CWPA Proceedings, 2003, pp 206-213

WOOD POLE MANAGEMENT AT MANITOBA HYDRO

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Summary

Wood Pole Management at Manitoba Hydro is on the verge of becoming a complete cradle to grave system. Over the years, as the company's focus has changed from development and expansion to maintenance and environmental awareness, its pole management has developed from simple "pole planting" to an integrated program of purchase specification, individual pole identification and tracking, in-situ pole maintenance, and ongoing data development with GPS/GIS interface. It will soon include complete asset management and environmental stewardship reporting, following each pole through to its ultimate disposal.

Pole Management at Manitoba Hydro has evolved significantly over the years from "hurry up and get them in the ground" to a comprehensive program of individual pole identification, inspection, remedial treatment, and data collection, co-coordinated with GPS locations and geographic information systems. As a participant in the Canadian Electrical Association Environmental Commitment and Responsibility program and the Canadian Environmental Protection Act Strategic Options Process for the Users of Industrial Treated Wood, Manitoba Hydro's wood pole management system is evolving to a complete cradle to grave program.

In 1920 the Manitoba Power Commission (MPC) built its first 66-kV transmission line from Winnipeg to Portage La Prairie (approx 100 km). By 1940 MPC was supplying electricity to 139 communities across southern Manitoba (figure 1.). In 1954 MPC connected its 100,000th rural customer – virtually every farm in the southern half of Manitoba had electrical service (figure 2), and just under *250,000* 30 foot class 7,8, and 9 creosote treated jackpine (blackpine) poles had been installed in less than 10 years. Today Manitoba Hydro services over 400,000 customers throughout the province, as well as provides significant export power onto neighboring transmission grids in Canada and the US. The infrastructure includes 16 Hydro-electric generating stations and approximately 750,000 poles supporting 95,000 km of distribution lines and 6500 km of transmission lines (figure 3.).

Acquiring almost *250,000* poles that were installed in the late 1940's and early 1950's was a tremendous challenge to the purchasers, suppliers, and treaters , not to mention the labour and equipment required to install them. Purchasing and treating specifications were quite loose for both the white wood purchases as well as for the treating, in order to allow for the supply of such a large number of poles in such a short time. The poles were almost entirely Manitoba grown jackpine purchased directly from the fellers, and treated with 3 to 4 lbs/cu. ft. of creosote by a local railway tie treater. This specification was bumped to 6 lbs in 1952.

During the 1960's and 1970's the emphasis at Manitoba Hydro remained one of growth, leaving few resources directed towards maintenance. During the late 1970's and early 1980's however, construction slowed, as much of the province had been serviced and the last of the hydro generation dams had been built. This allowed resources to be directed at reviewing, maintaining and upgrading the system and equipment. Up until 1975 little wood decay had been noticed on the blackpine pole population, but managers were starting to realize that these *250,000* or so poles were starting to present themselves a potentially huge liability. Random sampling from salvage returning to pole yards was starting to show that the incidence of both internal and external decay was on the increase. In 1981 a thorough field sampling of this pole population showed that 20% of the poles had external decay. It was becoming very obvious that big dollars were soon going to be needed to replace this quickly deteriorating pole population.

