



# THE LAKEHEAD PLANNING BOARD

995 MEMORIAL AVENUE - THUNDER BAY, ONTARIO - PHONE 344-9649

August 1, 1974

RECEIVED AUG - 6 1974

Mr. John E. Low  
Canadian Environmental Law Association  
Suite 303  
One Spadina Crescent  
Toronto, Ontario  
M5S 2J5

Dear Mr. Low:

Re: Generating Station Site

Your letter of July 30th, providing alternatives which could be pursued should our concerns on the environmental impact on the new generating station site not be answered satisfactorily is most welcomed. We would attempt to follow the outline that you have summarized in your letter.

For your information we are enclosing a copy of the submission to Ontario Hydro of the concerns of the Lakehead Planning Board, supported by member Councils in the Lakehead Planning Area. Ontario Hydro has recently replied to the submission stating that the environmental claims are exaggerated and untrue. In some cases this may be correct since our research material was basically related to problems in the United States and may not be applicable to that which would be controlled through the Ministry of the Environment in Ontario.

Should you have further comments on this report as it relates to the situation in Ontario, we would appreciate your assistance.

Yours truly,

D. McKay  
Planning Administrator

DM/mlz  
Encl.

SUBMISSION  
TO  
ONTARIO HYDRO

RE: POTENTIAL GENERATING STATIONS  
BARE POINT OR McKELLAR ISLAND

Lakehead Planning Board

July, 1974

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## SECTION 1 - INTRODUCTION

The population growth in the Lakehead Planning Area that is anticipated in the Lakehead Official Plan, and in Northwestern Ontario according to the Design for Development report will give rise to increased power consumption. The need for additional electrical power to meet the increased demand will entail the construction of facilities to generate the necessary electrical requirements, in conjunction with a firm energy conservation policy. The Lakehead Planning Board recognizes this as part of our area's development. It is the purpose of this submission not to oppose the generation of power in this region but to record our concern on the effects of the location of a thermal and nuclear generating station at Bare Point or McKellar Island, and the potential rural locations which were apparently eliminated by Ontario Hydro in their February report.

In its initial brief to Ontario Hydro, the Board stressed the need for an amendment to the Official Plan for each of the sites located in the Lakehead Planning Area and the resultant assessment of the impact of the introduction of such a major land use on the regional official plan policy before such an amendment could be approved. Although the locations considered in the rural portion of the planning area have apparently been abandoned in favour of the two sites in the urban area, the Board would emphasize that if a re-evaluation of all sites is undertaken and a decision is made to designate one of these rural sites as the location of the proposed generating station, the previously-stated concerns related to the impact of such a major land use on a small rural municipality would remain valid.

It appears that one of the premises which rated the location of the proposed generating station be at Bare Point or McKellar Island higher on the environmental and economic scale of the four sites selected was based on the initial input from environmental sources recommending that this major land use be located in an urban environment which already has a high level of pollution relative to the total area. The Board would agree to some degree with this contention because of its concern with the effect of the introduction of such a major land use on the rural environment. An obvious additional concern however would be the impact of a

thermal and nuclear generating station on the present environment in the City of Thunder Bay. The fact that the location of the plant within or near the urban area would provide all the necessary facilities for the workers in the construction and operation of the proposed plant is a valid argument for its location at Bare Point or McKellar Island. Since the purpose of planning is to ensure that development occurs in a manner such that future problems related to physical services and the health and welfare of citizens are minimized, the Board would contend that before the site is selected and considered for further environmental studies, an assessment of its impact on the area should be undertaken. We therefore, attempt in this submission to indicate some of the concerns related to the introduction of this use while at the same time recognizing the benefits that may accrue to the area through additional grants or assessment, increased work force and other related effects on the local economy.

In order to meet the projected power needs anticipated by Ontario Hydro a three-fold increase in the size of the Mission Island Plant will be required with the addition of an 800 megawatt thermal generating station and a 2000 megawatt nuclear generating station at a site to be selected. Since the existing thermal generating station represents only 100 megawatts of electric power, the introduction of the two new generating stations plus the addition to the existing one would increase the power potential produced in this area to at least 32 times its present thermal generating capacity. Also, the locations of the existing Mission Island Plant and potential Bare Point site would be within 8 miles of each other, thus concentrating the effects of these plants in a relatively small area. It must also be recognized that the major population concentration in the region is located within 10 miles of any of the sites.

Although the physical impact of the establishment of such a major land use must be considered in re-evaluating our present planning program, the social and economic implications must also be studied. The effect on the environment is an important part of this review and represents a good portion of this submission.

