-125	A06
126-150	A07
151-175	A08
176-200	A09
201-225	A010
226-250	A011
251-275	A012
276-300	A013

ECONOMIC AND LEGAL ASPECTS OF
UTILITY CONSORTIUMS FOR
HELIOSTAT PURCHASE

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TABLE OF CONTENTS

I. INTRODUCTION	1
PROBLEM	1
Power Tower Concept	1
Cost of Heliostats	1
PROPOSED SOLUTION	2
SCOPE OF REPORT	2
CONCLUSIONS	3
Real Problem/Wrong Solution	3
Barriers	4
Alternative Solutions	5
FUTURE ANALYSIS	6
NOTES - CHAPTER I	8
II. BACKGROUND	9
A MODEL OF THE INNOVATION PROCESS	9
Government as an Example of a Monopsonistic Buyer	11
TYPES OF UTILITY-SPONSORED CONSORTIA	13
Variation in Relationships Between the Consortium and its Members	13
Variations in the Arrangement Between the Consortium and the Manufacturers	14
EXPERIENCES WITH UTILITY COOPERATION	15
Associations	16
Power Pools and Reliability Councils	18
Joint Ventures	19
Other	20

ECONOMIES OF SCALE AND MARKET SIZE	20
Sources of Economies of Scale	22
Learning Curves	24
Market Size and Economies of Scale	24
ECONOMIES OF SCALE IN HELIOSTAT MANUFACTURING	29
POTENTIAL FOR HELIOSTAT COST REDUCTION THROUGH LEARNING CURVE PHENOMENA	29
NOTES - CHAPTER II	31
III. THE BUYER POINT OF VIEW	33
MAJOR ADVANTAGES	33
Lower Price	33
Greater Financial Resources	34
Lower Procurement Costs	35
Product Reliability	35
Market Development	35
DISADVANTAGES	36
Reduction in Design Flexibility	36
Vulnerability to Manufacturer Problems	36
Problems with the Consortium Itself	36
ACTUAL ADVANTAGES AND DISADVANTAGES OF UTILITY COOPERATIVE ORGANIZATIONS	37
Utility Interviews	38
How Realistic are Studies of Economies of Scale?	40
What are the Advantages and Disadvantages of Consortia Alternatives?	40
Who Might Organize a Utility Consortium?	42

What's Next for Solar Thermal Central Receivers	42
PROBLEMS OF CREATING CONSORTIUM-LIKE ARRANGEMENTS . . .	43
SUMMARY	44
NOTES - CHAPTER III	45
IV. THE SELLER POINT OF VIEW	47
ADVANTAGES	47
DISADVANTAGES	49
SOME VENDORS' EXPERIENCES IN DEALING WITH A CONSORTIUM	51
All-or-Nothing Bidding	51
Winning is Not Enough	51
Can't Afford to Give Service	52
Multiple Selling May be Required	52
Specifications Can be Rigged	52
Specifications Can be Poorly Drawn	52
Slow Players are Not Penalized	52
Some Districts are "Cherry Pickers"	53
Inflation Hurts	53
SUMMARY OF SELLER ADVANTAGES AND DISADVANTAGES . . .	53
NOTES - CHAPTER IV	54
V. THE ANTITRUST POINT OF VIEW	55
ISSUES	55
GENERAL APPLICABILITY TO REGULATED INDUSTRIES AND GROUNDS FOR EXEMPTION	57
"PER SE" VIOLATIONS UNDER SECTION I OF THE SHERMAN ACT	59

SECTION 2 OF SHERMAN ACT	61
SECTION 3 OF CLAYTON ACT	62
FORMAL BUSINESS REVIEW	65
CONCLUSIONS	65
NOTES - CHAPTER V	66
VI. BIBLIOGRAPHY	69
UTILITY ANTITRUST CASES	69
Other Utility Antitrust Cases	70
LAW REVIEW ARTICLES	73
OTHER REFERENCES	75

I. INTRODUCTION

PROBLEM

Power Tower Concept

One of the most frequently proposed methods for using solar energy to generate electricity is called the power tower concept or, more precisely, the Point Focus Central Receiver System. In this concept, a field of movable mirrors, called heliostats, are used to reflect the sunlight that falls on that field and focus it on a central receiver atop a tower. The central receiver provides heat through a heat exchanger to a boiler that generates steam to run a steam turbine generator set. There is relatively little question of the technical feasibility of such a concept, but a great deal of question concerning its economic feasibility.

Cost of Heliostats

The cost of the heliostats first generation units is estimated to be about \$170/m², assuming a production rate of 25,000 to 50,000 units per year. Second generation designs which have recently been prepared under Department of Energy contracts are estimated to cost \$100 to \$140/m² to produce at the same assumed production rate.⁽¹⁾ The goal of the Department of Energy is to reduce the cost to \$85 per m² (1980 dollars) by the mid-1980s. Currently it appears that it will be the mid-1990s before this is achieved.⁽²⁾

Many analysts of this concept feel the key to economic feasibility is reducing the costs of the individual heliostat. Since a single system could employ as many as several thousand heliostats, they constitute a large portion of the capital costs of such a facility. The analysts predict that cost reductions probably will come not through breakthroughs in materials or manufacturing techniques, but through economies of scale in manufacturing and installation. The problem is to get the output of one or more companies large enough so that these predicted scale economies can be achieved.

PROPOSED SOLUTION

One proposal for helping one or more companies to reach this size is to arrange for very large orders from a single buyer. In the case of photovoltaic technology, the U.S. Department of Defense is often proposed as a single large buyer. In the case of heliostats, a consortium of utilities has been proposed.

SCOPE OF REPORT

This report begins to explore the legal and economic considerations surrounding the formation and operation of some form of utility-sponsored collective buying arrangement for heliostats. We use the term preliminary exploration explicitly because only a few of the many issues identified are discussed in detail in this report. In particular, this report focuses on considerations of federal antitrust law surrounding collective buying and other joint operations by electric utilities. It also focuses on the considerations suggested by the economic theory of monopsony (markets with a single buyer) and oligopsony (markets with a small number of buyers).

The report briefly identifies a number of other issues, but consciously reserves discussion of them for other reports dealing with this subject. Issues identified but not completely discussed include the following:

- o Issues of federal law other than antitrust, such as the Public Utilities Holding Company Act and the law surrounding the Federal Energy Regulatory Commission,
- o Issues of state law such as state antitrust considerations and state utility regulation,
- o Issues surrounding the process of implementing a collective buying arrangement,
- o Issues surrounding the actual operation of a collective buying arrangement,

- o Issues surrounding the sources, nature, and extent of economies of scale in heliostat production,
- o Issues surrounding the process by which a company takes advantage of economies of scale.

In other words, our focus is on the expected legal and economic impacts of an electric utility sponsored collective buying arrangement once it is operating. Issues of why and how it comes into being and operates are identified but to be discussed in reports other than this one.

We have a related focus to the data we use. We have made extensive use of the relevant legal materials and literature of economics. We have made some, but not extensive, use of interviews with officials from the utilities that might participate in a collective buying arrangement. We have also made a similar limited number of contacts with officials in the federal government charged with antitrust matters. In addition, we have contacted both the buyers and sellers in a few cases of collective buying arrangements outside the utility industry. For this report, these interviews are intended as "reality checks" and sources of inspiration for the largely literature-based analysis. Accordingly, they are used as input to the theoretical analysis, but not a source of analysis themselves. Studies of the attitudes of potential utility participants or of past cases of successful or unsuccessful collective buying arrangements are also outside the scope of this report.

CONCLUSIONS

Real Problem/Wrong Solution

While there is a recognized problem of creating the right conditions for heliostat manufacturers to invest in large-scale, cost-reducing production plants, the suggested solution of creating a utility consortium to pool together utilities' orders may cause as many problems as it solves. Due to problems with the consortium organization itself, it may be preferable to seek alternative solutions to the problem of encouraging manufacturer investments in heliostat plants. Some of the disadvantages of the consortium arrangements include the difficulties of creating a utility buying organization that does not conflict with antitrust or other

legal constraints, and the organizational difficulties of creating and operating a consortium at an acceptable level of organizational cost and "hassle." In addition, a consortium arrangement may tend to lock the manufacturer into the current generation of heliostats, and into current production technology, leaving little opportunity for technological improvement of either the heliostats themselves or the production plant. A more flexible organizational arrangement which provides more opportunities and incentives for technological innovation in the heliostat industry would be preferable to the consortium arrangement.

Barriers

Two sets of barriers are unique to a consortium arrangement. The first is the set of problems involved in setting up and running a multi-member organization. The second set stems from the applicability of the federal antitrust laws.

Examination of the organizational barriers is outside the scope of this report. Therefore such barriers can only be identified here. In this case, the difficulties are the kind that are inherent in any arrangement that would bring together large complex organizations with separate objectives, subject to separate regulatory systems, into a cooperative arrangement. Obviously, utilities can cooperate in a number of ways; they have done so numerous times in the past. Nonetheless, working to achieve that cooperation has never been easy, and the question is always whether the cooperation is worth the cost it takes to achieve it. In this case, cooperation may not be worth the cost.

The second set of barriers, those stemming from federal antitrust law, were within the scope of this report. Our preliminary examination of those laws suggests that consortium arrangements will be subject to antitrust scrutiny. They will not escape such scrutiny on the grounds that they are fulfilling a public purpose or that implicit or explicit approval of the state regulatory commissions makes their activities "state action." In addition, the fact that more than one utility is inevitably involved means that the scrutiny is of concerted action, rather than action by a single entity. Concerted action is subject to many more constraints than action by a single entity. In particular, it is subject

to a number "per se" rules--activities that are illegal in and of themselves even without a demonstration of significant market impact. One of those per se rules applies to a concerted refusal to deal. A long-term arrangement with one manufacturer may be seen as a concerted refusal to deal with others. In addition, even if the per se rules do not apply, activity is subject to a rule of reason that looks at the amount of the market involved. Our preliminary analysis suggests that in order for the consortium to be large enough to enable a manufacturer or manufacturers to achieve significant economies of scale, the consortium would have to involve a very significant percentage of the total market for heliostats. As such, it would be subject to special scrutiny under antitrust law by virtue of its size alone. Our analysis does not rule out the possibility that a carefully drawn plan of a particular form may be legal under federal antitrust law. If such an arrangement is then also legal under other federal law and other state laws, such an arrangement may be possible. Here again, the question becomes whether the arrangement that is legally possible will have enough benefit to justify the cost of creating it.

Alternative Solutions

Three alternatives exist to the consortium arrangement. The first is advance orders from one or more utility buyers of heliostats. This solution is common practice in many industrial sectors, and while it may not result in early introduction of large-scale production plants, there are no apparent market failures which would prevent utilization of this route to the development of the industry over time.

A second and related possibility is to encourage the speedy application of heliostats in the utility industry by securing a large advance order from a leading utility organization. By adopting heliostat technology, a progressive utility can help to demonstrate to the rest of the industry that heliostat technology is practical and economically feasible. In addition, the progressive first user of the technology may also act as a direct salesman of heliostats within the utility industry. Contractual incentives can be worked out so that the leading utility gets a reduced price on heliostats if it is instrumental in convincing other

utilities to adopt the technology. This kind of proactive buyer role has been successfully utilized in other areas such as municipal procurements of new technological products.

A third possibility for encouraging investment in a large-scale and cost-effective heliostat production plant is for a major utility buyer of heliostats to assist in the financing of the plant. Analogs to this kind of arrangement exist in utility financing of coal mines, and utility financing of transportation facilities used to haul coal or other fuels to the utility plants. By financing the heliostat plant, the utility makes more credible its long-term demand for heliostats, and it has a direct financial interest in the success of the plant, which may lead it to act as a sales agent for heliostats within the utility industry.

FUTURE ANALYSIS

This preliminary working paper has assessed the possibility of utility consortia for the procurement of heliostats in only a sketchy way. Within the time and resource constraints, we were able to examine only a few of the issues which need to be thoroughly examined in order to identify the best ways of achieving the long-run goal of heliostat production at a cost-effective level. Our preliminary analysis of the consortium idea suggests that this idea may not be the best solution to the problem. The next logical step is to conduct preliminary assessments of the other options identified above at about the same level of depth as this analysis. Following these preliminary analyses of other alternatives, one or more alternatives could be selected for further in-depth work as discussed below.

In-depth analysis of selected alternatives would consist of case studies of analogous arrangements in the utility or other industries. These case studies would provide detailed empirical data on the actual workings of the analogous arrangements, in order to fill out the gaps and to answer the questions suggested by the literature-based preliminary assessments.

As a final step in the analysis of various alternatives for encouraging the heliostat industry to invest in large-scale plants, any

arrangements which involve possible antitrust questions, as the heliostat consortium arrangement does, should result in the preparation of a draft proposal to be sent to the Department of Justice for a review. While such a Department of Justice review is not binding on third parties, it does at least informally bind the Department of Justice. Thus, if Justice approves the plan in principle, then utilities and heliostat manufacturers can proceed with assurance of no antitrust actions initiated by the federal government itself. It is still possible that third parties could raise antitrust issues, but a thorough Department of Justice review should reveal any potential problems in this area as well.

NOTES - CHAPTER I

1. Mavis, C. Sandia Livermore Laboratory, Personal Communication, October 2, 1981.
2. Bates F. J., and Hall. E. H. Assessment Document for Supplemental and Alternative Generation Technologies for REA-financed programs. Battelle Columbus Laboratories for Rural Electrification Administration, USDA Contract. No. 53-3158-0-48107. June 11, 1981. (In press.)

II. BACKGROUND

A MODEL OF THE INNOVATION PROCESS

Construction of the first large-scale heliostat production plant is an example of economic innovation. A useful model of the innovation process is provided by Mansfield.⁽¹⁾ Mansfield distinguishes five stages in the innovation process:

- (1) Applied Research,
- (2) Preparation of project requirements and basic specifications,
- (3) Prototype or pilot plant design, construction and testing,
- (4) Production planning, tooling, construction and installation of manufacturing facilities,
- (5) Manufacturing start-up.

The heliostat program has reached stage three as a consequence of the federally funded program and participation in that program by equipment manufacturers and utility companies. Small scale production facilities exist, and demonstration plants operated by utilities are under construction. The problem now faced by the industry is to achieve the economies of scale in production through construction of one or more mass production plants. This is essentially the problem of moving from Mansfield's stage three to stage four.

