

Preliminary Line 5 Integrity Assessment

Prepared by Edward E. Timm, PhD, P,E, on 10/20/2015

Regarding Enbridge

Enbridge's position that all parts of Line 5 are in "great" condition is not supported by publicly available data and is contradicted by data released in Enbridge's 2014 Operational Reliability Report. Enbridge continues to wage a very expensive, data free PR campaign while making vague promises to back it up with engineering data. This approach coupled with Enbridge's operational failures that led to the rupture of Line 6b creates the impression that they cannot substantiate their position that Line 5 is not an imminent hazard.

Enbridge claims to have completely changed their culture of poor operational discipline and biased engineering assessments. This is also the position of the Association of Oil Pipelines (AOPL) but cultural change in an industry that has avoided accountability for decades is very difficult to implement. Real disclosure of Enbridge internal assessments of the condition of Line 5 that admit a 62 year old steel pipe is not "like new" is needed to build trust.

Regarding the Michigan Public Service Commission (MPSC) and Governor's Task Forces

The MPSC played a very active role in supervising the design and evolution of Line 5 from its inception in 1953 through 1993 resulting in publically available documentation of its configuration and meaningful operating restrictions. After 1993, the MPSC gave up meaningful oversight of Line 5 and little is publically available about how it is currently configured.

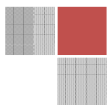
The MPSC last set operating pressure restrictions for Line 5 in 1963 based on new pipe. Since then the agency not reexamined this issue to determine the effects of extensive reconfiguration and 62 years of corrosion on Line 5.

Based on the limited publicly available information, it appears as if Enbridge has submitted significant data to the MPSC for examination by the original pipeline Task Force that data is being held by the Attorney General under a confidentiality agreement. It is not known how much of this data was reviewed by the original Pipeline Task Force but it is certain that any committee composed of non-experts will not be able to correctly interpret such information and will not reach meaningful conclusions.

Regarding the non-Straits Sections of Line 5

From an original capacity of 120,000 bbl/d with no pump stations in Michigan to a maximum of 565,000 bbl/d with 19 pump stations to its current 540,000 bbl/d with 12 pump stations and using drag reduction technology, Line 5 has been extensively reconfigured. Line 5 can now be considered as twelve separate pipelines that have not faced outside review since 1963.

The rupture of Line 5 near Crystal Falls in 1999 due to coating failure and corrosion as well as other documented maintenance activities leads to the conclusion that Line 5 is significantly corroded. This conclusion is supported by data in Enbridge's 2014 Operational Reliability Report. Richard Kuprewicz, a



Straits Area Concerned Citizens for Peace, Justice and the Environment

1/27/2016

noted pipeline expert, has said the section along US-2 is a most likely failure point. I support that conclusion but suspect the sections where Line 5 crosses the Indian River are also compromised.

Safe operation of any old pipeline depends on careful In Line Inspection (ILI using smart pigs) and unbiased interpretation of that data to make repair/replace decisions in real time then implementing them. Enbridge failed on all three of these tasks on Line 6B. It is not known if Line 5 has been completely reexamined using current good practice and how much risk Enbridge is willing to accept when a cash flow of about two million dollars a day is at stake.

Encroachment of habitation on the Line 5 Right of Way raises significant questions about whether adequate safety factors exist to prevent loss of life in these areas.

Regarding the Straits Sections of Line 5

Enbridge claims these pipes are in “like new” condition, an extremely improbable claim for any steel structure that has been submerged for 62 years. No publicly available data exists that would support this claim. It is known that washout of the support bed, encrustation by mussels, and currents that greatly exceed the original design bases have subjected these pipes to stresses not contemplated by the original pipeline designers. How much stress is locked up in Line 5 due to this abuse cannot be determined by Enbridge or anybody else.

The protective coating system of the Straits sections of Line 5 consisting of two layers of fiberglass saturated with plasticized coal tar and wrapped with oaken lagging for abrasion protection has apparently failed. The bottom of the pipe may well be subject to significant abrasion and corrosion because of this.

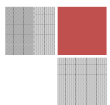
Even though the Straits sections of Line 5 have pipe with very thick walls, the combination of locked up stress and corrosion make it impossible to determine how safe this pipe is from the public record. It is certain that the original design safety factors agreed to between the MPSC and the Lakehead Pipeline Company no longer apply.

Conclusions

Significant recent ruptures of aging pipelines with resulting damage to the environment and loss of life makes it unclear if the industry has the knowledge and the will to operate safely.

It is my professional opinion that Line 5 which is well past its likely design life of 50 years, has been extensively reconfigured to operate well beyond its original design parameters, and has not been subjected to significant public scrutiny for a very long time should be thoroughly examined by licensed experts using all the information that exists under MPSC auspices.

Given the uncertainty and lack of urgency resulting from the political nature of such an examination it is my opinion that Line 5 should be derated to its original design capacity of 300,000 bbl/d and restricted to non-oil cargos (eg LPG, NGL's and Propane) because of the imminent hazard it presents until thorough review by licensed experts can take place. Legal analysis by attorneys from FLOW suggest the State of Michigan has the authority to order such restriction and may be failing in its public trust duty to protect the public and environment.



Straits Area Concerned Citizens for Peace, Justice and the Environment

1/27/2016