SECTION 2 - LAND USE EFFECTS

2-1 GENERAL PLANNING CONSIDERATIONS

GENERAL LAND USE

Urban and suburban growth and development is, or can be controlled in a variety of ways; by the location and timing of public improvements, by lending policies, and restrictions of private lending agencies and of government agencies that supervise them, by governmental subsidies and other programmes, as well as by public land use controls. The most important land use control - is zoning, but subdivisions regulations, building codes and health requirements can also be influenced in guiding land use.<sup>1</sup>

A PLANNING POLICIES AND REGULATIONS

Zoning may properly seek to preserve the quality and value of an established area, but these objectives may be overlooked in order to establish a particular land use. Zoning, to be effective, must restrain some persons or groups from doing what they inevitably would have chosen to do; otherwise, it is worthless. It must be based on long range development policies which consider the future growth of the community.

Zoning has provided a significant degree of stability of land use in established residential and other areas by reducing the ease of land use change within these designated locations. In this way discordant land use is kept out and values are maintained within these zones.

According to Hilberseimer, the key to planning is as follows:

"So as to develop and regulate the different parts of a settlement to each other and to the whole that each part fulfils its own function without impairing that of others."<sup>2</sup>

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1. M. Clawson, Modernizing Urban Land Policy, Baltimore & London, John Hopkins University Press, 1973. p. 5.
  2. Hilberseimer, The Nature of Cities, Chicago, Paul Theobald & Co., 1955 p.199.

the 7 year building phase and 250 permanent workers once the plant is completed, will commute daily to town via the Expressway/Lakeshore Drive if the Bare Point site is selected and through the Fort William Central Business District if McKellar Island is chosen. With this increase in population, heightened peak hour traffic will be noted between the hours of 3 and 6 p.m. daily at either the Bare Point or McKellar Island site. In addition increased public transit service to these sites would have to be provided and road upkeep costs might increase due to heavy construction equipment being transported to the site. The increase in the number of workers will not only create transportation problems within the area but also aggravate the housing situation since the

"Industry and its associated uses not only brings in new revenue but it brings in also vast volumes of traffic with which the street pattern of the community may never have been designated to cope and demands for types of housing that the community might not otherwise approve of. They also frequently demand auxiliary services that add to the cost of running a community."<sup>3</sup>

The possible expansion in the number and capacity of coal and lignite generating stations to the east of Thunder Bay will increase rail traffic within the City. The addition of one or more unit trains will augment the present conflict between CN rail traffic and vehicular traffic and with an increase in the exposure index (the number of trains X the number of vehicles at a crossing) will either warrant the earlier construction of grade separations or the removal of the CN tracks, Recently approved legislation which will make federal funds available to relocate such railway lines, could be implemented here, thus resolving this present problem.

Rail traffic problems would not only affect the average citizen but would also create traffic difficulties within the site itself and with the employees. Extra personnel would be required to regulate the crossing as well as the loading and unloading of the cars.

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3. H.B. Raymore & H. S. Orthoff, Its Your Community , M. Barrows & Co., New York, 1965 p, 33.



Additional problems may arise due to dust and soot being dispersed both in the transport of the lignite through the City, and at the plant itself. Although Hydro has stated that water will be used to control the dust, it is likely that evaporation will exceed the rate of periodic watering. In winter the water will freeze, and therefore, the lignite will be frozen onto the cars and extra men will be required to remove it, or excessive wastage will be incurred. Hydro has stated that, no specialized cars have been designed as yet to control the dispersal of soot as yet.

Another transportation problem which is anticipated is ash disposal. The ash disposal at Bare Point will be located below the scenic lookout on the Expressway with an additional 300 acres of land for disposal use, being located 30 miles east of Bare Point on the CNR line. Since the ash disposal site is on the other side of the highway and the production of 1800 tons of ash per day must be accommodated, some efficient method of transporting 45 tons of ash per hour across Lakeshore Drive must be found in order to eliminate any disturbances which may affect both the employees and the local residents.

The following statement by F. Gibberd substantiates this premise:

"The station will cause inconvenience from the dust, steam and vapour that emanate from it, and although one is assured that these nuisances do not occur with modern plants, one has only to live near a modern power station to be less convinced."<sup>4</sup>

#### C AESTHETICS

Historically, the edge of land and water has been indiscriminately exploited as opposed to well planned. As there are space limitations to this critical area, environmental design considerations and standards and development objectives for shoreline areas should be observed and perhaps a national environmental plan for all our coastlines, public and private should be formulated.

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4. F. Gibberd, Town Design, London, Architectural Press, 1959 p. 212

Although traditionally large-scale industrial uses including thermal plants have occupied this valuable waterfront space in urbanized areas, in recent years planners have come to realize the need for preserving this land for park purposes and other public uses.