While Mansfield analyzes the timing of movements from one stage to another, and considers the patterns of costs involved in each stage using empirical information from the chemical, machinery and electronics industries, he does not analyze the determinants of a decision to move from stage three to stage four. Based on Mansfield's work on the determinants of process innovation, where innovation is taken to mean the complete stage one through stage five process viewed as a single decision, we can hypothesize that the innovation process as a whole is determined by the potential profitability of the innovation in question, and is deterred to an extent by the size of the investment to produce the innovative product. However, the exact determinants of the stage four decision are unclear, given that we know the general determinants of the entire process. Investment by a private firm in stages one through three imply

that some decision has been reached that there is a potential profit to be made in producing the product, and that the eventual investments needed to put up a complete manufacturing plant are within the realm of feasibility. These global considerations represent necessary but not sufficient conditions for moving from stage three to stage four. Confronted with a heliostat industry which is not moving rapidly from stage three to stage four, it becomes very important to ascertain the exact determinants of this movement within the innovation process.

The premise of this analysis is that it may be helpful to establish a consortium for buying heliostats in order to help convince manufacturers to invest in large scale production facilities. By pooling together the orders of several buyers, a larger market may be available for a single heliostat manufacturer. In addition, advance sales commitments may be possible which may help the potential manufacturer decide to build the manufacturing plant. However, the economic literature provides no guidance on the relative importance of advance orders, pooling of orders or other characteristics of consortia which might affect the stage four decision. The existing economic literature focuses on market structure variables such as monopoly and oligopoly, i.e., concentration on the producer side of the market, in relation to technological change. Variables such as R&D spending and rate of innovation by an industry have been related to the concentration of that industry.⁽²⁾ These findings do not shed any light on the value of concentrating the buyer side of the market in order to stimulate innovative activity on the producer side.

However, a survey of leading industrial organization textbooks and research monographs on industrial innovation has uncovered absolutely no discussion of the effects of monopsony or oligopsony on innovation among suppliers.⁽³⁾ Thus, the economic case for a buyer consortium to encourage realization of economies of scale on the seller side has not been examined in the literature to date.

It would appear that concentration on the buyer side of the market is a double-edged sword. It may be a useful tool for creating large orders which would encourage investments in mass production facilities for heliostats. On the other hand, concentration of market power on the buyer

side will in the aggregate tend to reduce the total quantity of heliostats demanded relative to a perfectly competitive situation on the buyer side.

Examples of monopsonistic or oligopsonistic markets do exist in the private sector of the U.S. economy. Suppliers to dominant corporations in certain industries may be good places to study the effects of oligopsony. For example, suppliers to major aircraft firms such as Boeing and McDonnell Douglas could constitute good cases. Other examples exist in the automobile and computer industries. One could conduct empirical studies of the relationships between concentration of a buyer market and technological change among providers of inputs to such concentrated markets. No one seems to have conducted such studies in the past.

A discussion of government procurement follows. The U.S. Government itself is perhaps the major monopsonistic element in the economy.

Government as an Example of a Monopsonistic Buyer

Analysis of government procurements, particularly defense department procurements, shed some light on the effects of having only one buyer for a product. An analysis by Fox points out a number of the unique characteristics of the government/defense industry relationship. Because the size of the defense budget for each fiscal year is determined by a variety of political and economic factors which affect the votes of the members of Congress, the budgets for individual programs are subject to some instability from year to year. Since there is no other buyer for many of the products purchased by the defense department, the defense industry must cope with this built-in instability. As a result, the government takes roles in this market which are unusual in ordinary commercial markets. The government often underwrites the investments made by defense firms. It sometimes provides industrial facilities, and often makes advance and/or progress payments on weapons systems which may not be delivered for several months or years. The government also assists defense contractors in acquiring strategic materials which may be stockpiled under government programs. Because the defense department needs the production and research capabilities of the major defense firms, it cannot afford to let these firms go out of existence even if they perform at less than optimal levels. Since the government is their only

customer, these firms are likewise dependent on the government for their very existence. Fox notes that these government/defense industry relationships constitute a bilateral monopoly situation, which he characterizes as a condition of mutual interdependence in which neither the industry nor the government agency can survive independently.⁽⁴⁾

Some aspects of the government/defense industry relationship would not be present in a utility heliostat consortia relationship with one or more heliostat manufacturers. Advanced systems development phases of the heliostat development process may be largely completed by the time a consortium places an order with one or more heliostat manufacturers. Consequently, some of the complexity and uncertainty inherent in many weapons development programs are avoidable in the case of heliostats. In addition, the consortium may not represent the entire heliostat market for potential manufacturers, since industrial customers may be possible, and some utilities may buy outside the consortium.

However, the consortium may need to constitute a very substantial proportion of the heliostat market in order to be effective in inducing one or more manufacturers to make major plant investments. The situation of mutual interdependence between the consortium and the heliostat manufacturer(s) that exists in the defense industry will also be characteristic of the consortium and the manufacturers it deals with. This interdependence of the utilities and their supplier may get the consortium into difficult situations with regulatory commissions, and it may make cost control somewhat difficult.

Scherer has examined the difficulties in making defense contracting more economically efficient through the use of alternative contractual arrangements.⁽⁵⁾ Various kinds of incentive contracts, which make the amount of fee or profit conditional on contractor performance, or which expose the contractor to risks of having to absorb cost overruns, have not worked to the satisfaction of all observers. Due to the complexities of the relationship between contractors and the defense department, and due to the premium placed on performance over cost by defense department contract officers, it is difficult to achieve better economic performance in the weapons acquisition process through building economic incentives

into the contractual arrangements. To the degree that the heliostat buyer's consortium represents virtually the only market for heliostats, these same kinds of performance incentives and economic efficiency considerations will plague the relationship between the consortium and the heliostat manufacturing industry.

TYPES OF UTILITY-SPONSORED CONSORTIA

Consortia can take any one of a number of different forms. In particular, they can be sponsored by those buying a product, those selling a product, or some third party. Often, they exist to serve cartel-like objectives such as territorial division and price fixing. The same or different consortia can also serve objectives such as standardization and obtaining economies of scale.

This report focuses on the analysis of buyer-sponsored consortia. In particular, it focuses on a consortium to buy heliostats that would be formed by utilities interested in purchasing them. This form is obviously not the only interesting one--but it is the one within our scope. For instance, a Japanese style consortium among producers that allowed specialization, not along territorial step lines, but along production lines, would be very a very interesting study. It would be a form of development that is the opposite of vertical integration.

A focus on utility-sponsored consortia still leaves a variety of types to be analyzed. In particular, we are going to investigate changes along three important dimensions: (1) the relationship of consortia members to the consortium; (2) the relationship of consortia members to heliostat sellers; and (3) the portion of the potential market controlled by the consortium.

Variation in Relationships Between the Consortium and its Members

We have identified nine different types of arrangements that might exist between members and the consortium.

1. Exclusive Purchasing. In this form, consortium members to agree to buy all heliostats they buy through the consortium. They, however, do not guarantee that they will buy any set number.

2. Percentage Agreement. In the arrangement, consortium members agree to buy at least x percent of any heliostats they buy through the consortium.

In this arrangement, consortium members agree to buy a fixed number of heliostats from the consortium, whether or not they buy others elsewhere. Penalties would apply if orders were insufficient.

4. Joint Operating Company. In this arrangement, the consortium members form a joint venture to build and operate central power tower power plants.

5. Joint Research, Development and Demonstration. In this case, the plant is not full scale but is run jointly as a research, development, and demonstration activity.

6. Consortium Certified Heliostats. In this arrangement, consortium members agree to buy only the kind or kinds of heliostats certified by the consortium.

7. Only Consortium Certified Firms. In this arrangement, consortium members agree to buy only from the firm or firms certified by the consortium. Here again, the agreement could be to buy a certain amount, a certain percentage, or all that they buy.

8. Right of First Refusal. In this arrangement, each member firm agrees to give the consortium's vendor the chance to meet or beat any heliostat offer it gets directly from a heliostat manufacturer.

9. Certification with No Purchase Guarantee. The member participates in the consortium and its specification setting and price negotiation. It is free to buy outside if the price is lower.

Variations in the Arrangement Between the Consortium and the Manufacturers

Many of these alternatives are analogous to the arrangements among consortium members.

1. Fixed Amount Arrangements. In this deal, the consortium agrees to buy x amount from a given heliostat firm. Penalties would apply to failure to take this amount.

2. Output Arrangement. In this deal, the consortium agrees to buy the entire output of the heliostat firm.

3. Requirements Contract. In this deal, the consortium agrees to buy a percentage of its heliostats from a given firm, ranging from 100% of those it buys on down.

4. Fixed Heliostat Type. In this deal, the consortium agrees to buy only the type of heliostat one manufacturer makes, although it will allow other firms to try to meet or beat the price of the chosen firm by offering an identical heliostat.

5. Certify Your Heliostat. In this arrangement, the consortium certifies one firm's heliostat. It may also certify other firms' heliostats.

6. Certify Your Firm. In this arrangement, the consortium certifies a particular heliostat firm for purchases by consortium members. It may also certify other firms.

7. First Right of Refusal. In this arrangement the consortium gives one firm or firms the right to meet or beat offers made to the consortium by any other firms.

8. Negotiate Prices and Specifications. The consortium negotiates a price for a given specification and publishes a catalog. The members are free to go outside this arrangement in their purchase even in dealing with the chosen supplier.

9. Consortium Financing of Plant. Consortium could finance construction of the heliostat production facility through a loan or equity position, or by constructing the facility and leasing it to a manufacturer.

EXPERIENCES WITH UTILITY COOPERATION

A variety of cooperative arrangements have been created in the utility industry for several different purposes. None of these previous arrangements embodies all of the significant features of the proposed heliostat consortium. However, each of these historical experiences sheds some light on the effects of one or another proposed feature of the

heliostat consortium, and provides a general body of experience on the problems of creating and maintaining cooperative arrangements in the utility industry. We discuss three different types of cooperative arrangement below: associations, power pools and reliability councils, and joint operations.

Associations

Edison Electric Institute

The Edison Electric Institute (EEI) is an association of investor-owned utilities organized in 1933 and incorporated in 1970. Association members produce electricity for about 75% of the U.S. population. The primary purpose of the organization is to provide a forum for investor-owned utilities to discuss common interests. EEI maintains a liaison between the industry and the federal government.

The organization also maintains a research capability, particularly directed toward analytical results rather than hardware research. EEI emphasizes statistical and analytical studies of energy supply and demand. EEI emphasizes statistical and analytical studies of energy supply and demand. EEI also produces several annual reports of data and statistics relating to the electric power industry. Yearly reports include data on generating capacity, energy sales, number of customers, revenues, and operating and financial data.

EEI's present range of activities and objectives would seem to preclude taking an active role in serving as a heliostat consortium. Because of its present emphasis on its role as an industry forum, the organization would seem better suited as a catalyst and information source for a separate utility consortium. EEI has utilized several mechanisms for bringing issues to its members attention. Alternatives for promoting the consortium could include articles in its quarterly publication, Perspectives, through mailings, or informational seminars.

Electric Power Research Institute

The Electric Power Research Institute (EPRI) was created in 1972, by the public, private and cooperative utilities in the U.S. EPRI's purpose is to conduct a broad program of research and development for technologies

in electric power production, and transmission, distribution, and utilization. Economically and environmentally acceptable technologies are developed in coordination with research activities of utility, federal and state government, and other research organizations. One specific goal of the institute is develop technologies that will permit essentially unlimited resources for power generation, in other words solar and other renewable energy technologies.⁽⁶⁾

Use of EPRI as a collective buying agent seems to be beyond the scope of EPRI as presently conceived. While the general goal statements do not appear to restrict EPRI to purely research activities, it is definitely beyond the current scope of activities of EPRI to engage in collective buying arrangements to provide lower cost inputs for use by the utilities. The federal tax laws might constrain use of EPRI resources in this way, since it is organized as a not for profit entity. Policy or other legal constraints to use of EPRI as a collective buying consortia for heliostat procurement will be investigated through interviews with EPRI officials at a later date.

Current experience with maintaining the EPRI organization suggests one problem of creating an organization with investor-owned, public utility commission regulated utility members. Public utility commissions are currently questioning the individual utility contributions to EPRI, demanding justification of the expense by a showing of benefits to the utility of the EPRI funds. EPRI now devotes a larger proportion of its resources to demonstrating the benefits of its research programs, rather than using those resources to create more benefits directly through the research and development processes. Because of the regulatory oversight of investor-owned utilities, any consortium arrangement must be able to demonstrate clear benefits in order for the utility members to recover their costs of participation in the consortium.

American Public Power Association

The American Public Power Association is a trade association representing the 2,200 publicly-owned electric systems in the United State. The association carries out research and demonstration projects such as testing new power and transmission technologies, energy

conservation projects including audit program development, rate structure seminars, training for the personnel of publicly owned utilities, and communication services including publications and use of other media. In addition, the association conducts lobbying activities on behalf of the publicly owned utilities and provides information and counselling to organizations attempting to establish public power systems. The association does not function as a collective buying consortium for the publicly owned utilities in the country at this time.

National Rural Electric Cooperative Association

The National Rural Electric Cooperative Association is a trade association formed by the nation's cooperative utilities. More than 950 cooperative utilities belong to the organization, which is supported by annual membership dues and service fees. The Association carries out governmental relations activities, develops positions on energy and environmental policy issues, provides management services to its member cooperatives and handles retirement, safety and insurance matters for its members. The Association publishes several magazines and conducts an annual meeting for its members. The Association does not function as a buying cooperative for its members except that it does operate insurance and other cooperative employee benefits programs.

Power Pools and Reliability Councils

In order to increase the reliability of electric power systems, it is necessary to have some extra capacity which is available in case one or more of the system's generating plants go down in an unexpected manner due to plant failures. The costs of maintaining an acceptable level of reliability, where acceptable is set at very high levels, can be reduced if neighboring utilities jointly plan for the provision of reserve capacity. This possibility arises since one utility's unexpected outages are not likely to occur at the same time as its neighbors. By joining together in a power pool, a group of adjacent utilities can significantly reduce the costs of maintaining the reliability of their systems. Agreements to interconnect systems and to jointly plan for a provide reserve power have been developed through the nation's reliability councils. The reliability councils now cover virtually all of the

country, and many of the reliability councils have agreements with neighboring councils to provide additional levels of reliability. Much of the development of reliability councils was encouraged by the Federal Power Commission (now FERC) during the 1950s and 1960s.

