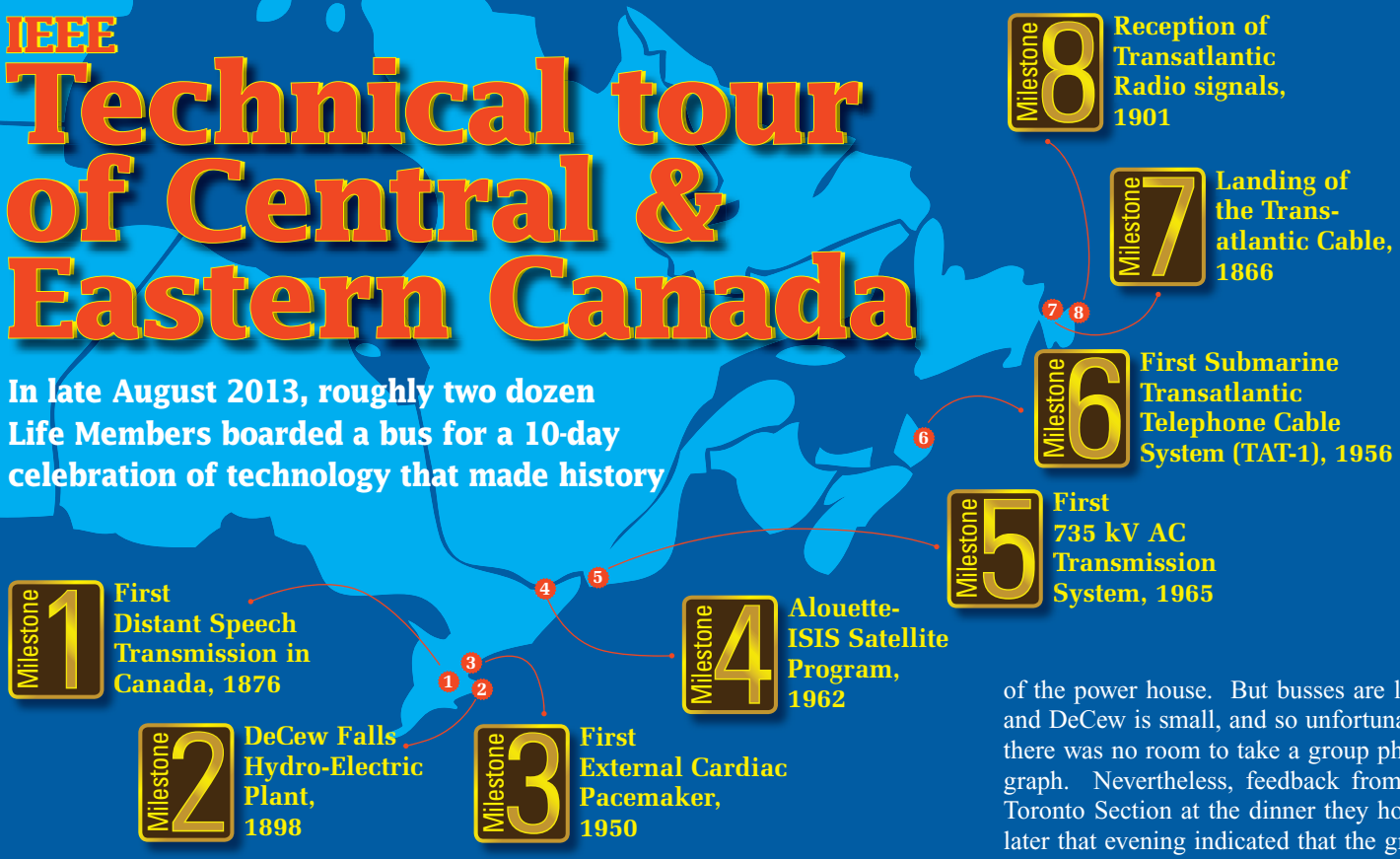
IEEE Technical tour of Central & Eastern Canada

In late August 2013, roughly two dozen Life Members boarded a bus for a 10-day celebration of technology that made history



DeCew hydro plant in St Catharines

by **Dave Hepburn**

The old, but still vibrant, DeCew hydro plant in St Catharines has a most interesting history. And what's more, not only is it still working 24/7, it is now well on its way to creating a few more "firsts," as will shortly be revealed.

The public relations manager for Ontario Power Generation (OPG) and I met the group the afternoon of August 26 in St. Catharines; it was hot, steamy and overcast, to a tropical extent.

