Southwestern Ontario Transmission: Designing A Route Selection Planning Program

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Summary

In the summer of 1982, Ontario Hydro began a route selection program for the planning of major new 500-kV transmission facilities in southwestern Ontario. The objective of the program was to establish a planning framework to assess environmental, technical, cost, and social issues in the location of over 480 km of 500-kV transmission lines and a transformer site. It also had to integrate public involvement with a variety of interest groups, government agencies, and affected landowners. It was essential that the program produce technically sound, accurate, and defendable conclusions as the study had to undergo major environmental approval hearings. The planning studies took 3 years to complete and produced a five-volume Environmental Assessment. The program ran well and was very successful in meeting its objectives. After 131 days of hearings lasting over a year, Ontario Hydro received approval to proceed with a modified but acceptable version of the undertaking.

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Introduction

In June 1982, Ontario Hydro received approval of a program for the expansion of its 500-kV transmission network in southwestern Ontario.

This "Plan Stage" approval was the first of two required under a two-stage planning and approval process undertaken by Ontario Hydro. It was comprised of three parts: a System Plan, which specified the terminal points and the type of transmission facilities to be used; a route stage study area, within which the specific locations for the required transmission facilities would be determined; and a general outline of the study activities leading to an application for the second or "Route Stage" approval.

The scope of the route stage study required the location of over 480 km (300 mi) of 500-kV transmission line through some of the most scenic countryside and rich natural environments in Ontario. It also required crossing some of the most productive agricultural land in Canada and affecting many rural communities with environmentally aware and active residents. As one of the largest and most complex studies of its type ever undertaken by Hydro, the Southwestern Ontario Study represented a formidable planning challenge.

As a result, a great deal of planning and preparation went into the design of the route stage planning program. This paper will examine some of the main aspects of the program design for the Southwestern Ontario Study. It will discuss the program objectives and some of the methods and techniques used to achieve them. The effectiveness of the program will be assessed based on the results of the study and some observations made on what it takes to get approval of major utility rights of way in today's regulatory and social environments.

Background

In the early 1970s, Ontario Hydro began planning for two 2-cct 500-kV transmission lines to incorporate the power from its Bruce Nuclear Power Development under construction on Lake Huron. In 1974, approval was received to proceed with construction of the first line, but approval of the second was withheld pending a full review of Ontario Hydro's long-range planning process.

In 1976, Ontario Hydro began a study of its long-term transmission requirements in southwestern Ontario under the requirements of the new Environmental Assessment Act. The study was deferred in 1977 to await the report of the Royal Commission on Electric Power Planning (RCEPP). This Commission was to look at the long-range planning needs and issues in Ontario and also address the need for a second power line from the Bruce Nuclear Power Development. In its final report, the Commission stated that it was indefensible for power to remain bottled up at the Bruce NPD and urged Ontario Hydro, along with the agricultural community, to start planning studies for the new line (RCEPP, 1980).

Hydro decided to adopt a two-stage planning and approval process (plan stage and route stage) and began evaluating numerous system plans. The new transmission facilities were urgently needed to reliably deliver the existing and approved generating capacity at the Bruce Nuclear Power Development to the power consumers of Ontario, to supply the growing loads in southwestern Ontario, and to maintain adequate interchange capability with utilities in the state of Michigan. In 1981, Hydro again started meeting with public groups in southwestern Ontario to review a number of conceptual system plans for new transmission. In the fall of the same year, Hydro submitted a Plan Stage Environmental Assessment to the government evaluating six alternative system plans and recommending approval of one. A public hearing then took place. It lasted 32 days and saw intervenors from a coalition of agricultural or-

ganizations and the provincial agriculture ministry oppose the recommended Plan 1.

In June 1982, the Joint Board released its decision rejecting Plan 1 but approving a modified version of Hydro's much less preferred alternative, Plan 3. The approved plan was known as Plan M3.