Beyond the level of reliability councils, another kind of utility organization provides for joint planning and/or operation of utility systems so as to minimize generation costs. Because some utilities are too small to achieve all available economies of scale and generation, joining these systems together can achieve further economies of scale. The organizations for accomplishing these goals are called power pools. Power pools encompass much of the country, with very strong and cohesive organizations in the Northeast, and various looser types of associations in other parts of the country. Some power pools provide only for the joint planning of the expansion of utility systems, while others such as the Northeast Power Pool provide for joint operation of the combined systems of the member utilities. Organizational arrangements vary from pool to pool, as well as the kinds of activities which are jointly carried out. Little documentary material is presently available on the organizational arrangements of the various power pools, the advantages and disadvantages of these arrangements, and on the difficulties of creating and maintaining the power pool organizations. More intensive research could provide such information, but probably only through interviews with power pool or member utility officials.

Joint Ventures

A simpler kind of inter-utility agreement simply provides for a limited partnership to jointly construct or operate a power plant or other facility. Such joint agreements have been used to construct large nuclear power plants by neighboring utilities which could not afford to individually undertake such a project. In addition, transmission lines over which both utilities' power will be transmitted have been jointly constructed, and other joint venture projects such as conduct of R&D on nuclear technologies have been funded as joint ventures. Table 1 summarizes the information we have been able to compile about joint venture R&D projects, especially nuclear projects in the utility

industry. Again, little is known about the process by which these joint ventures were created, the precise contractual arrangements in the joint venture agreement, and the problems encountered in carrying out the joint venture's activities. Such data can only be obtained by interviewing key actors in each joint venture, an activity we have been unable to undertake to date.

Other

Table 2 provides information about non-utility, non-cooperative arrangements used to finance production facilities for new production facilities or products. These examples suggest that advance orders are key features of these non-cooperative mechanisms. Where only one customer is involved, buyer financing of the production plant may be an attractive idea since it gives the buyer a direct interest in the productivity of the production plant.

ECONOMIES OF SCALE AND MARKET SIZE

Standard theoretical treatments of economies of scale define this concept as the relationship between unit production costs and the quantity of output. If cost per unit of output declines as the quantity of production from a plant or an industry increases, the plant or industry is said to enjoy economies of scale. Most cost engineering studies have found that manufacturing costs fall as production rates and volumes increase. There are several reasons for this common occurrence. First, individuals on the production line reduce the total production time by continually performing the same task. This learning curve effect can be significant for high technology products. Second, large scale production increases the cost effectiveness of expensive, highly efficient manufacturing equipment. For example, at high production rates sophisticated dies, mechanical handling devices, and other high technology equipment and specialized tools can be cost effective in producing the product. Third, as production volume increases, many production inputs can be purchased at quantity discounts. Fourth, proportionately less material may be used to build larger equipment. For example, the volume

TABLE 1. Historical Examples of Utility and
Utility/Manufacturer Consortia*

Example	Utility/ Utility Relationship	Utility/Equipment Manufacturer Relationship
Nuclear Power Group (Dresden)	Joint funding	Project requirements purchased
Peach Bottom High Temperature Reactor Development Associates	Joint funding purchased	Project requirements
Carolina Virginia Nuclear Power Associates	Joint funding	Project requirements
Yankee Electric Co.	Jointly owned corporation	Project requirements
Atomic Power Development Associates (Enrico Fermi)	Joint funding	Joint funding of project project requirements purchased
Central Utilities Atomic Power Associates (Pathfinder)	Joint funding	Project requirements purchased
Gulf General Atomic Corp. (fusion research)	Joint funding	Vendor carried out research for utilities
EEI, APPA, EPRI	Joint funding	Utility, manufacturer or research group executes project
American Electric Power (high voltage, high speed circuit breakers)	N/A	Requirements contract offered; Swiss firm agreed to develop and produce product
Public Service Electric and Gas Co., N.J. (floating LWRs)	N/A	Utility offered to buy x reactors; vendor free to market additional units to other utilities
Washington Public Power Supply System (Nuclear Units)	Units built by new corporate entity established by legislature; each utility has different percentage share in each plant.	Requirements of each project purchased from various vendors

TABLE 2. Historical Examples of Non-Utility/Manufacturer New Technology Arrangements

Example	Buyer/Buyer Relationship	Buyer/Manufacturer Relationship
Large scale coal mines	Regulated utilities monopolies	Buyer financing of mine construction; buyer holds output contract for large percentage of output
Commercial aircraft: Boeing 757-767 design	Competitive, non-cooperative	Design developed by manufacturer after consultation with major customers; airplane goes into production after minimum number of firm orders received
Commercial aircraft: competitor to 757-767 designs	Competitive, non-cooperative	One airline procures European competitive aircraft; another approaches second U.S. manufacturer with an offer to buy competitive aircraft if the firm designs and builds it

of a spherical vessel increases as the cube of its radius but its wall area only by the square of the radius.

The sources of economies of scale are discussed in more detail below, including specific studies of scale effects in heliostat production. Following the economy of scale discussion, learning curve, market size issues are considered.

Sources of Economies of Scale

Economies of scale are found in the manufacture of many products for a number of reasons. These include:

Introduction of High Technology Manufacturing Equipment

Large-scale production increases the cost effectiveness of expensive, highly efficient manufacturing equipment. For example, for very low scale automobile production, it may be cost effective to make automobile bodies by hand. However, at very high production rates, highly sophisticated dies and presses are used. Per unit manufacturing costs are likely to fall in spite of the large initial outlays for such equipment. Other production factors that change with the volume and rate of production include the type of tooling, jig and fixture design, special handling equipment, and the time and effort devoted to matching the type and sophistication of equipment to the production volume.

Improved Production Planning

Improved production planning also becomes cost effective with larger production volume. Saving 10 minutes per unit is much more important at a production volume of 100,000 units a week than at 1,000 units a week. Similarly, the increased cost effectiveness of improvements in handling of materials, and training and incentives for the production force, result in lower unit costs for larger production volumes.

Increased Specialization of Functions

One of the benefits from mass production is the increased level of specialization achieved by the production workers. The assembly line achieves these gains by dividing the large task into a number of small, specialized subtasks. This allows the worker to become highly proficient at his job and reduces total manufacturing time. The increased specialization also includes nonmanufacturing tasks such as subcontract administration, legal and engineering support and managerial.

Purchasing of Inputs at Quantity Discounts

Achievement of large production volumes obviously increases the size of input orders. The firm can often take advantage of this situation through quantity discounts from its suppliers. The firm obtains the discounts either by taking advantage of the economies of scale now also available to the supplier through the large order or using its buyer power (monopsony) to obtain the inputs at below market prices.

The ability to accurately predict the relationship between production volume and production costs is crucial to new product development and pricing strategies. Many companies have developed successful marketing and production campaigns based on falling per unit production costs resulting from increased production volume. If the reduction in product price is accompanied by sufficiently large sales, the firm may find the reduction in production costs more than offsetting the lowered prices. The results are often larger profits, a higher market share, and significant advantages over competitors.

Learning Curves

Another means of reducing production costs is to rely on learning curve phenomena as the cumulative output of the industry increases over time. In many technologies, production costs decrease not because the scale of production increases, but because new and better means of producing the product are discovered. Individuals on the production line may become more proficient at their tasks, or they may suggest better procedures. In addition, different technological systems for meeting the same need are often developed as time goes on, representing a different kind of learning. Cost reductions achieved through learning phenomena can be quite powerful. Cost reductions of 60 to 90% have been found for other technologies. (See Table 3.) Learning curve and economy of scale phenomena may imply different policy strategies. The economy of scale argument calls for policies to encourage early construction of a large-scale plant, while the learning curve argument may call for a series of smaller plants to maximize the opportunities for learning to occur.

Market Size and Economies of Scale

Empirical studies, based on both engineering and accounting data, typically show a long-run average cost curve of the "L-shape" shown in Figure 1.^(7,8) There is a point, not precisely defined, denoted by q^* in Figure 1 where the economies of scale diminish. This can be considered the minimum economic size. Plants smaller than q^* have much higher production costs, and can be undercut in price competition by existing larger plants. Plants with output equal to q^* are not at as much

TABLE 3. Results of Pacific Northwest Laboratory's Survey
of Learning Curves

Author		Learning Factors
Ostwald, 1977	Gas Powered Generating Plants	85.0-88.8%
	Coal Powered Generating Plants	91.7-92.8%
	Nuclear Generating Plants	78.3-81.3%
Hirsh, 1956	Mean of Eight Types of Machines	80.70%
	Shipbuilding	78.0-84.0%
Baloff, 1966	Electrolytic Tinning Processes	61.0-88.6%
Abernathy, 1974	Model T <u>Prices</u> 1909-1923	85.0%
Henderson, 1978	Continuous Steel Casting Machine Startup	60.0-92.9%
Cheney	Military Avionic Systems	85.0-95.0%
	Consumer and Industrial Products	70.0-80.0%
Baloff, 1974	Electronic Musical Instruments	54.8-90.5%
	Wearing Apparel	75.3-79.4%
	Automotive Assembly	79.9-90.4%
Delionback, 1975	Aerospace	85.0%
	Shipbuilding	80.0-85.0%
	Complex New machine Tools	75.0-85.0%
	Repetitive Electronics Manufacturer	90.0-95.0%
	Repetitive Machining	90.0-95.0%
	Repetitive Welding	90.0%
	Construction	70.0-90.0%
	Raw Materials	93.0-69.0%
	Purchased Parts	85.0-88.0%
	Other Examples	
	Fabrication	85.0-95.0%
	Subassemblies	75.0-85.0%
	Final Assembly	75.0-80%
	Structures Subsystems	84.0-88.0%
	New State of the Art Products	75.0-80.0%
	Standard Electric Parts	95.0%
	Fabricated Standard Catalog Items	90.0%
	Labor, Learning Only	85.0%
Boston Consulting Group	Semiconductor <u>Prices</u>	70.0-80.0%
Solarex	Photovoltaics (estimated)	75.0%

Source: Pacific Northwest Laboratory, Export Potential for Photovoltaic
Systems. April 1979.

disadvantage relative to an existing larger plant and may survive on the basis of location, desire of purchasers for two suppliers, etc. Some studies suggest that there are U-shaped cost curves in a few industries, implying that firms or plants can be too large as well as too small to achieve the lowest feasible cost level. The upward turning part of the cost curve as volume increases may be due to limitations on managerial ability rather than technological factors. Whereas in the case of L-shaped cost curves, a variety of plant sizes are feasible in the long run, as long as they have output of at least q^* , a U-shaped cost curve implies that the minimum efficient scale plant is also the maximum efficient scale plant, q^* as shown in Figure 2.⁽⁹⁾

In the case of a new plant entering the market, the analysis is more complex. The rival plant would have to price its output at less than the variable cost of original plant, since the fixed costs of the original plant are sunk costs which are not avoidable. That is, as long as the original plant can cover its variable costs, it will continue to produce.

In the case of heliostats, the minimum efficient scale plant may represent the entire expected annual demand for heliostats from the utility industry. In fact, there may be some question whether there is enough demand in the utility industry to support a plant of minimum efficient scale. One plant, owned by a single firm, may therefore be sufficient to provide all of the industry output. Only if demand for heliostats rises substantially above the q^* level will more than one heliostat firm be able to survive in this industry. This conclusion holds whether the long-run cost curve is of the L or U-shaped variety.

Even if annual demand is expected to be at least at the q^* level, any one manufacturer may still be reluctant to invest in a large-scale production plant of minimum efficient scale. This could be the case if technological change is expected to change either the characteristics of the heliostats themselves, requiring modifications of the production process, or if technological change is likely in the production process itself. A manufacturer which built a large production plant that is only capable of producing current generation heliostats with current generation

FIGURE 1. Typical L-Shaped Long Run Cost Curve

FIGURE 1. U-Shaped Long Run Cost Curve

production technology could be undercut in price competition by a rival which built a plant at a later date using more advanced production processes or which is capable of producing more advanced heliostat designs. If the market is expected to grow very rapidly, a firm building a small plant for today's market could be put out of business in a few years by a new large plant if the total costs of the new plant were less than the variable costs of the small older plant. Thus, the annual expected demand for heliostats may have to substantially exceed the q^* of a minimal efficient scale plant in order to induce at least one manufacturer to make the investments required to build the minimum efficient scale plant.

The percentage of the potential market controlled by the consortium is absolutely crucial to the legal and economic consequences of such a consortium. Obviously, this fraction depends on a number of variables, almost all of which have to be estimated or assumed for the purpose of this analysis. The first is the size of the potential market. The second is the size of the market represented by the consortium. Of course, the size of the market represented by the consortium depends not only on the potential market for each utility involved, but also on the arrangements among utilities and between the consortium and heliostat firms.

A consortium of utility heliostat buyers may be able break this impasse in one of several ways. By promising to buy only from a certain manufacturer, or by promising to buy at least the number of heliostats of fixed characteristics which would support the investments in a large-scale production plant, a consortium of buyers could induce a manufacturer to build the minimum efficient scale plant earlier than otherwise. However, a consortium which only offers to buy a certain number of heliostats, without limiting the order to a specific design or to a specific manufacturer, may not be able to induce manufacturer investments unless the expected annual orders are very large in relation to the expected output of the minimum efficient scale plant.

ECONOMIES OF SCALE IN HELIOSTAT MANUFACTURING

The Solar Energy Research Institute (SERI) has commissioned several studies of the impacts of large scale production on the cost of producing heliostats. Table 4 below shows two sets of estimates of the potential cost reductions from large scale heliostat production. The first set of estimates is from a study for SERI by the General Motors Transportation Systems Center. The GM study estimated the sum of production costs necessary to place the product on the factory dock for two levels of production. The cost estimates did not include installation costs, a return on the manufacturing equipment necessary to produce the given production rate, and a number of general and administrative expenses. SERI developed estimates of many of these excluded costs. Another estimate of costs including installation comes from a study performed for SERI by Battelle-Pacific Northwest Laboratory (PNL). The PNL study also estimated the economies of large scale heliostat production. Comparable estimates by PNL of the installed costs per unit are provided in Table 5.

The GM study estimates a per unit cost reduction of 27% from increasing production from 25,000 units per year to 250,000 units a year. The Battelle study, which had lower calculated costs, estimates a 12% reduction in production costs with a ten-fold increase in scale.

