



Institute for Energy Economics  
and Financial Analysis

# Enbridge Should Consider Closing Its Old, Troubled Line 5 Pipeline

Given Its High Capital Costs and Uncertain Future

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## Key Findings

**Enbridge Energy L.P.'s plan to bore a tunnel under the Straights of Mackinac between Lake Michigan and Lake Huron to replace an underwater segment of Line 5 is costly and ill-advised.**

**The Enbridge tunnel pipeline faces rising costs: Based on risks and construction inflation, the project may ultimately cost three or more times as much as initially estimated.**

**In addition to the tunnel's rising costs, Enbridge faces an expensive project to re-route Line 5's Wisconsin segment, plus litigation related to both projects that could result in Line 5 shutdown.**

**A plan to close Line 5 would not only relieve Enbridge of debt burdens and litigation battles related to the projects, but also would allow the company to chart a more flexible energy transition course.**



## Executive Summary

Enbridge Energy L.P.'s plan to bore a tunnel under the Straits of Mackinac between Lake Michigan and Lake Huron to replace an underwater segment of Line 5 is costly and ill-advised. The aging pipeline transports light crude oil, propane and other natural gas liquids (NGLs)—products for which key markets are projected to shrink. Also, the company's plan to re-route part of the pipeline around tribal land in response to a trespass-related court order adds to the prospective cost of maintaining Line 5 operations. The company should reconsider pouring major capital expenditures into a 70-year-old pipeline. The tunnel project's purpose is to replace a set of two old pipeline segments that lie on the bottom of the lakebed, part of Enbridge's Line 5 pipeline. But a tunnel pipeline will likely be more costly than project proponents have disclosed publicly to date.

IEEFA's review of testimony and documentation in proceedings on the matter, along with information and analysis from other pertinent sources, concludes:

- The Enbridge tunnel pipeline faces rising costs. The company's publicly released estimate in 2018 was \$500 million. By 2022, Enbridge disclosed in a corporate earnings call that the costs had risen to \$750 million and were trending upward. Based on risks and construction inflation, the project may ultimately cost three or more times as much as initially estimated.
- It is reasonable to assume government agencies and communities make initial determinations about whether to support a project based on a full development package, including construction cost estimates. The estimate for the Enbridge tunnel pipeline project has already proven to be substantially understated.
- The expensive tunnel pipeline project, especially if combined with the estimated \$450 million (2024 dollars) cost of building a 41-mile Line 5 re-route segment in Wisconsin to address a tribal claim of trespass—likely approaching \$500 million by the time of construction—may contribute to credit risk for Enbridge. Other costs may arise going forward, given Line 5's age.
- Enbridge should question whether it makes sense to keep sinking money into an old pipeline—prolonging the "carbon lock-in" effect of the fossil fuel infrastructure—when markets for its products are on a declining trajectory. Electrification and other technologies are increasingly competitive with Line 5's products. Also, a recent study raises concern about propane use in the home. Flexible alternatives can provide leeway for Enbridge, its customers and the region to adapt to energy shifts via incremental scale-down of activity.

Enbridge should consider the long-term wisdom of a non-pipeline solution to the Line 5 quandary.

## Background

Enbridge Energy, L.P. (“Enbridge Energy”),<sup>1</sup> owns and operates a 70-year-old pipeline that splits into two parallel pipeline segments as it crosses the Straits of Mackinac in Lake Michigan. The segments lie in and on the lakebed.<sup>2</sup> The 645-mile Line 5 pipeline carries light crude oil and some NGLs from Superior, Wisconsin through Michigan to Sarnia, Ontario.<sup>3</sup> Some of the oil and NGLs are offloaded at Sarnia, and the rest are shipped eastward via Enbridge Line 9 to refineries in Quebec.<sup>4</sup> See Figure 1.<sup>5</sup>

**Figure 1: Enbridge Line 5 Pipeline**



Source: EIA U.S. Energy Atlas

Line 5 is part of Enbridge Energy’s Lakehead pipeline system, which transports light crude oil and NGLs from western Canada (mainly Alberta) through northern mid-western U.S. states and back to Canada.<sup>6</sup> The system connects to Enbridge Energy Pipelines, Inc.’s Mainline system, linking

<sup>1</sup> Enbridge Energy, L.P., is an operating subsidiary of Enbridge Energy Partners, L.P., headquartered in Houston, Tx. Enbridge Inc., headquartered in Calgary, Alberta, acquired all publicly held units of Enbridge Energy Partners, L.P., in 2018. See Enbridge Energy. [Oil Pipeline Filing: Att. A—Enbridge May 2021 Depreciation Study Update](#), submitted to Federal Energy Regulatory Commission. May 21, 2021 (hereafter, [Enbridge 2021 Depreciation Study Update](#)), p. 1.

<sup>2</sup> Line 5 has operated since 1953. Enbridge. [Line 5 Wisconsin segment relocation project](#). Accessed December 12, 2024.

<sup>3</sup> Army Corps. [Notice of intent to prepare a draft environmental impact statement for the Line Tunnel Project, Mackinac and Emmet counties, Michigan](#). 87 Federal Register 50074. August 15, 2022 (hereafter, [Army Corps Notice of Intent to produce draft EIS](#)). The oil includes light, light synthetic and light sweet crude oil.

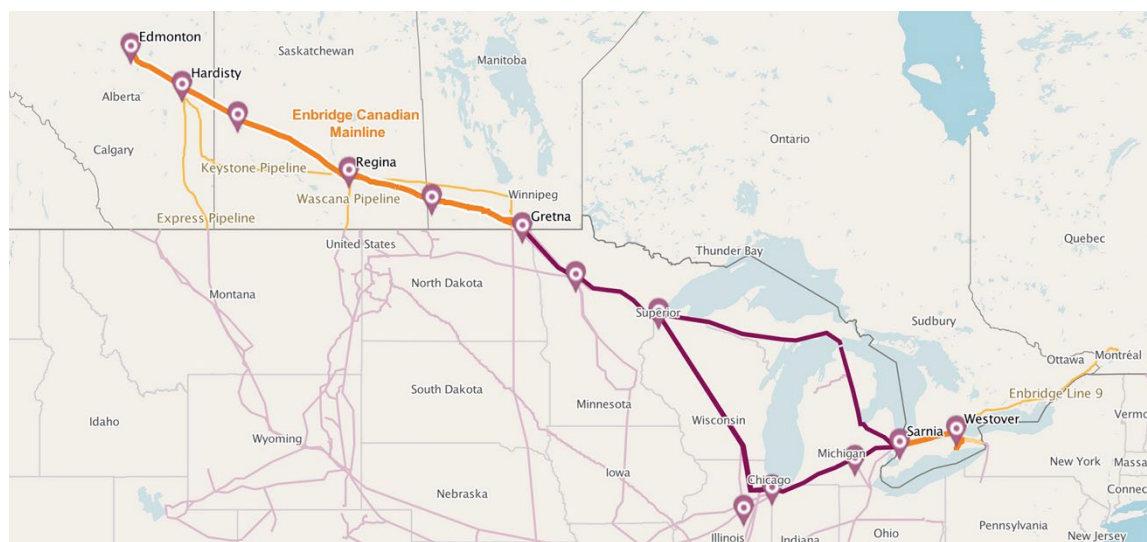
<sup>4</sup> Canada Energy Regulator. [Pipeline Profiles: Enbridge Line 9](#). May 2024.

<sup>5</sup> Figure 1 map was generated by the [Energy Information Administration’s U.S. Energy Atlas for Energy Infrastructure and Resources](#). Accessed December 4, 2024.

<sup>6</sup> Canada Energy Regulator. [Pipeline Profiles: Enbridge Mainline](#). May 2024.

Canadian oil to markets in eastern Canada and the U.S. Midwest, and NGLs to the U.S. Midwest and Sarnia.<sup>7</sup>

**Figure 2: Enbridge Canadian Mainline System<sup>8</sup>**



Source: Canada Energy Regulator

Line 5 has the capacity to transport 540,000 barrels per day (bpd) of petroleum liquids,<sup>9</sup> including two products:

- 450,000 bpd of light synthetic and conventional light sweet crude oil from a Mainline/Lakehead system connection point in Edmonton, Alberta, to refineries in Sarnia; and
- 90,000 bpd of natural gas liquids (NGLs), including propane and butane, from western Canada.<sup>10</sup>

<sup>7</sup> *Ibid.* Also see: Enbridge Pipelines, Inc. [Canadian Mainline Contracting Application](#). December 19, 2019, p. 12. Also see: Canada Energy Regulator. [Pipeline profiles: Enbridge Mainline](#). Accessed December 12, 2024. The Mainline originates in Edmonton, Alberta and extends eastward, crossing the Canada-U.S. border near Gretna, Manitoba, where it joins with the Enbridge Lakehead System (the U.S. section of the Mainline). At Superior, Wisc., the Lakehead System branches into two segments. The northern segment, Line 5, passes through northern Wisconsin and Michigan and crosses into Ontario at Sarnia. The southern segment (Lines 6, 14 and 61) curves south of Lake Michigan, passing through the Chicago area on the way to Flanagan, Ill., where it connects with downstream pipelines and storage facilities. The southern segment also includes Line 78, which starts near Griffiths/Hartsdale in Indiana and extends northeast, terminating near Sarnia, Ont. From Sarnia, Lines 7 and 11 continue to Westover and Nanticoke in Ontario. Also from Sarnia, the Mainline connects with Line 9.

<sup>8</sup> Canada Energy Regulator, *op. cit.*

<sup>9</sup> A barrel contains 42 gallons.

<sup>10</sup> MPSC. [Order. Matter of application of Enbridge Energy, L.P., for authority to replace and relocate the segment of Line 5 crossing the Straits of Mackinac into a tunnel beneath the Straits of Mackinac](#). MPSC case no. U-20763. December 1, 2023 (hereafter, [MPSC 2023 Order](#)), p. 116. Also see [Application of Enbridge Energy, L.P., for authority to replace and relocate the segment of Line 5 crossing the Straits of Mackinac into a tunnel beneath the Straits of Mackinac](#). MPSC case no. U-20763, docket accession no. U-20763-0001. April 17, 2020 (hereafter, [Enbridge application to MPSC](#), p. 5.

The pipeline typically operates at about 90% capacity.<sup>11</sup>

Crude oil refiners that serve as direct off-takers from Line 5 include PBF Energy's Toledo Refinery and the BP/Husky Toledo refinery in Ohio, as well as Marathon's Detroit refinery.<sup>12</sup> The refineries produce petroleum end products such as gasoline, diesel, jet fuel and propane.<sup>13</sup> Also, Line 5 crude oil is sent to the Sarnia area, including Enbridge's operational terminal, where it is injected into pipelines that feed refineries in New York and elsewhere.<sup>14</sup>

Propane comprises over 60% of Line 5 NGLs, as explained in Part IV below, with butane constituting over 30% and the remainder a mix of methane, ethane and other chemicals. The main U.S.-based off-taker is the Plains All American processing plant at Rapid River, Michigan, which separates and processes propane. The remaining NGLs go to Sarnia, Ontario, for processing and sale as propane for local use and for export to Michigan, and as chemical feedstock.<sup>15</sup>

## Enbridge Faces Legal Action Aimed at Shutting Down the Old Dual Pipeline

The Michigan attorney general filed a civil action in Ingham County Civil Court in 2019 to halt continued operation of the dual pipeline.<sup>16,17</sup> The attorney general had reasons for concern. In water less than 65 feet deep, the existing dual pipelines are buried, but at greater depths the lines simply are supported over, or rest openly on, the lakebed.<sup>18</sup> The pipeline had been struck by an anchor in 2018, causing three dents. In that same year, Enbridge had disclosed to the Michigan State Department of Environment, Great Lakes and Energy (EGLE) the existence of gaps in the underwater pipeline's protective coating.<sup>19</sup> The state's action, still pending, cites the state's common law of public nuisance, the common law public trust doctrine and the Michigan Environmental Protection Act.<sup>20</sup>

<sup>11</sup> [Direct testimony of Marlon Samuel, Enbridge Vice President for Customer Service](#), MPSC case no. U-20763, 7 Tr 757, January 14, 2022 (stating Line 5 operated at about 90% of its annual average capacity for the previous 10 years).

<sup>12</sup> See United Steelworkers, [Letter to MPSC supporting Enbridge's Act 16 application](#), MPSC case no. U-20763, docket accession no. U-20763-0172, August 5, 2020.

<sup>13</sup> [Testimony of Alex Morese on behalf of MPSC staff](#), MPSC case no. U-20763, 12 TR 1780, January 24, 2022 (hereafter, [Testimony of MPSC witness Alex Morese](#), 12 TR 1780), also cited in [MPSC 2023 Order](#), p. 81.

<sup>14</sup> [MPSC 2023 Order](#), p.66.

<sup>15</sup> [MPSC 2023 Order](#), p.66. Also see Dynamic Risk, [Alternatives Analysis for the Straits Pipelines: Final Report](#), Prepared for State of Michigan, October 26, 2017 (hereafter, [Dynamic Risk 2017 Report](#)), p. 4-4.

<sup>16</sup> *Nessel v. Enbridge Energy, L.P., et al.*, No. 19-474-CE, Ingham County Circuit Court.

<sup>17</sup> A federal appeals court on June 17, 2024, rejected Enbridge's attempt to remove the state's lawsuit from state to federal court on the ground that the company's notice of removal was untimely. Order, *Nessel v. Enbridge Energy, LP, et al.*, No. 23-1671, U.S. Sixth Circuit Court of Appeals.

<sup>18</sup> Army Corps, [Memorandum for Record: NEPA and Public Interest Review Scope of Analysis for Enbridge Line 5 Tunnel](#), LRE-2010-00463-56-A19, June 28, 2023, p. 1 (hereafter, [Army Corps 2023 Memorandum for Record re Scope of Analysis](#)).

<sup>19</sup> [EGLE Line 5 Overview](#). Enbridge made the disclosure in a permit application to install more anchor screws to secure portions of the pipeline to the lakebed. *Ibid.* Also see: Associated Press, [Enbridge finds protective coating gaps on Michigan pipeline](#), May 27, 2020.

<sup>20</sup> See [Michigan Environmental Protection Act](#), Mich. Comp. Laws § 324.1701 *et seq.*



In another incident, the east line of the dual pipelines was shut down for investigation and repairs. The line was kept closed under court order issued June 25, 2020, after discovery that a cable from a passing ship had tangled with the structure, pulling the line and its supports out of alignment.<sup>21</sup> It was reopened 78 days later, on September 10, 2020.<sup>22</sup>

The governor of Michigan in November 2020 issued a declaration revoking and terminating the easement for the pipeline.<sup>23</sup> Enbridge rejected the Governor's order, asserting it is in full compliance with the easement for its dual pipeline in the Straits of Mackinac.<sup>24</sup> The company filed suit against the governor and the director of Michigan's Department of Natural Resources, a case separate from the state attorney general's action.<sup>25</sup> Both cases are still pending.