Organization

The Route and Site Selection Group of Ontario Hydro has the responsibility for conducting the route selection studies, preparing the required Environmental Assessment Documents, and obtaining the necessary government approvals for new transmission facilities. Immediately after the Plan Stage approval, a project planning team under the direction of a Supervisory Project Engineer was formed to carry out the route stage studies. The main body of the team came from the three departments in the Route and Site Selection Group. The team, consisting of project engineers, community relations officials, and planners with backgrounds in agriculture, forestry, biology, heritage, land use, and socioeconomic assessment, numbered approximately 20 individuals. This group of individuals had responsibility for developing the study design, as well as planning and implementing the specific studies, work programs, and activities. The project team members worked together to plan and coordinate the various study activities, keep abreast of developments, and exchange information. The team concept was particularly important in making sound planning decisions where trade-offs between the environmental, technical, economic, and public perspectives were necessary. Participation in the decision-making process also created a sense of responsibility and commitment among team members and a spirit of team work.

Study Objectives

The goal of the route stage study was to select and obtain the necessary approvals for transmission rights of way and a transformer station site for the facilities associated with System Plan M3. To achieve this goal, a planning strategy and program was developed. It described the approach, data requirements, methods, activities, scheduling, resources, and documentation necessary to identify alternative routes and sites. It set out the methods for evaluation, public input, review, and decision making, and, finally, the format and content of the EA and the schedule for submission and review.

The route stage planning studies had to meet four objectives if they were to be successful: identify and fully assess acceptable routes and sites, provide for adequate public involvement, meet the requirements of the Environmental Assessment Act, obtain approvals from a Joint Hearings Board. These objectives were kept in mind when developing the program and were often referred to as a test of the appropriateness or effectiveness of activities or decisions.

The first objective was to meet the technical objectives and terms of reference for the route stage studies as determined by Ontario Hydro's System Planning Division. This meant identifying routes that were technically, environmentally, and economically acceptable for the type of lines required in System Plan M3 and recommending appropriate tower designs. This meant the route planning process had to identify and assess major technical or engineering impediments in addition to the more obvious environmental constraints that could make a route or site unacceptable.

The second objective was to design a program that would identify and respond to the concerns and informational needs of the public. For the route selection program to be successful, it was important to continue the spirit of public involvement established during the earlier plan stage studies. This meant having people contribute to, review, question, or simply observe the planning studies as suited their interests. Without adequate involvement, the program would lack local perspectives and ideas and people would remain skeptical of both the study methods and its conclusions or findings.

The third objective related to obtaining acceptance of the EA. To obtain approval under the EA Act, two conditions are required for approval (1) the EA document is adequate for a decision to be made; and (2) that approval to proceed with the undertaking (or acceptable alternative) is given (Environmental Assessment Act, 1975). The EA must include the purpose of the undertaking, consideration of alternative methods of carrying out the undertaking, a description of the environment that might be affected, the effects on the environment that might be expected, the measures to prevent or mitigate those effects, and an evaluation of the advantages and disadvantages to the environment of the undertaking. It is therefore of the utmost importance that the planning studies and, subsequently, the environmental assessment can address each with sufficient scope and substance to satisfy the EA reviewers and, ultimately, the Joint Board.

The final, and probably the most important, objective in establishing the planning program was to produce a recommendation(s) that would stand up to the scrutiny of a major hearing and receive approval. This meant the program had to make a thorough and well-balanced evaluation of the environmental, technical, social, and economic aspects of the project. It meant using the most current, accurate, and relevant data available as the basis for analysis and decision making. The process and study methods had to be technically sound and consistently applied if results, conclusions, and rationale were to be accepted with any reliability. The experience from the Plan Stage hearings and the anticipated public opposition to the project made it ever more important that no weakness exist in the design or conduct of the route stage planning program.

Other Planning Considerations

In addition to the four basic objectives of the planning program, there were a number of other factors that had to be taken into account in the design. The sheer size of the project was one. Plan M3 consisted of the Bruce NPD to Essa TS study area and the London to the East study area (Figure 1). With a combined area of close to 1,000,000 ha (3,860 square miles) and distances of up to 160 km (100 miles) between the terminal points, the logistics of data collection alone were formidable.