The economies of large scale production are achieved only with an increase in risk. First, the increased production volume requires a large capital investment. The GM study estimated an investment of \$87 million was required for a production volume of 25,000 heliostats per year and \$393 million was required to produce 250,000 heliostats per year. Second, the large investment required to achieve the cost advantages will only be successful if the heliostats can be sold. Heliostat production, and many other products, are not presently achieving large production economies because the overall market size and individual market shares are not sufficient to support large scale production.

POTENTIAL FOR HELIOSTAT COST REDUCTION THROUGH LEARNING CURVE PHENOMENA

The potential for learning curve phenomena in the case of heliostats is probably quite modest. The technologies which are most susceptible to

TABLE 4. Heliostat Cost Estimates--General Motors Study (1979 dollars)

Annual Production Rate	25,000	250,000
Factory Costs (unit)	\$4,699.07	\$3,301.87
Profit	350.86	207.96
Installation Costs	940.38	978.52
Installed Costs Per Unit	\$5,990.31	\$4,389.35
Installed Costs per Square Meter	122.12	89.48

TABLE 5. Heliostat Cost Estimates Battelle-Pacific
Northwest Laboratory Study (1979 dollars)

Annual Production Rate	25,000	250,000
Installed Costs per Unit	\$4,507.01	\$3,948.35
Installed Costs per Square Meter	92.88	80.49

cost reductions through learning are those which are embodied in fundamentally new production technologies where the best processes and equipment choices are not obvious at the outset. In the case of heliostats, relatively conventional components need to be fabricated and assembled in the most efficient possible manner. Assembly and fabrication processes are fairly standard and well-known in industry, and learning is likely to consist of relatively small-scale adjustments at the margin to make the individual components and processes mesh together more efficiently. Fundamental breakthroughs are not as likely in this production process as with new semi-conductor technologies or other rapidly advancing fields. Consequently, the extent of cost reduction through learning phenomena is likely to be modest with heliostats, and the argument for policies to encourage achievement of economies of scale early on is more powerful in this case than would be the situation with a rapidly advancing technological situation such as photovoltaic technology.

NOTES - CHAPTER II

1. Mansfield, Edwin. "The Anatomy of the Product-Innovation Process: Cost and Time," In E. Mansfield, Research and Innovation in the Modern Corporation, New York: W. W. Norton and Company, 1971, pp. 110-135.
2. Kamien, M. I. and Schwartz, N. L. "Market Structure and Innovation: A Survey." Journal of Economic Literature, 13 (1), 1975, 1-37.
3. Scherer, F. M. Industrial Market Structure and Economic Performance, Chicago: Rand McNally & Company, 1971; William C. Shepherd, The Economics of Industrial Organization, Englewood Cliffs: Prentice Hall, Inc., 1979; Carter, C. F. and Williams, B. R. Investment in Innovation, London: Oxford University Press, 1958; Masson, Robert T. and Qualls, P. David (Eds.), Essays on Industrial Organization in honor of Joe S. Bain, Cambridge, Massachusetts: Ballinger Publishing Company, 1976; and Mansfield, Edwin. Industrial Research and Technological Innovation: An Econometric Analysis, New York: W. W. Norton and Company, 1968.
4. Fox, J. Ronald. Arming America: How the U.S. Buys Weapons, Cambridge, Massachusetts: Harvard University Press, 1974.
5. Scherer, Frederic M. The Weapons Acquisition Process: Economic Incentives, Boston: Graduate School of Business Administration, Harvard University, 1964.
6. Electric Power Research Institute, Policy Planning Division. Overview and Strategy: 1981-85 Research and Development Program Plan, Palo Alto, California: Electric Power Research Institute, October, 1980. pp. i-ii.
7. The L-shaped curve is often transformable to a straight line when the logarithm of cost per unit of output is plotted against the logarithm of the quantity of output or the size of plant. In other words, $\text{Cost} = aq^b$ where q is the quantity produced and a and b are parameters. For many processes, the parameter b is -0.3 to -0.4.
8. See, for example, Schuman, S. C. "How Plant Size Affects Unit Costs," Cost Engineering in the Process Industries, C. Chilton, ed., McGraw-Hill 1960 pp. 307-310.
9. See Mansfield, E. Microeconomics: Theory and Applications. New York: Norton and Company, 1970, pp. 178-184.

III. THE BUYER POINT OF VIEW

A heliostat consortium presents a number of potential advantages and disadvantages for heliostat buyers. In this section, we provide a discussion of the various advantages and disadvantages, and use economic literature to comment on those points. Utilities are very familiar with collective arrangements to build and finance large-scale electrical generating facilities requiring large financial investments. Both public and private utilities have participated in consortia to build and operate coal and nuclear power plants. However, utilities are much less familiar with the idea of a consortium for collective buying. This section discusses the advantages and disadvantages from the utilities' perspective of collective buying arrangements, in particular for purchasing heliostats.

MAJOR ADVANTAGES

Lower Price

By pooling together the orders of several buyers of heliostats into a single large order, it is likely that the consortium can negotiate a lower price for heliostats than could the individual utilities acting independently. Concentration on the buyer side of the market establishes conditions known as monopsony or oligopsony. Monopsony is defined as having just one buyer for a product while oligopsony refers to a small number of buyers. In either case, the quantity of products purchased by the concentrated buyer industry is predicted to be smaller than the quantity to be purchased by a perfectly competitive buyer industry. An oligopsonist or monopsonist perceives input price/quantity relationships (supply curves) wherein the price paid is an increasing function of the size of order, while the perfectly competitive buying industry sees a single minimum input price paid, (the supply curve is vertical implying an unlimited supply at $W = W^*$ and no supply at $W < W^*$). The concentrated oligopsonistic or monopsonistic buyer industry will purchase a smaller quantity of the input than will the competitive industry (if it optimizes purchases by buying at the level where marginal cost equals marginal revenue product). This point has been elegantly demonstrated in standard

economic theory textbooks⁽¹⁾ Textbook discussions of monopsony and oligopsony which go beyond the standard theoretical treatment often note that monopsony or oligopsony firms often use their market power to bargain down the prices of their suppliers.⁽²⁾

Greater Financial Resources

Under certain types of conditions, it may be financially attractive for utilities to form consortia. First, some large scale projects could stretch the financial resources of firms beyond desirable limits. For example, a project such as the Alaska pipeline would require financing beyond a single firm's borrowing capability. High interest rates also tend to encourage participation of firms in consortia for large scale projects. These projects can be financed by several smaller firms each putting up portions of the required equity and using their resources for debt collateral. By using the combined resources of the participants, the consortium may be able to borrow the remaining debt at a lower rate than any individual member. Second, the collective action allows individual members to "pool" the risk of the project. The risk pooling advantage is related to the first advantage. Not only do individual members have fewer dollars at risk on any project, but the members can diversify by participation in alternatives to the project. For example, a utility can participate in both nuclear and coal power plants at low levels of consortium involvement and also be involved in renewable electricity generation. This diversification reduces the utility's financial risk.

The financial advantages discussed above occur because the optimal firm size for financing the projects is greater than the firm size of the individual consortium participants. The consortium is borrowing on the combined financial strength of the participants. Similarly, differences in efficient size between the project and the individual utilities may encourage joint arrangements. For example, the efficient sized nuclear plant may be larger and produce more electricity than desired by an individual utility. Joint participation is one way for a utility to obtain the advantages of large scale production.

Lower Procurement Costs

Because member utilities can place their orders through the consortium, and because the consortium will probably deal with only one or a small number of heliostat manufacturers, it is likely that total procurement or transaction costs for heliostat systems will be lower for the member utilities. Economies of scale in purchasing inputs can occur if the administrative, legal, or overhead per unit costs associated with purchasing inputs fall as the purchase size increases. Because of differences in the size of orders, a consortium of small purchasers may achieve these economies when the individual members are not. An example is a cooperative which purchases products for its members. Large purchase orders from a consortium may allow one or a few manufacturers to increase their production volume and lead the economies of scale for the manufacturers. This savings could be shared by the consortium members and the manufacturers. In addition to the lower unit costs, this reduction in procurement costs may provide additional, though rather small, cost advantages to the consortium arrangements.

Product Reliability

Because the consortium will be a very large buyer, it may be able to bargain for a more reliable and carefully demonstrated product than could the individual utilities acting on their own. Thus, the member utilities would procure a power generation system that offered greater reliability than they could acting independently.

Market Development

A utility consortium for purchasing heliostats has another distinct advantage in that it may help to develop an orderly heliostat market. Presently, there are no firm utility orders for heliostats. Even a decision by Southern California Edison to proceed with a 100 MWe plant may only create a short run expansion of the heliostat market. If the consortium can help achieve the economies of scale which are believed to exist in the manufacture of heliostats, the consortium might help encourage and foster an orderly market for heliostats which is important for further development of the central receiver. The utility industry

would benefit from a heliostat market that has several manufacturers and several potential manufacturers.

DISADVANTAGES

Reduction in Design Flexibility

In order to achieve economies of scale on the manufacturers side, the consortium will probably have to agree on a standardized design for heliostat systems. Thus, each individual utility will have to give up some flexibility in the design of the heliostat system. Depending on the internal negotiating processes of the consortium, some utilities could end up with a substantially different heliostat system than they would have procured acting on their own. The consortium heliostat might represent a system that will satisfy all the needs of all buyers, not one that any of the utilities would have purchased on their own to suit their own special situation. It is difficult to say how much of a disadvantage this process is; one can only say that the outcome of a group negotiation process is likely to be different than the outcome each individual would have chosen on its own.

Vulnerability to Manufacturer Problems

Because the consortium is likely to deal with only one or a small number of heliostat manufacturers, the buyers of consortium heliostats will be vulnerable to any production problems experienced by the heliostat manufacturer. Strikes, materials shortages, or problems in setting up and operating the production system may have a greater potential impact on the utilities since they are likely to be dealing with a smaller number of manufacturers in the aggregate.

Problems with the Consortium Itself

It is possible that the creation and operation of the consortium arrangement may pose difficulties of its own. Negotiating on a standardized design and on contractual arrangements among the utilities may be time-consuming and expensive. The consortium may take on a life of its own, by creating a bureaucracy and a role for itself. This process could become expensive to the utilities. The negotiations among member

utilities may make it difficult for the consortium to get innovative changes in the heliostat design. Innovative utilities might be able to incorporate better ideas more quickly if they acted on their own.

Consortia would be much more common if the advantages of joint arrangements were not offset by a number of potential problems. However, the utility must weigh the potential advantages with potential problems. Three of the more significant potential disadvantages are discussed below. First, joint operations require sharing a great deal of technical and financial information among participants. Firms in many industries are reluctant to expose their planning operations to the views of outsiders. Second, joint arrangements require strong, often legal commitments, to abide by the consortium's decisions. Firms in many industries have diverging viewpoints on everything from operating procedures to future demand estimates. Reaching agreements between all consortium participants requires either fairly similar perspectives and operations or a great deal of compromise. Third, many consortia could cause legal and antitrust problems. For example, arrangements among companies to divide up marketing territories are illegal. Concern about possible public and legal scrutiny could cause some companies to drop out of joint arrangements.

ACTUAL ADVANTAGES AND DISADVANTAGES OF UTILITY COOPERATIVE ORGANIZATIONS

Little can be said about the actual advantages and disadvantages of the various cooperative utility organizations identified above. There is little literature on the subject, and the existing literature merely points out the historical existence of these organizations, rather than detailing the actual advantages and disadvantages encountered with each. Information of this sort could only come from case studies of individual organizations, identifying key actors and collecting material on the actual contractual arrangement. Such case studies are beyond the current scope of our research and must be postponed to a future phase. A few interviews with utilities have been conducted as a preliminary check on actual perceived advantages and disadvantages of a heliostat buying consortium.

Utility Interviews

The potential advantages and disadvantages of a utility consortium to purchase heliostats were discussed with a number of utility representatives. The objectives of the interviews were to obtain (1) utility reaction to the consortium idea, (2) feedback on the advantages and disadvantages of specific consortia alternatives, and (3) information on utility thinking and planning regarding solar thermal central receivers.

An interview guide was prepared to structure the interviews and to ensure consistency. The utility representatives were usually engineers with experience in solar thermal technologies. Both line management and staff were represented. Often the utility representatives were connected with the utility's research department but in several cases individuals with responsibility for planning future generation options were present.

The interviews began with a description of the project's objectives and scope. The first questions usually dealt with the utility's experience and background in solar thermal and in joint arrangements with other utilities. A second series of questions dealt with the potential for economies of scale in the manufacture of heliostats. Most of the utility representatives were familiar with the studies estimating manufacturing costs. The questions revolved around the realism of these estimates. Finally, the interviewee was handed a description of three alternative consortium alternatives. The final questions addressed the advantages and disadvantages of each alternative. Copies of the interview guide along with a list of all utilities and groups interviewed are included on the next page.

The interviews often took important diversions from the structured questions. In particular, discussions during several interviews focused on who might be appropriate actors in organizing a utility consortium. Also, time was spent discussing the present state of the solar thermal central receiver technology and what might need to occur before utilities would feel comfortable proceeding with heliostat orders. The sections

DRAFT INTERVIEW GUIDE

1. How many heliostats per year does your firm presently purchase?
2. Has your utility been involved in any joint purchasing schemes with other utilities?
3. Has your utility been involved in any joint production or operation of power plants?
4. What would you estimate to be the size of the overall heliostat market in 1985? in 1990?
5. Several studies estimating the advantages of large scale heliostat production have been performed by the Solar Energy Research Institute. They estimate that at an annual production rate of 25,000 heliostats, installed costs would be about \$6,000 per heliostat and at an annual rate of 250,000 heliostats a year, installed costs would be about \$4,400 per heliostat. Do these estimates seem realistic?

The following kinds of consortia arrangements have been proposed as possible ways to organize the buyers side of the market (utilities) to permit manufacturers to achieve economies of scale. (Hand respondent card with consortia description.)

6. Would most utilities be able to agree on a specific type of heliostat?
7. How effective would this consortium be in reducing heliostat prices?
8. What organizational problems would you see with this type of consortium?
9. Do you see any purchasing or financial difficulties with this arrangement?
10. Would this type of arrangement discourage introduction of new types of heliostat systems?
11. Are there any other problems with this consortium arrangement?