Nevertheless, troupers as they were, the tourists were off the bus and into the powerhouse in a trice. Their visit could not have come at a better time, because DeCew (pronounced D Q) is currently undergoing a comprehensive "Life Extension" program. This is quite extraordinary, given its age. The two original units from 1898 are alas, no longer there, but four of the remaining units which date from 1903, and are therefore already 110 years old, are being extensively renovated, with a view to keeping them in service for another 25 years or so. This obviously caught the interest of the tourists, and, to my surprise, they kept asking probing questions for over an hour-and-a-half. Given that the original time allocation was 30 minutes, and given also that everyone was gently steaming in the heat, humidity and noise (two of the generators were running at the time) that was surely a tribute to the endurance of both the visitors and the plant.

Eventually, and not without some difficulty, the tourists were coaxed back on to the bus. But just at that moment, the heavens opened and a downpour began. The rain was in fact so heavy that the driver decided to drive his bus into the main door of the power house. But busses are large and DeCew is small, and so unfortunately there was no room to take a group photograph. Nevertheless, feedback from the Toronto Section at the dinner they hosted later that evening indicated that the group considered digging into living history at DeCew was preferable to trailing around Niagara Falls soaking wet. They did however, see the statue of Nicola Tesla, the man who started it all in 1897.

Photos: Dave Hepburn

Here are some further tour technical tidbits. The genesis of the DeCew plant originated in 1896, when a plan was put forward to use some of the water from the Welland Canal to generate power to send to a street railway in Hamilton, 35 miles distant. Lord Kelvin said it could not be done economically, but Nicola Tesla said it could if the voltage was high enough. Tesla won and he designed a system using 22.5 kV, 66 2/3 cycles, and TWO phases. The two original machines were 1,000 kW (1 MW), but it was the voltage (astonishing at the time) which is the basis of the IEEE historic marker, dedicated in 1998 to commemorate the centenary of its first entry into service in August 1898. The two original units were converted to 3 phase in about 1903 and, alas, were cut up for scrap during WW II. The units still running date from 1903 and each produces 6.5 MW, 28.0 MW total. At the current domestic rate of about 15 cents/kW.h, that represents revenue of about $33 million per year. Not so dusty for a centenarian!

Peterborough Liftlock

by **Sean Dunne**

Although we don't have any milestones in Peterborough we saw an opportunity to host the LM tourists for lunch on their way from Toronto to Ottawa and to treat them to a visit to a unique Canadian engineering achievement, the Peterborough Liftlock— the World's tallest. We then acquainted them with the Canadian Canoe Museum which in its own way symbolizes Canadian engineering and innovation over four centuries.

At the Canoe Museum we had two displays one prepared by Life Member John Mackelvie on Unilogic the world's first digital logic developed in Peterborough in 1957, just ten years after the invention of the transistor. Bob Rehder, Life Member, discussed the three 100MW rotary variable frequency transformers built to interface the Hydro Quebec and Mohawk grids that are not synchronized, as well as the 735kV Air-blast Circuit Breakers built in Peterborough for Hydro Quebec. Finally a presentation by Life Member Andy Stevenson traced the long history of innovation and invention in Power Conversion which took place in Peterborough.

Our visitors got to see the Liftlock operate not once but twice before we sent them on their happy way to dinner in Ottawa.

Photos: Sean Dunne

Capital hospitality

Photos: Janet Davis

by **Janet Davis**

The Ottawa LM tour showcased our local universities. We toured the undergrad labs at the University of Ottawa and fabrication facility at Carleton University. The participants had a very interesting session seeing some of the past CAPSTONE projects on video and in the Ottawa U lab. Some also saw the light show after dark on Parliament Hill and toured the Parliament Buildings. Unfortunately CRC was not available for a tour of the milestone Alouette-ISIS Satellite Program, 1962. We ended the tour with a dinner at the hotel and some new friends. It was a fun day.

Landing of the Trans-atlantic Cable, 1866

by **Matt Baum**

Although the entire trip was informative and exciting, the Cable Station at Heart's Content was for me far and away the most exciting stop.

I had long known and thought about the fact that transatlantic communication by wire (this was before wireless, or radio) had forever speeded up communications between North America and Europe and thus revolutionized commerce between the two major trading areas. Now, to be at the actual place where this was born was an unbelievable thrill.

To also see the equipment there in place - some of which was from the original times, in 1866 - was almost beyond belief. I'm sure that all of us would liked to have spent a few days there, instead of the short time available. I'm glad that I took plenty of pictures, as this will be a favorite memory of mine forever.

1

1. The Heart's Content Cable Station - outside view; **2**. Cable Ends inside, as they enter the building; **3**. Some of the Equipment present in 1965; **4**. Some cable ends emerging on the beach. *Photos:* Matt Baum

2

3

4

Tour meets Submarine Cable Milestones in Atlantic Canada

Tour entourage at Sydney Mines, including a proud display of short section of the transatlantic cable that once was the telecommunication lifeline between North America and Europe

Photo: Patricia Manuel

by **Dirk Werle**

Whether you look at a historic map of early transatlantic telegraph cables or a modern network chart of the global fiber-optic connections, you will soon realize that the eastern seaboard of Canada has remained a hotbed of submarine telecommunication traffic for the past 150 years [1, 2].