The study area environments were also extremely diverse. The Bruce × Essa study area contained large tracts of forest, numerous rivers and wetlands, rare plant communities, and some very scenic and natural landscapes associated with the Niagara Escarpment geological formation. Many of the once predominantly agricultural land uses were converting to recreational and rural residential uses. The more southerly London to the East study area had a highly productive, strong agricultural base. However, an extension of the study area by the Joint Board in its Plan M3

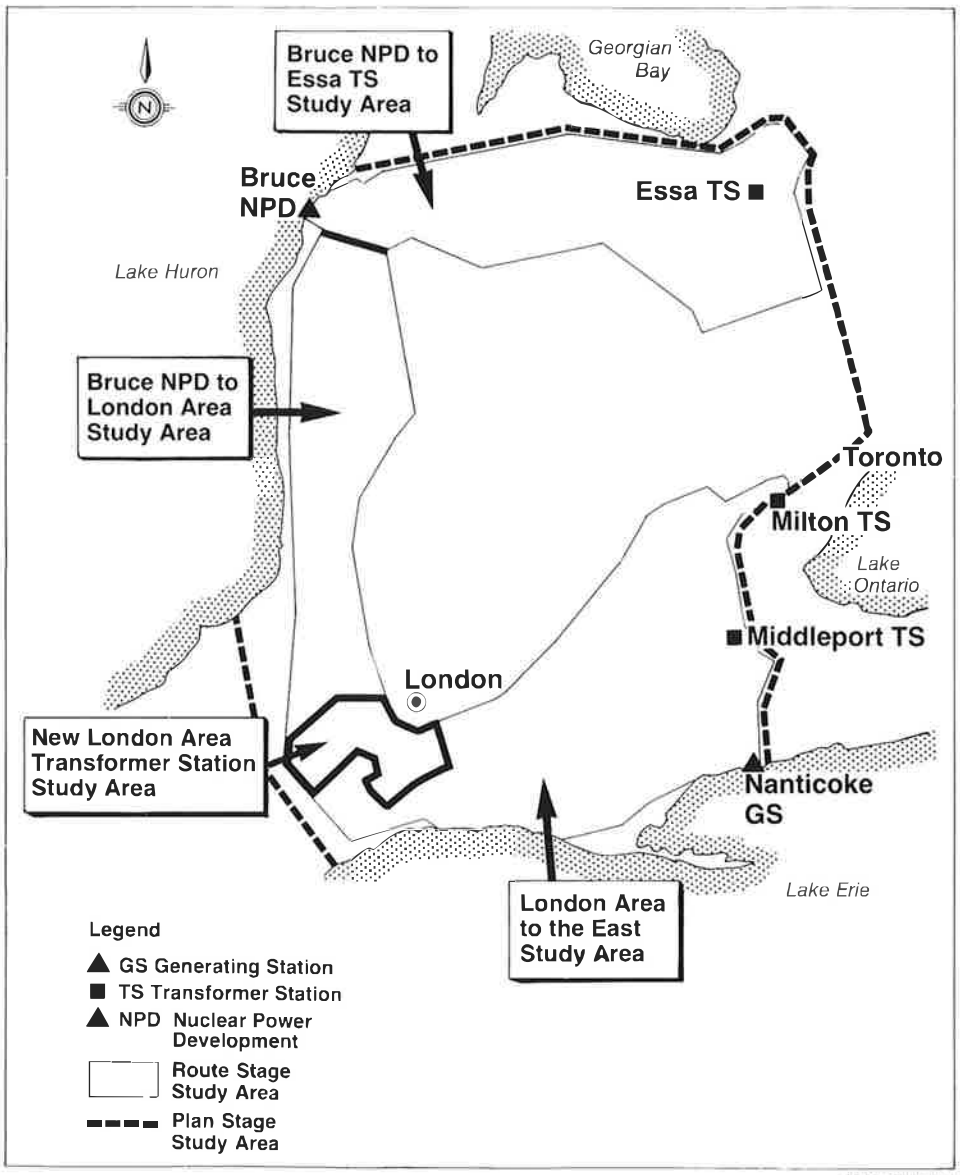

Figure 1. Route stage study areas.

decision added an area along Highway 401, the major controlled access highway in southwestern Ontario. This area contained urban development associated with some of the larger towns and cities. The large percentage of prime agricultural land, presence of other high quality natural resources, and the pressures of expanding urbanization made for difficult routing trade-offs.