UTILITIES AND AGENCIES INTERVIEWED

Sierra Pacific Power	Reno, Nevada
Pacific Gas and Electric	San Francisco, California
Southern California Edison	Los Angeles, California
Arizona Public Service	Phoenix, Arizona
California Energy Commission	Sacramento, California
Bonneville Power Administration	Portland, Oregon

below summarize utility responses to both the unstructured and the structured portion of the interviews.

How Realistic are Studies of Economies of Scale?

Nearly all utility representatives felt the estimates of heliostat manufacturing costs in the General Motors study were accurate and realistic. This perception reflects the reputation of General Motors in cost estimation in large scale production. Some utilities were concerned that manufacturing costs might be significantly higher for the low volumes of heliostats forecast for the next several years. However, a heliostat manufacturing representative from McDonnell Douglas claimed the cost differences between lower levels of production and the levels assumed in the GM study were not significant.

What are the Advantages and Disadvantages of the Consortia Alternatives?

Nearly all utilities mentioned the future of the central receiver was extremely uncertain due to, among other factors, decreased DOE involvement in solar thermal. One bright spot was the possibility that Southern California Edison might build a 100 MW central receiver. The utilities believe some new utility initiatives are necessary to continue the momentum in solar thermal developed during the last few years. Thus, most utilities felt there were significant advantages to some form of collective utility arrangement to research, promote, or advance the central receiver. However, utilities were divided over the objectives of the joint arrangement and the level and commitment of utility member involvement.

For many of the utilities, the most attractive next step would be to jointly decide on uniform heliostat specifications, possibly to test heliostat reliability and maintenance, and to certify approved heliostats. Several forms of this arrangement were mentioned. Some utility representatives felt the emphasis for this type of consortium should be on the testing and evaluating of heliostats; others felt the testing performed to date by Sandia National Laboratories under the Second Generation Heliostat Program is adequate. To the utilities, the strongest advantages of this form of consortium were (1) the low level of utility

commitment to the consortium would allow utilities to decide independently their purchasing of heliostats and investment in solar thermal and (2) the certification would not reduce the rate of technological advances in heliostats. The first advantage was important to several utilities because of past problems with joint arrangements with other utilities. All utilities were concerned with the possibility of a utility consortium delaying or reducing technological innovation in heliostats.

A purchase commitment by utilities was the next type of consortium discussed. Under this arrangement, utilities would agree to buy any heliostats they purchased through the consortium. The consortium would serve as broker to combine orders and could negotiate sales prices with the manufacturer. This arrangement can achieve all potential economies of scale by passing through all orders to one manufacturer. There was little interest in this arrangement. This might be because few utilities are willing to commit to a heliostat order. Some utilities mentioned organizational problems as a drawback. These concerns included the problems of organizing such a consortium and the potential problems created by requiring a utility to agree to abide by the consortium's decisions. Others were concerned with reducing the number of manufacturers too early. Not only might the consortium's large order eliminate all manufacturers except one or two and thereby create a potential bilateral monopoly, but the single order might eliminate research and development work by alternative manufacturers. The utilities wanted to ensure efficient producers were not driven from the market.

The third alternative discussed was a consortium to build and operate a solar thermal central receiver. The utilities expressed some interest in such an arrangement. However, at present all were watching the progress of Southern California Edison in deciding their plans to build and operate a 100 MW plant. Southern California Edison mentioned they were still some time away from a decision to proceed. If the decision were made to proceed, an optimistic estimate was the plant would go on line around 1988.

Who Might Organize a Utility Consortium?

A major problem in the formation of a consortium to purchase or certify heliostats is the lack of a lead agency or organization to promote the concept. Several utilities mentioned they thought the next step in the process of developing the solar thermal central receiver was further testing and evaluation of reliability and maintenance. The Electric Power Research Institute (EPRI) or a combined EPRI-utility program was proposed. However, EPRI was not seen as a likely lead to form a consortium. Southern California Edison and Pacific Gas and Electric seemed to be viewed as the utilities most likely to lead a utility consortium.

One solution might be the recent proposal for utilities to form an organization to promote the interests of users of solar thermal central receivers. The organization, the Solar Central Receiver Council, would be supported by fees imposed on member utilities. Hal Seilestad of Pacific Gas and Electric is taking an active lead in promoting the Solar Central Receiver Council. The objective of this organization would be the promotion of the interests of solar thermal users. The organization, still in the conceptual stage, would appear to be a likely candidate for further development of the consortium.

What's Next for Solar Thermal Central Receivers?

Utility representatives revealed a reluctance to aggressively expand their central receiver programs. With the possible exception of the Southern California Edison's consideration of a solar power plant and a few utilities considering future repowering options, it is difficult to conceive of significant heliostat orders before 1985, and possibly not until 1987. The manufacturers of heliostats feel the technology has been proven, and that studies such as the General Motors study and the Sandia Second Generation Heliostat Program have demonstrated economic feasibility. McDonnell Douglas, and likely other heliostat manufacturers, stated they stand ready to bid on utility heliostat orders of any size. Several utilities remain unconvinced of the heliostat's reliability and maintenance performance and long term costs. Utilities felt the responsibility was on the heliostat manufacturer to demonstrate that the

solar thermal central receiver made good sense. Each group, utilities and manufacturers, appears supportive of the central receiver concept. Each appears to be waiting for the other to take the next step.

PROBLEMS OF CREATING CONSORTIUM-LIKE ARRANGEMENTS

The process of actually creating a consortium has received relatively little attention in the literature. Establishing a cooperative arrangement among a set of independent utilities is a difficult, time-consuming and easily derailed process, as illustrated by the example of the Mid-Continent Area Power Planners (MAPP). MAPP was established in 1963 with 21 investor-owned, cooperative, and state-owned utility members.⁽³⁾ Creation of this organization was a gradual process of working out expanded cooperative arrangements, which can be traced back to the mid-1940s, shortly after the dissolution of large utility holding companies left the area's utilities in a fragmented and uncoordinated state. Cooperative utility interconnections with investor-owned utilities represented a first and somewhat tentative step in the direction of inter-utility coordination. This initial step was followed by joint public-private transmission line projects, a step that was initially resisted by investor-owned utilities. A series of discussions then followed on the prospects of more cooperation, at both executive and engineering levels of the area utility organizations. These discussions finally resulted in the establishment of MAPP in 1963. MAPP now represents a vehicle for further cooperation of the member utilities with power pools which overlap and adjoin its members' service territories.

The MAPP organization is the only documented example that is now available of the process of establishing cooperative arrangements among utilities. Other examples of such organizations have been mentioned elsewhere in this report, and a legal analysis of antitrust constraints on such organizations is presented in Chapter V. It is possible that in subsequent phases of this research, the organizational development process for some of these other cases could be examined in order to develop further guidelines about the kinds of organizational arrangements which

are viable, the constraints on developing new cooperative organizations, and organizational and process pitfalls that need to be avoided.

SUMMARY

The major potential advantages of a consortium for heliostat buyers are price reductions achieved both through lower unit prices and reduced transaction costs, and possible stronger reliability guarantees than individual utilities could obtain from heliostat manufacturers. Offsetting disadvantages include reduced design flexibility, vulnerability to supplier problems, and the expense and trouble of creating and operating the consortium.

NOTES - CHAPTER III

1. See for example Mansfield, E. Microeconomics: Theory and Applications, New York: W. W. Norton and Company, 1970, pp. 367-374.
2. Scherer, F. M. Industrial Market Structure and Economic Performance. Chicago: Rand McNally, 1971, pp. 239-252.
3. Nelson, W. Stewart. Mid-Continent Area Power Planners: A New Approach to Planning in the Electric Power Industry. East Lansing, Michigan: Michigan State University Public Utilities Studies, Graduate School of Business Administration, 1968.

IV. THE SELLER POINT OF VIEW

As viewed by the manufacturer of heliostats, there are several advantages and disadvantages to this type of arrangement on the seller's side of the market. These advantages and disadvantages are discussed in six sections below.

ADVANTAGES

Production Economies

By pooling together the orders of several utilities, a consortium that agrees on a common heliostat design offers several production advantages to heliostat manufacturers who provide the requirements for heliostats for the consortium members. First of all, the products could be standardized, eliminating the custom work operations inherent in tailoring heliostat designs to the particular requirements of each individual utility. Such custom designing and mass production is seldom done in utility industry in the case of thermal electric power plants. While standardized designs have been proposed as a cost-reducing feature in the case of both coal-fired and especially nuclear power plants, no firm has managed to sell truly standardized units of either type to the utilities. Using a collecting buying arrangement to achieve standardization in the case of heliostats would represent a major breakthrough in the utility industry's cost control programs.

Using a standardized design, and having a large number of orders for this design pooled together by a consortium, may also permit the heliostat manufacturer to achieve economies of scale by designing a production plant that is capable of producing large quantities of heliostats in the most efficient manner. Studies funded by the Department of Energy have shown significant potential for cost reduction if a heliostat plant produces 250,000 units per year.⁽¹⁾ These studies show that at lower volume outputs such as 25,000 units per year, the costs could be twice as high as at the higher volume level of 250,000 units per year. (This corresponds to a constant b of -0.30 in the equation $\text{cost} = a \times \text{volume}^b$.) The economies of scale result from more efficient lay-out of the production

system within the plant, as well as increased ability to fabricate components on site rather than purchasing ready-made components. If the collective buying arrangement among the utilities results in a firm large estimate of the potential demand for a single firm's output, then the economies of scale that are inherent in larger volume production can be fully realized by optimizing the plant design for the particular estimated demand that will result from the utility orders through the consortium. There is, of course, a danger in designing a plant which can product only a specific heliostat design at specific output levels. If desired output or design change, the "optimized" plant may look very inefficient. A recent example of this phenomenon is the closing of an automobile engine plant which was designed to produce V-8 engine blocks at high volume and low cost. When customer preferences switched to smaller cars and smaller engines, the large, modern plant was unable to compete with an older and smaller but more flexible plant.⁽²⁾

Marketing Costs

As part of the reduction in costs achievable, the winning seller would have ease of planning and stability of scheduling for his laborforce, and a chance to extract from his own suppliers and subcontractors the advantages of low prices the consortium receives. His cash flows may also be more stable. Pooling utility orders through a consortium will have some effects that may reduce marketing costs, and others which may increase marketing costs. Lower marketing costs could result because there will be just one big customer in place of several smaller customers. A day-to-day sales force will not be needed because visits have to be made to fewer customers. A single marketing presentation can be put together for this customer; however the negotiation may be lengthy. Offsetting this potential reduction in marketing costs is a tendency to invest more in the marketing effort since it is such a large potential order and is an all or nothing requisition. The net effects of these two offsetting tendencies are not clear. However, since the risk and penalty of not getting the consortium order is much greater than the risk of not getting the order of a single buyer, quite considerable resources could be put into marketing the consortium.

In an extreme case, three selling efforts may be needed. The first is to sell one or more influential companies on the need to request this device; second, to sell to the consortium; and third, to sell to other members if the contract is not an exclusive one.

Reduced Market Share of Rivals

The heliostat manufacturer which receives a large order from the consortium may be able to reap some monopoly profits due to being the sole or the largest supplier of heliostats in the industry. Because the consortium order may limit the market for potential rivals, the heliostat manufacturer which deals with the consortium may enjoy some degree of monopoly power.

Reduction in After-Sale Costs

The single seller will have lower costs in servicing and complying with the warrantee because of the opportunity for better quality control on savings due to a long-run ("learning curve" savings) and standardization of parts. Servicing costs also may be reduced, to the buyers' disadvantage, if the competition on price to get the large single award leads to exclusion of service from the contract and cutting corners on quality to lower price. This is analogous to getting less service from a discount house than a specialty shop.

Ease of Gaining Financing

A single seller would find it much easier to gain financing from a third party. This is analogous to a coal mining company financing a mine at a bank when it has a life-of-mine contract from an electric company. In addition, the existence of a consortium may make it easier for the vendor to get financing either in the form of debt or equity investment from the consortium or its members where such arrangements are permitted.

DISADVANTAGES

Offsetting the potential market power to be gained by the heliostat manufacturer, the buyer will be in a monopsonistic position with respect to the seller of heliostats. Because a single large buyer will exist for

heliostats, this buyer may be able to bargain down the price of heliostats by pointing out the large size of the order, the potential for economies of scale, the stable and secure nature of the market position that will be enjoyed by the manufacturer which deals with the consortium, and so forth. Thus, the seller of heliostats may have to accept a lower price from the consortium than it would be able to achieve from the individual members of the consortium if they were marketed separately, particularly if ease of entry is high once prototypes have been developed. On the other hand if ease of entry is low, the seller may be locked in and can raise prices at renewal time.

Risk of Contract Loss

Because a major proportion of the manufacturers output is likely to be sold to the utility consortium, the manufacturer will be very dependent on the consortium for its financial viability. If a contract renewal period is built into the contract, then the firm will be in a somewhat weak bargaining position at the time of contract renewal. If other firms exist which the consortium could switch to at that point, then the firm may be in some difficulty at that point. The difficulty of contract renewal may be enhanced if the consortium has succeeded in driving down the price of heliostats to such an extent that the manufacturer cannot afford to invest in R&D during the period of the contract. Thus, potential rivals could develop better heliostat products or less expensive manufacturing processes during the period of the initial contract, while the manufacturer chosen in the first round would be forced to offer the same old technology and same old product at the time of contract renewal. This situation could lead the consortium to switch to a different manufacturer at contract renewal time.

Loss of Flexibility

Related to the previous point, a manufacturer which must devote most or all of its production to a single customer has little flexibility to accommodate new customers which might represent growth markets in the future. Little can be done to attract new customers by offering custom products or by offering an especially early delivery of the product if the

production plant is tied up in meeting the contractual obligation due to the consortium.

SOME VENDORS' EXPERIENCES IN DEALING WITH A CONSORTIUM

A cooperative buying organization for a group of school districts was examined in some detail to determine the sort of problems a seller to a consortium might face. The consortium acts for 63 school districts in 8 counties in obtaining firm price quotations for large volume items such as educational and operational supplies, insurance, and data processing services. The individual school districts are free to make deals on their own but they are guaranteed to be able to purchase at the negotiated price. The consortium has an executive staff, technical advisory committees and a board of governors made up of representatives of the school districts. It is supported by a per-pupil fee and is currently "in the black."

Although making buying arrangements is the principal activity, the consortium staff has originated proposals for selling waste paper for recycling and for a while operated a data processing service.