## Enbridge's Proposed Tunnel Pipeline Under the Straits

Enbridge seeks permits to replace the dual pipelines with a single new 30-inch diameter pipeline segment,<sup>26</sup> to be installed within a 23-foot-diameter tunnel bored below the lakebed.<sup>27</sup> The tunnel would extend between Mackinac County in Michigan's Upper Peninsula and Emmet County in Michigan's Lower Peninsula.<sup>28</sup> The Mackinac Straits Corridor Authority (MSCA), established by legislation in 2018 to manage the Straits easement, made an agreement with Enbridge allowing such a tunnel to be built.<sup>29</sup>

The Michigan Public Service Commission (MPSC), which regulates energy in the state, approved the tunnel pipeline project.<sup>30</sup> Upon completion and start-up of the Line 5 tunnel pipeline system, Enbridge must permanently deactivate the old dual pipeline system. Enbridge proposes to purge, clean and abandon the pipelines in place.<sup>31, 32</sup>

Several nonprofit organizations and tribal governments appealed the MPSC decision in December 2023. They seek an order from the Michigan Court of Appeals to overturn the MPSC decision and require the agency to fully consider alternatives to the tunnel in order to protect the Great Lakes—

<sup>21</sup> [Temporary Restraining Order, \*Nessel v. Enbridge Energy, L.P., et al.\*](#) No. 19-474-CE, 30<sup>th</sup> Judicial Circuit for Ingham County, Michigan, June 25, 2020. Also see: The Canadian Press. [Enbridge reopens underwear section of Line 5 pipeline after inspection.](#) June 21, 2020 (referring to reopening west line of underwater segment).

<sup>22</sup> See: Michigan Advance. [Gary Street column: Gas price hikes are another Enbridge scare tactic.](#) June 3, 2023.

<sup>23</sup> Office of the Governor, State of Michigan. [Notice of Revocation and Termination of Easement.](#) November 13, 2020.

<sup>24</sup> Letter from Vern Vu, EVP & President, Liquids Pipelines, Enbridge to Governor Gretchen Whitmer and Daniel Eichinger, Director, Michigan Department of Natural Resources. January 12, 2021, pp-2-5. Available in [Enbridge Energy, Limited Partnership's Rebuttal Exhibits A-15 to A-26](#). MPSC case no. U-20763, docket accession no. U-20763-0941. December 14, 2021.

<sup>25</sup> [Enbridge Energy L.P., et al. v. Whitmer, et al.](#), No. 1:20-cv-01141 (W.D. Mich.).

<sup>26</sup> Enbridge 2024 Form 8-K, p. 18.

<sup>27</sup> [Army Corps Notice of Intent to prepare draft EIS](#), p. 50075. The inner diameter of the tunnel would be 21 feet. *Ibid.* Also see [MPSC Staff Initial Brief](#). MPSC case no. U-20763, docket accession no. U-20763-1084. February 18, 2022, p. 1.

<sup>28</sup> Enbridge 2024 Form 8-K, p. 18.

<sup>29</sup> The "Second Agreement" between Michigan and Enbridge was signed in 2018. [Second Agreement between the State of Michigan, et al., and Enbridge Energy, L.P., et al.](#) October 2018 (hereafter, [Second Agreement](#)).

<sup>30</sup> [MPSC 2023 Order](#).

<sup>31</sup> [Army Corps Notice of intent to prepare a draft EIS](#), at 50076.

<sup>32</sup> The Second Agreement does not require Enbridge to remove the dual pipelines. It allows Enbridge to abandon the entire length of the dual pipelines in place or remove parts not fully buried and place them "under cover" near the Straits shoreline. [Second Agreement](#), pp. 6-7. Also see: [ELGE Line 5: Overview](#).

which they emphasized comprise 84% of North America’s fresh surface water—from a catastrophic oil spill.<sup>33</sup> The case is still pending.<sup>34</sup>

The tunnel pipeline construction also requires permission from the U.S. Army Corps of Engineers (Army Corps) under Clean Water Act §404 and the Rivers and Harbors Act §10.<sup>35</sup> The agency announced in August 2022 it would require an environmental impact statement (EIS) for the application,<sup>36</sup> pursuant to the National Environmental Protection Act (NEPA).<sup>37</sup> The Army Corps expects to hold a hearing on a draft EIS in Spring 2025, and issue a Final EIS in early 2026.<sup>38</sup>

## Legal Action Against a Line 5 Segment on Tribal Land

Enbridge faces additional litigation related to Line 5. The Bad River Band of the Lake Superior Tribe of Chippewa Indians of the Bad River Reservation demands that the segment of Line 5 that crosses its tribal lands in Wisconsin be decommissioned. The band asserts continued operation of Line 5 on its property constitutes illegal trespass because the pipeline easement expired in 2013. A federal district court agreed in 2022 with the trespass allegation.<sup>39</sup> The court subsequently ordered Enbridge on June 26, 2023 to cease operations within three years—by June 16, 2026.<sup>40</sup> As Enbridge opposed the finding of trespass and the Bad River Band opposed the three-year delay in shutdown of pipeline operations on its land, both Enbridge and the Bad River Band appealed the decision.<sup>41</sup> Oral argument was held on February 8, 2024.<sup>42</sup> The litigation is still pending.

The Government of Canada objects to Michigan’s efforts to close the old dual pipeline, as well as the efforts of the Bad River Band. The Canadian government has invoked a negotiation process with the United States,<sup>43</sup> pursuant to a 1977 Transit Treaty between the two countries,<sup>44</sup> and filed amicus (friend-of-the-court) briefs in the litigation. A White House spokesperson in 2021 stated the countries

<sup>33</sup> Nonprofit organizations include the Environmental Law & Policy Center, Michigan Climate Action Network, For Love of Water (FLOW) and others. Tribal governments include the Bay Mills Indian Community, Grand Traverse Band of Ottawa and Chippewa Indians, and the Nottawaseppi Huron Band of the Potawatomi. See Michigan Court of Appeals filings in [docket for MPSC case no. U-20763](#). Also see: FLOW. [FLOW appeals MPSC permit to site replacement Line 5 pipeline in proposed Great Lakes tunnel](#). January 4, 2024.

<sup>34</sup> See *In re Application of Enbridge Energy to Replace and Relocate Line 5*, Mich. Ct. App. consolidated case nos. 369156, 369157, 369159, 369161, 369162.

<sup>35</sup> See Clean Water Act, [33 U.S.C. § 1344](#) and Rivers and Harbors Act of 1899, [33 U.S.C. § 403](#).

<sup>36</sup> [Army Corps Notice of Intent to prepare draft EIS](#).

<sup>37</sup> NEPA, [42 U.S.C. §§4321](#), *et seq.*

<sup>38</sup> Army Corps. [Line 5 Environmental Impact Statement Timeline](#). Accessed December 12, 2024.

<sup>39</sup> [Bad River Band of the Lake Superior Tribe of Chippewa Indians of Bad River Reservation v. Enbridge Energy Company, Inc.](#), 626 F. Supp. 3d 1030 (W.D. Wis. 2022).

<sup>40</sup> [Order, Bad River Band of the Lake Superior Tribe of Chippewa Indians of Bad River Reservation v. Enbridge Energy Company, Inc., et al.](#), No. 19-cv-00602-wmc, 2023 WL 4043961 (W.D. Wis., June 16, 2023), (hereafter, [U.S. District Court June 2023 Order to cease L5 operation on tribal land](#)).

<sup>41</sup> [Bad River Band of the Lake Superior Tribe of Chippewa Indians of the Bad River Reservation v. Enbridge Energy Co. Inc. et al.](#), Nos. 23-2309 and 23-2467, U.S. Court of Appeals, 7th Circuit.

<sup>42</sup> Wisconsin Examiner. [Bad River Band and Enbridge offer oral arguments in Line 5 shutdown appeal](#). February 13, 2024.

<sup>43</sup> Government of Canada. [Statement by Minister Garneau: Line 5 transit pipeline](#). October 4, 2021. Also see: [Amicus brief of the Government of Canada](#), in [Michigan v. Enbridge Energy Ltd.](#), 571 F. Supp. 3d 851, (W.D. Mich. 2021).

<sup>44</sup> [Agreement between the governments of the United States of America and Canada concerning transit pipelines](#), January 28, 1977, 28 U.S.T. 7449. The countries had launched the treaty negotiation in the wake of the 1973-1974 OPEC oil embargo. See Federal Reserve History. [Oil shock of 1973-74](#). Accessed December 12, 2024.

would engage in negotiations, stating the White House was not considering shutdown of the pipeline, but acknowledged the pending litigation by the State of Michigan and the role of the Army Corps.<sup>45</sup> The Bad River Band and other tribal entities are advocating for the sovereign rights of a tribal nation to expel trespassers from its lands, asserting Congress did not state any intention to supersede its commitments to tribal sovereignty in adopting the 1977 Transit treaty.<sup>46</sup>

As Enbridge continues to pursue its appeal of the court ruling on trespass, the company is also applying for permits to build a 41.2-mile re-route of the pipeline around the reservation. See Part II below.

## Potential Alternatives to Line 5

Two nonprofit organizations released expert reports presenting alternative ways to transport the amount of oil and NGLs currently moved across the Straits of Mackinac without Line 5. For oil transport, both reports recommended a system that would use an existing Enbridge pipeline, Line 78, which could transport a substantial percentage of Line 5's crude oil, buttressed by waterborne and rail transportation. In addition, multiple alternative sources were identified for propane and other NGLs. Enbridge criticized proposed alternatives.<sup>47</sup> The range of alternatives, however, allows for flexibility of choices, and the likelihood of reduced demand is a critical factor to consider. Both reports concluded such an alternative system could be implemented at minimal cost.<sup>48</sup>

A Canada-based group stated:

*Enbridge continues to insist that the safest way to move oil is through pipelines. But when it comes to Line 5, this could not be further from the truth. This 69-year-old, deteriorating pipeline is at an increased risk of rupture, and it runs right through the heart of the Great Lakes which hold 84 per cent of North America's freshwater. While there are no good options for transporting oil, in the case of this aged and dangerous pipeline, exploring other options is not only reasonable, but necessary.*<sup>49</sup>

<sup>45</sup> White House. [Press briefing by principal deputy press secretary Karine Jean-Pierre and Commerce Secretary Gina Raimondo](#). November 9, 2021.

<sup>46</sup> See Supplemental Brief of Bad River Band in Response to Amicus Curiae Brief of the United States, and [Brief of Native American Rights Fund](#), in *Bad River Band of the Lake Superior Tribe of Chippewa Indians of the Bad River Reservation v. Enbridge Energy Co. Inc. et al.*, Nos. 23-2309 and 23-2467, *op. cit.*, filed April 29, 2024, and October 23, 2023, resp. Also see Yahoo Native News Online. [27 Tribes file amicus brief in support of Bad River Band's lawsuit to evict Enbridge Energy from tribal land](#). October 18, 2023.

<sup>47</sup> In the [U.S. District Court June 2023 Order to cease L5 operation on tribal land](#) the court provided a description of the debate over alternatives to Line 5 and decided in favor of a three-year deadline for cessation of operations rather than immediate shutdown. The Bad River Band countered the court's narrative on appeal, as did an amicus brief submitted on October 17, 2023, by Great Lakes Business Network, in *Bad River Band of the Lake Superior Tribe of Chippewa Indians, et al. v. Enbridge Energy Company, Inc., et al.*, Nos. 23-2309 and 23-2467, *op. cit.*

<sup>48</sup> PLG Consulting. [Likely Market Responses to a Shutdown of Line 5](#) (prepared for the National Wildlife Federation). October 2023 (hereafter, [PLG Consulting 2023 Report](#)). Also see: M. Woodhouse and K. Brooks. [Closing Enbridge's Line 5 Pipeline: What are the options and alternatives available?](#) (prepared for Environmental Defence Canada) February 2021 (hereafter, [Woodhouse and Brooks 2021 report](#)).

<sup>49</sup> [Woodhouse and Brooks 2021 report](#), p. 4.

The MPSC decision acknowledged a rupture of the dual pipelines “would be catastrophic for the Great Lakes.”<sup>50</sup> The incremental flexibility of the alternative systems of water and rail transport means risk is reduced as demand for oil and NGLs in the service areas declines, lessening the frequency of such transport. This report describes important factors reasonably likely to reduce demand for the pipeline’s products.

## I. The Tunnel Pipeline Project Costs Will Likely Be Much Higher Than Announced

Operational costs for the tunnel would be recoverable incrementally through the Tunnel Surcharge, as set according to the Mainline Tolling Settlement,<sup>51</sup> but construction would entail high up-front capital costs that could only be recovered over time.

### A. The Tunnel Pipeline’s Projected Costs Have Escalated and Its Design Changes Likely Will Raise Costs Further

The company plans to install pre-cast concrete segmental lining as the tunnel is built.<sup>52</sup> The tunnel would be roughly four miles long,<sup>53</sup> with an inside diameter of about 21 feet and a one-foot-thick concrete liner.<sup>54,55</sup>

Both Enbridge and Michigan’s environmental agency currently still post a 2018 pipeline cost estimate of \$500 million (updated to 2024 dollars in Table 2 below), as of December 12, 2024.<sup>56,57</sup> Averaged over the approximately 4-mile length of the tunnel pipeline, the 2018 estimate—which did not include decommissioning of the existing dual pipeline<sup>58</sup>—indicated a construction cost of roughly \$125 million per mile.

<sup>50</sup> MPSC 2023 Order, p. 347.

<sup>51</sup> Enbridge 2024 Form 8-K, p. 33.

<sup>52</sup> Army Corps. [Line 5 Tunnel EIS: Project Information](#). Accessed December 12, 2024.

<sup>53</sup> Enbridge application to MPSC, p. 3. Also see: [Army Corps Notice of Intent to prepare draft EIS](#), p. 50076. The surface distance is approximately 3.6 miles, but the tunnel would angle downward, then upward, roughly following the underwater terrain. *Ibid.*, p. 50075.

<sup>54</sup> See: Enbridge 2024 Form 8-K, p. 18. Also see: [Corrected Direct Testimony of Dr. Michael Mooney to the MPSC on behalf of the MSCA](#). MPSC case no. U-20763, docket accession no. U-20763-0882. September 14, 2021 (hereafter, [Michael Mooney corrected testimony to MPSC](#)), p. 19-20.

<sup>55</sup> The initial suggested width of the tunnel was 10 feet. [Enbridge application to MPSC](#), p. 9.

<sup>56</sup> See: Enbridge. [Upgrading vital energy infrastructure: Line 5 Straits of Mackinac crossing](#). Accessed December 12, 2024. Also see: [EGLE Line 5 Overview](#). Enbridge 2024 Form 8-K, p. 12. See “Recoverable Line 5 Capital” in Form 8-K, Article 12.9.

<sup>57</sup> The figure is at the upper end of the \$350-million to \$500-million cost range Enbridge initially provided publicly in 2018. Enbridge. [Report to the State of Michigan: Alternatives for replacing Enbridge’s dual Line 5 pipelines crossing the Straits of Mackinac](#). June 15, 2018 (hereafter, [Enbridge 2018 Report to the State of Michigan](#)), pp. 25 and 63. Available in [Application Exh. A-9](#), MPSC case no. U-20763, document accession no. U-20763-0003. April 17, 2020. Also see: [Upgrading vital energy infrastructure: Line 5 Straits of Mackinac crossing](#).

<sup>58</sup> Enbridge’s listing of factors considered for the \$500-million 2018 estimate did not include decommissioning the existing dual pipeline system. [Enbridge 2018 Report to the State of Michigan](#), p. 63. Such decommissioning would be required whether the tunnel is built or an alternative system is employed to move Line 5’s liquids.