Keeping this in mind, we wish to point out that thermal plants should be situated away from valuable urban and rural recreational waterfront areas. F. Gibberd, in his book Town Design points out that power stations are:

"Neither dependent upon a large labour pool nor any other industries ..... their comparatively few skilled workers (two or three hundred to a station) can live in the country or travel, and their raw materials are only coal and water. There are convincing reasons why they should not be so placed-convincing, that is, to anyone who does not allow his aesthetic sensibility to be blinded by science or false romanticism.

Power stations are platitudinously called 'modern cathedrals'; they are indeed of the scale of cathedrals, and their forms, in their own way, are as exciting. But, unlike the cathedral, they are not a focus for man's material life, neither do they point the way to an ultimate spiritual existence. At Durham, Lincoln, and elsewhere, it was not just a matter of the form of the power station coming into conflict with that of the cathedral-a duality of visual interest-but the degradation of a spiritual symbol.

Power stations represent a power beyond the scope of the ordinary everyday existence of a town; they are out of place in the urban picture, and it is to the wider and more open setting of the region that they belong."<sup>5</sup>

Needless to say, the visual pollution created by the 650 foot smoke stack, ash disposal grounds, extended rail facilities, the broad expanse of the plant itself, in addition to other possible industrial plants being attracted to the waterfront must be seriously considered in order to ensure that the aesthetic qualities of the waterfront are not overlooked. This is not to state that no room is available for Ontario Hydro to be part of the orderly growth for the region. On the contrary, if the plants are tastefully designed and the grounds well maintained, it is highly likely that the plants would be more aesthetically pleasing than existing waterfront uses. In addition, it is probable that with Hydro in control of such a vast expanse of the waterfront, much of the land not being directly used for the plants could be preserved for open spaces and recreational uses.

One must admit, as does Gibberd that the

"large industrial plants must be quite separate from the town; for whereas they are seldom in themselves ugly-in fact many of them have their own splendour-they do, when mixed with buildings of different functions, provide a mean and sordid environment."<sup>6</sup>

## 2-2 SELECTED SITES IN THE LAKEHEAD PLANNING AREA

In the site selection process undertaken by Ontario Hydro attempts were made to obtain public participation on the environmental aspect of the location of the generating station in the 11 designated sites within the study area. From the information obtained at the February 18th public hearing it would appear that the input was minimal due to the complexity in completing the environmental comparison chart. It is our understanding that Ontario Hydro used this public response in preparing a composite environmental comparison chart, which in conjunction with the economic considerations formed the basis for rating the four sites selected on February 18th, 1974.

From reliable reports it appears that many of those attending the meetings in October and November were basically concerned with the preservation of the rural environment. The apparent support of some naturalists and environmental groups at these meetings to locate this particular use within an urban environment may not have represented the true feeling of the majority of persons in the Lakehead Planning Area, since the composition of those meetings was dissimilar from the meeting held in February at which time the concerns from the urban population close to the plants were voiced.

Although the two urban sites represent the only choices within the Lakehead Planning Area the Board would stress that the emphasis made by those who participated in the environmental comparison, in addition to the economic arguments for location near the transmitting station in McGregor Township, made an obvious impact on the rating of Bare Point and McKellar Island. A re-evaluation based on recent input from the public and other concerned organizations should be considered by Ontario Hydro.

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6. Ibid p. 206

The effect of locating this major land use in the urban area is emphasized by the following comments.

A McKELLAR SITE

Traditional industries are not expected to be the major generators of employment opportunities in the area, although reliable growth is foreseen in the service industries. The extent of the growth is dependent upon the rate of development of the region. The Thunder Bay Transportation Study assumes that the labour force participation rate will increase to 35% by 1990 with the estimated number of employment opportunities equaling 52,000. Hydro could aid in substantiating these predictions by constructing the proposed nuclear and thermal plants in this part of Northwestern Ontario. This could in turn attract other industries whose power demands are high. Although the Board appreciates Hydro's proposal as a viable asset, it must nevertheless support the Official Plan and the necessary precautions needed to preserve the natural ecological balance of the system.

The McKellar site appears to satisfy Ontario Hydro's criteria for situating a generating station in Northwestern Ontario but the need for underground transmission lines might make this site economically unfeasible. The potential effect on the environment is also a consideration, since it is within an urban location which at present has air and water quality problems.