The development of the public involvement program has a great deal of history to contend with. Studies for new 500-kV transmission lines in southwestern Ontario had been under way, off and on, since the early seventies. As a result, there was a very high awareness of the project in some communities. Some agricultural organizations had been involved with the issue during the RCEPP, and some groups had been formed specifically to oppose the 1973 plans for new lines in their communities. These groups and individuals were very knowledgeable and keenly interested in participating in any new transmission studies that might impact on agriculture.

Both study areas contained large rural farm and rural residential/recreational populations. Many small towns, villages, and urbanized areas dotted the countryside. The size of the study areas, combined with the length and number of alternatives that would have to be studied, made it evident that many thousands of people could be affected by the study. For the people in the Bruce × Essa study area, their inclusion came as a shock. This area was not part of the plan favored by the public in 1981 and recommended by Ontario Hydro for approval. A negative reaction to the decision and subsequent route stage studies was anticipated from these people.

The approval and construction of a second 500-kV transmission line from the BNPD was of top priority to Ontario Hydro. As a result of the delays and setbacks in the earlier stages of the project, the original in-service dates had slipped several years, making the successful completion of the route stage studies extremely urgent. With the seventh and eighth generating units coming on line in 1986 and 1987, the capacity of the existing transmission facilities to deliver all the power from the Bruce Nuclear Power Development to the Ontario grid would be exceeded. The cost of replacing this "locked in energy" by burning coal was estimated at $100 million per year. There was great pressure to conduct the route planning studies and produce the EA as quickly as possible. This urgency had to be balanced against the need to conduct a thorough and complete study that would meet the planning objectives.

Route Stage Planning Program

Environmental Study

The environmental study formed a major part of the route stage planning program. It involved a complete assessment of the natural and human environment to determine the route/site locations where the new transmission facilities would cause the least environmental impact. It required a comprehensive environmental data base to make and support planning decisions. An initial data base at a scale of 1:50,000 was used to develop an environmental constraint map and identify "corridors" of lower constraint for further study. A more detailed data base was then produced within each corridor. Mapped at a scale of 1:15,000, it was used to locate routes and sites and as a basis for evaluating the environmental impacts and selecting the preferred alternatives (Scott and Bancroft-Wilson, 1987). The validity of the study results were, therefore, very dependent on how accurately and completely the data base represented the actual land base and environmental conditions.

The environmental data collection covered nine different environmental factors: agricultural, forest, mineral, biological, hydrological, and heritage resources, cultural landscapes, human settlement, and recreation. Every effort was made to obtain the most up-to-date data for each factor. Government ministries were consulted to determine the most appropriate and current information available. In some cases, the

data were readily available from existing sources. Sensitive Area Reports, mineral and aggregate reserves, agricultural land use systems, proposed land use designations, and Forest Resource Inventory data were some examples. Other data, such as the country soil surveys, had to be upgraded to current standards for consistency across the study areas. Some data had to be created using models such as archaeological potential and soil capability to produce specialty crops. Still other data types, such as cultural landscape units, were derived by Hydro planners combining several different data types.

To ensure that a high standard of map accuracy was maintained, guidelines for minimum mappable units, legibility, and classification were established. Field tests of locational and classification accuracy were conducted and sources of error determined.

All data were digitized and stored in the Land Use and Environmental Planning Department computer system. With the volume of data being used this was essential to manipulation, evaluation, and reproduction of the data. A VAX11/785 computer using the Computer Assisted Route Selection System (CARSS)[1] permitted the digitizing and storage of large amounts of data. The data could be manipulated and reclassified to produce new data types and to be displayed in various formats or scales (Neill, 1987). The system was essential to the 1:50,000 constraint mapping process involving prioritizing and overlaying the data to produce environmental constraint maps for identifying corridors and transformer station zones.