The high 2018 estimate was a red flag, but subsequent changes to the project—as well as construction inflation and other factors—likely will further increase the final price tag substantially.

## 1. The Tunnel May Cost Three or More Times as Much as Initially Estimated, Based on Construction Inflation and Enlargement of the Tunnel Design

Enbridge's initial 2018 report to the State of Michigan promoting the tunnel pipeline project suggested the interior diameter of the tunnel would be 10 feet,<sup>59</sup> but this plan did not last long. The results of the 2019 geotechnical report prepared for Enbridge persuaded the planners to increase the tunnel's interior diameter from 10 feet to 21 feet, for "long-term tunnel operational reasons and to improve reliability during construction."<sup>60</sup> MSCA consultant Michael Mooney described this design change to the MSCA in a January 2021 report.<sup>61,62</sup>

The more-than-doubling of the tunnel's interior diameter will have significant effects on cost factors for the project. As an engineer formerly employed by Dow Chemical explained in comments to the MPSC, the impact of the increased diameter means the interior cross-sectional area of the proposed 21-foot tunnel is not merely twice as large as the original, but rather must be calculated using the basic  $A=\pi r^2$  formula.<sup>63</sup> Adding the 1-foot width of the exterior concrete casing to the radius for both the original and the enlarged interior demonstrates that the proposed tunnel's volume is now 3.67 times larger than the original Enbridge proposal, for a roughly four-mile (21,120 feet) tunnel.

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<sup>59</sup> [Enbridge 2018 Report to the State of Michigan](#). June 15, 2018, pp. 21 and 25. Also see: [Enbridge application to MPSC](#), p. 9.

<sup>60</sup> MPSC. [MPSC approves siting permit for Enbridge to relocate Line 5 in Straits of Mackinac, with conditions; finds tunnel best option](#). December 1, 2023.

<sup>61</sup> Letter from Michael Mooney, MSCA consultant to Michael Nystrom, MSCA Chairman, re summary of Great lakes Tunnel Project activity. January 28, 2001, p. 6, provided in Direct Testimony of Dr. Michael Mooney to MPSC, [Exh. MM6](#). MPSC case no. U-20763, docket accession no. U-20763-0845. September 14, 2021 (hereafter, [Michael Mooney Exh. MM6](#)). Also see [Corrected Direct Testimony of Dr. Michael Mooney, MPSC consultant](#), pp. 19-20.

<sup>62</sup> A report provided to the State of Michigan Pipeline Safety Advisory Board and the state Senate by students of Michigan Technological University in May 2018, described below, already assumed the tunnel would have an interior diameter of 21 feet. Michigan Technological Institute student research team. [CEE4905 Senior Design Project: Mackinac Straits Underground Utility corridor](#). May 2018, pp. 11 and 15.

<sup>63</sup> Gary Street, M.S., P.E. [Increase in tunnel diameter: Impact on solid waste, wastewater, fresh water and construction cost](#). August 22, 2020. Submitted in MPSC case no. U-20763, docket accession no. U-20763-0256. August 24, 2020 (calculation compares interior cross-sectional areas with a 5-foot radius and a 10.5-foot radius).

**Table 1: Impact of Tunnel Diameter Increase on Tunnel Volume**

Interior diameter in feet	Interior radius in feet	Concrete liner in feet	Cross-section area ( $A=\pi r^2$ ) in square feet	Tunnel volume in cubic feet or cubic yards for 4-mile est. length
10	5	1	113.1	2,388,672 ft <sup>3</sup>
21	10.5	1	415.5	8,775,360 ft <sup>3</sup>

Based on Enbridge’s representations to the Army Corps of Engineers, the amount of material to be excavated for the new proposed tunnel size (including tunnel shafts and related structures) is 364,000 cubic yards—which, spread level on the ground, would amount to approximately 225.6 acre-feet.<sup>64</sup>

The change in tunnel width increases the water infiltration management challenge by as much as 40%. MSCA consultant Michael Mooney reported in January 2021 to the MSCA as follows:

*The 5000 gallons per day limit [was intended for] a considerably smaller inside diameter tunnel per the Tunnel Agreement while the designed tunnel is 21 ft inside diameter. The increase to 7000 gallons per day is primarily due to the increased surface area resulting from the increase in diameter.*<sup>65</sup>

In the Fall of 2020, just two years after the Second Agreement was signed, an Enbridge employee informed a state agency staff member the cost was likely to be nearly double the initial \$500 million estimate. An October 5, 2020 email from a contracting unit manager of the Michigan Department of Transportation (MDOT) to the MSCA described receiving “an impromptu update” from Enbridge. Based on the briefing, the manager reported:

*Project has experienced significant cost creep over the development period—From 30%, to 60%, and now 90%, estimated construction cost has nearly doubled.*<sup>66</sup>

A 90% increase would boost the initial cost estimate to \$950 million, not counting inflation.<sup>67</sup>

<sup>64</sup> Army Corps Notice of Intent to prepare draft EIS, p. 50076.

<sup>65</sup> Michael Mooney Exh. MM6, p. 6.

<sup>66</sup> Memorandum from Ryan Mitchell, Michigan Department of Transportation, to Mike Nystrom, MSCA chair. October 5, 2020.

<sup>67</sup> The memorandum was first unearthed by the Detroit News in 2021. See The Detroit News. [Estimates for Line 5 tunnel project soar over ‘cost creep.’](#) February 12, 2021.

Enbridge has not confirmed a new cost figure in the general public media. In April 2024, the Crains Detroit Business publication reported, “the estimated \$500 million cost has risen, though Enbridge officials have not estimated by how much.”<sup>68</sup>

But in a First Quarter 2022 earnings call, Enbridge’s then-CFO Colin Gruending (now Enbridge’s head of Liquid Pipelines) had responded to Barclay reporter Theresa Chen’s query on the tunnel cost, stating, “So I think we’re probably looking there at about \$750 million, Theresa, probably trending up.”<sup>69</sup>

Two other cost estimates have been part of the MPSC proceeding, one submitted by a group of Michigan Technology Institute students with a faculty advisor,<sup>70</sup> and the other by a concerned engineer, who amended Enbridge’s 2018 cost estimate based on the increased volume of the pipeline and the impact of inflation.<sup>71</sup> Updated to 2024 dollars and adjusted for construction inflation,<sup>72</sup> the estimates are as follows in Table 2.

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<sup>68</sup> Crains Detroit Business. [Enbridge chooses contractor to build Line 5 pipeline tunnel](#), April 30, 2024. Enbridge was similarly mum when questioned by WGVU (an NPR station). WGVU News. [Enbridge selects companies to construct Line 5 tunnel in Straits of Mackinac](#). April 30, 2024. Also see: The Record-Eagle (Traverse City, Mich.). [Enbridge signs contractors for tunnel project](#). April 20, 2024. Also see: Engineering News-Record. [Contractors selected for \\$500M Great Lakes tunnel in Michigan](#). May 3, 2024.

<sup>69</sup> Motley Fool Transcript. [Enbridge \(ENB\) 1<sup>st</sup> Qtr 2022 Earnings Call Transcript \(comments of then-CFO Colin Gruending\)](#), May 6, 2022.

<sup>70</sup> Students of Michigan Technological University in May 2018 provided the results of a cost analysis to the State of Michigan Pipeline Safety Advisory Board and state Senate. Assuming the tunnel would have an inner diameter of 21 feet, the student technical research project produced a “concept construction cost” estimate of \$569,542,000. The figure was comprised of \$380,145,000 for tunnel construction, \$147,659,000 for overall contingency (35%), \$35,849,000 for portal construction and \$5,889,000 for headhouse and systems construction. M. Drewyor, PE, PS, lead professor, and Michigan Technological Institute student research team. [CEE4905 Senior Design Project: Mackinac Straits Underground Utility corridor](#). May 2018, pp. 11 and 15 (included in PSAB Meeting Packet, May 14, 2018, Att. D, pp. 80 and 84).

<sup>71</sup> Gary Street. [Comments to MPSC: Reasons not to build a tunnel](#). MPSC case no. U-20763, docket accession number U-20763-0256. August 23, 2020. Also see: Record-Eagle. [Enbridge Pipeline: Embattled Line 5 marks 70 years](#). August 16, 2023.

<sup>72</sup> IEEFA calculation based on construction cost trends for the region as set forth in Whitman, Requardt, and Associates. Handy Whitman Index of Public Utility Construction Costs. Md. Bulletin 199, 2024.

**Table 2: Rough Estimates of Enbridge Tunnel Pipeline Cost in Millions of Dollars and Adjusted for Construction-Related Inflation**

Source of originally stated estimate	Estimated cost at time of statement (year varies by source)	Estimated cost in 2024 dollars adjusted for construction inflation
<b>Enbridge 2018 estimate based on 10' inner diameter (design not adopted)</b>	\$500 million	\$698 million
<b>Michigan Tech student team 2018 estimate based on 21' inner diameter</b>	\$569 million	\$796 million
<b>Enbridge then-CFO Colin Gruending reply to question at First Quarter 2022 Earnings Call, likely based on 21' inner diameter</b>	\$750 million “probably trending up”	\$734 million+
<b>Enbridge unit manager 2020 informal update to MDOT (90% higher than 2018 est.), likely based on 21' inner diameter</b>	\$950 million	\$1,266 million
<b>Gary Street P.E. 2021 estimate based on Enbridge 2018 estimate adjusted from 10' to 21' with 4% ann. inflation to 2024</b>	\$1,539 million	\$1,539 million <sup>73</sup>

But all these estimates likely will be exceeded. Since the tunnel pipeline will not be built in 2024, more construction inflation costs likely will be added. Also, as explained below, other project changes may increase the pipeline’s full cost, and price escalations seen in certain other pipeline projects should raise caution regarding the Enbridge tunnel project. It is probably reasonable to presume the project will cost \$1.5 billion or more.

<sup>73</sup> The estimate by Gary Street, P.E. used an annual average inflation rate rather than a construction inflation rate. When IEEFA used the regional construction cost inflation rate, consistent with our calculations to update the other project cost estimates, and also calculated the project scale increase based on both the interior diameter and the concrete casing, the cost estimate result in 2024 dollars was similar, at \$1,523 million.



## 2. The Tunnel Must Be Bored More Than 100 Feet Deeper Than Originally Planned

A 2020 academic study of cost overruns in tunneling projects observed that such construction work is particularly challenging because the actual ground conditions are not fully known until construction. The analysis concluded that geological and geo-technical investigation can only partly reveal the entire range of subsurface conditions in the preliminary stages of the design. “The ground investigation plays the most significant role that will impact the overall cost,”<sup>74</sup> the researchers said, adding that “site investigation is the main way to avoid cost overruns during the construction period.”<sup>75</sup>

In the case of the Enbridge tunnel project, the bedrock through which the tunnel would be drilled lies deeper than initially predicted. MSCA geotechnical consultant Michael Mooney testified to the MPSC that, as a result of geotechnical investigation:

*The depth to rock was determined to be deeper than assumed during the Alternative study and the resulting vertical profile takes the tunnel deeper in order to remain fully within rock. The [December 2019] geotechnical investigation also revealed highly fractured rock in places that would yield high groundwater pressures during construction.*<sup>76</sup>

Enbridge revised its plan, proposing to drill deeper and steeper than previously expected. As a consequence, except for its entrance and exit, the tunnel would be built in bedrock at depths ranging between 30 feet and 370 feet beneath the lakebed of the Straits,<sup>77</sup> rather than the originally proposed depth range of 60 feet to 250 feet.<sup>78</sup> The deepest point would be more than 100 feet—roughly 8-10 stories—deeper than originally planned.<sup>79</sup>

The extent to which this change will add to the project costs has not been publicly disclosed.

An additional concern is whether more surprises may be in store for the project. Engineer Brian O’Mara, an expert in geo-environmental engineering and construction, including tunneling, raised a series of concerns about the adequacy of the geotechnical investigation for the project. He challenged the number and spacing of exploratory boreholes, the condition and quality of the rock

<sup>74</sup> C. Paraskevopoulou and G. Boutsis. [Cost overruns in tunneling projects: Investigating the impact of geological and geotechnical uncertainty using case studies](#). *Infrastructures* 5:73. 2020 (hereafter, [Cost overruns in tunneling projects](#)), p. 2.

<sup>75</sup> *Ibid.*, p. 32.

<sup>76</sup> [Michael Mooney corrected testimony to MPSC](#), pp. 19-20. (The geotechnical investigation report is contained in attached [exhibit MM4](#). MPSC case no. U-20763, docket accession no. U-20763-0832. September 14, 2021.)

<sup>77</sup> [Army Corps Notice of Intent to prepare draft EIS](#), at 50076. The company had submitted a correction to the MPSC on December 17, 2021, stating the tunnel would be “at a depth of approximately 60 to 370 feet beneath the lakebed, except that from the TBM launch site on the south side the tunnel will be 30 feet below the lakebed and will taper to the depth of 60 feet or more below the lakebed for 250 feet from the shoreline.” Enbridge. [Exhibits 13.1 and 14.2 corrections](#). MPSC case no. U-20763, docket accession no. U-20763-1015. January 17, 2022.

<sup>78</sup> Enbridge had originally described the likely depth range as between 60 feet and 250 feet in its application to the MPSC. [Enbridge](#)

targeted for boring, as well as the potential for elevated water inflow rates during construction. He raised concern about uncertainties that could pose problems with stability and water management during construction.<sup>80</sup>

The 2020 academic study on tunnel cost overruns cautioned, “It should be highlighted that uncertainty is immeasurable and the means to measure it is called risk,” and “the risk can be estimated or increased due to the uncertainty of input parameters.”<sup>81</sup> While concerns have been raised that inadequate geotechnical analysis can give rise to construction problems and safety risks, such an inadequacy can also pose financial risks.

### 3. Safety Requirements May Increase Costs, and Mishaps May Occur

The tunnel pipeline likely will incur some additional costs in complying with added safety measures. The MPSC conditioned its approval of the project on Enbridge developing and providing a detailed risk management plan to the Mackinac Straits Corridor Authority. The plan, according to the MPSC 2023 order, must require real-time reporting of test-bore and probe-hole data, as well as inspections of concrete cast sections before and after placement, placement of gaskets and other matters. Also, the MPSC required Enbridge to implement procedures for low-hydrogen welding for all mainline girth welds, along with temperature requirements, and to ensure the mainline girth welds are nondestructively tested using methods proposed by the MPSC staff.<sup>82</sup>

The Army Corps of Engineers, in consultation with the U.S. Department of Transportation’s Pipeline and Hazardous Materials Safety Administration (PHMSA), may impose additional safety requirements. PHMSA has already indicated the need for careful review. In response to the MPSC’s query about the project’s safety, PHMSA wrote that “the tunnel approach is associated with its own unique operations and maintenance challenges.”<sup>83</sup> The agency explained:

*PHMSA did not specifically identify non-compliance items but notes that once constructed, O&M [operation and maintenance] for a pipeline situated inside the utility tunnel would require unique monitoring practices, as compared to buried or submerged pipelines.... These challenges may include the difficulty of performing routine maintenance deep within the tunnel or recovery efforts when a leak or incident occurs.*<sup>84</sup>

<sup>80</sup> See Brian O’Mara. [Review of Enbridge Line 5 replacement tunnel project permit applications/supporting documents](#). MPSC case no. U-20763, docket accession no. U-20763-1031. January 14 2022 (hereafter, [O’Mara review of Line 5 project application](#)).