Since the proposed McKellar Site is within an Open Space Uses category in the Lakehead Official Plan, encouragement of recreation facilities is of primary importance. The Plan's policy suggests that further study is required in order to determine the best potential use for McKellar Island, prior to a final policy for development being formulated. Until this study is completed no further industrial uses should be permitted. The Plan recognizes the need to provide easy access for the urban population to Lake Superior and as such designates the area for recreational purposes. The fact that industrial development has infringed upon much of the City's shoreline, prompts the need for such a study.

This situation is not unique to the local area, but is common to the North American scene as illustrated by Gibberd's applicable remarks:

"Waterside industries..... usually present an aesthetic problem similar to ribbon development along main highways as the factories and storage warehouses generally extend in a thin straggle along the waterfront, shutting it out from view."<sup>7</sup>

The environmental consequences of locating these generating stations within an urbanized area are of prime concern. As compared to the Bare Point site, the McKellar site would have 100,000 persons situated within the short span of five miles of the lignite and nuclear plants. The following is a person/mile breakdown of population figures based on the 1971 Census Tract figures and the Future Population Growth Forecast according to the Official Plan.

<u>DISTANCE</u>	<u>EXISTING POPULATION</u>	<u>FUTURE POPULATION</u>
1 mile	50	50
2 miles	1,450	16,000
3 miles	33,000	45,000
4 miles	63,500	80,000
5 miles	100,000	125,000

Another point of consideration should be the work force employed in the waterfront industries as represented by the concentrations of workers within the specified zones of influence (ie. radii) from McKellar Island.

Based on figures and calculations provided by the Thunder Bay Urban Transportation Study, the population and employment projections related to waterfront industries have been calculated and compiled according to the same zones as previously used to estimate future growth. The following chart exemplifies the existing population/future population of the waterfront industries within the 5 mile radii from the proposed McKellar site;

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7. Ibid p. 209.

<u>DISTANCE</u>	<u>EXISTING LABOUR FORCE</u>	<u>FUTURE LABOUR FORCE</u>
1 mile	805	575
2 miles	2,426	3,510
3 miles	3,559	4,810
4 miles	4,250	6,995
5 miles	7,931	11,020

A further breakdown of the number of persons who are directly employed by each particular business on the waterfront is provided by the Thunder Bay Urban Transportation Study by both charts and maps of the area (see Appendix I). More persons are directly employed in working in waterfront industries in close proximity to the McKellar site than the Bare Point site. For example Zone 215, employs 250 persons industrially and has a potential for 300 industry workers, while a total of 240 persons are presently employed in all categories with a future potential of 800 within this zone. In total, a substantial work force population may be affected by the location of a nuclear plant on the McKellar site, since the existing labour force within the 5 mile radius is 7,931 persons with an estimated number of 11,020 for the future.

As previously noted, environmental effects on the urban area are of paramount concern, although we do appreciate the advantages of the McKellar Site in terms of proximity to the transformer station, market, workforce, rail and road transportation and abundant water supply.

#### B BARE POINT SITE

The economic advantages of this particular site and its relationship with the transmitting station just north of Green Point is apparent. However, this particular location is within the Rural Area designation of the Lakehead Official Plan allowing for farming, forestry, water management and recreational uses, all of which require large areas of open space. An amendment to the Official Plan would be required to accommodate large industrial uses.

The Recreational Development Uses policy encourages the siting of summer cottages, marinas, boat liveries and related uses within the Municipality of Shuniah. Since Shuniah's lakefront is already extensively used to accommodate recreational needs of a segment of the present population of 115,000 persons in the Lakehead area and no doubt will increase in the future, the preservation and maintenance of the lakeshore land must be carefully guarded.

The two existing railway corridors and the former Trans-Canada Highway (Lakeshore Drive) which bisect the site, may cause difficulty in the efficient operation on this plant. Other disadvantages pertaining to this site are the environmental problems which may arise due to the proximity of the site to the City of Thunder Bay.

For example, the North Ward presently secures its water supply from Lake Superior by means of an intake pipe and pumping station located at Bare Point. Water is pumped to the distribution system through two 24 inch diameter feeder mains, and the water distribution system itself is divided into three pressure zones. In view of the situation with the North Ward entirely dependent on this system for its water supply, the City must therefore protect the supply either by relocating the intake piping or by extending the pipes and allowing Hydro to control the intake through an agreement with the City. The Board is concerned that water pressure volume or quality may be affected in such a situation.

