

A MARKET APPROACH TO SITING TRANSMISSION FACILITIES IN  
MINNESOTA AND NORTH DAKOTA

by

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ABSTRACT

The siting of a linear facility connecting two or more points (eg. transmission line, highway) involves two tasks: (1) an efficient path must be selected based on the combination of construction costs, local impact costs, and other environmental costs; and (2) individuals along the paths must be properly compensated for any adverse effects the facility may cause them if local opposition to an otherwise socially desirable facility is to be avoided. Current siting processes have been limited by the difficulty of assessing local impact costs which to a large extent depend on the personal preferences of individual landowners. This thesis develops a variation of an approach introduced by O'Hare for creating a market for development rights within which local costs are made explicit through the competitive behavior of individual landowners. Each landowner within a designated corridor is asked to specify the amount of compensation he would require in order for him to allow the facility to cross his land. This produces a local impact cost function over the corridor that can be used in conjunction with a construction cost function and other environmental considerations to determine an optimal path and the appropriate amount of compensation to each of the landowners along that path. A case study of the routing of a high voltage transmission line crossing portions of Minnesota and North Dakota under the current siting laws of those states is presented and an implementation of this method in that context is discussed.

Name and Title of Thesis Supervisor: Michael O'Hare,  
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## I. INTRODUCTION

An issue that has aroused concern in recent years is increased local opposition to large facilities that are socially beneficial but locally noxious (e.g. prisons, power plants, waste treatment facilities, etc.). Many local groups have successfully used delay tactics to block or stall such projects, causing the society as a whole to do without many important facilities.

Interest has been developing among researchers and policymakers to find better ways of resolving such conflicts. One approach, suggested by O'Hare (77) involves the use of an auction procedure to incorporate local concerns into the site selection process.<sup>1</sup> His proposal involves the creation of a "market" for development rights in which local communities offer to sell a developer the right to locate in their towns in competition with other communities. In this way the problem of local opposition is resolved by allowing communities to determine the amount of compensation they would require to accept such project. Furthermore, an appropriate level of the facility's social costs would be defined and incorporated into the site selection process.

This thesis will develop a variation of the auction model for siting facilities which lie along a narrow path connecting two designated points, such as transmission

lines, highways, and pipelines. To make the discussion of the issues more concrete, we will develop this model in the context of the controversy surrounding the siting of transmission lines in Minnesota and North Dakota. We shall first examine the reasons for local opposition to these facilities within the framework of the existing siting processes in these States. Our focus will be on a controversial 400KV transmission project that was recently routed in the two states. In the second chapter we will present a theoretical discussion of an auction process for siting "linear" facilities. In the third chapter we present a strategy for implementing that process for transmission line siting in Minnesota and North Dakota, and in the final chapter, we will discuss the market approach to siting facilities from a planning perspective.

II. AN ANALYSIS OF THE OPPOSITION TO TRANSMISSION FACILITIES  
AND CURRENT STATE RESPONSES IN MINNESOTA AND NORTH DAKOTA

In Minnesota and North Dakota, one of the most controversial issues in recent years has been the siting of a high voltage transmission line across the two states. Landowners from across the affected counties have consolidated into various opposition groups to block the project. Some want the project to be scrapped entirely, while others want it to be rerouted to cross less productive agricultural lands. The controversy began in the summer of 1974 when two Minnesota utility cooperatives, the United Power Association and the Cooperative Power Association (UPA/CPA), announced a project that would transmit power from their mine-mouth power plant in McLean County, North Dakota to Duluth, Minnesota (approximately 427 miles). Since then numerous public hearings have been held on the subject and the siting authorities in both states have approved a specific route for the line within their borders.

In Minnesota, the State's intervention so far seems to have only hardened the resistance of the opposing landowners. They angrily accused the state of failing to address their concerns adequately in the siting process. A year long delay with no end in sight has frustrated the two utilities. Since December, 1976, a moratorium has been imposed on all surveying work in Minnesota until the State's

Supreme Court makes a decision on seven separate suits filed against the utilities by opposition groups.

In North Dakota, the intensity of the opposition subsided somewhat after the State designated a route, but the compromise was not a satisfactory one to all of the landowners.<sup>2</sup>

There are two major aspects of the landowner's opposition to UPA/CPA's transmission facility: the direct adverse impacts transmission facilities have on landowners; and the grievances the landowners have over the way their concerns have been handled by the utilities and the state in the site selection process.

A. Impacts from Transmission Facilities

1. Interference with Agricultural Activities. A major problem landowners have with transmission facility is its interference with agriculture, which is the leading industry in both states. Ninety-five percent of the land in Minnesota is cropland,<sup>3</sup> and ninety-seven percent of the land in North Dakota is devoted to farming and ranching.<sup>4</sup> The towers and lines actually take very little land out of production. Only those areas occupied by tower footings are wholly removed from use. They generally do not exceed .03 acres per tower with an average of four towers per mile.<sup>5</sup> Their presence, however, imposes a number of adverse impacts upon the farming operations in fields along the route.