Modern fiber-optics cables come ashore near Halifax, Nova Scotia, yet most of them have now been routed directly to Boston and New York in the United States. Remnants of old telegraph and telephone cables are still in evidence at landing sites in Newfoundland and in Nova Scotia and were eagerly inspected this summer as part of the 2013 IEEE Life Member Tour of Engineering Milestones in Central and Eastern Canada. A group of 25 members from around the world participated in the two-week long bus tour that took them from Toronto to St. John's [3].

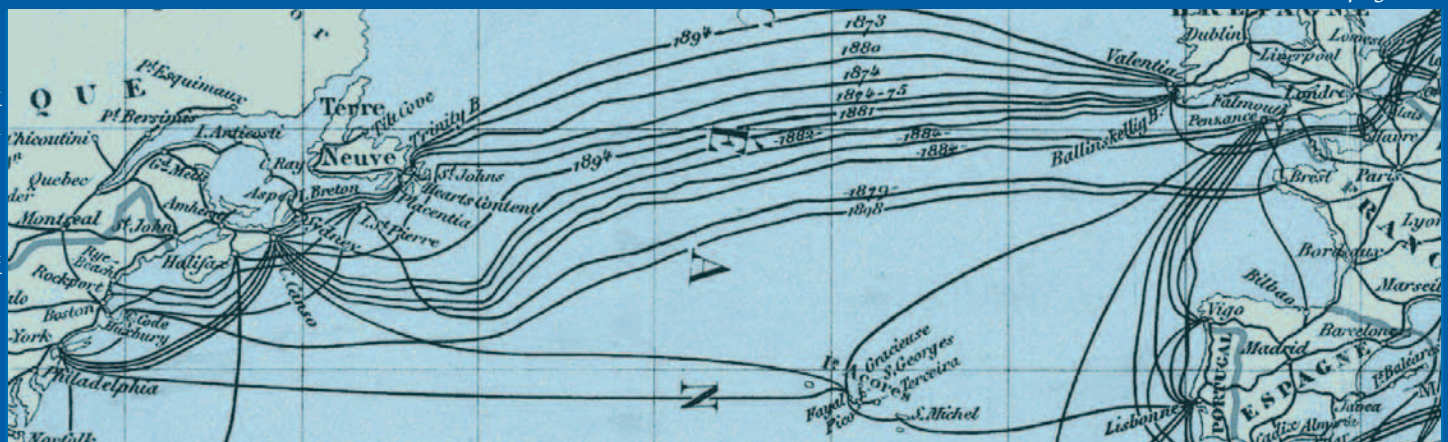
There was growing excitement among this group of distinguished engineers traveling to the beginnings – or end points, depending on your perspective – of the most innovative and advanced submarine telecommunication infrastructure of the past two centuries. Two of the Milestones commemorate the first transatlantic telegraph cable of 1866 in Newfoundland and the first transatlantic telephone cable (TAT-1) of 1956 in Nova Scotia, respectively [4]. These submarine cables revolutionized communication between Europe and North America. The first ones shortened the news cycle during the second half of the nineteenth century from the long duration of a ship's passage across the Atlantic to a matter of seconds. Entire lines of business, let alone stock markets, started to rely on timely telegraph messaging and news services upon inauguration in the 1860s. The copper core cables became essential infrastructure of what some have termed the "Victorian Internet", manifested and celebrated by a commemorative plaque at its western submarine cable landing point in Hearts Content, Newfoundland.

Photo: Patricia Manuel

The old landing site of the transatlantic cable in Sydney Mines was successfully searched for "evidence" by the IEEE Life Members (Source: [3])

The other "real thing" stuck out on a stretch of sandy beach near Sydney Mines, NS, where the first transatlantic coaxial telephone cable was brought ashore and into operational service in 1956 (see photo). The Tour members jumped at the opportunity to pay an impromptu visit to this rather inconspicuous site which, unbeknown to most, is located just a short drive down the street from the Sydney Mines Heritage Museum where the commemorative TAT-1 Milestone plaque has found its home.

Continued on page 16 ›



Credit: http://atlantic-cable.com/Maps/

Continued from page 15 ›

While the first set of TAT-1 cables consisted of less than a few dozen telephone lines some 50 years ago, subsequent TAT lines with greater capacity have opened telephone connections between millions of people on either side of the Atlantic. The extraordinary technological achievement of the TAT-1 consisted, among others, in the provision of reliable repeaters, each containing a set of three fragile vacuum tubes that functioned flawlessly for two decades under very hostile conditions [5].