Some of the problems found by sellers are general to most cooperative buying arrangements. Others are due to defects in the particular selling arrangement chosen.

At first, vendors were opposed, but most have adjusted to the system. However, only the larger vendors have participated since, with the exception of food, the vendor has to guarantee to be able to meet the needs of all the members.

All-or-Nothing Bidding

Vendors complain about the problem of being the second best bidder, but only by a small amount. This is recognized as part of the game but is still a matter of great frustration.

Winning is Not Enough

Because individual school boards are free to buy elsewhere, the winner may stock up to supply a large expected demand, then find himself

being undercut by someone else's discontinued stock or a drop in the market price may leave him stuck. In the case of food, where two vendors are chosen, he must still market actively to individual school districts to get his share.

Can't Afford to Give Service

Because of the strong emphasis on price, the vendor shaves his margin to the point where he cannot afford to provide service. This is not important for food or paper, but is for audio-visual equipment.

Multiple Selling May be Required

One advantage of cooperative buying is presumed to be that only one selling job needs to be done. However, for sophisticated purchases such as audio-visual equipment, it seldom works that way. The firm must first persuade individual school systems to request the item they have exclusive selling rights to. Then members on the technical advisory committee must draft appropriate specifications. Then the vendor must make the low bid to the consortium. Finally, it must promote their equipment to individual school systems, particularly if the purchase is somewhat discretionary.

Specifications Can be Rigged

By carefully drafting the specifications, particularly for sophisticated items, it is possible to exclude many possible vendors, since they usually sell on a semi-exclusive basis for the manufacturer. It is reported that this is much less likely to happen with the consortium than if each district bought independently.

Specifications Can be Poorly Drawn

A complaint heard was that the advisory committee drew the specifications poorly or that the specifications were out of date.

Slow Payers are Not Penalized

Many school systems are in financial trouble and do not pay quickly. Either the vendor pays for the float or the prices are raised at the bidding stage and the fast paying districts pay for it indirectly. The seasonal nature of buying makes this worse, but presumably the vendor knows in advance that most districts order in April and May, receive

delivery in July, and do not pay until late September. Hence, this factor is built into the bidding. Insisting on different terms of payment at the bidding might help.

Some Districts are "Cherry Pickers"

Vendors who bid low on a few items to get in the catalog with door openers are often frustrated when only the bargains are purchased and other items, frequently smaller volume, higher margin sales, are bought elsewhere. This is probably not a legitimate complaint, rather it is a strategy that failed.

Inflation Hurts

Vendors are frequently stuck when inflation is greater than expected. Changes in the system to include escalation or more frequent catalogs would help but would be cumbersome.

SUMMARY OF SELLER ADVANTAGES AND DISADVANTAGES

While many disadvantages for the seller can be listed, it is not obvious that these disadvantages would outweigh the major advantages of a consortium. These advantages include large and stable orders which could allow the manufacturer to invest in a large-scale and efficient production plant. The total profit which can be earned on a large volume plant is quite considerable and may provide sufficient inducement to the manufacturer that it would undertake such a commitment despite the off-setting disadvantages of a consortium arrangement. The opportunity would probably be of interest only to a large firm that can live with the all-or-nothing character of the procurement, especially if he must develop a prototype at his own expense. The seller may have to give up control of operations to the monopsonistic buyer. In the guise of overseeing quality control, buyer inspectors may be on the manufacturing site. Next, buyer representatives are making day-to-day decisions such as choice of subcontractors. This sort of overt direction has been alleged in the case of some large retailers, some of whom even have acquired large equity positions in their suppliers.

NOTES - CHAPTER IV

1. See Britt, J. S., Shulte, C. W. and Davey, H. L. Heliostat Production, Evaluation, and Cost Analysis, Report for the Solar Energy Research Institute by G. M. Transportation Systems Center, General Motors Corporation, Warren, Michigan, December, 1979 (SERI/TR-8052-1); Drumheller, K., Schulte, K. S. C., Dilbeck, R. A., and Long, L. W. Heliostat Manufacturing Cost Analysis, Volume I, Report for Solar Energy Research Institute by Battelle Pacific Northwest Laboratories, Richland, October, 1979 (SERI/TR-8043-1); Drumheller, K. Cost of Heliostats in Low Volume Production, Report for Solar Energy Research Institute by Battelle Pacific Northwest Laboratories, Richland, January, 1980 (SERI/TR-8043-2).
2. Wall Street Journal, September 15, 1981, p. 25.

V. THE ANTITRUST POINT OF VIEW

As mentioned before, one of the concerns surrounding a collective buying arrangement for heliostats is that for utilities to act in concert in this matter might violate federal antitrust law. Accordingly, this section presents a very brief review of federal antitrust law and discusses how it has been applied to electric utilities in the past. The analysis does suggest some areas of concern and the section concludes with a description of those areas.

The body of federal antitrust law, like the body of federal constitutional law, has a skeleton of a relatively small set of enacted law which speaks in general terms, and a rather extensive flesh of case law which tends to speak in quite specific terms. The U.S. Constitution and its amendments are obviously the skeleton of constitutional law; the Sherman Act, the Clayton Act, the Federal Trade Act, and their amendments are the skeleton of federal antitrust law. The Sherman Act¹ has two major sections. Since passage of the Act in 1890, each has accumulated an extensive body of relevant case law, and each section is discussed under a separate heading below. Relevant case law has also been developed under the Clayton Act of 1914² especially since its major amendment by the Robinson-Patman Act of 1936.³ Relevant case law under the Clayton Act is discussed under a third heading below. The Federal Trade Act of 1914⁴ has also been a source of extensive administrative and judicial case law, but little of it has applied to electric utilities. As a consequence, this preliminary review does not discuss it further.

ISSUES

In this section we discuss possible constraints on a heliostat consortium stemming from antitrust concerns. First, we examine whether there is a basis for exempting the proposed agreement from antitrust laws on the grounds that:

- o Utilities are regulated industries and may not be subject to antitrust laws,

- o If regulated industries are generally subject to antitrust laws, there may be special considerations applying to public utilities that help make them partially exempt--"natural monopoly," public interest in securing power, and so forth,
- o The state action exclusion may be applicable. If there is a requisite level of involvement by a state agency with respect to intrastate portion of the transaction or by the Federal Energy Regulatory Commission, then the consortium could be exempt from antitrust.

Second, we assess the possibility for action under Section I of the Sherman Act. This section defines per se violations, the application of these standards, as in the case of collective boycotts, and discusses what factors are relevant to determinations of antitrust violations.

Next we examine Section 2 of the Sherman Act. Under this section, important issues are whether there is sufficient intent to monopolize, and whether the proposed agreement be modified so as to avoid such violations.

Finally, under Section 3 of the Clayton Act, the major issue is what constitutes probability of substantial foreclosure of the relevant market? Under what circumstances would this provision be violated in present cases?

As discussed in the introduction to this volume, only federal antitrust issues have been analyzed in this draft. Other federal and state laws may have important implications for the proposed consortium arrangement. Legal issues which should be examined in the future include:

- o Public Utility Holding Company Act of 1935, and Securities and Exchange Commission reviews under this act,
- o Federal Energy Regulatory Commission purview over interstate power transmission and wholesale rate-setting,
- o Utility cases in general,
- o Any other federal level legal issues,
- o State utility regulatory commission,

- o State restrictions on municipal or other publicly owned utilities,
- o Other state law that may be relevant.

GENERAL APPLICABILITY TO REGULATED INDUSTRIES AND GROUNDS FOR EXEMPTION

Antitrust laws have been held applicable to regulated industries in general and to the electric power industry in particular.⁵ Although utilities are partially regulated by state and federal officials, this regulation does not eliminate the need to encourage free competition through antitrust laws.⁶ Accordingly, the argument that antitrust law does not apply or that, as a rule, state or federal regulation (for example by the Federal Energy Regulatory Commission) was intended as a substitute for or to supersede antitrust regulation will not be persuasive.⁷

The courts have sought to clarify and restrict the scope of federal and state action exceptions. For example, some major cases have distinguished between corporate-initiated actions or proposals, whether with respect to rate or distribution, that were submitted for agency approval and government regulatory measures or decisions coercing "violations of antitrust laws."⁸ The court concluded in *Otter*, "When these relationships are governed in the first instance by business judgement and not regulatory coercion, courts must be hesitant to conclude that Congress intended to override the fundamental rational policies embodied in the antitrust laws." In short, despite differing approaches, the federal courts have on the whole been loath to regard an amorphous government "presence" as a type of magic wand legalizing antitrust violations.

In practice, however, there is no single ironclad test, but instead a variety of factors that help determine whether "state action" has insulated a defendant from antitrust liability. The following questions need to be considered: Is the agency a regulatory arm of the government? Was it created by and was it utilizing powers expressly granted by the legislature? Was the agency actively involved in deciding upon or implementing the challenged practice?⁹ Lurking in the

background of discussion of state action issues is generally some assessment of the perniciousness of the alleged antitrust violation.

Accordingly, tangential input from or involvement by a state or federal agency will generally not result in "state action" immunity. Agency acquiescence or even approval in a collective buying arrangement would probably not in itself provide immunity, unless perhaps the agency was fairly clearly acting within and based on the authority of legislatively granted powers. The more specific or intimate the involvement of an nexus between agency approval and oversight and legislative authority, the more likely a claim of "state action" will be accorded significant weight.

On the other hand if an agency, state or federal, were the primary, or a primary actor, and was acting within its authority and was "an arm" of the state, fairly strong arguments for immunity could be raised. Active involvement is far more persuasive than vague presence or passive oversight. Similarly state compulsion of some type of actions required by the state is far more convincing than non-compulsory state action.¹⁰ Even those cases that have sought to protect against a Pandora's Box of immunity because of state or federal agency involvement have generally accepted, expressly or implicitly, that antitrust laws are not directed at restraining acts of the state as directed by its legislature. As one case put it: "The teaching of Parker v. Brown is that antitrust laws are directed against individual and not state action. . . the state may regulate that industry to control, or in a proper case, even eliminate competition."¹¹

Based upon this part of "state action" left intact, purchase or financing of purchase by state or federal actors of heliostats would significantly increase the probability of the private utilities and the heliostat producer not being found liable under antitrust laws. If, for example, a state agency acting within its legislative authority purchased the heliostats for resale or acted as a guarantor of sale of a certain number of heliostats, challenged actions would be far more likely to fall within the protective cloak of "state action."

"PER SE" VIOLATIONS UNDER SECTION I OF THE SHERMAN ACT

Certain activities under the Sherman Act are considered "per se" violations of antitrust laws. This type of violation includes: (1) horizontal combinations, most notably price fixing or division of markets among competition and (2) collective boycotts.¹² Categorizing alleged illegal activity in either of these "per se" categories greatly complicates the job of a defendant. Thus, in West Texas Utilities Co., the court observes, "Concerted refusals to deal, or group boycotts, are per se illegal under the Sherman Antitrust Law."¹³ The court concludes: "The principle of the group boycott cases is that where businessmen concert their actions to deprive others of access to merchandise which the latter wish to sell to the public, we need not inquire into the economic motivation underlying their conduct because exclusion of traders from the market by means of combination or conspiracy is so inconsistent with the free market principle embodied in the Sherman Act that we do not consider any alleged justification." Instead, the court largely limits examination of the facts to determine whether the circumstantial evidence justifies an inference of intent to eliminate competition. Where exclusionary or coercive conduct is present, the court need not even apply a "rule of reason."

Collective refusals to deal are viewed much differently from individual refusals to deal. Thus, any particular manufacturer has the right to select customers and to refuse to sell goods to anyone for reasons sufficient to himself.

The Supreme Court has strengthened the argument for especially harsh treatment of per se violations, though perhaps more by implication than by express declaration. In Radiant Burners, Inc. v. People Gas Light and Coke Company,¹⁴ the court held that a refusal (not based on objective standards) by an association to certify the plaintiff's gas burners with a resulting refusal by utility members to supply gas to burners was, in itself, a violation of antitrust laws. The court reasoned that since in effect purchasers cannot buy gas for use in the plaintiff's burners, the conspiratorial refusal to supply gas "falls within one of the

classes of restraint which from their nature or character are unduly restrictive."¹⁵ Accordingly, defendant's argument that Radiant Burner was so small that its destruction would not substantially lessen competition was considered irrelevant.

Another major court decision involving regulated industries, albeit not one dealing with electrical utilities, further clarifies the standards for judicial determination.¹⁶ In Richfield, petroleum producers and distributors imposed upon gasoline station operators the requirement that gasoline station operators limit dealings to goods produced or sponsored by the distributor. The court declares that specific intent and motivation are not a concern for determination of a Section I violation of the Sherman Act. It observes that "a specific intent, or good motive, for that matter, is not material when we deal with Section 1 of the Sherman Act." A determining consideration is effect of a particular practice on interstate trade. "Other considerations, such as economic necessity, do not and should not enter into" the inquiry.¹⁷

Other cases, though differing somewhat in precise standards, and though occasionally placing some greater weight on impacts and intent, also suggest harsh judicial treatment of per se violations.¹⁸ The court in Pennsylvania concludes, "Congress has not left us with the determination of whether or not unhealthy price-fixing schemes are wise or unwise, healthy or destructive. . . . It has no more allowed genuine or fancied competitive abuses as a legal justification for such schemes than it has the good intention of the members of the combination."¹⁹ The Pennsylvania Water reiterates the principle that "The statute is broken as well by the prevention as by the destruction of competition."

Any arrangement smacking of a collective boycott should raise a red flag concerning potential liability under antitrust. While the agreement currently under consideration involves an emergent industry and an array of different policy considerations, the existing case law would suggest that a collusive, exclusive buying arrangement might well precipitate potentially successful litigation.

An examination of alternative approaches to achieving the same objectives would be appropriate. For example, if prospective purchasers could guarantee purchase of a certain number of units (perhaps for example 50% of their anticipated needs) over a specified number years, the agreements would sound less akin to the "collective boycott." If the heliostat maker could execute individual requirements contracts based upon overall estimation of total demand, rather than contracts based upon some offer of "either you all buy all you need from me or I won't produce them," this might well be immune to per se violation claims. However, the arrangement may still raise questions under the Clayton Act. If the maker could encourage large purchases through quantity discounts, it would again be in a better position to argue that there has been no antitrust violation. The heliostat manufacturer's request for partial financing of the entire venture with partial shared return might be another approach, although this conceivably could raise other antitrust questions.