First, irrigation operations are vulnerable to the routing of transmission lines. An irrigation system widely used in these two states is the center-pivot sprinkler system which can effectively irrigate a quarter section of land (131 acres) at a time.<sup>6</sup> A tower anywhere in the quarter section other than in the four corners would prevent center-pivot irrigation. This problem is of concern to landowners with irrigated field as well as those whose fields have the potential of being irrigated in the future. Drier weather in recent years has caused a trend toward the installation of such systems. Irrigation in North Dakota increased by 18% between 1974-1975, and forecasts by county soil conservation specialists and Agricultural Cooperative Extension personnel indicate that this trend will continue over the next few years.<sup>7</sup>

Second, many large scale farm machines such as combines are not easily maneuvered around the towers. Bill Michelson Jr., a North Dakota farmer who copes with nine towers in his field describes the problem in this way:

"In the first place, you've got to be very careful when you are swathing so that you go around the tower from the right direction or the combine can not get that close on account of the grain auger. It does not always work out that you are going the right direction with the swather so you have to turn short and go around to the other side of the tower. This means you leave some grain and then the next round you have to run over some which you have already cut. So there is always some waste each and every year."<sup>8</sup>

Besides the waste and the additional work, maneuvering

machines near towers tends to increase the rate at which machines breakdown due to accidental hits with tower legs.

Third, the presence of lines and towers may interfere with aerial spraying, which is used extensively in Minnesota and North Dakota for seeding, fertilizing, controlling weeds, and treating plant diseases. A pilot can usually cope with the presence of a single line, but his task becomes very dangerous or even impossible if additional obstacles such as shelterbelts and distribution lines are in close proximity to the transmission line. In addition, he may have some difficulty judging the location of the lines if they are aligned diagonally across a field.

2. Other Impacts. Visual and noise impacts, health and safety concerns, and radio and television interference are also associated with high voltage transmission lines. However, they have not played a major role in the controversy in Minnesota and North Dakota yet.

B. The Inability of Landowners to Influence The Site Selection Process

The direct impacts from transmission lines are serious problems for landowners, but to many, the more irritating problem has to do with the way they have been dealt with during the siting of transmission lines. Harold Hagen, president of a prominent local opposition group, has said that his group is not opposed to electricity, but they are

opposed to the procedures used by the utilities.<sup>9</sup>

In both states, utilities have been granted the State's power of eminent domain to acquire transmission easements from unwilling landowners. Landowners have little recourse other than to dispute the amount of compensation paid for the easement, taking the company to court when the two parties cannot reach an agreement.

Landowners in Minnesota and North Dakota, who have traditionally placed a high value on their right to control the use of their property, have attempted to chip away at the utilities' eminent domain power. In 1976, a group of landowners in Burleigh County, North Dakota asked a district court to deny a utility the power of eminent domain on the grounds that it existed solely to transmit power out-of-state, therefore did not serve any public purpose in North Dakota. The district court affirmed their contention, but the decision was later overturned by the North Dakota Supreme Court.<sup>10</sup>

State legislation recently passed in the two states, however, did restrict a utility's use of eminent domain to state approved routes, and provisions were made to give affected landowners a greater voice in routing decisions through public hearings and citizen advisory committees.

To analyze the effects the siting legislation has had on the opposition problem, we will first examine the

procedures of the siting process as it is stated in each State's siting legislation, then we will examine how the controversial UPA/CPA project was routed under the two siting laws and how the process was viewed by landowners opposed to the project.

1. The Current Siting Process in Minnesota and North Dakota. The Minnesota legislature passed the State's Power Plant Siting and Transmission Line Routing Act in 1973, and placed its administration under the Minnesota Environmental Quality Council (MEQC).<sup>11</sup>

A two-tier review process was established for the routing of transmission lines. The Council first approves a general corridor for the line, whose width may be variable up to approximately 19 miles. The Council then designates a specific route within the corridor. Route width may be up to one kilometer which still leaves the utility some choices in the actual right-of-way. In both processes, the Council is given 180 days to issue a permit after the receipt of an application, and its decision supersedes and preempts all local regulations.

In the corridor review process, the Council evaluates alternative corridors in light of their construction cost considerations, their impacts on local landowners and environmental interests. It may appoint a corridor evaluation committee to help assess the various alternatives.

Committee members, who are appointed by the Council, must include at least one representative from a public or municipally owned utility, a cooperatively owned utility, a regional council, and each of the county and municipal corporations in which the transmission line corridor is to be located. A committee of similar composition must be appointed during the route selection process.

The siting legislation and the rules and regulations subsequently issued by MEQC did not specify any criteria for the selection of a route within the corridor.

The Act also provided that all of the state agencies which are authorized to issue permits for the construction and operation of high voltage transmission lines shall participate in the public hearing process by clarifying whether the proposed corridors and routes will be in compliance with their own rules and regulations. This helps to ensure coordinated action among state agencies who have separate responsibilities for the same project.

The siting act also gave the MEQC the authority to develop an inventory of potential sites for power plants and transmission line corridors. The MEQC has refrained from doing this, however, arguing that it would result in a finite number of sites based on very inflexible criteria. Besides, as a practical matter, the State did not have and could not afford the financial and technical

resources needed to develop such an inventory. Instead, the Council prepared an inventory designating "exclusion areas" and "avoidance areas". A transmission line is not allowed to pass through an exclusion area under any conditions, and passage through an avoidance area is permitted only if it can be shown to the Council's satisfaction that there are no reasonable alternatives. Exclusion areas include national and state wilderness areas, areas in which the presence of a line would violate federal and state agency regulations, and any other area designated as "exclusionery" by the Council. Avoidance areas consist of areas with valued historical or natural features, including national and state parks, national monuments, wildlife refuge areas, and county and city parks.

Activities of the Council are financed from an annual assessment made by the Council against the utility.