<sup>81</sup> [Cost overruns in tunneling projects](#), p. 3.

<sup>82</sup> [MPSC 2023 Order](#), pp. 347-348.

<sup>83</sup> PHMSA. [Letter to David Chislea, Manager, Gas Operations Section, MPSC, re MI PSC Case No. U-20763](#). November 18, 2021.

<sup>84</sup> [Ibid.](#) PHMSA’s letter noted that its structural safety review was limited to the design of the pipeline itself, not the tunnel, due to the limits of the agency’s jurisdictional mandate.

PHMSA warned it would need to evaluate the company's O&M plans to determine if the project includes "the capabilities necessary to ensure ongoing compliance" and adequate means for PHMSA to conduct construction inspections.<sup>85</sup>

Public comments during the MPSC proceeding raised concerns about the potential for methane in the tunneling zone to seep into the tunnel, especially during construction.<sup>86</sup> The geotechnical data submitted by Enbridge stated that dissolved methane in groundwater was detected at concentrations ranging from 5 to 11 micrograms ( $\mu\text{g}$ ) per liter, roughly two to four times the reporting limit of 2.6  $\mu\text{g}$  per liter.<sup>87</sup>

With regard to post-construction tunnel operation, an expert witness on pipeline safety, Richard Kuprewicz, warned that including propane in such a tunnel pipeline project is "atypical" and increases the explosion risk due to its low autoignition temperature and broad flammability range.<sup>88,89</sup> The Kuprewicz testimony contradicted a 2017 report produced for the State of Michigan that concluded the safety risk from the tunnel pipeline would be "negligible,"<sup>90</sup> and a similar position put forth by MPSC staff.<sup>91</sup>

In addition, construction mishaps can incur significant costs. The Minnesota Pollution Control Agency (MPCA) took enforcement actions against Enbridge Energy, L.P., when construction activities on Enbridge Line 3 resulted in aquifer breaches in three areas. The MPCA and Minnesota Department of Natural Resources—in cooperation with the Fond du Lac Band of Lake Superior Chippewa—negotiated an agreement with Enbridge in October 2021, resulting in \$11 million in payments, environmental projects, and financial assurances.<sup>92</sup> In July 2023, the Minnesota Department of Natural Resources reported a fourth aquifer breach, which it described as "confined," from the Line 3 Replacement Project, and required a corrective action plan.<sup>93</sup>

<sup>85</sup> [Ibid.](#)

<sup>86</sup> [O'Mara review of Line 5 project application.](#)

<sup>87</sup> See Line Replacement and Tunnel Project: Geotechnical Data, Part 1. December 20, 2019, p. 32. Attached to Michael Mooney direct testimony, [Exh. MM4](#). MPSC case no. U-20763, docket accession no. U-20763-0834. September 14, 2021.

<sup>88</sup> [Rebuttal testimony by Richard Kuprewicz on behalf of Bay Mills Indian Community.](#) MPSC case no. U-20763, document accession no. U-20763-0943. December 14, 2021 pp. 7 and 9.

<sup>89</sup> The term "autoignition temperature" refers to the temperature at which a flammable substance may ignite in the presence of air at atmospheric pressure without an ignition source such as a spark or flame. See T. Borhani, *et al.* [QSPR estimation of the auto-ignition temperature for pure hydrocarbons.](#) *Process Safety and Environmental Protection*. 103(Part A):115-125. September 2016.

<sup>90</sup> [Dynamic Risk 2017 Report](#), p. ES-22, Table ES-2 (Economic Evaluation Summary).

<sup>91</sup> Citing the [Dynamic Risk 2017 Report](#), p. 3-60 ("unquantifiably low") and the [Enbridge 2018 Report to the State of Michigan \("virtually zero"\)](#), p. 6, MPSC witness Travis Warner, a public utilities engineer specialist for the agency, highlighted their statements that the risk would be "negligible". [Testimony of Travis Warner, MPSC](#), 12 Tr 81 and 89. MPSC case no. U-20763, docket accession no. U-20763-1070. January 24, 2022.

<sup>92</sup> Minnesota Pollution Control Agency. News release. [Minnesota state agencies and Fond du Lac Band announce Enbridge enforcement resulting in \\$11 million in payments, environmental projects, and financial resources.](#) October 17, 2022. Also see MPCA and Enbridge Energy, L.P. [Stipulation Agreement](#). October 17, 2022.

<sup>93</sup> Minnesota Department of Natural Resources. [Recent developments: Line 3 aquifer breach investigation near Moose Lake.](#) July 27, 2023. Also see: AP. [Oil pipeline construction in Minnesota ruptured an aquifer. Officials say it's the 4th time.](#) July 28, 2023.

## B. Expect the Unexpected: Oil and Gas Infrastructure Construction Costs Have Risen, and in Some Instances Balloon Far Beyond Early Estimates

A significant factor to consider in assessing the tunnel pipeline's potential cost is the extraordinary increase in general pipeline construction costs that have occurred over time.

### 1. Pipeline Construction Costs Have Escalated Nationwide

Although Enbridge has not publicly disclosed the specific reasons for the Line 5 tunnel pipeline's price increase, the company admits generally that construction costs have risen. It stated to the SEC (and shareholders) in its 2024 Form 10-K:

*Continued challenges with global supply chains have created unpredictability in materials cost and availability. Labor shortages and inflationary pressures have increased costs of engineering and construction services.<sup>94</sup>*

The issues Enbridge lists in its 2024 Form 10-K are not unique to the company. Such reasons have also been listed for cost escalation in natural gas pipeline construction nationwide.

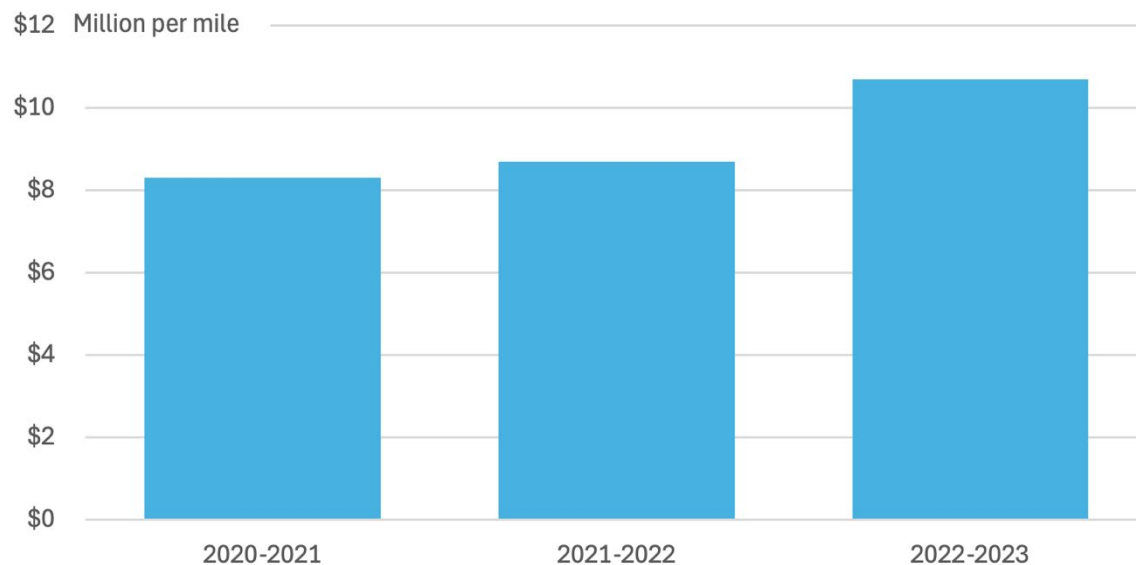
The *Oil & Gas Journal* reports onshore (as opposed to underwater) natural gas pipeline construction costs for 2022-2023 new projects, as filed for pipelines under the Federal Energy Regulatory Commission's jurisdiction, hit a record \$10.7 million per mile.<sup>95</sup>

<sup>94</sup> Enbridge. [Form 10-K](#), 2024, p. 52 (hereafter, [Enbridge 2024 Form 10-K](#)).

<sup>95</sup> The average cost per mile for such projects had been \$8.7 million in 2021-2022 and \$8.3 million in 2020-2021. [Oil & Gas Journal. Land pipeline construction costs hit record \\$10.7 million/mile](#). October 2, 2023. Pipelines narrower than 24 inches would be less costly and pipelines wider than 36 inches would be more costly. The average cost in 2018-2019 for a pipeline between 24 and 36 inches in diameter was \$6.18 million/mi, while the aggregate average cost for all diameters was \$6.55 million/mi. Mark Kaiser. [A review of onshore and offshore pipeline construction and decommissioning cost in the USA—part 1: specifications, cost estimation and onshore construction](#). *Int. J. Oil, Gas and Coal Technology*. 27(3):247-285, 280. 2021.



**Figure 3: Rise in Average Construction Costs for Natural Gas Pipelines Under FERC Jurisdiction**



Source: *Oil & Gas Journal*

The *Journal* stated the 2022-2023 price hike occurred due to the near doubling of “miscellaneous costs,” as well as labor costs, despite a reduction in cost of materials.<sup>96</sup>

Projects that face opposition can experience additional costs and delays. Enbridge has acknowledged the risk that litigation against Line 5 and the tunnel project poses to stakeholder trust and confidence,<sup>97</sup> noting:

*Companies in the energy industry are experiencing stakeholder opposition to new and existing infrastructure, as well as organized opposition to oil and natural gas extraction and shipment of oil and natural gas products. Changing expectations of our practices and performance across these ESG [environmental, social and governance] areas may impose additional costs or create exposure to new or additional risks. We are also exposed to the risk of higher costs, delays, project cancellations, loss of ability to secure new growth opportunities, new restrictions or the cessation of operations of existing pipelines due to*

<sup>96</sup> Oil & Gas Journal. [Land pipeline construction costs hit record \\$10.7 million/mile](#). October 2, 2023. The term “miscellaneous costs” included surveying, engineering, supervision, contingencies, telecommunications, equipment, freight, taxes, allowances for funds used during construction (AFUDC), administrative and overhead expenses, and regulatory costs (including participation in regulatory proceedings). *Ibid.*

<sup>97</sup> Fintel listed the company’s largest shareholders, as of December 12, 2024, as including: The Royal Bank of Canada, Vanguard Group Inc, GQG Partners LLC, Bank Of Montreal /can/, Td Asset Management Inc, 1832 Asset Management L.P., Deutsche Bank Ag, VGT SX - Vanguard Total International Stock Index Fund Investor Shares, GSIHX – Goldman Sachs GQG Partners International Opportunities Fund Class A Shares, and CIBC World Markets Inc. Fintel. [ENB-Enbridge Inc. stock—stock price, institutional ownership, shareholders \(NYSE\)](#). Accessed December 12, 2024.

*increased pressure on governments and regulators, and legal action, such as the legal challenges to the operation of Line 5 in Michigan and Wisconsin.*<sup>98</sup>

What follows are examples that illustrate the potential impact of publicly opposed projects, especially those that go through sensitive terrain.

## 2. Canada's Trans Mountain Extension Pipeline Cost Hikes Are a Red Flag

The price escalation of the Trans Mountain Extension (TMX) pipeline has raised concerns among the pipeline's shippers and the Canadian government. Although its construction involved a long pipeline rather than a short segment—running from Edmonton, Alberta to Burnaby, British Columbia—its cost trajectory should serve as a warning to Enbridge and the governments considering the tunnel pipeline project.

TMX and Enbridge Line 5 share some similarities. Both TMX and Enbridge Line 5 move crude oil— heavy crude in the TMX system and light crude (plus NGLs) in Line 5. TMX, a twinning of a pipeline, added 590,000 bpd of capacity to the existing Trans Mountain Pipeline system;<sup>99</sup> Enbridge Line 5's capacity, as noted above, is 540,000 bpd. TMX is mostly 36 inches in diameter,<sup>100</sup> compared to Enbridge Line 5's 30-inch diameter. Perhaps most significantly, both projects involve challenging terrain and public opposition.

The Canadian government in 2018 took the unusual step of buying both TMX and the original Trans Mountain pipeline from Kinder Morgan for \$4.5 billion, essentially bailing out the project when Kinder Morgan's CEO had threatened to cancel it in the face of public opposition and rising costs. The government insisted it would ultimately find a buyer for the pipeline system, but some analysts were skeptical.<sup>101</sup>

The construction costs of TMX soared from C\$7.4 billion in 2017 to C\$12.6 billion in 2020, to C\$21.4 billion in February 2022, to C\$30.9 billion (\$22.35 billion in U.S. dollars) in early 2023.<sup>102</sup> The final price tag was C\$34.2 billion, according to the Canada Development Investment Corporation's Annual Report for 2023.<sup>103</sup> See Figure 4 below.

<sup>98</sup> Enbridge 2024 Form 10-K p. 53.

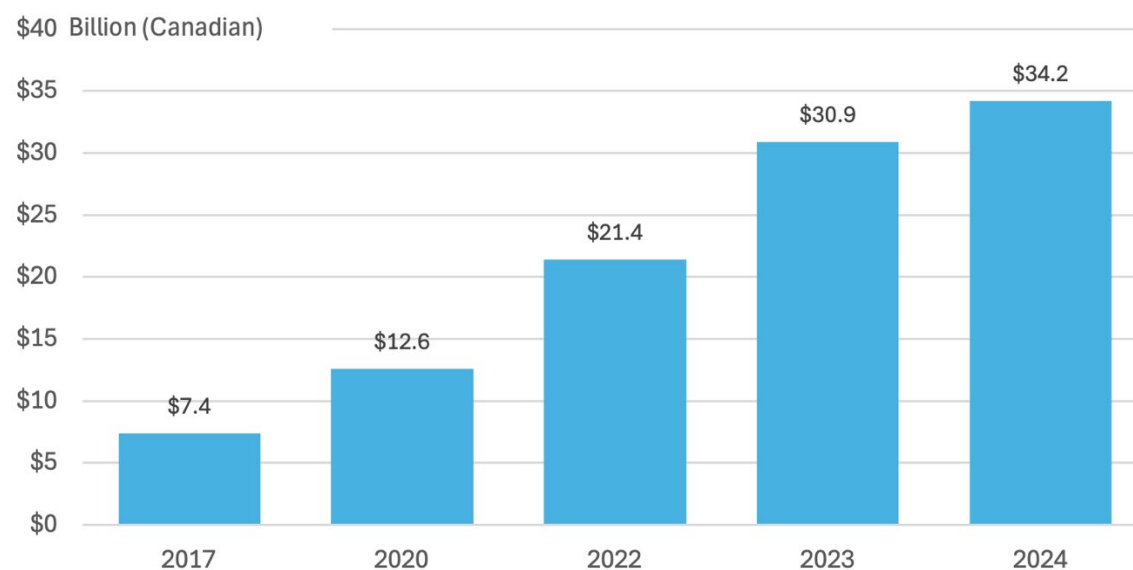
<sup>99</sup> National Energy Board. *Reconsideration of aspects of its OH-001-2014 Report re Trans Mountain Pipeline ULC application for the Trans Mountain Expansion Project, MH-052-2018*. February 2019, p. 9.

