Enwave's
Deep Lake Cooling

Distribution Cooling Network Expansion – The refreshing way that risk was managed

Presentation to CSVA

October 24, 2006

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I-10687.06

Who is Enwave?

- One of the largest District Energy Providers in North America
- 1964 Toronto Hydro begins to supply steam heating
- Toronto District Heating Corporation (TDHC) formed in 1984
- 1999 TDHC is Restructured with Borealis Penco and City of Toronto 50/50 Owners
- Enwave currently provides heating and cooling services to over 140 downtown office buildings

What is Deep Lake Cooling?

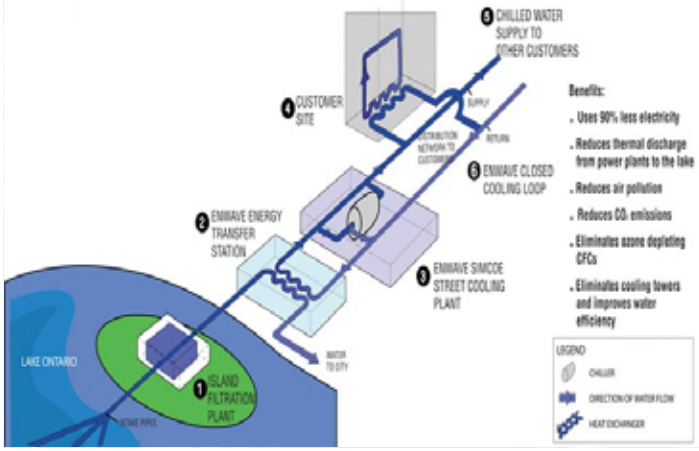
- Deep Lake Cooling uses cold energy from Lake Ontario to cool buildings in downtown Toronto
- Naturally cold water is drawn from Lake Ontario (permanently 4ºc)
- Intake pipes are 83m deep and intake is 5km off shore
- Intake pipes designed and built (by others) in conjunction with the City of Toronto

What is Deep Lake Cooling?

- City of Toronto uses the water, Enwave uses the coldness
- Enwave utilizes heat exchangers to transfer the energy from the cold lake water to their closed chilled water supply loop
- Energy transfer happens at John Street Pumping Station
- Enwave has enough capacity to air condition ±100 office buildings (3.0 million square metres)

What is Deep Lake Cooling?

Deep Lake Water Cooling System



Key Risks for Owner

- Initially, Uncertain Market
- Constructability Issues (open cut vs. tunnel)
- New “Utility”
- Cost and Scheduling Uncertainties

How was Risk Managed

- Uncertain Market:
  - Very limited first phase (test the market)
- Constructability Issues:
  - Thorough review of open cut vs. tunnel
  - Analysis of optimal tunnel shaft locations
  - Analysis of piping construction materials
- New "Utility":
  - Application of combined consultant and contractor knowledge
  - Applied AWWA Potable Water Standards
  - Engaged Corrosion Specialist to monitor "stray" currents

How was Risk Managed

- Cost and Scheduling Uncertainties:
  - Teamed with a reputable contractor early on
  - Collaborative approach on:
    - Scheduling
    - Costing
    - Design Approach

What is MMM's Role?

- Preliminary Engineering, including: route selection and pipe material selection; construction technology (open cut vs. tunnelling); cost estimates; and scheduling
- Design and Contract Administration for the extension of Enwave's Trunk Chilled Water System
- Extension of twin 1200mm cement lined steel pipes in a 3.5 diameter tunnel under York, Wellington, Queen and Bay
- Chilled Water Connections from trunklines to highrise buildings

Enwave Key Plan

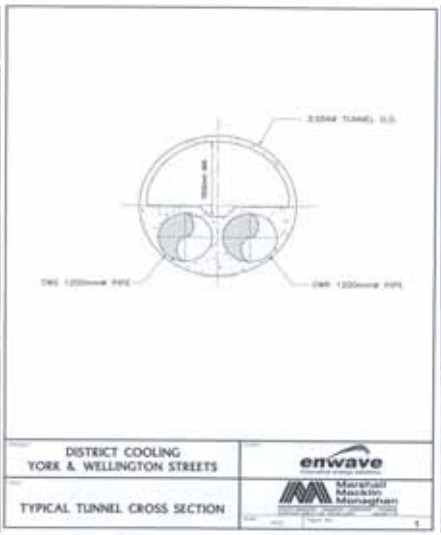
Legend

— Recent Tunnels

••• Future Tunnels

xxx Future Open Cut

Typical Tunnel Cross Section



What is MMM's Role?

- Original assignment was won competitively in January 2003
- Comprised:
  - Route Evaluation for Trunk Chilled Water Lines
  - Construction methodology (open cut vs tunnel)
  - Pipe material
  - Evaluation of construction options for building connections
  - Cost estimates and scheduling
  - Detailed designs and approvals
  - Preparation of contract documents

What is MMM's Role?

- Original assignment only included the trunks on York and Wellington
- Subsequently, Queen Street, Bay Street and Simcoe Street were added
- Scope also now includes multiple service connections from buildings to trunks in the tunnels
- Design of extensions to Queen's Park and infrastructure supply strengthening on Simcoe Street now underway

Unique Relationship Between Owner – Consultant - Contractor

- Original Tender only provided Outline Specifications and Outline Project Description
- "Indicative Bids" were solicited
- C+M McNally awarded the Contract
- Enwave, McNally & MMM continue to have weekly design/construction progress meetings
- Construction contract extensions are now all negotiated
- Currently three Master Construction Contracts with Change Orders issued when required

Key Statistics

Tunnel locations	Length, m	Avg Depth, m
York St.	630	23.0
Wellington St. W.	650	22.0
Queen Street W.	364	27.0
Bay St.	2120	32.0

Shaft Locations

Location	Depth, m
York at Piper	23.0
Wellington at Simcoe	22.0
Hayter/Laplante (SW of Bay & College) (15m Ø circular shaft)	41.0
Lakeshore and Simcoe Street (proposed)	20.0

Spin Off Project

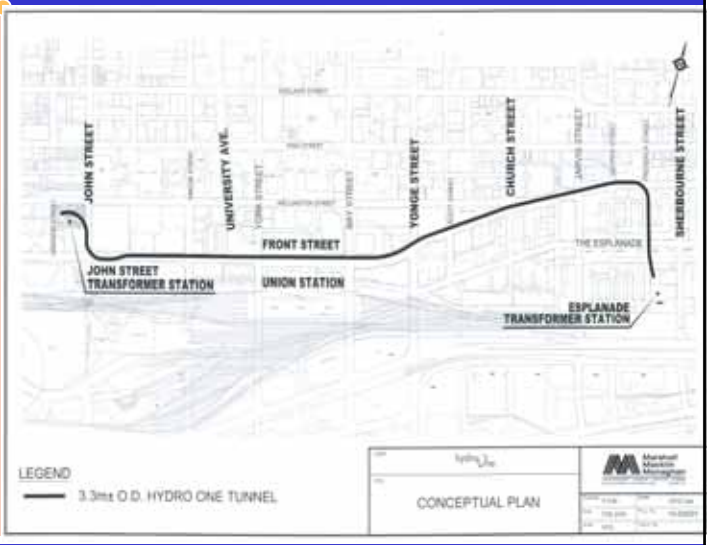
Hydro One Tunnel

- 2.2 km of tunnel
- 2 construction shafts 24m & 29m deep
- Links two downtown substations
- Tunnel Route is under Front Street (Union Station)

Hydro One Key Plan

Conventional

- Design
- Tender
- Construct




enwave
DEEP LAKE WATER COOLING