North Dakota passed its siting act in 1975 and charged the Public Service Commission with its administration (PSC).<sup>12</sup> There are only a few differences from Minnesota's law (which served as its model).

First, the North Dakota siting law places different constraints on the size of the area that has to be examined in designating a corridor or a route. It limits the width of a corridor to between one and six miles, and the width of a route to coincide with the right-of-way required by a

transmission line.

Second, North Dakota has developed more restrictive criteria for designating "exclusion" and "avoidance" areas. It placed some of the sites designated as avoidance areas by MEQC under the exclusionary category. Furthermore, it included in its avoidance category a number of areas that were not included by MEQC such as woodland and irrigated land.

Third, although the PSC is given the authority to appoint an advisory committee composed of citizens from the affected area and representatives from utilities and state agencies, it is not required to do so at any stage of the review process.

2. The Siting of UPA/CPA's High Voltage Transmission Line. To date, the UPA/CPA line is the only major transmission project that has been routed under the 1973 Minnesota siting law. Planning for the 400KV DC line began several years before the siting law was enacted and the two utilities could have argued for its exemption from the law. But they opted to have the route designated under the siting law because of the threat of intense local opposition and potential problems with county zoning regulations.<sup>13</sup>

The line will transmit power from the Cooperatives' mine-mouth power plant in McLean County, North Dakota to Duluth, Minnesota. The proposed right-of-way is 160 feet wide and

approximately 427 miles long, 172 miles in Minnesota and 255 miles in North Dakota. Typical land uses in the region crossed by the proposed route include cropland, pastureland, and native rangeland. The UPA/CPA estimated that the total land area that will be taken out of production due to the placement of towers would be 49 acres.<sup>14</sup>

The utilities submitted an application for a corridor in April 1975, which included preliminary engineering, environmental, and cost analyses for its preferred and alternate corridors. The MEQC staff recommended three other corridors for consideration. The Corridor Selection Committee recommended a substantially different corridor that crossed less productive agricultural land.<sup>15</sup>

During July and August of that year, eleven public hearings were held in counties where the various corridors were proposed. A number of citizen groups participated extensively in the hearings, including "Counties United for Rural Environment", "Keep Towers Out", "No Power Lines", "Concerned Douglas Citizens", and several irrigation associations. Representatives from environmental and public interest groups were also present.

After considering all of the evidence and data presented by the utilities, landowner groups, and state agencies, the hearing officer recommended the UPA/CPA preferred corridor to the MEQC, stating that the estimated benefits