<sup>100</sup> *Ibid.*, p. 107. A 75-mile stretch (12% of the new pipeline) has a 42-inch diameter.

<sup>101</sup> Financial Post. *Canada buys Kinder Morgan's Trans Mountain pipeline for \$4.5 billion—but can we sell it?* May 29, 2018.

<sup>102</sup> Reuters. *Trans Mountain oil pipeline expansion costs surge 44% to C\$30.9 billion*. March 10, 2023. Also see: Trans Mountain Corporation. *Trans Mountain Corporation updates expansion project cost and schedule*. February 18, 2022. Also see: Canadian Press – Financial Post. *Cost to build Trans Mountain Pipeline jumps 70% to \$12.6 billion*. February 7, 2020.

<sup>103</sup> Canada Development Investment Corporation. *Annual Report 2023*, p. 61. Also see Office of the Parliamentary Budget Officer. *Trans Mountain Pipeline—2024 Report* (hereafter, *Canada PBO 2024 report*), p. 2.

**Figure 4: Cost Estimates for Trans Mountain Pipeline Over Time**

Sources: Reuters; Trans Mountain Corp.; The Canadian Press-Financial Post; Canada Development Investment Corporation Annual Report 2023

In a description of forces similar to the construction cost concerns Enbridge cited in its recent SEC filing, TMX in 2022 stated the escalation of its pipeline costs “can be attributed to five broad categories – project enhancements, safety and security, productivity challenges, schedule pressures and financing costs.”<sup>104</sup>

The cost escalations were already so alarming by 2022 that the Canadian government declared it would “spend no additional public money on the project,” asserting the Trans Mountain Corporation would secure the funding to complete the pipeline through third-party financing in the public debt markets or with financial institutions.<sup>105</sup>

Upon the release of the 2023 TMX estimate, the Financial Post warned, “It has also been clear for some time that pipeline tolls won’t be sufficient to cover the increased costs.”<sup>106</sup>

The Financial Post cited a 2022 IEEFA report cautioning that the Canadian government could wind up having to write off most of TMX’s cost.<sup>107</sup> IEEFA’s analysis had concluded the government would not be able to generate an adequate profit for investors because the pipeline tolls could not be raised

<sup>104</sup> Trans Mountain Corporation. [Trans Mountain Expansion Project Update: Project cost and schedule](#). February 2022.

<sup>105</sup> Department of Finance. [News Release: Government announces next steps on Trans Mountain Expansion Project](#). February 18, 2022. The Finance Minister did not rule out borrowing for the project through various Canadian economic development entities. See IEEFA. [Trans Mountain Expansion could never return the expected \\$26.1 billion spent by taxpayers](#). March 2022.

<sup>106</sup> Financial Post. ‘Horrorified’: Trans Mountain’s latest big cost increase catches watchers by surprise. March 15, 2023.

<sup>107</sup> *Ibid.*

high enough to support new debt on the pipeline plus operational costs. To do so would raise the cost of exporting oil through TMX to a price not competitive in international markets. To compete, the government would have to keep toll rates so low it would be operating TMX at a loss for investors. IEEFA warned the Canadian government would likely have to guarantee the debt.<sup>108</sup> Canada's Parliamentary Budget Officer (PBO) in 2023 calculated the present value of the Trans Mountain Pipeline system in two ways, and concluded that if the system sold in 2024 at either of the two present values, after outstanding liabilities were repaid, the remaining amount would be less than the shareholder's equity. The PBO warned, "TMC would have to write off the balance of the equity and record a loss," although it noted factors related to future revenues and length of service could alter the scenario.<sup>109</sup>

In March 2024, shippers with TMX agreements urged the Canada Energy Regulator to require Trans Mountain to explain its escalating construction costs.<sup>110</sup> Although Trans Mountain Corp., a Crown corporation, has said 70% of TMX's cost overruns will be borne by the pipeline company and will have no effect on tolls, the shippers still object that the toll is too high.<sup>111</sup> The Canada Energy Regulator thus far has only granted approval for TMX to charge the higher toll on an interim basis.<sup>112</sup> A final decision may not be made until early 2025.<sup>113</sup>

### 3. Other Recent Examples of Construction Price Hikes: Mountain Valley Pipeline, Coastal GasLink Pipeline, Petrochemical Plants

The cost to build the Mountain Valley Pipeline (MVP), a 330-mile-long gas pipeline extending from West Virginia to Virginia, leaped from \$3.5 billion in 2014 to \$7.85 billion in 2024.<sup>114,115</sup> It was supposed to be in commercial operation by the end of 2018, but did not open until June 2024.<sup>116</sup> Like the Enbridge tunnel pipeline project, MVP involved challenging terrain and public opposition.

The 415-mile Coastal GasLink (CGL) Pipeline in British Columbia,<sup>117</sup> designed to supply natural gas to the LNG Canada project in Kitimat, B.C., saw its costs rise from C\$6.6 billion in 2018 to C\$11.2

<sup>108</sup> IEEFA. [Trans Mountain Expansion could never return the expected \\$26.1 billion spent by taxpayers](#). March 2022.

<sup>109</sup> Canada PBO 2024 report, p. 8.

<sup>110</sup> Canada National Observer. [Oil shippers demand explanation for Trans Mountain Pipeline Cost overruns](#). March 14, 2024. The shippers who sent the letter included Canadian Natural Resources, Ltd.; Suncor Energy, Inc.; Cenovus Energy, Inc.; Petrochina Canada Ltd.; and Marathon Petroleum Canada.

<sup>111</sup> Reuters. [Canadian regulators approve preliminary interim tolls on expanded Trans Mountain pipeline](#). November 30, 2023.

<sup>112</sup> The benchmark toll is set at \$11.46 per barrel for shippers with 15-year contracts transporting under 75,000 bpd/day from Edmonton to Burnaby. Canada Energy Regulator. [CER sets interim tolls for the expanded Trans Mountain pipeline system](#). November 30, 2023.

<sup>113</sup> Cenovus. [Cenovus Energy Inc. \(NYSE:CVE\) Q1 2024 Earnings Call Transcript for May 1, 2024](#). May 4, 2024.

<sup>114</sup> EQT. [EQT and NextEra Energy Announce Southeast Pipeline Project](#). June 12, 2014.

<sup>115</sup> Dow Jones. [Mountain Valley Pipeline Cost Now Estimated at \\$7.85 Billion – OPI](#). April 30, 2024.

<sup>116</sup> *Ibid.* Also see Reuters. [U.S. Mountain Valley natural gas pipeline begins operations](#). June 14, 2024.

<sup>117</sup> For more background on cost concerns about this project, see IEEFA. [British Columbia LNG project costs rising again](#). February 2023.

billion in 2022.<sup>118</sup> In February 2023, the pipeline sponsor, TC Energy, announced a cost estimate of C\$14.5 billion.<sup>119</sup> The company attributed the expense hike to factors that included:

*...challenging conditions in the Western Canadian labour market; shortages of skilled labour; impacts of contractor underperformance and disputes; as well as other unexpected events like drought conditions and erosion and sediment control challenges.*<sup>120</sup>

The CGL, like the Enbridge tunnel project and the MVP, involved challenging terrain (relevant to the erosion and sediment control issues mentioned) and public controversy. Mechanical completion of the pipeline was achieved in November 2023, with further work pending on such activities as clean-up, reclamation, and erosion and sediment control.<sup>121</sup> TC Energy's 2024 Second Quarter Report still restates the 2023 estimated cost of C\$14.5 billion.<sup>122, 123</sup>

Construction costs also plague petrochemical plant projects, another segment of the oil and gas industry. ICIS cites construction cost overruns at multiple petrochemical projects, which it partly attributes to a chronic shortage of qualified construction workers.<sup>124</sup> Shell disclosed to the Securities Exchange Commission (SEC) this year that the cost of its petrochemical complex in Pennsylvania, which opened in November 2022, was \$14 billion—40% higher than had been estimated by IHS and IEEFA, and 130% higher than an unconfirmed yet apparently undenied estimate previously reported by media.<sup>125</sup> In 2020, shareholders of Sasol sued the company for failing to disclose construction cost increases at its petrochemical plant in Lake Charles, Louisiana, successfully settling the case in 2022.<sup>126</sup>

It is reasonable to assume that government agencies and communities make their initial determinations about supporting or not supporting a pipeline or petrochemical project based on a professionally designed development package that includes as an essential element the construction cost estimates. In each instance described above—and in the instance of the Enbridge tunnel pipeline project—the initial cost estimate was substantially understated.

<sup>118</sup> Globe and Mail. [Cost estimate for Coastal GasLink pipeline cost soars 70 per cent to \\$11.2 billion](#). July 28, 2022.

<sup>119</sup> TC Energy Press Release. [TC Energy provides Coastal Gaslink project update](#). February 1, 2023.

<sup>120</sup> *Ibid.*

<sup>121</sup> Coastalgaslink.com. [Post-construction update](#). June 18, 2024.

<sup>122</sup> TC Energy. [Quarterly Report to Shareholders, Second Quarter 2024](#). August 1, 2024, p. 33.

<sup>123</sup> TC Energy took an after-tax impairment charge of \$809 million and \$838 million for the three and six months ended June 30, 2023 related to its investment in the Coastal GasLink Pipeline Limited Partnership. *Ibid.*, p. 8.

<sup>124</sup> ICIS. [Insight: Large construction cost overruns hit US chemical plants](#). September 21, 2023.

<sup>125</sup> IEEFA. [Shell acknowledges \\$14 billion price tag for petrochemical plant, more than double street estimates](#). February 8, 2024.

<sup>126</sup> Settlement approved, *Moshell v. Sasol, Ltd., et al.*, No. 1:20-cv-010008-JPC (S.D.N.Y., April 26, 2023). Also see Hagens Berman, Sasol Ltd. (NYSE:SSL). Accessed December 12, 2024. Also see: Court Listener. [Moshell v. Sasol](#). Accessed December 12, 2024.



## C. Risks of Prolonged Operation of the Dual Pipeline During Tunnel Construction Must Be Considered

As noted above, concerns for the safety of Line 5's old underwater dual pipeline have grown. The MPSC took cognizance of the anchor strike that occurred in 2018 and the issue that arose the same year regarding gaps in the protective coating of the underwater pipeline system.<sup>127</sup>

The MPSC also noted the long-term stresses on the old pipelines of the Straits' vigorous currents. It found that "the dual pipelines are subject to VIV [vortex-induced vibrations] and spanning stress, which may contribute to the risk of failure and a release of Line 5 product."<sup>128</sup> Slender subsea structures like pipelines, when exposed to currents, may experience vortex-induced vibrations, which can shorten their fatigue life and increase the risk of structural failure.<sup>129</sup> Fatigue life is the number of stress cycles a material can withstand before failure.<sup>130</sup>

The MPSC decision cited testimony that such a rupture could cost an estimated \$1.37 billion in damages.<sup>131</sup> A 2018 Independent Risk Analysis commissioned by the State of Michigan found Enbridge's potential total quantifiable response liability for a worst-case spill could be nearly \$2 billion.<sup>132</sup>

Both figures may be substantial underestimates. Many businesses in the area depend on the water quality of the Great Lakes, including members of the craft beer industries and recreational businesses.<sup>133</sup> An analysis by oceanographer David Schwab of the University of Michigan prepared for the National Wildlife Federation found the currents in the Straits so strong that more than 1,000 kilometers of Lake Huron-Michigan shoreline and specific islands are potentially vulnerable to an oil release from the dual pipeline into the Straits.<sup>134</sup>

A 2018 study conducted by ecological economist Robert Richardson of Michigan State University, commissioned by For Love of Water (FLOW), estimated more than \$5.6 billion in total economic impacts, including impacts on commercial fishing, municipal water systems, tourism, and coastal property values from a 59,500-barrel spill.<sup>135</sup> The Richardson study also added an estimated \$697.5

<sup>127</sup> [MPSC 2023 Order](#), pp. 346-347.

<sup>128</sup> *Ibid.*

<sup>129</sup> See M. Janocho and M. Ong, [Vortex-induced vibrations of piggyback pipelines near the horizontal plane wall in the upper transition regime](#), *Marine Structures* 75:102872, January 2021.

<sup>130</sup> See F. Van den Abeele, *et al.* [Fatigue analysis of free spanning pipelines subjected to vortex induced vibrations](#), Proceedings of ASME 32d International Conference on Offshore Mechanics and Offshore Engineering, June 2023.

<sup>131</sup> [MPSC 2023 Order](#), p. 347.

<sup>132</sup> The exact figure in 2018 was 1,878,000,000. [Second Agreement](#), p. 8.

<sup>133</sup> See Brief of Great Lakes Business Network, in *Bad River Band of the Lake Superior Tribe of Chippewa Indians, et al. v. Enbridge Energy Company, Inc., et al.*, Nos. 23-2309 and 23-2467, *op. cit.*, filed October 17, 2023.

<sup>134</sup> David J. Schwab, Ph.D., University of Michigan Water Center. [Statistical analysis of Straits of Mackinac Line 5: Worst case spill scenarios](#). Prepared for National Wildlife Federation. March 2016.

<sup>135</sup> R. Richardson and N. Brugnone. [Oil Spill Economics: Estimates of the Economic Damages of an Oil Spill in the Straits of Mackinac in Michigan](#). May 2018, p. 34. Also included in [MPSAB meeting packet](#), August 6, 2018, p. 48.

million in costs for natural resource damages and restoration.<sup>136</sup> A subsequent addendum to the study considered the impact to shipping businesses and their customers—such as steel producers and the auto industry—of temporarily closing down shipping in the aftermath of a spill to allow cleanup vessels and equipment to operate. If the spill affected the St. Marys River and the Soo Locks that facilitate the passage of freighters, barges and other vessels from Lake Superior to Lake Huron during the early part of the shipping season, the impact of a 15-day closure of the Mackinac Straits and 13-day closure of the Soo Locks was estimated to be \$45.8 billion.<sup>137,138</sup>

What is receiving far too little attention in the tunnel pipeline debate is how long the risks of operating the old dual pipeline system would persist if the Enbridge tunnel pipeline plan is carried out. The Army Corps does not expect to reach a final decision on the tunnel project until early 2026.<sup>139</sup> Enbridge has estimated at times that, once permitted, the tunnel excavation and concrete liner installation would take about two years to complete.<sup>140,141</sup> Construction of related infrastructure and installation of the pipeline segment would also be required. A spokesperson for the company stated in a 2022 media interview that construction would take about four years.<sup>142</sup> The project likely will not be able to start operations until at least 2030. The heavy opposition to the pipeline project also may cause delays.

During that period—potentially five or more years—the old dual pipeline system would continue to operate, posing a risk to the waters within which it lies. The MPSC decision found continued operation of the old dual pipeline system is not consistent with public health, safety and welfare.<sup>143</sup> Every month the old dual pipeline system remains in operation presents risk to an essential freshwater resource.