It might also make a difference here as elsewhere, even though business justification is not generally an acceptable excuse under Section 11, whether the contract involves the inception of the industry or is ongoing seemingly for several years beyond the time required to recoup some of the initial investment.²⁰ The longer the period exclusive dealings, the greater the likelihood of a finding of antitrust violation.

SECTION 2 OF SHERMAN ACT

Section 2 of the Sherman Act makes it illegal for any person to monopolize or attempt to monopolize through three basic actions:

- o monopolization
- o attempt to monopolize
- o combination to monopolize.

Proof of this claim requires showing possession of monopoly power and the willful acquisition or maintenance of that power. The charge of "willful acquisition of such power" can be countered by showing that such power naturally accrued to the producer by virtue of technical efficiency or a better idea.

Monopoly power requires reference to the relevant market and some indication of the share of such market occupied by the defendant. Market definition requires reference to product and location. Whether each of several energy products constitutes a separate market, or whether the several energy products should be grouped together can be important.

Intent to monopolize does not require actual monopoly powers, but instead an intent to monopolize. Section 2 also requires a specific intent to monopolize. Intent is inferred from surrounding circumstances.

Generally, Section 2 has not been used as frequently as other sections in antitrust actions. The standard is seemingly not as tough as the "per se" standards of Section 1 and lacks the specificity of Section 3 of the Clayton Act.

In evaluating the current situation in respect to Section 2 a number of considerations seem relevant. In inferring motive, were the contracts tailored to the reasonable needs of the supplier in undertaking a new or costly venture, or were they in excess of such needs? Is there some other business explanation that might justify the contracts? If there is no such business explanation, is there a reasonable inference that there were ulterior motives? What is the relevant market? What was producer's role relative to the relevant market? Did producer's/supplier's contract leave room for competition?

SECTION 3 OF THE CLAYTON ACT

Section 3 of the Clayton Act contains more specific prohibitions than the Sherman Act Section 1 prohibition on "every contract. . . in restraint of trade or commerce among the several states." Section 3 of the Clayton Act was designed to stop practices that might restrain trade in its infancy.²¹ This clause makes it unlawful to "make a sale or contract for sale of goods, wares, merchandise, machinery. . . on the condition, agreement or understanding that the lessee or purchaser thereof shall not use or deal in the goods of a competitor. . . where the effect of such lease, sale or contract for sale. . . may be to substantially lessen competition or tend to create a monopoly in any line of

commerce.²² The key consideration is whether the agreement may tend to substantially reduce competition in the relevant market.²³

The Supreme Court developed Section 3 review standards in Tampa Electric Company v. Nashville Coal Company.²⁴ The case involved a requirement contract for 20 years between the utility and the coal company, which the utility wanted to have declared valid.

First, not just any reduction in competition but only a substantial reduction in competition is sufficient. If the practical effect of the contract was to prevent a lessee or buyer from using the products of a competitor of the lessor or seller and the contract would thereby probably substantially lessen commerce in a line of commerce, it is proscribed.

To determine whether it is probable that a market will be substantially foreclosed, the court provides a number of guidelines. First, the line of commerce (type of good) must be determined. Second, the area of effective competition must be charted by determining the market area in which the seller operates and to which the purchaser can practicably turn for supplies. The narrower the area of competition, the greater the comparative effect on the area's competitors.

Finally, the competition foreclosed by the contract must constitute a substantial portion of the relevant market. The proportionate volume of commerce involved relative to the total volume of commerce is highly relevant, as is the impact, immediate and long-term, of preemption of that share of the market on effective competition therein.

The court distinguishes Tampa Electric Company from Standard Fashions. In the latter case, there was a seller with a dominant position and myriad outlets with substantial volume. In Tampa, even assuming preemption to the extent of maximum anticipated total requirements, only 77% of the market was involved.

Possible liability of the heliostat maker/consumer requires similar analysis. What is the relevant market? What portion of the market will be foreclosed by the exclusive requirements contract? This will hinge on the share of buyers in the relevant market. Since the proposed agreement

is not just a single requirement contract but a multiple one, with possible collusive activity, the court's treatment might be somewhat harsher than that in Tampa.

Multiple or joint requirements contracts are almost inherently suspect because (1) they prevent competitors from entering the market and finding product outlets, and (2) they eliminate the buyer's ability to shop around for best sources. These general concerns would apply in evaluating the proposed venture.

There is, however, a glimmer of special consideration for the utility industry contained in the Tampa Electric Company opinion. The court remarks, almost as if in passing, "The 20-year period of the contract is singled out as the principal vice, but at least in the case of public utilities, the assurance of a steady and ample supply of fuel is necessary in the public interest. Otherwise consumers are left unprotected against surprise failures owing to the shutdowns." The court continues, "The compelling validity of such considerations has been recognized fully in the natural gas field." It concludes, "This is not to say that utilities are immunized from Clayton Act proscriptions, but more that, in judging the term of a requirement contracts in relation to the substantiality of the foreclosure of competition, particularized considerations of the parties operations are not irrelevant." Although the precise import of these statements is unclear, they suggest that in applying the "substantial foreclosure" test there is greater room for a "rule of reason" or public interest justification in the case of public utilities.

A highly respected law review article suggests that high capital costs "should" justify requirement contracts geared to deal with problems created by such costs.²⁵ Meeks suggests that the requirements contract should not be for any longer than necessary to allow the supply to absorb or otherwise dispose of otherwise excess capacity. For a large block of power, Meeks suggests an initial five to seven year requirement, renewable yearly thereafter. In sum, there seems some basis for creative argument based on public policy and utility specific considerations, but the substantiality test still seems crucial.

FORMAL BUSINESS REVIEW

Attorneys at the Department of Justice indicate that any appraisal of the proposed consortium will only be undertaken if plans detailing the proposed action are sent for formal Business Review. Any such review is facilitated by sufficient description of the anticipated transaction. Such inquiries must be sent to William F. Baxter, Assistant Attorney General, Department of Justice, Washington, D.C. 20530. Submissions are made publicly available, and any judgments are of course not binding on any court of law and are subject to revision based upon new enforcement policies or new cases.

CONCLUSIONS

The review of federal antitrust issues presented here suggests that the consortium notion could be challenged as a per se violation of Section 1 of the Sherman Act, as an attempt to monopolize under Section 2 of the Sherman Act, and possibly on other grounds. However, it may be possible to structure the consortium in such a way as to avoid per se violations and to leave room for rules of reason to be applied. The chief argument in favor of the consortium would be that the benefits of achieving economies of scale in heliostat manufacture outweigh the social costs of possible encouraging the achievement of a dominant market position by one favored heliostat manufacturer. Because there are significant antitrust concerns about the consortium, the Department of Justice Business Review should be conducted before any substantial steps are taken to create such an organization.

NOTES - CHAPTER V

1. 26 Stat. 29 (1890), codified in 15 U.S.C. 1 et. seq. (1976).
2. 38 Stat. 730 (1914), codified in 15 U.S.C. 17 et. seq. (1976), 18 U.S.C. 402, 660, 3285, 3691 (1976), 29 U.S.C. 52, 53 (1976).
3. 49 Stat. 1526 (1936), codified in 15 U.S.C. 13, 13a, 13b, 21a (1976).
4. 38 Stat. 717 (1914) and 52 Stat. 111 (1938), codified in 15 U.S.C. 41 et. seq. (1976).
5. See e.g. Otter Tail Power v. United States, 410 U.S. 366 (1973).
6. Hearings on Competitive Aspects of the Energy Industry Before the Subcommittee on Antitrust and Monopoly of the Senate Committee on the Judiciary, 91st Congress 2nd Session, pt. 2 at 558 (1970).
7. Pennsylvania Water and Power Company v. Consolidated Gas, Electric, Light and Power Company of Baltimore, 184 F. 2d 552, 1980; Cantor v. Detroit Edison Co., 428 U.S. Sup. 79 (1976).
8. City of Groton v. Connecticut Light and Power, 456 F. Supp. 360 (1978); Otter Tail Power, Cantor DBA Sheldon Drags v. Detroit Edison Co., 428 U.S. (1976). For contra, see Gas Light Company of Columbus v. Georgia Power Company, 440 F. 2d 7135 (1971).
9. Washington Gas Light Company v. Virginia Electric and Power Company, 430 Fed. Rep. 248; Gas Light Company of Columbus v. Georgia Power, 440 F. 2d 1135.
10. Goldfarb v. Virginia State Bar, 421 U.S. 773 (1975); "Municipal Antitrust Liability; Applying City of Lafayette v. Louisiana Power and Light," Baylor Law Review 31.563, 1976.
11. Washington Gas Light v. Virginia electric and Power Company, 438 F2d 248 (1971). See also Alabama Power Company v. Alabama Electric Cooperative, 394 F. 2nd 672 and City of Lafayette, Louisiana v. Louisiana Power and Light Co., 98 S. ct. 1123 (1978).
12. West Texas Utilities Company v. Texas Electric Service Company; 470 F. Supp. 798 (1979). Radiant Burners Inc. v. People's Gas Light and Coke Company, 81 S. Ct. 365 (1961); Gainesville utilities Department v. Florida Power and Light Co., 573 F. 2d 292 (1978).
13. 470 F. Supp. 798, 815 (1979). See also for general discussion, Woolley, "Is Boycott A Per Se Violation of Antitrust Laws." 27 Rutgers C.R. 773 (1974).
14. 81 S. Ct. 365 (1961).

15. 81 S. ct. 365, 367.
16. United States v. Richfield Oil Corporation, 99 F. Supp. 280 (1951).
17. Richfield, 99 F. Supp. 280, 287. The court also echoes an earlier Supreme Court conclusion, "The antitrust laws are as much violated by the prevention of competition as by its destruction." United States v. Griffith, 334 U.S. 100 (1948).
18. See Pennsylvania Water and Power Company v. Consolidated Gas, Electric, Light and Power Company, 184 F 2d 558.
19. 184 Fed. Supp. 552.
20. See e.g. United States v. Jerrold Electronics.
21. See e.g. S. Rep No. 698, 63rd Cong, 2nd Sess. 1 (1914); Standard Fashion Co. V. Magrane Houston Co, 238 U.S. 346 (1922).
22. 38 Stat. 731, 15 U.S.C. 14 (1958).
23. "Exclusive Dealing Arrangements under the Antitrust Laws," Virginia Law Review. 47:6750691, 1961.
24. 81 S. Ct. 623 (1961).
25. J. E. Meeks. "Concentration in the Electric Power Industry: The Impact of Antitrust Policy," Columbia Law Review, 72:64-130, 1972.

VI. BIBLIOGRAPHY

UTILITY ANTITRUST CASES

Collusive Dealing and Watershed Cases

City of Newark v. Delmarva Power and Light Co., 467 F. Supp. 763 (D. Del. 1979). p. 25

City of Groton v. Connecticut Light and Power Co., 456 F. Supp. 360 (D. Conn. 1978). p. 62

City of Mishawaka, Indiana v. American Electric Power Co., Inc., 616 F.2d 976 (1980).

City of Mishawaka, Indiana v. Indiana and Michigan Electric Co., 560 F.2d 1314 (1977).

Consolidated Gas Electric Light and Power Co. of Baltimore v. Pennsylvania Water and Power Co., 194 F.2d 89 (C.A. Md. 1952). Certificate denied 72 S. Ct. 1056, 343 U.S. 963, 96 L. Ed. 1360, 2 mems, p. 158.

First Iowa Hydro Electric Cooperative v. Iowa-Illinois Gas and Electric Co., 245 F.2d 630 (Ct. App. Iowa 1957).

Gainesville Utilities Dept. v. Florida Power and Light Co., 573 F.2d 292 (C.A. Fla. 1978). Certificate denied 99 S. Ct. 454, 493 U.S. 966, 58 L. Ed 2d 424. p. 77.

Lowe v. Consolidated Edison Co., 1 FRD 559 (1940).

Michigan Gas & Electric Co. v. American Electric Power Co., 41 FRD 462 (1966).

Montana-Dakota Utilities Co. v. Williams Electric Coop., 263 F.2d 431 (1959).

North Carolina Electric Membership Corporation v. Carolina Power & Light Co., 85 F.R.D. 249 (1979).

Otter Tail Power Co. v. United States, 410 U.S. 336 (1970).

Pennsylvania Water and Power Co. v. Consolidated Gas Elec. Light and Power Co. of Baltimore, 209 F.2d 131 (C.A. Md. 1953). Certificate denied 745. ct. 709, 347 U.S. 960, 98 L. Ed. 1104. p. 178.

Pennsylvania Water and Power Co. v. Federal Power Commission, 193 F.2d 230, 89 U.S. App. D. 235 (1951). Affirmed 72 S. Ct. 843, 343 U.S. 414, 96 L. Ed. 1042. p. 28, 398.

Pennsylvania Water and Power Co. v. Consolidated Gas, Electric Light and Power Co., 184 F.2d 552 (C.A. Md. 1950). Certificate denied 715 Ct. 282, 340 U.S. 906, 95 L. Ed. 655, 2 mems. p. 141.

Radiant Burners, Inc. v. People's Gas Light and Coke Co., 87 S. Ct. 365 (D. La. 1961).

Shavver & Son Inc. v. Oklahoma Gas & Electric Co., 432 F.2d 204 (1972).

Commonwealth Edison Co. v. Federal Pacific Electric Co., 208 F. Supp. 936 (D. Ill. 1962). p. 401

Sunflower Electric Co-op v. Kansas Power and Light Co., (C.A. Kan. 1979), 603 F.2d 791. p. 69

Tampa Electric Co. v. Nashville Coal Co., Tennessee 81 S. Ct. 623 (1961). 365 U.S. 320, 5 L. Ed. 2d 580 on remand 214 F. Supp. 647 pp. 125-128, 130, 141

West Texas Utilities Co. v. Texas Elec. Service Co., 470 F. Supp. 798. (D. Tex. 1979). pp. 41, 49, 53, 61, 63, 64, 65, 66, 71, 73, 75

Other Utility Antitrust Cases

Alabama Power Co. v. Alabama Electric Cooperative, Inc., 394 F.2d 672 (C.A. Ala. 1968). Rehearing denied, 397 F.2d 809. Certificate denied 89 S. Ct. 488, 393 U.S. 1000, 21 L. Ed. 2d 465. p. 122.

Almeda Mall Inc. v. Houston Lighting & Power Co., 615 F.2d 343 (1980).