For the mapping of the data within the corridors, a 1:15,000 scale photo mosaic base was introduced. Referred to as a "composite" map, it portrayed all of the information important to route location and assessment of impacts. Because approval for specific route locations and the right to expropriate property rights was being applied for simultaneously, it was considered necessary to go to this large a scale. The use of the mosaic base for the map made it easier for property owners to see how their lands might be affected and see the environmental features that influenced the route location. Once again, the location and proper classification of the data was a top priority. Information was thoroughly reviewed in the field, with source agencies and the public tapped to obtain as accurate a data base as possible. Aerial inspection of the routes by helicopter was used to view actual locations of the routes on the ground and check inaccessible areas.

[1] *CARSS Information pamphlet produced by The Land Use and Environmental Planning Department, Ontario Hydro, 1986.*

Public Involvement Program

The direct involvement of local officials, interest groups, and community leaders in the planning studies was a major objective of the program. The benefits were numerous. The information, local values, and views provided by these people were essential to the environmental planning process. They provided a sounding board for making decisions and a forum to express and discuss peoples' concerns. Presentations and meetings let them obtain information and follow the study's progress, thus reducing skepticism and the opinion that "Hydro has already made up its mind where the route is going."

The formation of public "working groups" and "liaison committees" in each study area provided the main vehicle for direct public participation in the studies. Made up of representatives from township councils, agricultural organizations, naturalist clubs, municipal planning departments and the district ministry offices, and other interested groups, the groups met with the Hydro study team every 3 to 4 weeks, over the course of the study. The groups' terms of reference were to deal with the specific planning for transmission routes/sites but excluding any debate of system plans or the Plan Stage decision. The groups reviewed the environmental data; identified concerns; developed planning objectives; set priorities among the various environmental resources, features, and land uses; and helped identify corridors and, later, routes and sites. The groups became closely associated with the studies, and their views and comments were considered valuable.

Other techniques used to keep the public informed about the study included presentations, newsletters, and information centers. Information centers were held to review results and progress at important stages of the studies. For example, once alternative routes/sites were identified, all property owners and the public at large were invited to review the maps and discuss the route location with the Ontario Hydro study team. Using property assessment information to determine the affected landowners, over 35,000 letters were sent inviting people to review the alternative routes. Information centers produced an increased awareness of the study and produced some additions and changes to the data and some minor route adjustments.

Technical Studies

The route stage planning program made provisions for a number of technical studies. These were necessary to assess engineering and technical constraints such as soil conditions, clearance requirements at airports, the effect of audible noise and electro-magnetic interference on communication facilities, separation distances from other linear facilities, and the implications for system operations if existing transmission lines were paralleled, overbuilt, or removed from service. Tower design and line layout had to be reviewed for special or unique situations to ensure that the line could be built as shown.

Two of the technical studies illustrate the importance of identifying potential problems and proper follow-up. The first involved potential interference with a sensitive communication facility owned by the Department of National Defense. Since this federal agency had jurisdiction to prohibit the line location if it felt its facilities were jeopardized, extensive discussions and tests were required to fully explore the potential impact. The successful resolution of the issue enabled the preferred routing to be retained without further objections from the DND.

Another technical matter involved the separation of any new transmission line from Highway 401. The Ministry of Transportation and Communications with jurisdiction for highways wanted the towers located well outside the highway right of way for safety reasons. Again, after much discussion, it was determined that a standard tower setback from the highway to provide fall free clearance from the outermost traffic lane would alleviate any safety problems. Although this setback did not sit well with those who wanted the power line to be located on the highway right of way, it did avoid a technical problem arising in the EA review or hearings.

Documentation

Documentation of all phases, activities, and decisions was another of the objectives considered in the design of the program. There were two main categories of docu-

mentation: documentation for the EA, and documentation for support of the EA and evidence at the hearings. With the benefit of experience with both the Plan Stage EA and the presentation of evidence at the Plan Stage hearings, great importance was placed on both for the route stage. Systems were set up for project correspondence, contact documentation, and public comment forms from information centers. All decisions and rationale, whether related to a type of data to collect or the identification of an alternative route, were documented. Particular emphasis was placed on explaining the thoughts and reasoning behind judgmental or subjective decisions. Such decisions were frequently required in route/site identification, evaluation, and comparison. Opinions or positions developed during project meetings were often tested as to whether they would withstand a rigorous cross-examination by a well-known lawyer.