Operational costs should be considered as well. The Second Agreement between Michigan and Enbridge requires Enbridge to maintain financial assurance mechanisms that meet or exceed the \$1,878,000 estimate of Enbridge’s potential total quantifiable response liability for a worst-case spill from the existing dual pipelines, as calculated in the 2018 Independent Risk Analysis commissioned

<sup>136</sup> *Ibid.*

<sup>137</sup> N. Brugnone and R. Richardson. [Oil Spill Economics: Estimates of the Economic Damages of an Oil Spill in the Straits of Mackinac in Michigan, Addendum A—Multibillion-dollar Economic Impact to Great Lakes Shipping, Steel Production, and Jobs](#). November 20, 2018, pp. 6-7 and 10. The St. Marys River links Lake Superior and Lake Huron.

<sup>138</sup> In Canada, major oil pipelines are subject to an absolute liability limit (regardless of fault or negligence) of \$1 billion for spills. If a pipeline operator’s fault or negligence causes a spill, however, liability is not limited. Canada Energy Regulator. [Pipeline Financial Requirements Regulations](#). June 9, 2023.

<sup>139</sup> Army Corps. [Press Release: Corps of Engineers revises Enbridge Line 5 EIS schedule to ensure thorough analysis](#). March 23, 2023. Also see: Ap. [Army Corps further delays decision on Great lakes oil tunnel](#). March 23, 2023.

<sup>140</sup> Enbridge. [Upgrading vital energy infrastructure: Line 5 Straits of Mackinac crossing](#). Also see: [Dynamic Risk 2017 Report](#), p. ES-27, Table ES-4 (Operational Risk Analysis Summary).

<sup>141</sup> Enbridge has stated the tunnel-boring machine would excavate and install concrete lining at a rate of about 40 feet per day over a period of two years, working five days per week. See Enbridge. [Great Lakes Tunnel Project animation](#) (video). Accessed December 12, 2024. Also see: Michigan Engineering, University of Michigan. [The future of Line 5: Engineering under Lake Michigan](#). May 6, 2021.

<sup>142</sup> Petronoticias. [Construction on a seven-kilometer tunnel beneath Lake Michigan for the Line 5 pipeline to begin early next year](#). May 25, 2022. Also see Engineering News Report. [Enbridge to issue RFPs for \\$500M Straits of Mackinac oil-gas tunnel replacement for Line bridge to issue RFPs for \\$500M Straits of Mackinac oil-gas tunnel: Replacement for Line 5 pipeline could start construction as early as 2024](#). February 17, 2022.

<sup>143</sup> [MPSC 2023 Order](#), p. 346.

by the State.<sup>144,145</sup> The financial assurance requirement, as well as operational costs for the dual pipelines, could continue for four to five years—or more if delays occur—under the tunnel pipeline option, versus a substantially shorter period for a non-pipeline alternative.

Implementing the tunnel pipeline plan means prolonged operation of the existing system rather than moving expeditiously to alternatives.

Practically speaking, moving expeditiously to a non-tunnel-pipeline alternative would speed shutdown of the old system while also allowing businesses to plan for the change. Businesses can deal with many changes in supply and demand if they have time to make the adjustments needed to ensure a reliable flow of business. A one-day turn-around resulting from an accident or pipeline failure is very different from a period of a few months to put contracts in place for alternative transport of oil or NGL products.

In addition to the findings of the PLG Consulting 2023 Report that alternatives to Line 5 can be put in place expeditiously, an *amicus* brief submitted in litigation over part of the land-based pipeline route by a group of businesses supporting Line 5 closure agree that alternatives to Line 5 are available and asserted nearly all parts of the non-tunnel system could be set up within several months.<sup>146</sup>

Canada should reconsider its insistence on prolonged operation of the old dual pipeline, of which a rupture would cause substantial harm, when reasonable alternatives are available that could be implemented much sooner.

## D. The Enbridge Mainline System Feeding Line 5 Faces New Competition From TMX That May Affect Company Profitability

MacroTips Trading, writing for Seeking Alpha, observes Enbridge's Mainline pipeline system faces new, direct competition with the recently opened TMX Pipeline for oil (both heavy and light crude) produced in Alberta.<sup>147</sup>

Enbridge reduced the toll rate on its Mainline pipeline in mid-2023 for flows from Hardisty, Alberta to Flanagan, Illinois, an action that Bloomberg characterized as part of a “pipeline price war.”<sup>148</sup> MacroTips Trading notes that Enbridge's toll rate action was taken “at a potential hit to

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<sup>144</sup> [Second Agreement](#), p. 8.

<sup>145</sup> For spills in Canada, Enbridge is required to provide \$1 billion in financial assurance for coverage of damages from a spill, pursuant to the [Canadian Energy Regulator Act](#), §§136-142. Enbridge Pipelines Inc. has provided to the Canada Energy Regulator a credit agreement between its ultimate parent company, Enbridge Inc., and itself establishing a C\$1 billion revolving term credit facility. See Enbridge. [Letter to the Canada Energy Regulator re implementation of financial resource requirements, with copy of credit agreement attached](#). August 8, 2023.

<sup>146</sup> Brief of *amicus curiae* Great Lakes Business Network, *op. cit.*

<sup>147</sup> Seeking Alpha. [E Split: Enbridge's economic moat weakening](#). February 2, 2024 (hereafter, [Enbridge's economic moat weakening](#)). Also see: Reuters. [Canada's Trans Mountain pipe expansion to disrupt oil flow to US, boost prices](#). September 19, 2023.

<sup>148</sup> Bloomberg. [Pipeline price war brews in Canada as Enbridge cuts on oil](#). June 2, 2023. Also see Reuters. [Trans Mountain oil pipeline expansion pushes rivals to cut rates, for now](#). September 4, 2024.

profitability,”<sup>149</sup> although Enbridge CEO Greg Ebel characterized it as a “win-win-win” under which Enbridge “will earn attractive risk-adjusted returns.”<sup>150</sup>

Although shippers complain, as noted above, about the tolls for the TMX pipeline, BTU Analytics notes the updated tariffs for the TMX pipeline have improved its competitiveness.<sup>151</sup> It further observes:

*[A]s the pipeline provides exposure to the Brent market, whereas Enbridge Mainline and Keystone are exposed to WTI, Trans Mountain commands a greater netback than the other pipelines since WTI trades at a discount to Brent. This factor ultimately makes Trans Mountain the most economic shipping option out of Western Canada. As a result, Enbridge Mainline becomes the least economic route, potentially causing a drop in its near-term utilization unless crude production in Western Canada increases to fill Mainline capacity. BTU Analytics forecasts 164 Mb/d of Canadian crude production growth through 2029 and does not expect Enbridge Mainline to be fully utilized in the near term.*<sup>152</sup>

This summer Enbridge filed a new rating cutting tolls from points in Alberta, Saskatchewan and Manitoba to points in the State of Texas.<sup>153</sup> The company reported in its third quarter that it has successfully maintained robust business for its Mainline system.<sup>154</sup> Still, the presence of TMX in the market is likely to encourage Enbridge to keep its rates low enough to be competitive.

## II. The Line 5 Re-Route Project in Wisconsin Will Be Expensive and Other Capital Costs May Arise

### A. The Wisconsin Re-Route Project Costs Will Likely Be Higher Than Stated in 2021

In connection with the Wisconsin ruling on trespass in the litigation brought by the Bad River Band, as noted above, the company is applying for permits to build a 41.2-mile re-route of the pipeline around the reservation. The existing pipeline segment crossing the reservation is about 12 miles.<sup>155</sup>

<sup>149</sup> [Enbridge's economic moat weakening.](#)

<sup>150</sup> CBC News. [Enbridge signs tolling deal with shippers for Mainline pipeline system.](#) May 4, 2023.

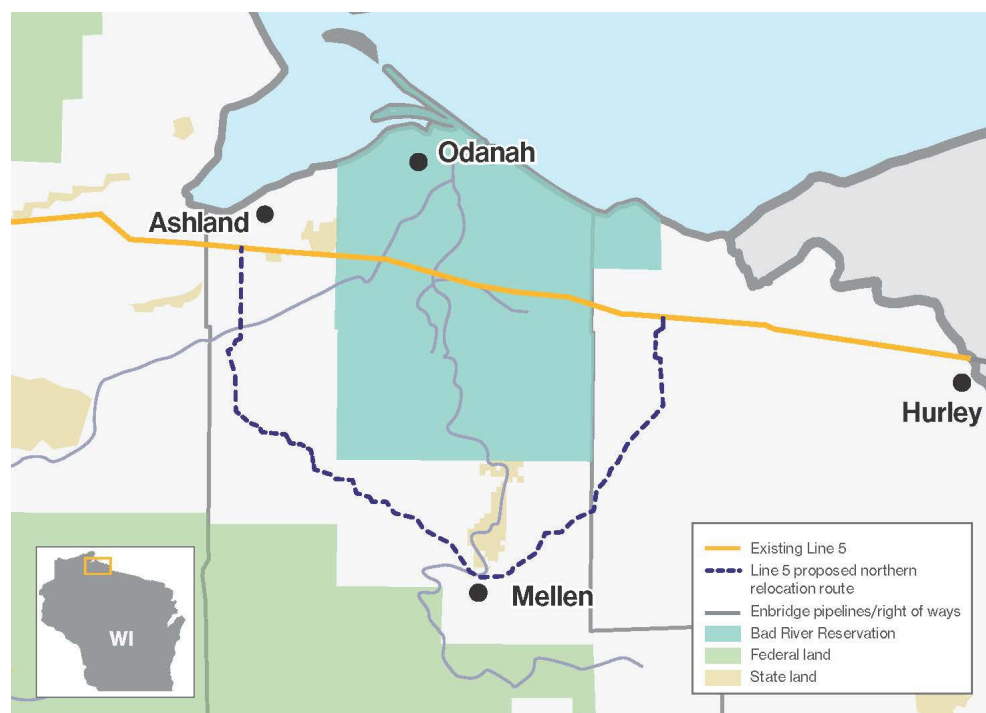
<sup>151</sup> BTU Analytics. [Better late than never: Trans Mountain Expansion completion imminent.](#) April 30, 2024.

<sup>152</sup> *Ibid.*

<sup>153</sup> Enbridge Pipelines Inc. [Canadian Mainline Tariffs. International joint rate tariff CER No. 557 and FERC no. 3.45.0.](#) Issued August 9, 2024 and commencing September 1, 2024. Also see: Bloomberg. [Enbridge cuts tolls on oil pipeline system amid new competition.](#) August 21, 2024.

<sup>154</sup> Enbridge. [Enbridge Inc. \(ENB\) Q3 Earnings Call Transcript.](#) November 1, 2024, opening comments of president/CEO Gregory Ebel.

<sup>155</sup> Army Corps of Engineers. [Enbridge Line 5 Wisconsin Segment Relocation Project: Draft Environmental Assessment, Clean Water Act § 404\(b\)\(1\) Guidelines Evaluation, and Public Interest Review.](#) May 20, 2024, p. 8.

**Figure 5: Map of the Proposed Re-Route of Line 5 in Wisconsin<sup>156</sup>**

Source: Enbridge. *Enbridge Line 5 – Wisconsin Segment Permit Request*

The pipeline re-route was projected to cost about \$450 million in 2024 dollars.<sup>157</sup>

It will likely cost more. The project construction did not commence in the year 2024. The re-routed pipeline would cross wetlands and waterways, and would result in some permanent filling of wetland area as well as temporary disruptions.<sup>158</sup> The Wisconsin Department of Natural Resources issued water quality and wetland permits for the project on November 14, 2024, but the Bad River Band has filed a petition to appeal that decision.<sup>159</sup> Other agency approvals are still required.<sup>160</sup> The court that ordered cessation of operations of Line 5 on the Bad River Band's reservation observed that although Enbridge has obtained easements for the targeted route, the project will not be unopposed, and the Bad River Band is concerned the new route affects the Bad River watershed.<sup>161</sup> The

<sup>156</sup> The map was submitted to the U.S. Army Corps of Engineers by Enbridge. See U.S. Army Corps of Engineers. [Enbridge Line 5 – Wisconsin Segment Permit Request](#). Accessed December 12, 2024.

<sup>157</sup> Wisconsin Department of Natural Resources. [Final Environmental Impact Statement: Proposed Enbridge Line 5 Relocation Project](#). September 2024 (hereafter, [Enbridge Line 5 Re-route Project FEIS](#)), pp 640-641.

<sup>158</sup> *Ibid.*, p. 14.

<sup>159</sup> *Bad River Band of Lake Superior Chippewa Indians v. Wisconsin Department of Natural Resources*, case number unavailable, filed December 12, 2024, in the Circuit Court of the State of Wisconsin, Ashland County.

<sup>160</sup> Wisconsin Department of Natural Resources. [Enbridge Pipeline Projects in Wisconsin](#). Accessed December 12, 2024. Also see: Army Corps of Engineers. [Enbridge Line 5: Wisconsin segment relocation](#). Accessed December 12, 2024.

<sup>161</sup> U.S. District Court June 2023 Order to cease L5 operation on tribal land, p. 21.



construction period alone, according to Enbridge, will take 12 to 14 months.<sup>162</sup> It is realistic to presume the project will ultimately cost roughly \$500 million or more.

## B. Other Risks May Arise Related to Maintaining a 70-Year-Old Pipeline

The Straits tunnel and Bad River lands re-route issues may not be the only challenges Enbridge faces on Line 5. Enbridge asserts, “inspection results along Enbridge’s Line 5 have regularly told us that from an engineering and maintenance perspective, the pipe is like new and in excellent condition.”<sup>163</sup> This does not appear to be correct with regard to the condition of the existing underwater dual pipeline. Enbridge has also experienced spills within its pipeline system over the years.

Enbridge’s most significant spill of the past is the Line 6B rupture that occurred on July 25, 2010. The incident spilled 843,444 gallons of crude oil into the surrounding wetlands, which then flowed into Talmadge Creek and the Kalamazoo River.<sup>164</sup> The National Transportation Safety Board (NTSB) excoriated Enbridge for misinterpreting its own alarms and instead identifying the problem only after being notified by an outside caller more than 17 hours later.<sup>165</sup>

Enbridge may well have improved safety protocols after the Line 6B spill, but operations since then have not been perfect. In connection with a special permit proceeding on another pipeline system operated by Enbridge, PHMSA provided a tabulation of its enforcement on 10 Enbridge pipeline systems in the United States, in just over a 10-year period, from January 2013 through February 2023. It found 53 enforcement actions, with a total of \$1,901,900 in assessed civil penalties.<sup>166</sup> One incident that occurred nearly three years after the Line 6B event—a 105,000-gallon spill of crude oil from a tank on the Cushing Tank Farm in Oklahoma that the company managed to contain onsite—again involved misinterpretation of alarms and delayed awareness (in this case, for nearly 24 hours) of the leak.<sup>167</sup> Also, the aquifer breaches associated with Enbridge Line 3, discussed above, occurred more than a decade after the Line 6B spill.

<sup>162</sup> [Enbridge Line 5 Re-route Project FEIS](#), p. 640.

<sup>163</sup> Enbridge. [How do you know line 5 is safe?](#) Accessed December 12, 2024.

<sup>164</sup> National Transportation Safety Board. [Accident Report: Enbridge Incorporated Hazardous Liquid Pipeline Rupture and Release, Marshall, Michigan, July 25, 2010](#). NTSB/PAR-12/01. July 10, 2012 (hereafter, [NTSB Accident Report 2012](#)). Also see: U.S. Fish & Wildlife Service. [Enbridge must restore environment injured by 2010 Kalamazoo River oil spill](#). June 8, 2015.