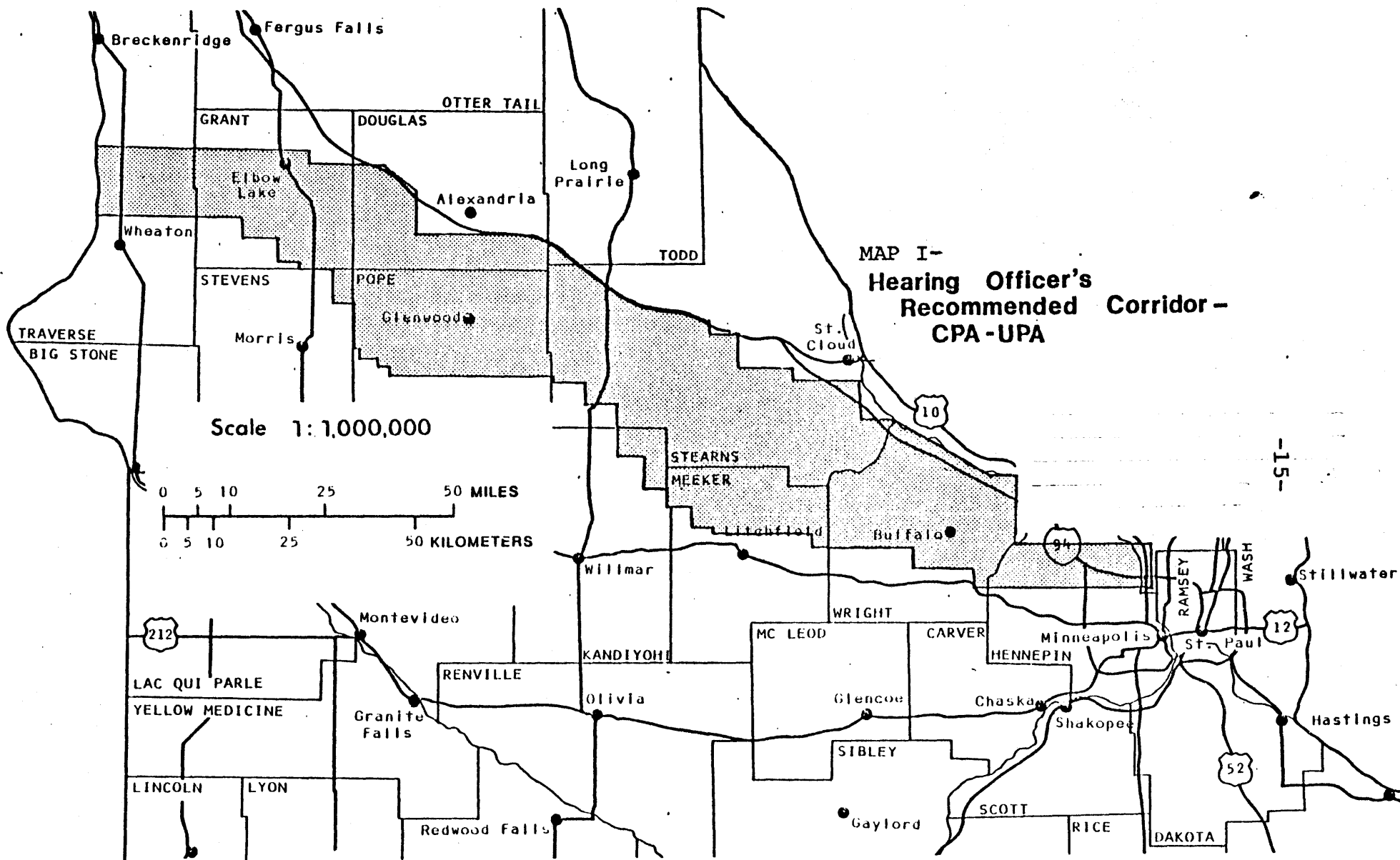


of the other corridors could not justify their increased construction costs. His recommendation was adopted by the Council on October 3, 1975 (see Map I).

Following the corridor designation, UPA/CPA filed an application for a construction permit for a specific route within the designated corridor. The proposed route basically followed a straight line between the two terminal points, crossing many stretches of prime cropland diagonally. Several alternative routes were proposed by MEQC's siting staff and the Citizen Route Evaluation Committee. Again public hearings were held in the affected areas to hear the concerns and preferences of landowners.

The final route selected by MEQC generally follows the UPA/CPA preferred route, but made some deviations in the central Minnesota section. A series of diagonal crossings were revised to go along field edges and property lines. In addition to routing alterations, MEQC increased the ground clearance for conductors over cropland from 35 to 50 feet.<sup>16</sup>

The construction permit for the route was issued in MEQC's meeting on June 3, 1976. Approximately 200 people from the affected counties went to that meeting, most as participants of their local protest groups. Spokesmen were appointed to present their positions to the MEQC. Throughout the meeting, the crowd noisely disapproved of



Source: The Minnesota Environmental Quality Council  
 St. Paul, Minnesota

remarks made by the MEQC. After the meeting, over 50 of them marched angrily to the adjoining capitol building, threatening to fight before permitting surveyors and construction workers on their land.<sup>17</sup>

Anthropologist Luther Gerlach observed that including citizen participation in MEQC's routing process seems to have increased the differences between opposing interests. In particular, the process of presenting testimony and cross-examining witnesses during the public hearings tended to increase the antagonism.<sup>18</sup>

Landowners had many grievances against the review process. Some were bitter that their participation did not result in major route changes. They felt that their participation only served to legitimize MEQC's actions. Others complained about the fact easement compensation is still determined by utilities. Under the siting law, once a route has been given the State's blessing, the utility can proceed with construction by paying a set amount to landowners crossed by the route. Even through the amount of compensation offered by UPA/CPA was record high (see Table I), many landowners were not satisfied. Virgil Fuchs, a landowner whose farm lies along the approved route, said: "If they (utilities) have to give farmers the true value of the land, this wouldn't be the cheapest way anymore."<sup>19</sup> As of December, 1976, the utilities had

Table I

STANDARD EASEMENT FEES PAID TO  
LANDOWNERS FOR THE UPA/CPA PROJECT, 1976

	untillable	tillable, parallel alignment	tillable, diagonal alignment
payment per tower	\$1,000	\$2,000	\$3,000
payment per mile of overhang	\$1,000	\$3,000	\$3,000
total payment* per mile	\$5,000	\$11,000	\$15,000

\* The average tower spacing is four per mile.

SOURCES: McConnon, Dan, United Power Association, Environmental  
and Safety Division, March, 1977.

only obtained 23% of all the easements it needed.<sup>20</sup>

Frustrated by their lack of power to affect changes, many landowners resorted to harrassing utility employees to block the line's construction. They milled about in front of the surveyors, carried signs to block their view, and interfered with walkie-talkie communication by running chain saws and tractors. On a few occasions, tempers ran short and scuffles broke out. The Meeker County District Court refused the landowners' request to halt the power line survey and enjoined them from interfering with surveyors. However, neither county or state officials wanted the responsibility of enforcing the Court's order.<sup>21</sup>

To prevent an incident, a moratorium has since been imposed on further surveying work until the Minnesota State Supreme Court makes a decision on a case consolidating seven separate suits filed against the utilities. All of the suits were filed by local groups attempting to halt surveying activities. An attorney representing the landowners argued that a confrontation between the landowners and surveyors would be explosive, and such confrontations would violate the landowner's civil constitutional rights to an equal protection under the law.<sup>22</sup>

The UPA/CPA line is also the first to be routed under the North Dakota siting law. The PSC issued an order taking jurisdiction of the line on March 6, 1976. Since

by that time the utilities had already obtained more than 70% of the easements they needed in North Dakota, the PSC decided to accept their proposed corridor without holding hearings or checking into alternative corridors. It also decided to route the line within all easements acquired so long as they did not violate the facility routing criteria formulated by the Commission.<sup>23</sup> These decisions were challenged by the County Association for Rural Environment (CARE) as being "contrary to the law", but the court ruled against the CARE.<sup>24</sup>

Fifteen days of public hearings on UPA/CPA's route permit application were held, producing more than two thousand pages of testimony from a hundred witnesses. The majority were landowners who owned land along the route. Most of their suggestions concerned the placement of power lines along section or quarter section lines rather than diagonally across fields, and the elimination of towers from cropland and potentially irrigable land. In some cases, the affected landowners presented an alternate route to the PSC. In general, the hearings went smoothly and seemed to have resulted in some constructive exchanges between landowners and UPA/CPA representatives. Some landowners stated after the hearings that they appreciated the opportunity to speak their piece, even if it did not lead to a favorable change.<sup>25</sup>

The PSC designated route followed the utilities' preferred route, but included a number of adjustments which steered the structures away from cropland and potentially irrigable fields. Later, CARE and several individual landowners in Richland and Sargent counties petitioned for a relocation of the route in that area. The petition was denied by the PSC.