Although existing residential and other development is limited in the vicinity of the proposed Bare Point site, the potential for new growth can be anticipated. Sporadic residential growth in McGregor Township, in particular between the Expressway and Lakeshore Drive, will undoubtedly increase population densities within five miles of the site. The addition of new industries surrounding the generating station will also increase the labour force in the area. Although the Official Plan and the projections in the Thunder Bay Urban Transportation Study have indicated little or no development to the latter part of the 1980's subsequent planning policy up to and beyond the turn of the century could encourage development in the

Our concern lies with the possible creation of fog and icing conditions along Lakeshore Drive and Current River and possible fogging in the narrow entrance to the harbour due to the substantial hot water discharges into the Bay. The International Association for the Great Lakes suggests that prior to the installation of large thermal power plants on the Great Lakes, studies will be required to assess the inadvertent weather modifications which are likely to result. Under the criteria established by the Ministry of the Environment, a complete on-site study of the chosen location and of the environmental impact is mandatory in order that all environmental effects are within the guidelines set down by the Ministry. The Lakehead Planning Board is nevertheless concerned that modifications could be granted to Ontario Hydro which would allow more lenient standards to be observed, should engineering difficulties arise. We feel that the more natural state of the environment in this area warrants that more stringent standards be set for Northwestern Ontario as opposed to those for Southern Ontario in order to ensure that the quality of the environment is not altered to any significant degree.

B SULPHUR DIOXIDE

Experiments have shown that sulphur dioxide alone has no ill effects on health at 1.0 parts per million or even at somewhat higher concentrations, but in situations where  $SO_2$  is just one of several pollutants which includes respirable particles such as water vapour, grain dust etc. evidence indicates that at levels between 0.1 and 1.0 parts per million, it could have some harmful effect on susceptible people over a long period of time.<sup>9</sup> Thus sulphur dioxide becomes more harmful in the presence of moisture and fine particles than in the pure state and can cause damage to the lower throat and lungs when it is attached to air particles and is inhaled.

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9. Ministry of the Environment, Air Pollution and Human Health. Information Services Branch, Toronto.



The production of sulphur dioxide tends to rise in periods of cold weather with increases in fuel consumption. In addition inversions tend to predominate in winter thus causing stagnating air to accumulate pollutants close to the earth's surface.<sup>10</sup> People with advanced heart or lung disease are most susceptible at these times. Cancer causing substances have also been associated with this type of air pollution. "Some people believe that these substances are responsible for the fact that lung cancer is more common in cities than in rural areas!"<sup>11</sup>

In addition to being hazardous to human health, sulphur dioxide accelerates the rate of corrosion and of deterioration of wire, metals, paper, textiles and building materials. Sulphur dioxide is readily absorbed by vegetation and soils, with the rate of absorption increasing significantly under the influence of moisture. For example very acidic soils exhibit no absorptive capacity in the absence of soil moisture yet significant amounts of SO<sub>2</sub> absorption occur when moisture is present.

According to a recent HOPE Committee report, based on figures provided by Ontario Hydro, it has been calculated that 2.88 tons of sulphur will be oxidized per hour, producing 5.76 tons of sulphur dioxide per hour and 138.24 tons of SO<sub>2</sub> per day from the lignite plant. Our concern lies not in the mixing of the sulphur dioxide discharged at high levels with the thermal plume from the thermal discharge into the Bay, but rather with the mixing of the SO<sub>2</sub> with the water vapour discharged from the smoke stacks. If this should occur, it could cause damage to both the health and property of the residents of Thunder Bay and the immediate surrounding area.

#### C METEOROLOGICAL CONSIDERATIONS

Prevailing wind direction plays an important role in the selection of sites for thermal plants, particularly in the assessment of sites for the erection of atomic installations. Nuclear plants must be located such that they present little if any hazard to the local

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10. Environment Canada, A Pollution Primer, Ottawa 1972.

11. Krenkel P.A. & Parker F.L. (eds) Biological Aspects of Thermal Pollution, Vanderbilt University Press, 1969.

population from permanent or accidental radioactive pollution. The Atomic Energy Commission (USA) recommends that high power nuclear reactors be located so that no densely populated regions are in a downwind direction.

Hydro states that 61% of the time the prevailing winds blow towards the Lake; nevertheless this means that 39% or approximately over one-third of the year the winds are landward and could present a significant hazard in the event of a nuclear accident. In addition these winds would contribute to the distribution of the sulphur dioxide and other pollutants throughout the Thunder Bay area.

Since Thunder Bay is the only significantly populated area in the entire Northwestern Ontario region, perhaps Hydro could more seriously consider other less densely populated locations in which wind direction would not have such significant bearing on the location of the plant.

Another meteorological aspect which should receive attention but on which little information is available at the present time in the Thunder Bay area, is the diffusion capacity of the atmosphere. Diffusion capacities, which are determined by such considerations as frequency of inversions, wind speed and wind direction, enable meteorologists to predict the ratio at which pollutants can be dispersed into the atmosphere. These rates could aid in the selection of a site for the new thermal plants and in determining the times when closure of the plants would be required due to adverse meteorological conditions.