Atlantic City Electric Co. v. General Electric Co., 226 F. Supp. 59 (D. N.Y. 1964). Appeal denied 337 F.2d 844. p. 248.

Atlantic City Electric Co. v. General Electric Company, 226 F. Supp. 59 (D. N.Y. 1964). Appeal denied 337 F.2d 844. p. 172.

Atlantic City Electric Company v. General Electric Company, 207 F. Supp. 620 (D. N.Y. 1962). pp. 281, 317, 332, 333

Bowen v. New York News, 366 F. Supp. 651, 1973.

Cantor v. Detroit Edison Co., Mich, 96 S. Ct. 3110 (1976). 428, U.S. 579, (1976) 49 L. Ed. 2d 1141. pp. 23, 36.

City of Lafayette, La. v. Louisiana Power and Light Co., 98 S. Ct. 1123, 435 U.S. 389, 55 L. Ed. 2d 364 (La. 1978). pp. 21, 23.

City of Shakpoe v. Northern States Power Co., Civ. No. 4-75-591 (D Minn 1976).

Commonwealth Edison Company v. Allis Chalmers Manufacturing Company, 315 F.2d 564 (C.A. Ill. 1963). Certificate denied S. Ct. 64, 375 U.S. 834, 11 L. Ed. 2d 64. p. 411.

Detroit City Dairy, Inc. v. Kowalski Sausage Co. Inc., 393 F. Supp. 453, 1975

Dillon Materials Handling Inc. v. Albion Industries, 567 F. 2nd 1299, 1978.

Gainsville v. Florida Power & Light Co., 488 F. Supp. 1258 (1980).

Gas Light Co. of Columbus v. Georgia Power Co., 313 F. Supp. 860 (1970 D. Ga). affirmed 440 F.2d 1135. Certificate denied 92 S. Ct. 732, 404 U.S. 1062, 30 L. Ed. 2d 750, rehearing denied 92 S. Ct. 1162, 405 U.S. 969, 31 L. Ed. 2d 244. pp. 46, 48, 137, 228, 398, 442.

Kentucky Rural Electric Cooperative Corporation v. Moloney Electric Company, 282 F.2d 481 (C.A. Ky. 1960). Certificate denied 81 S. Ct. 692, 365 U.S. 812, 5 L. Ed. 2d 691, rehearing denied 8/5 Ct. 799, 365 U.S. 855, 5 L. Ed. 2d 820. p. 62. also p. 117

Magnus Petroleum Co, Inc. v. Skelly Oil Co., 446 F. Supp. 874, 1978.

Michigan Gas & Electric Company v. American Electric Power Co., 41 F.R.D. 462 (D. N.Y. 1966). pp. 227; 332

Moore v. Jas. H. Matheus & Co., 550 F. 2nd, 1207, 1977.

Ohio Valley Electric Corporation v. General Electric Co., 244 F. Supp. 914 (D. N.Y. 1965). p. 255

Okefenokee Rural Electric Membership Corp. v. Florida Power and Light Company, 214 F.2d 413 (C.A. Fla. 1954). pp. 284, 315

Philadelphia Electric Company v. Westinghouse Electric Corporation, 308 F.2d 856 (C.A. Pa. 1962). Certificate denied 83 S. Ct. 883, 372 U.S. 936, 9 L. Ed., 2d 767. p. 411

Pitchford v. Pepsi Inc., 531 F. 2d 92, 1975.

Public Service Co. of N.M. v. General Electric Co., N.M. and Utah 315 F.2d 306 (C.A. Colo. 1963). Certificate denied 83 S. Ct. 169.5, 374 U.S. 809, 101. Ed. 2d 1033

Public Utility District No. 1 of Chelan County, Washington v. General Electric Co., 230 F. Supp. 744 (D. Washington 1964). p. 242

Region Properties, Inc. v. Appalachian Power Co., 368 F. Supp. 630 (D. Va. 1973). p. 22

Sahwuer and Son, Inc. v. Oklahoma Gas and Elec. Co., 463 F.2d 204 (C.A. Okl. 1972). p. 234

Solar Electric Corporation v. General Electric Company, 156 F. Supp. 51 (D. Pa. 1975). p. 432

Washington Gas Light Company v. Virginia Electric and Power Company, 309 F. Supp. 1119 (D. Va. 1970). Reversed on other grounds 438 F.2d 248. pp. 126, 129, 159

Washington Gas Light Co. v. Virginia Electric and Power Company, 438 F.2d 248 (C.A. Va. 1971). pp. 48, 203

Washington Gas Light Co. v. Virginia Electric and Power Company, 309 F. Supp. 1119 (D. Va. 1970). Reversed on other grounds 438 F.2d 248. pp. 201, 369

Lowe v Co. Edison, 1 FRD 559.

Sprague Electric Company v. Cornell-Dubleliar Electric Corp. 62 F. Supp. 1.

Stanley Novak d/b/a/ Supreme Tire Service v. General Electric Corporation, 282 F. Supp. 1010, 1967.

Ohio Valley Electric v. General Electric Co., 244, F. Supp 914, 1965.

Michigan Gas and Electric Company v. American Electric Power, 41 FRD 462, 1966.

Dalweld Company v. Westinghouse Electric Corporation, 252 F Supp 934, 1966.

Kentucky Tennessee Light and Power Company v. Nash, 37 F Supp 728.

Price v. Kentuckey Tennessee Light and Power Company, 136 F 2d 12.

General Gas Corporation v. National Utilities of Gainsville, Inc. 271 F. 2d 820.

Westinghouse v. Pacific Gas and Electric, 329 F. 2d 825.

Shotkin v. General Electric Co., 171, F. 2d, 236.

Camfield Manufacturing Company v. McGraw Electricity (right to choose) 70 F. Supp. 1977.

Williamson v. Colorado Gas and Electric, 110 F. 2d 75, 1947.

U.S. v. General Electric Co., 209 F. Supp. 169.

State of Washington v. General Electric Co., 246 F. Supp. 960.

City of Gainesville v. Florida Power and Light Company, 488 F. Suppl. 1258.

North Carolina Electric Membership Cooperation v. Carolina Power and Light Company, 85 F.R.D. 249 (D. N.C. 1979). p. 209.

City of Mishawaka, Ind. v. American Electric Power Company, Inc., 465 SF Supp. 1320 (D. Ind. 1979). Affirmed in part, vacated in part on other grounds 615 F. 2d 976. pp. 211, 218, 222, 236, 246, 249.

City of Mishawaka, Ind. v. Indiana and Michigan Electric Company, C.A. Ind. 1977, 560 F. 2d 1314. Certificate denied 98 S. Ct. 2274, 436 U.S. 922, 56 L. Ed. 2d 65. pp. 239, 245.

Philadelphia Electric Company v. Westinghouse Electric Company, 308 F 2d 856, 1962.

Montana Dakota Utility Company v. Williams Electric Corp., 263 F. 2d 431 (1959).

FRC v. Southern California Edison, 376 U.S. 205 (1964).

City of Newark v. Delmarua Power and Lights, 467 Supp. 763 1979.

U.S. v. General Electric Company, 358 F. Supp. 731; 1973.

Pennsylvania Water and Power Company v. FPC Series 193, F. 2d 230, affirmed in 72 S. Ct. 843.

LAW REVIEW ARTICLES

"Alabama Power Company v. Alabama Electric Cooperative: Rural Electrification and the Antitrust Laws--Irresistable Force Meets Immovable Object." 1969. Virginia Law Review 55:325.

"Antitrust Law-Monopolies-Unfair Trade-No violation of Section 3 of Clayton Act Found Because There Was Substantial Foreclosure of Competition in a Single Line of Commerce, Tampa Electric v. Nashville Coal Co., 365 U.S. 320 (1960)." 1961. Texas Law Review 39:913.

"Antitrust Laws-Enforceability of Requirements Contract Reasonableness of Restraint." 1962. Baylor Law Review 14:348.

Broadley, Joseph. 1976. "Legal Status Under the Antitrust Laws: A Summary Assessment." Antitrust Bulletin, p. 453.

"Cantor v. Detroit Edison Company." 1977. Hofstra Law Review 5:673-96.

"ERA boycott and the Sherman Act, J. Loutzenhiser." 1980. American Business Journal 17:507-19.

Hjelmfelt, D. C. "Exclusive Service Territories, Power Pooling and Electric Utility Regulations." 1979. Fed. B. Journal 38:21-33.

"Exclusive Dealing Agreements Under the Antitrust Laws." 1961. Virginia Law Review 47:675.

Halverson, J. T. and Lifland, W.T. "Franchisor-Franchisee Relationships-Antitrust Considerations." 1978. ABA Antitrust L.J. 47:869-952.

George, James A. "Free Enterprise Legality of Requirements Contract Under Section 3 of the Clayton Act," 1961. Louisiana Law Review 22:270-275.

Hale, G.E. and Rosemary. 1961. "Competition or Control v. Production and Distribution of Electric Energy." University of Pennsylvania Law Review 110:57.

U.S. Congress. Senate. Competitive Aspects of the Energy Industry. 1970. Hearings Pursuant to Res. 334 Before the Subcommittee on Antitrust and Monopoly of the Senate Committee on Judiciary. 91st Cong., 2nd Sess. Pts 1 and 2.

Johnson, Shirley. "Antitrust Snarls of Public Utility Promotional Programs." 1970. Georgetown Law Review 60:1253.

Kellman, Barry. "Deutilizing the Energy Industry: Planning the Solar Transition." 1980. UCLA Law Review 28:1.

Lackhart and Sacks. "The Relevance of Economic Factors in Determining whether Exclusive Arrangement Violates Section Three of the Clayton Act." 1952. Harvard Law Review. 65:913.

Meeks, James E. "Concentration in the Electric Power Industry,: The Impact of Antitrust Policy." 1972. Columbia Law Review 72:64.

Otter Tail Power Co. v. United States." 1973. Drake Law Review 23:186.

"Private Utilities: Threat of Corporate Destruction Does Not Legitimize Encluserary Conduct." Texas Law Review.

"Refusals to Deal by Vertically Integrated Monopolists." 1974. Harvard Law Review 87:1720.

"Requirements Contracts--Twenty-Year Contract to Purchase All Coal Requirements from Single Supplier Violates Section 3 and is Unenforceable Against Supplier." 1980. Virginia Law Review 46:1463.

- "The Impact of Antitrust Policy." 1972. Columbia Law Review 72:64.
- "The Otter Tail Power Case: Regulation by Commission of Antitrust Laws." 1973. Sup. Ct. Rev. 99-122.
- "The Scope of Antitrust and Other Economic Regulatory Policies." 1967. Harvard Law Review 82:1207.
- "Trade Regulation--Clayton Act Section 3--Requirements Contracts--Substantial Share of Relevant Market--Tamps Elec. Nashville Coal Co.." 1972. Boston College Industrial and Commercial Law Review 29:442.
- "Otter Tail and Its Import for Regulated Industries." 1973. Wake Forest Law Review 9:407.

OTHER REFERENCES

- Bates F. J., and Hall. E. H. Assessment Document for Supplemental and Alternative Generation Technologies for REA-financed programs. Report for Rural Electrification Administration by Battelle Columbus Laboratories, USDA Contract. No. 53-3158-0-48107. June 11, 1981. (In press.)
- Britt, J. S., Shulte, C. W. and Davey, H. L. Heliostat Production, Evaluation, and Cost Analysis, Report for the Solar Energy Research Institute by G. M. Transportation Systems Center, General Motors Corporation, Warren, Michigan, December, 1979 (SERI/TR-8052-1)
- Drumheller, K., Schulte, S. C., Dilbeck, R. A., and Long, L. W. Heliostat Manufacturing Cost Analysis, Volume I, Report for Solar Energy Research Institute by Battelle Pacific Northwest Laboratories, Richland, October, 1979 (SERI/TR-8043-1).
- Drumheller, K. Cost of Heliostats in Low Volume Production, Report for Solar Energy Research Institute by Battelle Pacific Northwest Laboratories, Richland, January, 1980 (SERI/TR-8043-2).
- Carter, C. F. and Williams, B. R. Investment in Innovation, London: Oxford University Press, 1958
- Electric Power Research Institute, Policy Planning Division. Overview and Strategy: 1981-85 Research and Development Program Plan, Palo Alto, California: Electric Power Research Institute, October, 1980. pp. i-ii.
- Fox, J. Ronald. Arming America: How the U.S. Buys Weapons, Cambridge, Massachusetts: Harvard University Press, 1974.
- Kamien, M. I. and Schwartz, N. L. "Market Structure and Innovation: A Survey." Journal of Economic Literature, 13 (1), 1975, 1-37.

Mansfield, Edwin. "The Anatomy of the Product-Innovation Process: Cost and Time," In E. Mansfield, Research and Innovation in the Modern Corporation, New York: W. W. Norton and Company, 1971, pp. 110-135.

Mansfield, Edwin. Industrial Research and Technological Innovation: An Econometric Analysis, New York: W. W. Norton and Company, 1968.

Mansfield, E. Microeconomics: Theory and Applications. New York: W. W. Norton and Company, 1970, pp. 178-184 & 367-374.

Masson, Robert T. and Qualls, P. David (Eds.), Essays on Industrial Organization in honor of Joe S. Bain, Cambridge, Massachusetts: Ballinger Publishing Company, 1976.

Mavis, C. Sandia Livermore Laboratory, Personal Communication, October 2, 1981.

Nelson, W. Stewart. Mid-Continent Area Power Planners: A New Approach to Planning in the Electric Power Industry. East Lansing, Michigan: Michigan State University Public Utilities Studies, Graduate School of Business Administration, 1968.

Pacific Northwest Laboratory, Export Potential for Photovoltaic Systems. Report for U.S. Department of Energy, Assistant Secretary for Conservation and Solar Applications, February, 1979, p. 6.7.

Scherer, F. M. Industrial Market Structure and Economic Performance. Chicago: Rand McNally & Company, 1971

Scherer, F. M. The Weapons Acquisition Process: Economic Incentives. Boston: Graduate School of Business Administration, Harvard University, 1964.

Schuman, S. C. "How Plant Size Affects Unit Costs," In C. Chilton, ed., Cost Engineering in the Process Industries, McGraw-Hill 1960 pp. 307-310.

Shepherd, William C. The Economics of Industrial Organization, Englewood Cliffs: Prentice Hall, Inc., 1979

Wall Street Journal, September 15, 1981, p. 25.

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