<sup>165</sup> [NTSB Accident Report 2010](#).

<sup>166</sup> PHMSA. [Special permit analysis and findings: Docket No. PHMSA-2002-0167 \(East Tennessee Natural Gas Transmission, LLC\)](#). March 31, 2023. Also see: National Wildlife Federation (NWF). [Sunken Hazard: Aging oil pipelines beneath the Straits of Mackinac an ever-present threat to the Great Lakes](#). 2012. The report, by Jeff Alexander and Beth Wallace of NWF, used the Freedom of Information Act to unearth inspection records issued before the availability of PHMSA data online. The report concluded that since 1968, Line 5 had spilled at least 1.13 million gallons of oil in 29 incidents.

<sup>167</sup> PHMSA Office of Pipeline Safety. [Failure Investigation Report—Enbridge Pipelines, LLC, Tank 2013 24-inch Fill Line failure in Cushing, OK](#). February 24, 2014 (date of failure: May 17, 2013). PHMSA maintains a database of Failure Investigation Reports issued for pipelines in the United States. PHMSA Office of Pipeline Safety. [Failure Investigation Reports](#). Accessed December 12, 2024.

Safety, of course, depends not only on pipeline inspections and maintenance but also on inspections of surrounding conditions, and Enbridge has been known to fail in specific instances on inspection and maintenance on Line 5. The anchor strike and the degraded pipeline coating problems at the dual underwater segments, described above—which spurred the State of Michigan’s legal actions—are two important examples.

The Wisconsin segment that is the subject of the Line 5 re-route project is another critical example of the issue of vigilance. The Western District Court of Wisconsin, in evaluating a request for preliminary injunctive relief in the Bad River Band case, examined the issue of erosion conditions near Line 5 where it runs alongside a bend in the Bad River, known as “the meander.”<sup>168</sup>

The facts, as found by the court after a six-day bench trial, are disturbing. The distance between the Wisconsin pipeline segment and the riverbank had been hovering around 26 or 27 feet for the prior three years at the time of trial in 2022, but three flooding events between April and May 2024 had reduced the closest point of Line 5 to only 11 feet.<sup>169</sup> The court found the pipeline at the meander was not exposed and was structurally intact, but stated with concern that the land under the pipeline at the site could be scoured away by the river’s current during future flooding events, leaving inadequate support for an aerial span of roughly 100 feet.<sup>170</sup>

Although finding the current threat of rupture at the meander “is still not so imminent that an immediate shutdown of the pipeline is necessary to prevent the nuisance,”<sup>171</sup> the court nevertheless ordered Enbridge to remove the pipeline within three years from any parcel in the tribal territory where it lacks a valid right of way.<sup>172</sup> The court stated:

*As explained in this opinion, the court concludes that a rupture of Line 5 at the Bad River meander would unquestionably be a public nuisance, and that the current conditions at the meander create a real and unreasonable risk of that nuisance occurring such that equitable relief is warranted.*<sup>173</sup>

In the meantime, the court expressed concern about how expeditiously Enbridge could close off the line in the event of an incident,<sup>174</sup> pursuant to its “Meander Monitoring and Shutdown Plan,” in place since 2021,<sup>175</sup> and ordered Enbridge to strengthen the plan.<sup>176</sup>

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<sup>168</sup> See [U.S. District Court June 2023 Order to cease L55 operation on tribal land](#).

<sup>169</sup> *Ibid.*, p. 8.

<sup>170</sup> *Ibid.*, pp. 6–7.

<sup>171</sup> *Ibid.*, p. 3.

<sup>172</sup> *Ibid.*, pp. 4 and 52.

<sup>173</sup> *Ibid.*, p. 3.

<sup>174</sup> *Ibid.*, p. 33. The court worried that, “the preparatory work required for Enbridge to even begin a 40-hour purge can itself take three to five days,” and that, “Enbridge’s plan does not account for inevitable delays that could occur due to weather conditions, supply and equipment problems and human error.”

<sup>175</sup> *Ibid.*, p. 8.

<sup>176</sup> *Ibid.*, pp. 3 and 52.

Oversight activities by public agencies and tribal government as well as a court ruling have played roles in Enbridge's response to the conditions of the dual underwater segment and the Bad River erosion area of Line 5. Such heightened scrutiny may not be present throughout the aging Line 5 corridor.

- The NTSB, in its investigative report regarding the major 2010 spill from Line 6B, criticized the PHMSA's "inadequate review and approval of Enbridge's facility response plan that failed to verify that the plan content was accurate and timely for an estimated worst-case discharge."<sup>177</sup>
- A year-long investigation by Politico's E&E News found the Federal Energy Regulatory Commission, the PHMSA, and state agencies rely almost entirely on private inspectors to monitor for safety lapses. The report stated these agencies leave pipeline construction monitoring "almost exclusively" to private inspectors paid by the developers.<sup>178</sup> The investigators found, "When inspectors identify safety lapses, it's often left to the companies themselves to decide when to make fixes, or whether to make fixes at all."<sup>179</sup>

Although Enbridge made many changes to its safety system,<sup>180</sup> the incidents on the dual pipeline segment indicate an imperfect safety system, and weaknesses in government oversight remain problematic.

Finally, the proposed tunnel pipeline itself may present new safety quandaries. As noted in Part I.A above, concerns have been raised about methane infiltration and other risks associated with the tunnel pipeline, and PHMSA has more generally raised concerns about the difficulty of performing routine maintenance deep within the tunnel or recovery efforts when a leak or incident occurs. A closer look at the issues is needed, as such incidents could have substantial financial and public safety repercussions.

The pressure to hurry things up so a project can open and start making money can be very persuasive. One individual interviewed as part of the 2024 E&E News/Politico investigation was an inspector for the Falcon pipeline built by Shell to supply ethane to a petrochemical plant in Beaver County, Pennsylvania. He had raised concerns about how the pipeline was being installed. Ultimately, his whistleblowing helped lead to the Pennsylvania attorney general filing 13 misdemeanor criminal charges against Shell for allegedly failing to control drilling mud (a heavy, viscous fluid used in horizontal drilling) and—equally, if not more, important—allegedly failing to

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<sup>177</sup> [NTSB Accident Report 2012](#).

<sup>178</sup> [E&E News/EnergyWire. 'Everything's on fire': Inside the US failure to safeguard pipelines](#). May 2, 2024 (hereafter, [E&E News pipeline inspection investigation](#)).

<sup>179</sup> [E&E News pipeline inspection investigation](#).

<sup>180</sup> [Enbridge. Press Release: Enbridge Energy Partners L.P. settles with the U.S. Department of Justice and U.S. Environmental Protection Agency on Marshall and Romeoville Incidents](#). July 20, 2016.

report drilling mud losses (which often contain pollutants) during construction.<sup>181</sup> The mere fact that a company is large and experienced does not ensure it will always take adequate steps for safety.

### III. Investing Substantial CAPEX in Line 5 Is Likely an Unwise Plan for Enbridge

Enbridge moves 30% of the crude oil in North America and 20% of the natural gas in pipeline transport in the United States, and recently has become the largest gas utility in North America by volume.<sup>182</sup> Line 5 accounts for 3.6% of Enbridge's 18,085 miles of oil and liquids pipelines in North America and 9% of its 5,800,000 bpd of oil and liquids transport by volume.<sup>183</sup> A segmental analysis of Enbridge's business showed second quarter earnings of C\$2.46 billion from liquids pipelines.<sup>184</sup> The company is a money-maker.

Still, Enbridge has issues of concern to some leading credit analysts. The tunnel pipeline project and the proposed pipeline re-route in Wisconsin pose costs, potential liabilities, and environmental risks that may raise further questions for credit review.

#### A. Enbridge's Credit Rating Bears Close Watching and Stock Analysts' Reviews Are Mixed

Moody's Ratings (Moody's), a leading credit rating agency that evaluates the creditworthiness of companies and governments, observes that Enbridge benefits from its large size and its diverse, low-risk asset base, which generates stable cash flow through rate regulation and a strong competitive position. But the credit agency cautions, "Offsetting these strengths is a weak financial profile and a multi-year capital program that is likely to grow."<sup>185</sup> Moody's Ratings vice president and senior creditor officer Gavin MacFarlane described Enbridge as having an "ongoing weakness in the company's financial profile."<sup>186</sup>

Moody's Ratings announced on March 29, 2024 that it had "downgraded the senior unsecured ratings" of Enbridge Inc and its subsidiaries Enbridge Energy Partners L.P. and Enbridge Energy L.P. and Spectra Energy Partners, L.P. to Baa2 from Baa1, although it upgraded the outlooks for the

<sup>181</sup> Pennsylvania Office of Attorney General. [Shell Falcon Pipeline charged with failures to report drilling issues that caused industrial waste, potential pollution of water](#). April 19, 2024. The case was heard before the Pennsylvania Court of Common Pleas on November 25, 2024. Shell pleaded no contest and agreed to pay a \$25,000 misdemeanors fine and provide \$275,000 to a local conservancy's watershed protection project. [Court of Common Pleas of Washington County. Criminal docket, Docket No. CP-63-CR-0001423-2024](#). Accessed December 12, 2024. Also see: Observer-Reporter. [Shell Pipeline Co. pleads no contest for discharges during Falcon pipeline construction](#). November 26, 2024.

<sup>182</sup> Enbridge. [Enbridge quick facts](#). Accessed December 12, 2024.

<sup>183</sup> See *ibid.*

<sup>184</sup> Zacks Equity Research. [Enbridge \(ENB\) Q2 earnings miss estimates, revenues rise Y/Y](#). August 6, 2024.

<sup>185</sup> Moody's Investors Service (now known as Moody's Ratings). Credit Opinion: Enbridge Inc. – Update following downgrade to Baa2. April 2, 2024 (proprietary) (hereafter Moody's Credit Opinion re Enbridge April 2024), p. 1.

<sup>186</sup> Moody's Ratings. [Rating Action: Moody's downgrades Enbridge and three subsidiaries to Baa2; outlook stable](#). March 29, 2024 (hereafter, [Moody's Rating Action re Enbridge March 2024](#), p. 1).

companies from negative to stable.<sup>187,188</sup> In the rating action, Moody's stated it expects Enbridge's distribution coverage (using depreciation), currently at 0.91x, to remain in the 0.9x-1x range for the next several years. It explained, "ENB is the only company in its peer group to sustain this figure below 1x, which we view as more indicative of a Baa2 rating."<sup>189</sup> Moody's notes, "By this and other measures of financial flexibility, the company is in a weaker position compared to peers."<sup>190</sup>

In its April 2024 credit opinion, Moody's projected:

*A combination of LDC [local distribution company] acquisitions, high capex and dividends will significantly outstrip cash flow from operations and cash on hand in 2024. We expect the company to issue significant debt, in addition to a mix of equity and hybrids, and to consider further asset sales.*<sup>191</sup>

Moody's observed that "proportionately consolidated debt to EBITDA [earnings before interest, taxes, depreciation, and amortization] was 5.3x at FYE 2023 and we believe it will be around 5.5x for the next few years."<sup>192</sup>

Other credit reports include positive actions but raise cautions.

S&P Global in June 2024 revised Enbridge Inc.'s outlook to stable from negative, and affirmed its rating of BBB+ for senior unsecured debt. The ratings agency had been concerned about the impact of acquisitions from Dominion Energy, Inc., but the new rating reflects its view that, "risk with respect to the acquisitions has been mitigated with credit metrics that are within our expectations."<sup>193</sup> Enbridge had recently closed its acquisition of Questar Gas Company and Wexpro Company, completing the second step toward finalizing its \$14 billion purchase of three Dominion Energy, Inc., gas utilities and related assets.<sup>194</sup>

The company has since completed purchase of the Public Service Company of North Carolina, Inc., from Dominion.<sup>195</sup> Enbridge reports that, as a result of these transactions, it is now the largest North American gas utility operator.<sup>196</sup>

<sup>187</sup> [Moody's Rating Action re Enbridge March 2024](#), p. 4.

<sup>188</sup> Enbridge's previous negative outlook ranking had been affected by the company's plan to acquire a portfolio of U.S. local gas distribution utilities from Dominion Energy, Inc., which would improve Enbridge's low business risk profile but add pressure on "an already weak financial profile." Moody's Investors Service. Credit Opinion—Enbridge Inc.: Update following outlook change to negative. September 15, 2023 (proprietary), pp. 1 and 11.

<sup>189</sup> [Moody's Rating Action re Enbridge March 2024](#), p. 4.

<sup>190</sup> Moody's Credit Opinion re Enbridge April 2024 (Proprietary), p. 4.

<sup>191</sup> *Ibid.*, p. 1.

<sup>192</sup> *Ibid.*

<sup>193</sup> S&P Global Ratings. [Enbridge Inc. outlook revised to stable on close of acquisitions, financing; ratings affirmed](#). June 18, 2024.

<sup>194</sup> Enbridge. [Enbridge completes acquisition of Questar Gas Company](#). June 3, 2024.

<sup>195</sup> Enbridge Inc. [Form 8-K](#). September 30, 2024. PRNewswire, published in S&P Capital IQ. [Dominion Energy Announces Closing of Sale of Public Service Company of North Carolina](#). October 1, 2024.

<sup>196</sup> Enbridge Inc. [Q2 2024 Earnings Call Transcript](#). August 2, 2024, opening comments of Gregory Ebel. Also see: Hart Energy. [Enbridge Closes \\$4.3B Deal for NatGas Utility Questar Gas](#). June 5, 2024.



Although the news has been met with some accolades,<sup>197</sup> the stock analysis firm MacroTips Trading has raised concerns, stating:

*While the move makes strategic sense as it reduces Enbridge's reliance on its waning liquids pipelines business, it does raise the possibility of Enbridge over paying. For example, ... Enbridge is paying \$25 billion in cash + debt to add ~\$2 billion in EBITDA, or 12.5x EV/EBITDA. However, Enbridge is only trading at 11.4x Fwd EV/EBITDA.... Furthermore, Gas Utilities as a group appear to trade at only ~10x Fwd EV/EBITDA, so Enbridge's purchase price appears high.*<sup>198</sup>

S&P cautioned it could take a negative rating action against Enbridge if the company's debt to EBITDA ratio reaches or exceeds 5.0x. The credit rating agency stated it expects the debt to EBITDA will be about 4.7x in 2025 and 4.6x 2026, but notes the ratio could rise "if the company adopts a more aggressive financial policy including capital expenditures or acquisitions that have disproportionate amounts of debt funding."<sup>199</sup> Enbridge states that it seeks to maintain a leverage target of 4.5 to 5x, expecting leverage to "peak" after closing on the PSNC acquisition and decrease in 2025 as the company earns annualized EBITDA contributions from the utilities,<sup>200</sup> but the company's third quarter earnings call for 2024 reported that its debt to EBITDA ratio is 4.9x.<sup>201</sup>

Construction projects are important in this context. In response to comments on the second quarter earnings call, Enbridge reported that number three of its top three priorities is to execute \$15 billion of projects, "[a]nd doing that all within our ability to keep the balance sheet between 4.5 and 5 times."<sup>202</sup>

Fitch ranks the company as Stable with a senior unsecured debt rating of BBB+,<sup>203</sup> but recently assigned a BBB- rating to the company's offering of USD-denominated junior subordinated notes, the proceeds of which Enbridge reportedly plans to use to repay existing indebtedness and capex as well as general corporate purposes.<sup>204</sup> Although the credit agency states its BBB+ rating is based on ENB's large size and the diversity and stability of its cash flows, it notes that the factors that could, individually or collectively, lead Fitch to issue a negative rating action or downgrade include adverse regulatory outcomes.<sup>205</sup> It is not clear to what extent adverse outcomes of litigation over Line 5 could contribute to such an analysis.