By and large, although private grumbling among North Dakota landowners has continued after PSC's designation, organized opposition to the line has dissipated. It should be noted that the intensity of the opposition in North Dakota was never at the same level as it was in Minnesota.

3. An Analysis of State Responses. The two states have nearly identical route selection processes, yet the success each had in handling the UPA/CPA case was quite different. In Minnesota, the process seems to have intensified the opposition, while in North Dakota the process led to some constructive compromises between the opposing groups even though opposition was not completely eliminated. One possible reason for this is simply that Minnesotan landowners are more strongly opposed to transmission lines. Another important consideration is that in North Dakota, the public hearing process focused on only local adjustments to an already established route,

since the utility had obtained most of the easements it needed when the line came under the jurisdiction of PSC. Thus the negotiations were about very concrete issues concerning individual landowners and the dialogue between them and the energy companies was reasonably productive. In Minnesota, on the other hand, the MEQC had to choose a corridor and then a route within it. Making an acceptable decision in these cases involved finding a route that is sensitive to the utilities' costs and agreeable to the landowners along it. The public hearing process is poorly suited for this task. While it can make small incremental changes in a route in responses to complaints from individuals (as was the case in North Dakota), it cannot anticipate the local reaction to a given route and it has no effective way of choosing one route over another in a manner acceptable to the different groups of landowners along those paths. Consequently, MEQC had no way of improving the situation for the impacted landowners since any global change to the route makes a different set of landowners unhappy.

In the next section, we will introduce a market approach to siting transmission lines which will address this problem.



### III. A MARKET APPROACH TO SITING LINEAR FACILITIES

In this chapter we will discuss an approach to siting a linear facility that has two principal objectives: (1) to select the most efficient route in terms of the combined costs to the developer and the landowners, and (2) to reduce or eliminate local opposition by giving landowners increased control over the use of their land and the compensation they are paid. In essence, the approach involves the creation of a market for development rights in which landowners in competition with their neighbors sell a developer the right to cross their land.

#### A. Selecting an Optimal Route

Figure 1 shows an example of a path P connecting two points through a corridor C. The total cost to society of constructing a facility along this path can be decomposed into three components: its construction cost, local impact costs, and environmental costs. The construction and local impact costs of a facility have the nice property that they can usually be expressed conveniently in terms of cost per unit length at a given location. For example the construction cost per mile of a high voltage transmission line is much higher over heavily forested terrain than it is over open range land with good access roads. Similarly, the local impact cost of a transmission

line is much higher over farmland where center-pivot irrigation is used than it is over pasture land. In addition, the local impact cost per mile of transmission line depends on the personal preferences of the individual who owns the land it crosses. The environmental costs of the facility along the path P are all the other non-local costs due to the facility. These shall not be addressed in this paper.

Given a corridor C and a specific facility X, the local nature of the construction and local impact costs makes it possible to define two cost functions f and g over the corridor C. For each location s in the corridor:

f(s) is the cost of constructing a unit length of the facility X at location s.

g(s) is the local impact cost due to a unit length of the facility X at location s.

In these terms, the combined construction and local impact cost of a facility X constructed along a path P through corridor C is:

$$\text{path-cost}(P) = \int_P [f(s) + g(s)] dl$$

which is the line integral along the path P of the combined corridor cost function f and g.

It is convenient to view the corridor C as a grid of many small parcels of land so that the functions f and g can be treated as constants over each of them

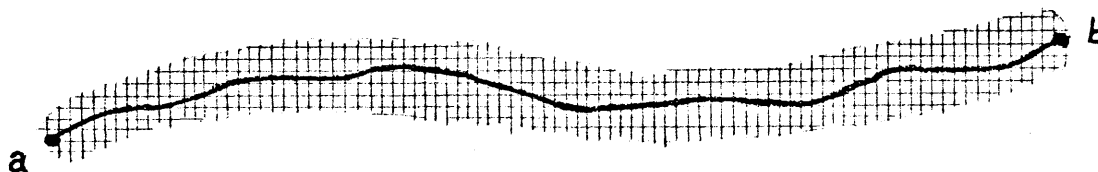


Figure 1. A path (solid line) is shown connecting the points a and b through a corridor (grid pattern).