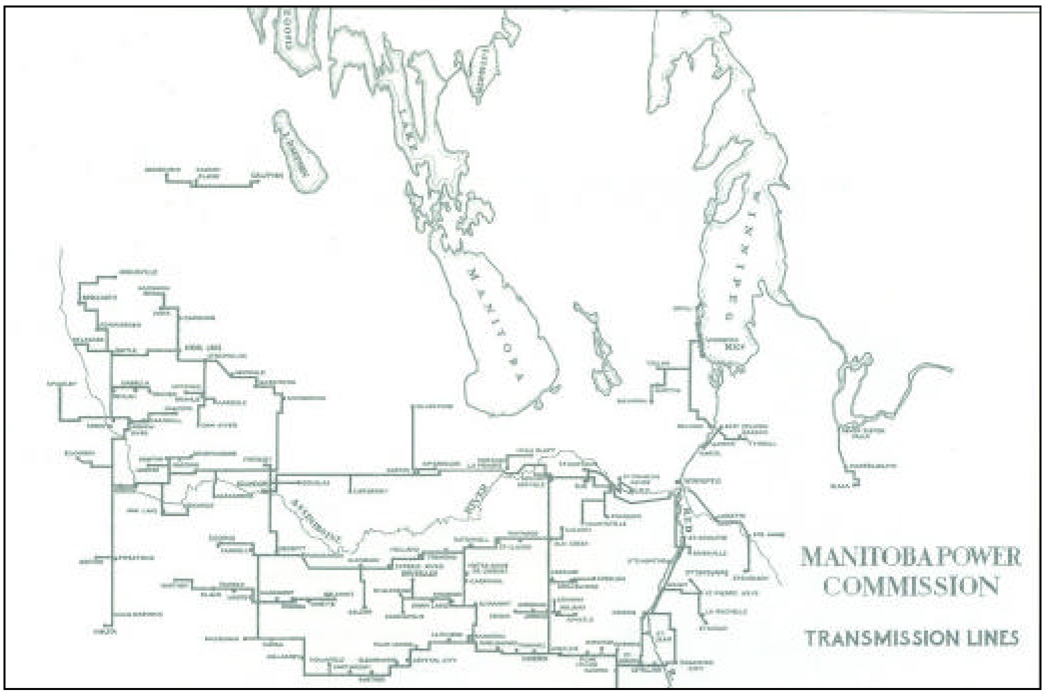

Figure 1. By 1940 130 rural communities were serviced by transmission lines in Manitoba.

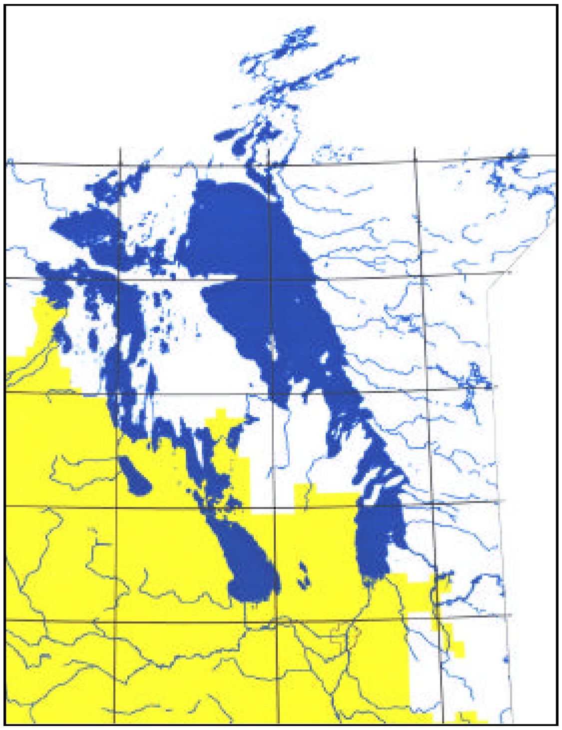

Figure 2. Rural Electrification Area, 1945 to 1954

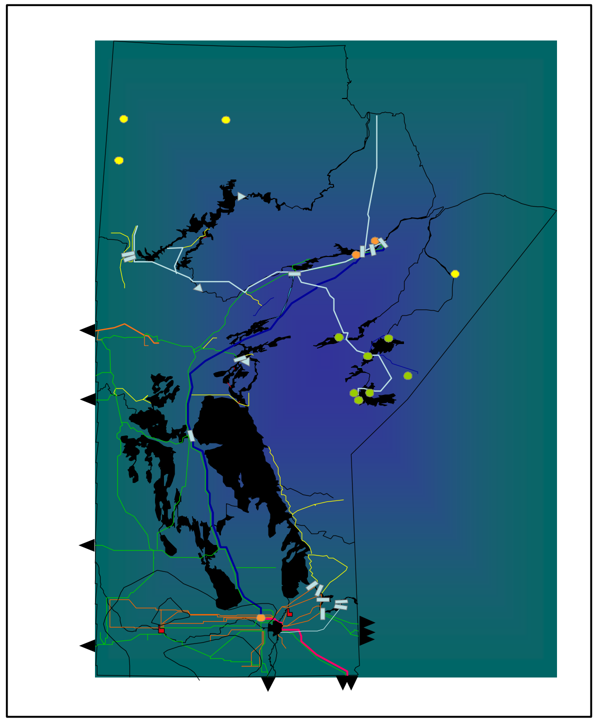

Figure 3. Manitoba Hydro Transmission and Generation System - 2003

Iowa Survivor Curves were used to described the likely patern of demise of this pole population. The infection and mortality estimates from the 1981 survey sugested that a 43 year average life was appropriate. Based on this, figure 4 shows that by 1988 Manitoba Hydro would be replacing 10's of thousands of poles annually for the next 15 years.