One of the IEEE Life Members recalled the experience of a previous LM Tour that had made arrangements in London, England to see the original plans for the TAT-1 project. What an exciting way to reach back into engineering history and make hands-on connections at either end of the line! By the time TAT-1 went out of service in 1978, the present era of fiber-optics submarine cables was already dawning with the advent of TAT-8, capable of handling vast volumes of voice and data traffic. The world had changed once again! Today, this global network consists of many thousands of kilometers of submarine cable, carrying more than 95 per cent of all transoceanic telecommunications.

The submarine communication industry is expecting at least $2 billion in new investments and 50,000 km of additional cable capacity annually [6]. And wouldn't you know, that it made its North American debut long ago, during November of 1852 – even a full decade before the famed 1866 Atlantic Cable – when Engineer and Electrician Frederic Newton Gisborne (1824-1892) completed a 14 mile long underwater telegraph cable connecting Carleton Head on Prince Edward Island with Cape Tormentine, New Brunswick.

Engineers take note, there are more milestones to discover in Atlantic Canada, and in many other parts of the country for that matter!

Dirk Werle *is a geoscientist with Ærde Environmental Research in Halifax, Nova Scotia Canada. He serves as Executive of IEEE Region 7 Canadian Atlantic Section and Editor of IEEE's TISP Canada Courier Newsletter.*

References

[1] http://atlantic-cable.com/contains materials and rich illustrations of the history of the Atlantic Cable & Undersea Communications

[2] http://www.telegeography.com contains contemporary up-to-date maps and telecom resources on submarine cables

[3] http://www.ieee.ca/activities/LMs/life-member-tour-2013.htm

[4] http://www.ieeeghn.org/wiki/index.php Special:Milestones

[5] Jeremiah F. Hayes, "Paths Beneath the Seas: Transatlantic Telephone Cable Systems," IEEE Canadian Review, Spring 2006. http://www.ewh.ieee.org/reg/7/canrev/cr52/CR52_TAT.pdf (accessed 15.10.2013)

[6] http://www.terabitconsulting.com/downloads/2013-submarine-cable-market-industry-report.pdf (accessed 15.10.2013)

Message from the Life Members Chair

M. E. El-Hawary

The 2013 Canadian IEEE Life Member Technical Tour

The IEEE Life Members Committee (LMC) organizes technology-themed tours around a number of the IEEE Milestones sponsored by the IEEE History Center; Milestones celebrate technological breakthroughs or turning points. The tours are planned with Life members and their companions in mind, and so the pace of the tour is set for seniors. However, all IEEE members are welcome.

In 2012, the IEEE Life Members Committee invited Region 7 to host the 2013 IEEE Technical Tour. As Life Member Coordinator for Region 7, I worked with Dave Kemp (IEEE Canada History Committee Chair), Cathie Lowell (IEEE Canada Administrator) and Stacey Waters (IEEE LMC Staff Support) to organize and ensure that the tour was a success.

Right from the outset, it was clear to us that Canada has an abundance of milestones from coast to coast and that the time constraints on the tour's duration would not allow us to cover all sections of Region 7. A decision was reluctantly made to restrict the tour to milestones located in sections of IEEE Canada's Central and Eastern Areas. With our rich selection of milestones to choose from, the next task was to draw a balanced itinerary that allowed participants to have a relaxed visit while allowing them to visit as many locations as could fit in the schedule. Ms. Lowell undertook the major part of the organizational details, which included preparing a plan, communicating with host sections to recruit volunteers to meet, greet, and act as guides to our guests. We are very grateful to the executive committees of the sections involved in the tour for sponsoring local hospitality events in honour of the tour's participants. Selection of a tour company and securing all legal details were also arranged by Ms. Lowell, with assistance from Ms. Waters. As is clear from the foregoing reports, many section volunteers gave of their time and energy to make the tour a success. I salute and thank you all.

The IEEE Life Members Committee launched its Technical Tour program in 2009, showcasing the history and operations of the Panama Canal in an eight-day itinerary in March, 2010. The second tour was hosted by the United Kingdom in May, 2011, with participants visiting a number of historical milestones over a 10-day period. Japan hosted its nine-day tour in May, 2012.

For more details of the Panama tour, please visit:
http://www.ieee.org/societies_communities/geo_activities/life_members/panama_canal_tech_tour.html

For details of the UK tour, please visit:
http://www.ieee.org/documents/united_kingdom_tech_tour_brochure.pdf

For details of the Japan tour, please visit:
http://www.ieee.org/societies_communities/geo_activities/life_members/tech_tour_japan.html

The official details of the Canada tour are at:
http://www.ieee.org/societies_communities/geo_activities/life_members/tech_tour_canada.html