Daily maps illustrating potential areas of stagnation across Canada, are now available from the Atmospheric Environment Service of Environment Canada. These maps indicate that the Thunder Bay area is at times susceptible to adverse meteorological conditions which would encourage pollutants to be concentrated in the lower atmosphere.

These maps may also be useful for site selection and in predicting times at which plant closure might be required.

3-2 WATER POLLUTION

A THERMAL DISCHARGES

The largest use of cooling water at the present time is by the rapidly expanding thermal electric power generating stations. The degree of thermal pollution depends on the thermal efficiency which is in turn determined by the amount of heat rejected to the cooling water. Heat rejection for a modern 800 megawatt fossil-fueled generating unit is about 50% while for a similar-sized nuclear unit this figure increases to approximately 66%;<sup>12</sup> thus a large nuclear-power plant currently requires approximately 50% more cooling water for a given temperature rise than a fossil fuel plant of equal size.<sup>13</sup>

Our concern lies with the possible environmental implications of locating a 2000 megawatt nuclear plant and the construction of a 800 megawatt lignite-fired plant on Bare Point or McKellar Island, in addition to the expansion of the coal-fired Mission Island plant from 100 megawatts to 400 megawatts. The HOPE Committee points out that 2,585,000 US gal. of hot water per minute will be flushed into Thunder Bay from these three plants. If these figures can be assumed to be accurate, then comprehensive studies must be undertaken to evaluate the environmental impact of dumping such vast quantities of heated water into our Bay. Generally the temperature of water employed for cooling purposes is raised 6°C to 9.5°C (11°F - 17°F) but under some circumstances this may be increased to 24.0°C (43°F).<sup>14</sup> Present regulations under the Ministry of the Environment though, require that water which has been discharged after being used for cooling purposes, be no greater than 20°F warmer than the ambient water.

The warmer water which is being discharged tends to hold together as a plume and remain close to shore until there is only about ½°F - 1°F difference between the discharge and the ambient waters, at which time the warm waters diffuse outward.

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12. Woodson R.D., "Cooling Towers For Large Steam - Electric Generating Units", in Electric Power and Thermal Discharges, Eisenberd M. and Gleason G. (eds), Gordon and Breach Science Publishers, New York , 1969.
  13. Krenkel P.A. & Parker F.L. (eds) Biological Aspects of Thermal Pollution, Vanderbilt University Press, 1969.
  14. Parker F. & Krenkel P. Dry Cooling Towers, C.R.C. Press, Cleveland Ohio, 1970.

Thermal discharges of this type contribute stress to the ecosystems and accelerate the process of eutrophication aging by increasing the temperature of the epilimnion (top layer of water), extending the season during which it remains warm or increasing the volume of that layer.<sup>15</sup> In this manner a lake's water becomes overenriched and laden with algae and other plant growth. The waters develop a characteristic 'pea soup' green colour and lose much of their value for recreational uses such as swimming, water skiing, sailing, and as a habitat for desirable cold water fish such as salmonids. "If fresh water lakes are to be preserved for the enjoyment of the present as well as succeeding generations, extensive efforts must be made to curtail additions of both nutrients and heat."<sup>16</sup>

Associated with thermal heating and the stimulation of growth of oxygen-robbing algae, one finds a decrease in the oxygen-carrying capacity of the waters. Studies have shown that fish require nearly twice as much oxygen for every 10°C increase in temperature. In addition trout and other cold water game fish will not spawn in some localities if water temperatures become too high, since reproductive activities are confined to a narrow range of temperatures.

Although the Canadian experience with nuclear generating stations have been rather limited, some major fish kill occurrences have been observed at both the Pickering and Nanticoke plants. In the United States, where experience is somewhat more extensive, studies such as the 1970 report to the Lake Michigan Enforcement Conference clearly indicate that the potential for damage to shallow water ecosystems by the electric power generating industry is great. The Lake Michigan study indicates that the destruction of fish and fish food organisms and the acceleration in the rate of eutrophication of the inshore waters is already taking place. Fish mortalities are occurring as a result of temperature increases and fluctuations (the latter is caused by generating plants starting and shutting down power operations according to power needs) and as a result of the

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15. Brown T.L., Energy and the Environment, C.E. Merrill Co., Columbus, 1971, P. 85.