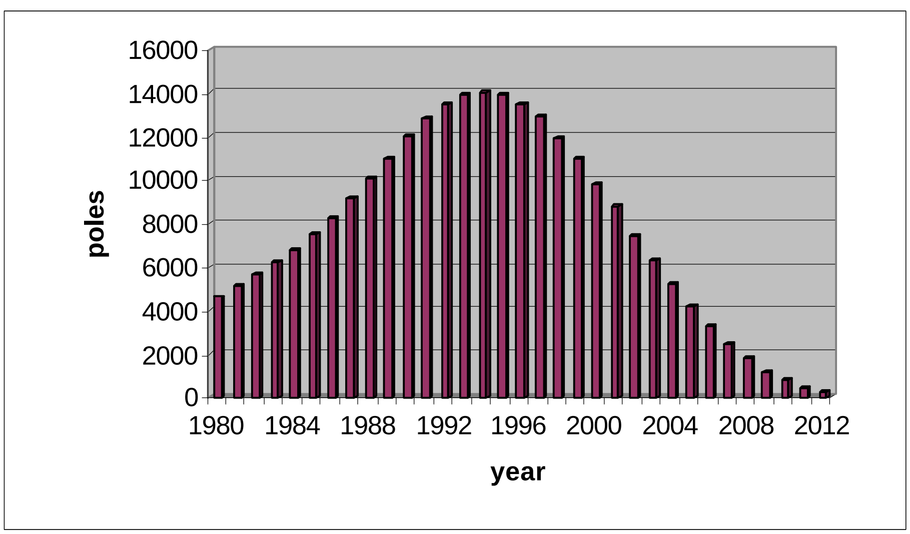

Figure 4. R4 Iowa Survivor Curves Retirement Predictions (43 year average life)

Assuming that an inspection and treatment program would provide 15 years of protection, and that the entire population would be treated over 6 years, a plan was developed to prolong the life of this pole population, saving millions of dollars both over the short and long term. Figure 5 demonstrates that less than a quarter of the pole population would be replaced by the year 2003 by implementing a groundline inspection and treatment program in the next three years. It also shows that 6 years after the program is implemented, annual replacements would drop to less than 1000.

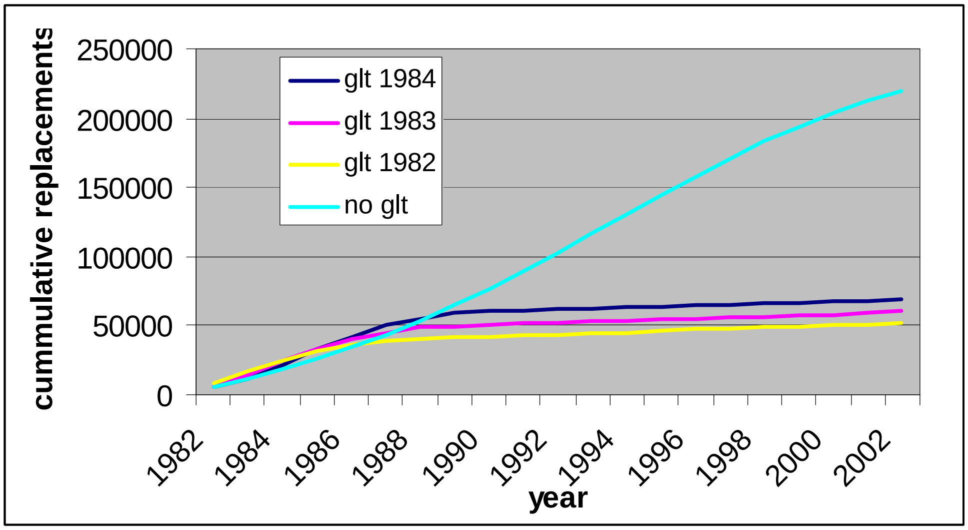

Figure 5. Cumulative pole retirements based on timing of pole inspection and maintenance program

The cost to replace this pole population as it naturally failed would be overwhelming, not to mention the strain on manpower, equipment and pole supplies. Comparisons between three program implementation schedules, showed that each year of delay starting the program significantly impacts the overall savings, in the order of millions of dollars (figure 6.).