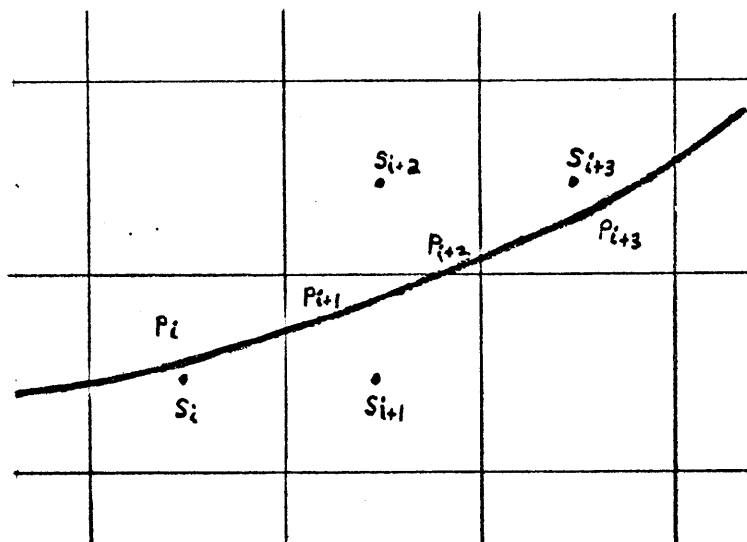


Figure 2. This enlarged view of a portion of figure 1 shows how the grid partitions the path into segments ( $P_i$ ). If each grid square is small enough, the local impact cost and construction cost associated with a unit length of the facility will be essentially the same no matter where it lies within the square. Thus the combined cost for the segment  $P_i$  can be expressed as  $[f(s_i) + g(s_i)] \times [\text{length of } P_i]$  where  $s_i$  is the center of the square.

(see Figure 2). These parcels could correspond to individually owned lots of land or they could be smaller if there are construction and impact cost differences within an individual's land. This grid breaks a path P into many segments  $P_i$  contained in a sequence of grid squares which we shall identify by their centers  $s_i$  so that:

$$\text{path-cost}(P) = \sum_{i=1}^n [f(s_i) + g(s_i)] \times [\text{length of } P_i]$$

There are infinitely many paths P through the corridor C connecting points a and b, of which the most interesting path is the one that costs the least. We shall refer to this as  $P_{\text{optimal}}$  and it obviously depends on the functions f and g.  $P_{\text{optimal}}$  can be determined in a straight forward manner using a computer provided that the cost functions f and g are known. Companies can often determine the construction cost function f adequately, but unfortunately the local impact function cannot be specified easily because it depends on individual preferences which can be very imprecisely expressed when solicited from landowners as opinions.

#### B. Local Opposition

In current facility siting practice, a developer must commit himself to a particular path and then attempt to acquire the development rights to the land crossed by

that path. This gives landowners a great deal of market power, especially after a significant proportion of the land has already been acquired. In response to this problem, developers have been motivated to begin acquiring land covertly well in advance of construction, and for projects of value to the state, they have been granted the power of eminent domain.

Such practices, especially the use of eminent domain, are distasteful to landowners along the facility's path for three reasons: (1) the developer is motivated to underestimate the real cost to the landowner, (2) the eminent domain process is insensitive to the less tangible local impact costs such as personal preferences, and (3) the use of eminent domain severely limits a landowner's ability to control the use of his land. The combination of these problems creates resentment among many impacted landowners and opposition to the project from them is common and often resolute.

#### C. An Auction Scheme For Linear Facilities

O'Hare has considered similar problems associated with the siting of facilities such as power plants and prisons, and has demonstrated that: (1) in order to put such facilities in the right place and overcome local opposition, it is strategically important to compensate

those communities that are adversely affected by the project, and (2) the correct amount of compensation can be determined through an auction process in which designated communities bid, in competition with each other, the amount of compensation they would require in order to accept the facility. The location promising the lowest sum of construction and compensation costs will be selected.

The important characteristic of O'Hare's scheme is that a facility's impact costs are determined by allowing communities to (offer to) trade its impacts for money in a market situation. The same principle can be applied to siting linear facilities with more elegance and equity than is possible for point facilities (e.g. prisons).

In this case, the auction is used to derive the local impact cost function,  $g$ , by asking each landowner in the corridor to make a binding bid in terms of the amount of compensation per unit length of the facility that would be required for him to agree to having it cross his land. This cost function would then be used in conjunction with the facility's construction cost function to select an optimal path through the corridor, and to compensate landowners.

The key assumption behind this approach is that the landowners will submit bids very close to the true cost of the facility to them. It is motivated by the following

considerations:

(1) a rational landowner will not submit a bid that is lower than the facility's cost to him, provided that he has the ability to estimate that cost accurately, and

(2) a rational landowner will not submit a bid very much higher than the facility's cost to him, provided that he is in competition with other landowners.

In the following sections, we shall discuss the major issues affecting the validity of these considerations.

#### D. Corridor Selection

In the basic auction scheme described above, no restrictions on the domain of the cost functions were considered. In practice, the width of the corridor that constitutes the domain of the impact and construction cost functions will be limited; thus the optimal path selected is very dependent on the particular corridor used.

There are several sources of constraints on the width of the corridor. First, there are three constraints associated with the development of the local impact cost function: (1) the corridor should be wide enough so the auction process appears fair, (2) the corridor width should not go beyond the point where the administrative cost of obtaining more bids exceed the expected benefits of having

more alternatives, and (3) the corridor should be narrow enough to give landowners who want the facility a reasonable chance of getting it; if it is too wide, his willingness to invest his time and money in preparing a bid would be reduced. Second, the cost of preparing the construction cost function may also limit the width of the corridor, especially for projects that require extensive geological or other site-specific studies. Third, if the auction method is used within an existing siting process, there may be corridor width limitations imposed by it.