Much of this information was included in the two EA volumes dealing with the route and site selection process, route descriptions, evaluations, and selections for each study area. Other information was prepared as support documents to have available if needed or filed for easy access in a separate project filing system. Maps of all the data used in the study were available in either computer format or on reproducible cronaflex composite maps. There were numerous requests for these latter maps from municipalities, government ministries, working group members, and landowners. These maps were also used as the principal means of illustrating alternative route and site locations during the hearings and portraying the environmental and land use data.

Another method used to document the recommended routes at the hearings was by the use of airborne videotapes of the routes (Pierce and Smith, 1987). These tapes were shown during the hearing and admitted as evidence. They provided a bird's eye view along the routes showing the terrain conditions, vegetation, land use patterns, buildings affected, and orientation to fence lines and field boundaries.

Presubmission Consultation

A presubmission consultation program was conducted to help reduce the time required for the EA review and identify any potential problems or deficiencies in advance. The program with government ministries was conducted during the route stage studies. It achieved good communication between Hydro, the Environmental Assessment Branch responsible for coordinating the EA Review, and those ministries with an interest or stake in the project. Several meetings were held during the study to review process, data, analysis, EA contents, public involvement, and route selection decisions. The objective was to provide ministry reviewers with information on how their programs or policies may be affected, to identify and resolve any problems, and to familiarize them with the EA contents. As an example, preliminary terms and conditions of approval were developed to satisfy concerns of some ministries. This facilitated a timely review of the EA and avoided any surprises in the ministries' positions later in the hearings.

Plan Stage Decision Quashed

The route stage EA and application for approval of the recommended transmission routes and transformer station site for Plan M3 was submitted to the Government in November 1983. However, before the second stage of hearings could begin, a judicial review of the 1982 Plan Stage hearing was initiated by a citizens coalition from the Bruce × Essa area. This resulted in the Plan Stage decision being quashed mainly on the basis of inadequate notice.

Without an approved system plan, the issue of terminal points, number and type of lines, and study areas was again thrown open. Ontario Hydro then decided to proceed with a one stage approval combining the system and route/site selection studies. A review of the acceptable system plans revealed that routes were required between Bruce Nuclear Power Developments and London to accommodate any of the system plans. This meant a route stage study had to be conducted for the Bruce × London study area (Figure 1) so that the same level of routing information would be available for all three geographic areas.

The design of the route stage studies for Bruce × London and the expanded London Area Transformer Station site study were kept similar to the previous route stage studies. However, because of the now even greater urgency to release the locked-in power at the Bruce Nuclear Power Development, a compressed study schedule was developed allowing 14 months to conduct the route and system studies and prepare the EA.

This reduced time frame required minor modifications to the planning process and public involvement programs. Based on a preliminary analysis of available data, some assumptions on potential corridor locations were made by the study team. This enabled some initial 1:15,000 data collection to commence while the 1:50,000 program was still under way and before the final corridors were identified. This was considered necessary if the entire 1:15,000 program was to be completed on schedule.

The public involvement program was again important to the study, but some changes were made to the composition and role of the working groups. Based on feedback from elected officials who had participated on the Bruce × Essa and London to the East studies, many elected officials were reluctant to get involved in a working group format. Instead, a regular program of contacts and presentations to councils were used to keep these officials informed. It was also decided to meet with the ministry and planning department representatives separately from the general interest groups and agricultural organizations. The former preferred working in smaller groups with other professionals as a more productive forum for exchanging information and views. The result was the formation of a "Planner Review" committee and a separate "Interest Group" committee with representatives from local organizations and interest groups. These groups still met at key stages to review data, set priorities, and to review, comment on, and modify corridors and routes, but they did not get as involved in the corridor and route identification process.