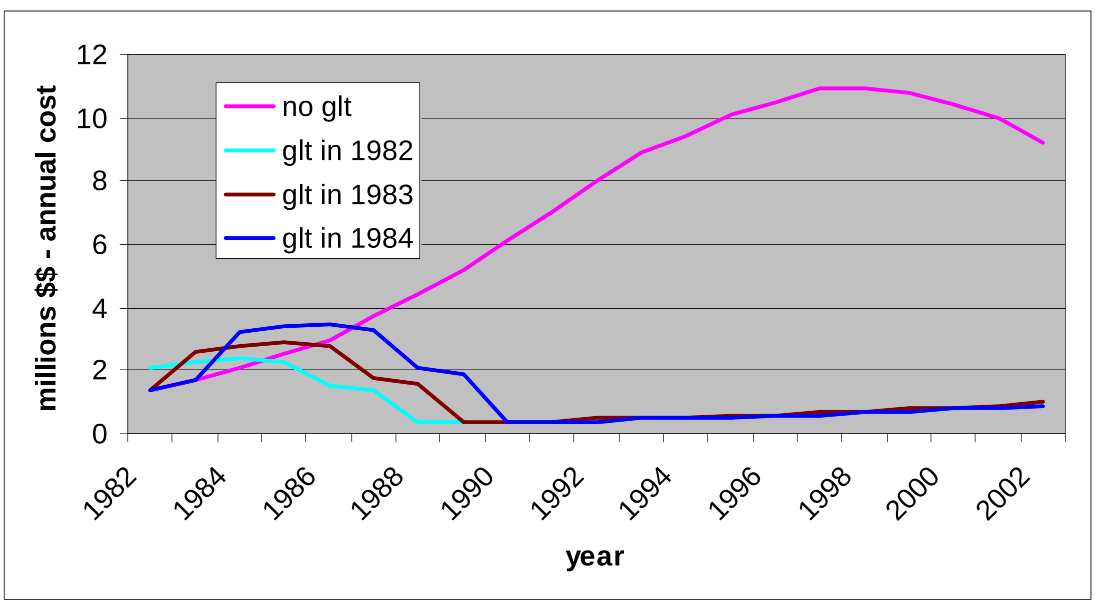

Figure 6. Cumulative cost of pole replacements for each of the program options.

After 1989 the inspection and treatment program was expanded beyond the “black pine” pole population to other species and treatments, realizing these significant savings on the entire pole plant. The treatments were also expanded to include internal fumigant treatment and insecticide treatment, as internal decay and carpenter ant infestations were shown to be common pole problems.

Data collection in the early years was challenging. Computers were not common and field staff did not appreciate the value of pole by pole information. Consequently a valuable opportunity to collect pole age/species/treatment and condition information was lost. The development of handheld dataloggers made it easier for field staff to collect data, although they were still skeptical of its value. Hence, the quality of the data collected was inconsistent in the beginning. However, over the years, as a significant amount of data was gathered, and as some rudimentary reporting was circulated from it, field staff and mangers have come to realize what a powerful tool it could be, and consequently the quality and the quantity of the collected data is now a priority. The pole inspection and treatment program is now viewed as an important opportunity to collect all sorts of information from equipment inventories, to GPS and digital photo line inventories for GIS database and basemap development.

Pole purchasing practices have also developed with the changing functional focus of the corporation. In the early “boom” days, purchasing specifications were weak, and product inspection was minimal. Not because of negligence, but due to limited supply and experience. MPC was not the only electric utility quickly expanding its service area. All of North America was doing the same thing. Supplies of pole material and treating facilities were not sufficiently developed to meet the demand, and standard specifications for poles were yet to be developed. Today, supply agreements, CSA standard specifications, internal product specifications, enforced quality control and assurance programs on behalf of both the supplier and purchaser, all work to ensure that the best possible product at the best possible price is installed into the system.

In 1993 Manitoba Hydro adopted a sustainable development policy and 13 guiding principles to influence its decisions, actions and day to day operations. To help it realize its environmental goals, Manitoba Hydro has developed an Environmental Management System certified to ISO 14001 standards. The EMS helps to identify environmental impacts, set goals to manage them, implement plans to meet those objectives, evaluate its performance, and to make continual improvements to its system.