Because its width is limited, the particular route the corridor takes is important and must be determined based on construction, local impact, and environmental cost considerations. While it may not be possible to develop precise cost functions for each of these on a large scale, rough estimates can usually be made that are useful for incorporating the State's various concerns into the corridor selection process. The exclusion and avoidance zones used by Minnesota and North Dakota is an example of how the state can incorporate estimates of local impact and environmental costs into the corridor selection process.

E. Market Power

In principle, the bids would be near the true impact



cost of the facility to the landowners since they are submitted in a competitive situation. However, this may not be the case for all the landowners in the corridor either because a portion of the corridor is very narrow, or because a group of landowners across some portion of the corridor have agreed among themselves not to compete. In such cases, those individuals with market power could extract a substantial profit over and above the true cost of the facility to them, draining much of the facility's benefits.

A major difficulty in dealing with this type of problem lies in distinguishing artificially high bids from bids that reflect real impact costs. For this reason, the most effective policy is to widen the corridor locally to include more competitors near regions where the average bids submitted are significantly higher than the average for the whole corridor, allowing all the landowners there to submit new bids (if they want to). If this is possible (sometimes construction or environmental considerations will prohibit this), the coalition, if there was one, is likely to be broken or weakened since the desirability of a coalition over bidding individually diminishes as the number of landowners sharing the profit increases. If there was no coalition, nothing is lost, and the likelihood of finding a route that

causes less impact is increased.

If the corridor cannot be widened sufficiently, the only remaining recourse is to fall back on the use of eminent domain. However, the problem of distinguishing artificially high bids from high bids due to real impacts remains. Perhaps the best compromise is to set a very generous threshold (several times higher than the easement fees currently paid) on the bids that would be accepted and use eminent domain, paying the threshold value, in cases where the bid was higher. This strategy would protect most landowners while limiting the size of the profits that could be taken by individuals possessing market power.

F. Information Requirements.

In order to have an effective market process, each landowner in the corridor must be able to make a bid that is consistent with his interests. To do this, he must have an accurate understanding of how the facility will affect him, and he must be familiar with the way this market works.

Fortunately, impacts from linear facilities are usually confined to the region near their sites, so each landowner only has to consider the impacts from that portion of the facility which crosses his land. This

means that the amount of information a landowner has to deal with is a lot less than what a more centralized organization would have to deal with if it had to evaluate the facility's overall impact. In addition, so long as he understands the objective characteristics of the facility, a landowner is probably in a better position to assess its local impacts than anyone else since the severity of the impacts is largely dependent on the way he uses (or intends to use) his land and on his personal preferences.

However, this is a new responsibility for the landowner and he may require information and technical support in making a decision. The developer would be eager to provide information to counter local misconceptions about the facility, but he would also be motivated to downplay its drawbacks. The state is a more credible source of information, but if it does not have the proper technical resources or funds allocated for this purpose, the landowners themselves will have the responsibility of obtaining the information they need. If an appropriate landowner's organization exists or can be established, they could pool their resources to hire consultants and to seek additional funding from the state and the developer to support their effort.

Each landowner must also understand the way the

development rights market works if he is to compete effectively in it. In particular, he must know whether there is an upper bound on the size of his bid; that is can he expect any bid he submits to be respected (the use of eminent domain is eliminated) or is there a threshold above which the developer will override his bid in favor of using eminent domain. If there is a threshold, the auction process will only be meaningful to those landowners whose true impact costs are below it. The landowner must also know what the implications of not submitting a bid. If eminent domain cannot be used by the developer, then the landowner should understand that no bid implies that he does not want the facility. If there is a threshold, then no bid implies that his land will only be used through eminent domain, and so his "default" bid is the value of the threshold.

IV. A SCHEME FOR USING THE AUCTION IDEA TO FACILITATE THE SITING OF TRANSMISSION LINES IN MINNESOTA AND NORTH DAKOTA

The auction concept for siting linear facilities is particularly well-suited for the transmission line siting problem in Minnesota and North Dakota for the following reasons:

(1) The impacts generated by these facilities are generally confined to their sites and affect only those landowners on whose land it lies, so the facility's local impact costs are much more significant than its "environmental" or non-local impact costs.

(2) The local impacts of transmission facilities are tangible and landowners are generally technically competent in estimating the facility's cost to them. Furthermore, there's little unknown or unpredictable risk with which bidders must deal.

(3) There are many local landowner's organization such as the Farmer's Union and irrigation associations which can help the landowner with his information requirements.

(4) The relative homogeneity of the land use in that area simplifies issues around three well-defined groups: the farmers, the developer, and the state.

The auction idea, however, is untested and it would have the best chance of being used if it could be implemented conservatively with a minimum of change to the State's

existing siting process. One possibility is for the state to simply raise the minimum eminent domain fee significantly, setting a threshold as discussed in the previous chapter in order to motivate developers to use the auction idea themselves, within the state's existing siting process. The feasibility of this scheme hinges on the following questions: (1) Can a company solicit binding bids from landowners without the backing of state law, and (2) can it do this within the confines of the existing facility siting process. In the following sections, we shall attempt to show that these questions can be answered affirmatively and then we shall examine the resulting implementation proposal from the perspectives of each of the interested parties.