16. Brown T. L., Energy and the Environment, C.E. Merrill Co., Columbus, 1971.

impingement of fish on intake screens and the entrainment of fish fry in discharges. Illustrating the general concern about the actual and/or potential problems, a nuclear plant being built near Southport North Carolina has been allowed to deposit its condenser-cooling water which was obtained from the Cape Fear estuary into the Atlantic Ocean for the next three years. After this initial period, the plant will be required to switch its operations to a close-cycle system to protect the commercial fishing industry.<sup>17</sup>

Our concern lies not specifically with the fish kill problem but rather more broadly with the possible eutrophication of part of an oligotrophic lake and its consequences both on the wildlife and human inhabitants along its shores. Based on the map found in the Ontario Hydro's Report on Evaluation of Siting Alternatives, dated Feb. 18, 1974, the cooling water pipe will discharge warm water at a depth of only about 13 feet, thus potentially affecting the entire shallow water ecosystem in the vicinity. Since we are not qualified to give detailed comments in the field of limnology, (the scientific study of physical, chemical, meteorological and biological conditions in fresh waters, especially of ponds and lakes) we wish to merely point out the wide range of possible environmental consequences of locating these thermal plants at Thunder Bay.

## B ALTERNATIVES

### (1) COOLING TOWERS

Realizing that costs do present a significant constraint, nevertheless we feel that cooling towers may provide a feasible solution to the problem of cooling and thermal pollution. Whereas wet cooling towers do present additional environmental problems, dry cooling towers do not waste water nor discharge any heat whatsoever into the surrounding bodies of water.

Dry-cooling towers cool fluids either by the dried condensing cycle method in which exhaust steam is piped to tubed condensing cooling coil over which the cooling air is passed and the warmed air

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17. Frye J. "North Carolina Nuke to Go Closed-Cycle in Three Years to Save Fish", National Fisherman, April, 1974.

large amounts of heat of low grade are available, the thermal electric plant can be made into multi-purpose energy sources of some sort. J. A. Nutant<sup>22</sup> points out that this low grade heat from thermal plants has been utilized for space heating (in Iceland) and also for air conditioning during the summer months. Another feasible concept would be to combine sewage plants with power plants.

"The average temperature of domestic and most industrial sewage in the USA is approximately 70°F with usually not more than 3°F seasonal variation. If the sewage temperature could be raised from 70° to 100°F, before going into activated sludge tanks, theoretically a treatment plant could double its BOD loading and cut its detention time, thus doubling its capacity".<sup>23</sup>

Waste heat can also be utilized for de-icing and de-fogging airports and for heating greenhouses. It has been estimated that a 100 megawatt nuclear plant could heat 4.4 square miles of greenhouses. Thus the potential for utilizing waste heat from thermal plants appears for local industries appears to be quite significant.

#### NUCLEAR ACCIDENTS

Whereas the HOPE Committee suggests on the basis of information obtained at an Ontario Hydro public meeting, that a major nuclear leak from a thermal nuclear plant can be expected once in 200 years, Ontario Hydro points out that "the expected frequency rate of accidents at CANDU nuclear plants resulting in significant radioactive release to the atmosphere is once in 10 million years". On the other hand the Atomic Energy Board of Canada states that it is not possible to extrapolate from the limited experience so far obtained in the CANDU-type of reactor with its many possible variants.<sup>24</sup>

It is possible for three types of accidents to occur in a nuclear reactor. A-blow-up or runaway chain reaction may occur due to the failure of a

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22. Nutant J. A. "Utilizing Waste Heat for Urban Systems", in Electric Power and Thermal Discharges Elsenberd M. and Gleason G. (eds), Gordon & Breach Science Publishers, New York, 1969.
  23. Nutant J. A. "Utilizing Waste Heat for Urban Systems", in Electric Power and Thermal Discharges Elsenberd M. and Gleason G. (eds), Gordon & Breach Science Publishers, New York, 1969.
  24. Atomic Energy of Canada Ltd., Some Aspects of the Releases of Radioactivity and Heat to the Environment from Nuclear Reactors in Canada, P. I. Barry (ed) Chalk River 1972

reactor control or due to an accident. A second type of accident may occur when the coolant flow through the reactor core might be blocked, with the result that the temperature of core materials would rise. The automatic shut-down of the reactor by emergency controls could stop the chain reaction, but the accumulated fission products would continue to emit heat because of their radioactivity. A third type of accident which could occur would involve coolant systems and heat exchanger. The corrosion of pipes, especially where the coolant is a liquid metal such as sodium might produce a violent chemical explosion and the release of radioactive debris. "For very high-power reactors the full release of the fission products in a violent explosion might produce human fatalities at a distance up to 30 miles or even more".<sup>25</sup>

A long standing policy of the Atomic Energy Commission (USA) has been to encourage the siting of nuclear power plants away from densely populated areas. Based upon an analysis of more than 60 nuclear power plants sites in the United States, the actual distance to the nearest population centres of 50,000 persons or more, range from about 4 to 100 miles, with a typical distance being 30 miles.<sup>26</sup>

Perhaps it would not be advisable to locate a nuclear generating station at such close proximity to Thunder Bay until more extensive studies evaluating the consequences of locating nuclear reactors near densely populated areas have been carried out and until experience has illustrated that this is feasible without any detrimental effects to the residents.