In 1997 the Canadian Electrical Association commissioned its Environmental Commitment and Responsibility Program (ECR), participation in which is a mandatory condition of membership. ECR is an industry wide approach to environmental performance through the development of Environmental Management Systems to ensure:

1. the efficient use of resources
2. the reduction of the environmental impact of doing business,
3. accountability to our constituents (reporting), and
4. that employees understand the environmental implications of their actions, and that their knowledge and skills enable them to make the right decisions.

The ECR program’s primary areas of focus are:

1. climate change,
2. air quality,
3. waste management,
4. fisheries,
5. protection of species at risk, and more recently,
6. management of treated wood.

In the early 1990's Environment Canada and Health Canada under the direction of the Canadian Environmental Protection Act (CEPA) developed a process for managing environmental contaminants:

1. identify toxic chemicals,
2. assess the risk to the environment and human health, and
3. review and implement the options available to reduce environmental and human health risks posed by these CEPA toxic chemicals. This became known as the Strategic Options Process (SOP).

The wood preservation sector was identified as a source of release of CEPA toxic substances.

A review of the treated wood life cycle determined that there were releases at all stages: during manufacturing of the preservatives, during the treating process, during storage and use, and after disposal. As a result, the SOP issues table produced Best Management Practices (BMPs), Technical Reference Documents (TRDs), and User Guidance Documents (UGDs) to address three areas: 1) the manufacture and treatment of treated wood, 2) consumer treated wood, and 3) industrial treated wood. Manitoba Hydro participated in the development of the recommendations in the UGD for Industrial Treated Wood, as users of treated wood poles.

The UGD for industrial treated wood identifies that the greatest opportunities to reduce releases are to make certain that wood is properly treated to minimize releases during use, and to appropriately re-use wood taken out of service. It focuses on reducing releases by implementing Best Management Practices to reduce inappropriate use, storage and disposal.

The UGD also commits user companies to:

1. implement a treated wood management system by the end of 2002,
2. providing a self audit and internal report by the end of 2003, and
3. completing 3rd party audit and public reporting by the end of 2005.

The reporting is to outline 1) the annual purchases, 2) annual disposal including tracking to the landfill, reuse, recycle, and recovery, 3) estimates of releases in service, and 4) annual trends in use, releases and disposal.

The UGD is seen as the guiding outline for the management of treated wood within Manitoba Hydro's EMS principles of minimizing our impact on the environment by meeting or exceeding regulatory requirements and other commitments such as the ECR. To meet the UGD and ECR reporting requirements Manitoba Hydro must track the treated wood being put into service, inventory the treated wood it already has in service, and track the treated wood it takes out of service including its reuse/recycle/recovery or disposal.

Manitoba Hydro plans to accomplish this by integrating GPS, GIS and the wood pole inspection and treat program. A unique bar-coded tag is being applied to each in-service pole as it is inspected. This unique barcode number then lives and dies with that pole. A GPS location is determined for each pole and electronically recorded along with pole height, class, species, original treatment and other inspection and remedial treatment information. This info is to be loaded into the corporate GIS to develop a "live" inventory of treated wood in service. New poles are tagged with the unique bar-coded tag by the preservative treaters, and an electronic datafile is supplied identifying the pole particulars associated with that number. As these poles are put into service, location information is added to the pole data, and this will be loaded into the corporate GIS as part of the plant "as-built" plans. When a pole is taken out of service, the barcode number is reported to the database along with the disposal information, and that pole record will then be archived. In about 10 years we should have a comprehensive inventory on all treated wood in service, going into service, and coming out of service.

The integrity of this database has consequently been given the priority we would have liked to have given it in 1982 when we started the first inspection and treating program. The database will include all maintenance and inspection details over a poles' lifespan. This will give us the information necessary to more accurately follow the trends within our pole population, and "tweak" our pole management program of purchase specifications, in-service inspection, remedial treatment, and disposal, to help us get the best value from our pole plant while meeting our environmental responsibilities.

Concepts to include in an Environmental Management System concerning the use of wood treated with CCA, ACA, ACZA, Creosote, and Pentachlorophenol". Revision 3, Guideline Development Working Group, Industrial Users Steering Committee, Wood Preservation SOP, June 2003.

[ECR] – " 2001 ECR Annual Report. The Annual Report of the Environmental Commitment and Responsibility Program". Canadian Electrical Association, October 2002.

Munro W., and Mann R., "Evaluation of the need for and the Timing of A Groundline Treating Program on 1946 to 1951 Blackpine Poles" Regional Services, Manitoba Hydro, 1981