A. Conditional Easement Contracts

One approach that can be used to ensure that the bids solicited from landowners are binding is to have them made in the form of a contractual agreement between the developer and the landowner. The landowner would decide on the amount of compensation he would require and would sign an agreement stating that the company could have the easement to cross his land provided it paid him that amount (within a given period of time). Such an agreement would be the same as the easement contracts currently

used by companies except that (1) the compensation would be determined by the landowner rather than the company, and (2) the landowner would sign it first and return it to the company for its consideration. In this way, the company can develop its cost functions for the corridor with the confidence that it could acquire the easements it needed, for any route selected, without opposition by completing the corresponding contracts. It is important to note that a landowner is not obligated to sign such an agreement any more than he is currently obligated to sign easement agreements with a company. Similarly, the company is not obligated to use the contract submitted by the landowners. It could still negotiate for a lower price or use eminent domain at the new threshold price set by the state.

There is one important difference between the easement contracts currently used and this proposal. In the former, the right-of-way required for the facility can be precisely specified while in this case, it cannot. This distinction can be reflected in the proposed contract in several ways. The simplest would be to ask the landowner for a bid to cover all possibilities, but that would lead to excessively large bids. Another would be to have the landowner submit a number of bids for several specific right-of-ways (for example, one following section lines

along his property and another for a specific diagonal crossing). However, this would limit the number of paths that could be considered. A third approach would be to subdivide his land into smaller parcels (possibly 330' x 330'), which he could bid on individually in recognition of the fact that it is not the direction of the line so much as what parts of his land that it crosses that is important to landowners. This latter approach would also be most convenient for setting up the cost function.

B. Using The Proposed Method within The Existing State Siting Process

A company could use this approach to prepare a route application after the state has approved a corridor for the line. The state's focus during the route review process has been to ensure that the route selected from within the corridor is acceptable to the company, landowners, and other state concerns. By using the auction method, the company can make a strong case to the state that it has selected the most efficient route in terms of the combined costs to the company and the landowners. Furthermore, if it is prepared to pay the bids, it has the approval of most or all of the landowners along the route. Should the state reject a portion of the proposed route, the company can simply adjust its cost function to reflect the new situation and compute the new optimal route.



C. The Company's Perspective

The major benefit the company would receive from this implementation would be a reduction in losses due to delays caused by local opposition. The United Power Association estimated that the construction of the 400 KV UPA/CPA line has been delayed a year by opposing landowners, costing the company approximately \$60 million which is roughly equivalent to the line's total construction cost and ten times the compensation that would be paid if the currently highest eminent domain fee was used (\$15,000 per mile for crossing tillable land diagonally) for the entire length of the line.<sup>26</sup>

The risk the company is forced to take is the higher threshold easement fee. While the auction process promises significantly lower compensation bids along the optimal path, in the worst case where all the landowners bid the threshold value, the total compensation cost paid by the company could be several times the amount currently paid.

D. The Landowner's Perspective

The benefit to landowners is obvious. They would have greater influence over the compensation they are paid and over the path selected by the company. Intertwined with this new power is the new responsibility of assessing impacts and making bids. Each landowner would have to

decide just what a transmission line would cost him in order to make a bid that would be to his advantage. The state may or may not provide information or technical assistance to the landowners for this purpose. However, it should be noted that in past transmission line siting cases, the officials presiding over public hearings were impressed by the knowledge many landowners had of the subject. In the public hearing on the UPA/CPA project, for example, it was the landowners who brought many impact issues to the states' attention.

## V. DISCUSSION

From a planning perspective, the key issues in evaluating this proposal are efficiency, equity, and implementability. We will compare the proposed auction method to current siting practices in these terms.

The proposed method should increase the efficiency of the siting process in two ways. First, the path selection is based on more complete cost information. In the current process only very coarse local impact information is available when the route is chosen and so it is based largely on construction cost considerations. The auction method will add much more precise local impact information over the entire corridor so that a better path can be determined. Second, by compensating landowners according to their perceived costs, construction delays due to local opposition can be avoided, further reducing costs to society.

The principal change affecting equity introduced by the auction method is the shift from defining local impact costs in terms of disruptions to the existing land use (eg. how much will agricultural production be reduced by the facility) to a broader definition that includes the less tangible costs experienced by the affected landowners. Given that the auction method can

determine these costs reliably, the local adverse effects created by a facility can be compensated for by an appropriate adjustment to the distribution of its benefits. (Should the required compensation exceed the benefits, the project could not be justified in terms of the net benefit it produces).

The most difficult issue raised by the auction approach is that it introduces a landowner's economic status into the measurement of the facility's impact on him. One can argue quite successfully that the process is fair since each bidder decides for himself the price of the development right he is selling, just as he would buy or sell anything else. However, it can also be argued that the effect of noise and air pollution from a nearby highway on an individual's health and well-being has nothing to do with his economic status. The pain a man may suffer, a priori, does not depend on his wealth although the price at which he will be willing to tolerate it does. The challenge to the planner is to decide which of these views leads to a more equitable assessment of a facility's cost to society.

There are two considerations that have been raised concerning the proposal's implementability. The first is the potential opposition from developers who would be forced to pay substantially higher compensations when using

their eminent domain power. This opposition will be reduced only if it can be demonstrated convincingly that the increase in the combined construction and compensation costs of the facility will be smaller than the expected losses due to local opposition under the current process. The second consideration is the acceptability of the auction method to landowners. While they stand to gain significantly from the change, some may be ideologically opposed to the idea of trading certain impacts in a market. If only a small percentage of the landowners feel this way, the process will not be hurt significantly by their non-participation. However if many hold this opinion, it would be meaningless to attempt to use the auction process without first persuading them to participate.

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