Plan Comparison

The environmental comparison of system plans was performed by comparing the total route evaluation data for the preferred routes in each plan. Because the same approach for assessing the environment was taken for each study area and the route evaluation criteria were very similar, it was possible to compare the environmental effects of routes in one area versus another in both quantitative and qualitative terms (Scott and Bancroft-Wilson, 1987). This provided the basis for comparing the plans environmentally and contributing to the overall system plan selection decision. The environmental comparison results and preferences were also used in a decision analysis model to test the sensitivity of the plan selection decision to different weightings (Buck and Hoglund, 1987).

Results

A five-volume Environmental Assessment detailing the three route stage studies, TS site studies, and system plan comparisons was submitted for government review in August 1985 (Ontario Hydro 1985). The EA review was completed and published 10 weeks later. No significant deficiencies were identified in the content or the approach taken.

Main hearings under the Consolidated Hearings Act began on November 13, 1985, before a three-member Joint Board. The hearings concluded on November 19, 1986, after 131 days of hearings held in five different locations across southwestern Ontario. Over 300 witnesses appeared before the Board, resulting in 24,000 pages of transcripts.

The Joint Board, in its decision of February 20, 1987, did not approve Hydro's recommended Plan 7 but did grant approval to proceed with System Plan 1, an acceptable alternative method of carrying out the undertaking. Plan 1 has less transmission lines than Plan 7 and is not as good for system operations; however, environmentally it is the best plan. On June 5, 1987, Ontario Hydro received final government approval to proceed with construction of the facilities.

The route stage planning programs were considered effective in meeting their objectives. The studies produced preferred routes and a site that were technically sound, acceptable cost wise, and generally considered to cause the least environmental effects and disruption. There was no substantive evidence presented during the hearings of inadequacies in the planning process or that any better routes existed. The Board found that the process was consistently applied by Hydro in each area studied in arriving at the preferred and acceptable alternative routes for Plan 1.[2]

The public involvement programs were also considered successful. Public involvement was never an issue during the hearings. For the most part, those people who had participated in the studies felt that Hydro had been open and fair in its planning, had provided sufficient information, and had given everyone the chance to have their say. The fact that no unexpected public issues surfaced during the hearings is an indication of the thoroughness of the public involvement program.

The EA also achieved its objective of satisfying the EA reviewers and their respective ministries. Most of the evidence presented at the hearings on the route stage process, route identification, evaluation, and comparison was contained in the EA. The Joint Board in its decision accepted the EA as amended with all the evidence presented at the hearings.

Finally, the route stage planning program provided the basis for a strong presentation of the case to the Joint Board for the recommendation of routes and TS site. The detail and accuracy of the environmental data, the comprehensive assessment of environmental effects, and the detailed knowledge of the local environment, routes, and affected properties by Hydro planners and engineers gave a high level of professional credibility and weight to their opinion evidence. The result was that most of Hydro's preferred routes were accepted with very little contrary evidence.

In conclusion, from Ontario Hydro's experience with the Southwestern Ontario Transmission Study, there are several steps that can be taken to help get approval of major undertakings given today's complex environment and socially aware society.

1. Produce comprehensive studies and assessments of all environmental, technical, and social implications to support conclusions and recommendations.

2. Use accurate, current, and complete information on which to base analysis and decision making.

3. Plan and coordinate all activities well in advance, but keep flexibility to adjust as studies progress; maintain good communication among everyone working on the project. The project team approach works well in these respects.

4. Provide adequate opportunities for public involvement; people expect to be involved in decisions that affect them. Keep those people/organizations well informed, listen to their views, and make every effort to address their concerns.

5. Document all information used, in particular, the rationale for decisions; use current technology whenever possible.

6. Fully review regulatory requirements to ensure that study process will meet them; review as study progresses with key agencies to ensure that their needs are being met; respond to and resolve issues as quickly as possible.

7. When conducting the planning studies, always keep in mind the need to present a factual, knowledgeable, and well-supported case before any approval boards. Members of the project team must be able to present and defend their professional judgments and decisions in a hearing. (IRWA)

[2] *Joint Board Decision, Southwestern Ontario Transmission, February 20, 1987.*

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