### 3-3 SUMMARY

Within this section, the Board has presented some of its concerns related to the effect on the environment of the introduction of a thermal and nuclear generating station in this area. The Lakehead Official Plan represents the

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25. Schubert J. & Lapp R. E. Radiation: What It is and How It Affects You, Compass Books, New York, 1968.

26. United States Atomic Energy Commission, General Environmental Siting Guides for Nuclear Power Plants, Washington, 1973.

policy for development of this planning area and provides general guidelines for orderly growth in a manner consistent with good planning principles, which not only includes the design, spacing and staging of the physical development, but the protection of the environment.

Although the Board recognizes the need for increased electric power to meet the demands created by growth in Northwestern Ontario, the arguments presented by the power commission that relate the good life to the increased use of electric power must be tempered by the effect on a fragile ecosystem which has already received the abuse of uncontrolled development. Realizing that specific provincial controls will provide a degree of protection, the fact that the acceptable pollution levels have been based on limited research particularly in this part of Ontario is not completely reassuring. The major weaknesses of the positions taken by power company spokesmen on the need for more electric power is based on our lack of knowledge on the long range effects created by a disturbance to the balance of our ecosystem.

"The first weakness is that the human race depends not only on electricity but on the total ecosystem including the water, the soil, and the air. The second point that the criteria are not based on sufficient scientific fact probably means that biologists cannot tell the precise death point for each and every species in the environment."<sup>27</sup>

Because recent studies on the Great Lakes have shown that although Lake Superior is large and deep, most aquatic life is restricted to a relatively narrow shelf. An imbalance in the life systems within this beach zone can cause major irreversible damage to the lake and must be carefully studied. The alternatives to siting a power plant on such a large but fragile body of water should be given top priority.

"Society cannot continue to expand production of electric power and increase discharge of heated waste water into the aquatic environment indefinitely without causing a major ecological crisis."<sup>28</sup>

The importance of Thunder Bay and Lake Superior to the future of Ontario and Canada should be considered as a prime study criteria. Therefore, the Lakehead Planning Board would recommend that Ontario Hydro in co-

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27. Cavins J. "Thermal Pollution - A Cause for Concern" Journal of the Water Pollution Control Federation, Vol 43, Jan. 1971.

28. Ibid.



operation with a Committee of independent environmentalists thoroughly investigate the implications of locating on the waters of Lake Superior before selecting a site for its total environmental impact study.

SECTION 4 - SUMMARY AND CONCLUSIONS

As a Board concerned with the planning process in this area we are well aware of the expanding power requirements of Northwestern Ontario, based on future growth projections and as such are not opposed to the construction of additional generating facilities in this region. However, the Lakehead Planning Board would have favoured a more active role in this site selection process for the new generating station since the construction will have such an immense impact on the immediate surrounding area. A closer liaison between Ontario Hydro and either the Board, its Technical Co-ordinating Committee or a similar local independent committee set up for this purpose would have provided information and reaction on particular conclusions and recommendations and eliminated some of the misunderstandings that have occurred. The opportunity provided by the circulation of the Lakehead Official Plan to all government departments for comments in 1972, at which time Ontario Hydro had indicated the Lakehead Planning Area's 20 year planning policy did not conflict with their development program, could have been an initiation of this participation process.

Since this submission to Ontario Hydro may appear to have negative connotations we wish to point out that it was not intended as such; it is extremely difficult to provide wholehearted support for a proposition about which we have so little concrete information and in which we have not actively participated. We do not condemn Hydro as such, for this oversight rather the manner in which the site selection process was conducted. Bearing these facts in mind, this submission is intended only as a comment on the Ontario Hydro reports and to bring a number of the Board's concerns to the surface, as opposed to furnishing support and recommendations for a particular site.

Both environmental and planning concerns were cited in this submission, in that the planning process and the environment are so tightly interwoven. However, since the urban-ecological system is so intricate it is extremely difficult if not impossible to monitor the ramifications imposed by a major land-use attraction on the system. In addition, the lack of adequate information, guidelines, and specific controls (i.e. governmental) hinder our attempts to effectively evaluate the implications of situating

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