<sup>197</sup> See, e.g., Yahoo Finance. [This 7.5%-yielding dividend stock is another step closer to securing a once-in-a-generation investment opportunity](#). June 5, 2024.

<sup>198</sup> Enbridge's economic moat weakening.

<sup>199</sup> S&P Global Ratings, *op. cit.*

<sup>200</sup> Enbridge Q2 2024 Earnings Call Transcript, opening comments of Gregory Ebel.

<sup>201</sup> Enbridge. [News Release: Enbridge reports strong third quarter 2024 financial results, executes on business priorities, and reaffirms financial guidance and outlook](#). November 1, 2024.

<sup>202</sup> Enbridge Q2 2024 Earnings Call Transcript, response by Gregory Ebel to question.

<sup>203</sup> Fitch Ratings. [Fitch Ranks Enbridge Senior Unsecured Debt BBB+](#). April 2, 2024.

<sup>204</sup> Fitch Ratings. [Fitch rates Enbridge's junior subordinated notes 'BBB-'](#). June 24, 2024.

<sup>205</sup> Fitch Ratings. [Fitch Ranks Enbridge Senior Unsecured Debt BBB+](#). April 2, 2024.

Reactions to Enbridge among stock analysts is somewhat mixed. Seeking Alpha reports its Quant rating “has rated the stock a HOLD, with a score of 3.16 out of 5, with A in profitability and momentum and a D- on valuation,” and observes that, “Among Wall Street analysts, nine out of 22 analysts recommend BUY and above, 11 analysts see the stock as a HOLD, while two recommend STRONG SELL.”<sup>206</sup> Jefferies, for example, downgraded its Enbridge recommendation to hold from buy in September 2024,<sup>207</sup> although UBS maintained a buy rating for the company.<sup>208</sup>

A Simply Wall St opinion editorial reported ENB’s third quarter revenue “exceeded analyst estimates by 120%,” and earnings per share surpassed analyst estimates by 8.1%.<sup>209</sup> The increase was largely attributed to acquisitions.<sup>210</sup> Still, Simply Wall St observed as of December 12, 2024, with some concern:

- ENB's net debt to equity ratio (136.2%) is considered high.
- ENB's debt to equity ratio has increased from 93.1% to 139% over the past 5 years.
- ENB's debt is not well covered by operating cash flow (13.3%).
- ENB's interest payments on its debt are not well covered by EBIT (2.2x coverage).
- ENB's short-term assets (CA\$11.9B) do not cover its short-term liabilities (CA\$19.1B).
- ENB's short-term assets (CA\$11.9B) do not cover its long-term liabilities (CA\$117.9B).<sup>211</sup>

Simply Wall St also stated in October 2024:

*We've established that Enbridge currently trades on a much higher than expected P/E [price-to-earnings ratio] since its forecast growth is lower than the wider market. When we see a weak earnings outlook with slower than market growth, we suspect the share price is at risk of declining, sending the high P/E lower. Unless these conditions improve markedly, it's very challenging to accept these prices as being reasonable.*<sup>212</sup>

The Motley Fool, in contrast, reacting positively to the third quarter revenues, described Enbridge as a reliable, “toll-taker” business, and praised the company for “offering investors a huge 6.5% dividend yield.”<sup>213</sup>

Zacks Equity Research, evaluating Enbridge in November 2024, expressed general optimism about the company’s stable cash flows, but stated, “Compared to composite stocks belonging to the industry, Enbridge’s balance sheet has more debt exposure.”<sup>214</sup> Zacks also noted a slowdown in

<sup>206</sup> Seeking Alpha. [Enbridge continues losses for seven straight sessions](#). October 29, 2024. Also see: Seeking Alpha. ENB [Enbridge Inc. – Quant rating and factor grades](#). Updated November 1, 2024..

<sup>207</sup> MT Newswires. [Jefferies downgrades Enbridge to hold from buy, adjusts price target to CA\\$58 from CA\\$55](#), September 30, 2024 (published in marketscreener.com on October 22, 2024).

<sup>208</sup> MT Newswires. [UBS adjusts price target on Enbridge to CA\\$63 from CA\\$61, maintains buy rating](#). October 3, 2024.

<sup>209</sup> Yahoo Finance. [Enbridge Third quarter 2024 earnings: Beats expectations](#). November 2, 2024.

<sup>210</sup> [Enbridge Inc. \(ENB\) Q3 Earnings Call Transcript, op. cit.](#) Also see: Reuters. [Enbridge's Q3 profit more than doubles on acquisition contributions](#). November 1, 2024.

<sup>211</sup> Simply Wall St. [Enbridge – Company Overview – Financial Health](#). Accessed December 12, 2024.

<sup>212</sup> Simply Wall St. [Enbridge Inc.'s \(TSE:ENB\) popularity with investors is under threat from overpricing](#). October 20, 2024.

<sup>213</sup> Yahoo Finance (The Motley Fool). [Three top high-yield stocks to buy in November](#). November 4, 2024.

<sup>214</sup> Zacks Equity Research. [Here's why you should retain Enbridge stock in your portfolio](#). November 21, 2024.

drilling activities that could affect demand for midstream assets.<sup>215</sup> As noted above, Enbridge reported a ratio of 4.9x for its third quarter. Although that ratio is within the company's target range of 4.7x to 5x, it bears close monitoring as a leverage issue.

Zacks provided a recommendation of hold, rather than buy.<sup>216</sup>

The global energy transition trend of increasing availability of renewable energy presents long-term risks to Enbridge's business model, which remains heavily reliant on oil, gas and petrochemical energy transport. Whether the company will be able to adapt to the changing energy sector is an open question that has implications for the company's asset management and bottom line.

Enbridge's ability to make such an energy transition may be hampered by the company's "bullish" view of the oil market. Bloomberg recently quoted the company's CEO as saying that oil demand may continue to grow in the coming decades.<sup>217</sup> The CEO reportedly told Bloomberg in an interview that he expects oil will be "well north" of 100 million bpd by 2050.<sup>218</sup> Bloomberg noted the CEO's stance was "putting his company's internal assumptions among the more bullish forecasters on long-term crude usage."<sup>219,220</sup>

The International Energy Agency (IEA), in contrast, expects oil demand to decrease to 97 million bpd by 2050 if the world continues with existing policies, but if governments meet their decarbonization pledges in full and on time, the estimate drops to 55 million bpd.<sup>221</sup>

## B. Line 5 Controversy Has Been Cited as a Matter of Potential Risk for Enbridge

As noted above, if the tunnel project faces cost escalations comparable to certain other pipeline projects—whether due to terrain challenges, public opposition or other factors—its price could rise to more than \$1.5 billion (see Table 2). Adding the Line 5 Re-Route Project related to the tribal land trespass litigation in Wisconsin, the total cost of the two capital projects may rise to as much as \$2 billion or more.

Morningstar DBRS has specifically cited Line 5 controversy as a potential risk. The credit agency ranks the company's outlook listed as "Stable" and provides a Senior Unsecured Debt rating of A

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<sup>215</sup> *Ibid.*

<sup>216</sup> See Zacks Equity Research. [Here's why hold strategy is apt for Enbridge \(ENB\) stock now](#). April 19, 2024.

<sup>217</sup> Bloomberg. [Enbridge sees strong oil demand in 2050, with US supply growing](#). August 20, 2024.

<sup>218</sup> *Ibid.*

<sup>219</sup> *Ibid.*

<sup>220</sup> ExxonMobil stated in its 2024 annual energy outlook it expects crude oil consumption in 2050 to be roughly the same as today. ExxonMobil. [ExxonMobil Global Outlook: Our View to 2050](#). August 2024, p.3-ES. Also see: Wall Street Journal. [Exxon says oil and gas to remain top energy sources in 2050](#). August 26, 2024.

<sup>221</sup> IEA. [World Energy Outlook 2023](#). October 2023. Worldwide adoption of a more rigorous net-zero pathway would drop the figure to 25 million bpd. Also see: Bloomberg. [Global oil demand to reach its peak this decade, IEA says](#). October 24, 2023.

(low).<sup>222</sup> The rating had been upgraded from BBB (high) in June 2024.<sup>223</sup> Still, in describing the company's credit rating drivers, DBRS highlighted the significance of the Line 5 dispute, stating:

*A positive credit rating action is unlikely in medium term unless there is a successful resolution of the Line 5 dispute and the Company maintains its consolidated cash flow-to-debt ratio of higher than 17.5%. While unlikely in the medium term, a negative credit rating action could occur if the Company's consolidated cash flow-to-debt ratio stays consistently less than 12.5%.*<sup>224</sup>

The fact that organizations and tribal entities are fighting regarding not one, but two, troubled segments of Line 5 suggests that if a new problem develops, public response is likely to be swift and well-organized. It is not unreasonable to assume—given the pipeline's old age and its history of leaks—that additional problems may arise in the future.

### C. Investing \$2 Billion or More To Replace Two Segments of a 70-Year-Old Pipeline Might Affect the Company's Pursuit of Long-Term Value Maximization

Even assuming no other major capital expenditures arise for the Line 5 pipeline, the combined cost of the Straits Tunnel Pipeline and the Wisconsin Re-Route Project is likely to be \$2 billion or more. It is a large amount to invest in an aging pipeline facing a market that, as described in Part IV below, is likely to diminish significantly over the next couple decades.

Writing for the Harvard Law School Forum on Corporate Governance early this year, a group of corporate law experts observed that certain risks and opportunities are not captured in financial statements or investment analysis, yet remain relevant to the creation of a company's long-term sustainable value. They noted the importance of pursuing tailored strategies related to climate, sustainability, human capital and diversity, equity and inclusion, regardless of whether this occurs under a formal "environment, social and governance" (ESG) mantle or other corporate policy system.<sup>225</sup>

<sup>222</sup> MorningStar DBRS. [Morningstar DBRS assigns credit rating of A \(low\) with Stable trend to Enbridge Inc.'s debt issuance](#). August 22, 2024.

<sup>223</sup> Morningstar DBRS. [Morningstar DBRS upgrades issue rating on Enbridge Inc to A \(low\) with a stable trend; removes under review with developing implications status of the credit ratings](#). June 28, 2024.

<sup>224</sup> *Ibid.* DBRS expects overall debt levels to rise as Enbridge funds part of its secured capital program from debt, but expects the company to stay within its target Debt/EBITDA range of 4.5 time (x) to 5.0x.

<sup>225</sup> Martin Lipton, *et al.* [The future of ESG: Thoughts for boards and management in 2024](#). Harvard Law School Forum on Corporate Governance. February 6, 2024.

The writers also cited the International Sustainability Standards Board’s global sustainability disclosure standards<sup>226</sup> (which are under consideration in many jurisdictions), the “clampdown on greenwashing,” and other accountability measures.<sup>227</sup>

Enbridge’s 2024 Form 10-K noted that failure to achieve ESG goals or meet stakeholder and investor expectations “could erode stakeholder trust and confidence, which could negatively impact our reputation, business, operations or financial results.”<sup>228</sup>

Moody’s cautions that Enbridge’s Environment, Social and Governance (ESG) Credit Impact Score is CIS-3 (Moderately Negative), noting such factors as “carbon transition risk and waste & pollution risk that are a challenge for the sector,” as well as “opposition from local communities and indigenous populations, and from increasing regulatory hurdles and public opposition to the construction of new midstream projects.”<sup>229</sup>

On the macro level, Moody’s issued a warning in September 2020 that it was tightening its review of oil and gas infrastructure projects—a significant shift in approach. The credit agency identified eight large oil and gas projects that had been cancelled or substantially delayed. It warned against companies tying up investor capital on speculative projects. Moody’s explained that the debt used to finance a given project “is on-credit and will depress financial metrics during the construction period, all else being equal,” and that Moody’s generally does not incorporate any revenue from such pipelines in its base case financial projections for a company because of “growing uncertainties about whether new projects will be completed.” Instead, Moody’s noted it considers cash contribution until the pipeline is built and in operation.<sup>230</sup> Although the commentary focused primarily on new pipeline projects, Moody’s cautioned that “even existing facilities have come under fire.”<sup>231</sup>

Enbridge should consider declining to finance the tunnel project and tribal land re-routing, and expediting an effective Line 5 shutdown plan instead.

<sup>226</sup> IFRS Foundation. [ISSB issues inaugural global sustainability disclosure standards](#). June 26, 2023.

<sup>227</sup> Martin Lipton, *op. cit.*

<sup>228</sup> [Enbridge 2024 Form 10-K](#), p. 54.

<sup>229</sup> Moody’s April 2024 Credit Opinion Update —Enbridge, Inc., p. 7.

<sup>230</sup> Moody’s Investors Service. Shifting environmental agendas raise long-term credit risk for natural gas investments. September 30, 2020, p. 3. Proprietary.

<sup>231</sup> *Ibid.*, p. 3.



## IV. The No-Line-5 Alternative Offers Flexibility for Responding to Transition-Based Declines in Fossil Fuel Demand, Reducing Carbon Lock-In

Closing Line 5 would require the creation of a more diversified regional transport system for oil and NGLs, detailed in Section V below. Such a system offers an important opportunity to reduce the “carbon lock-in” impact of the existing pipeline system.

### A. Carbon Lock-In Impairs Progress on the Energy Transition

The term “carbon lock-in” was introduced by Gregory Unruh in 1999.<sup>232</sup> Unruh argued the economy has been locked into fossil fuel technologies by past investments and policy decisions, profits, and growth of energy infrastructure. He posited that the existing interplay of these factors “creates persistent market and policy failures that can inhibit the diffusion of carbon-saving technologies despite their apparent environmental and economic advantages.”<sup>233</sup>

A 2015 analysis of the carbon lock-in problem noted, “By investing in assets prone to lock-in, planners and investors restrict future flexibility and increase the costs of achieving agreed climate protection goals.”<sup>234</sup> Studies have analyzed the future carbon emissions that existing energy infrastructure can generate.<sup>235</sup> The problem is magnified, year by year, as new infrastructure comes online.<sup>236</sup>

In a 2016 examination of the “lock-in” role of fossil fuel-supporting infrastructure such as pipelines, a team of researchers observed the value of such infrastructure depends on the extraction and transport of fossil fuels, and owners of such assets “have strong incentives to favor policies that maintain lock-in.”<sup>237</sup>

<sup>232</sup> G. Unruh, [Understanding carbon lock-in](#), Energy Policy, 28(12);817-830, October 2000).

<sup>233</sup> *Ibid.*

<sup>234</sup> P Erickson, *et al.* [Assessing carbon lock-in](#), Environmental Research Letters, 10:084023, 2015, p. 1.

<sup>235</sup> S. Davis, *et al.* [Future CO<sub>2</sub> emissions and climate change from existing energy infrastructure](#), Science, 329 (5997):13330-13333, 2010.

<sup>236</sup> See, e.g., S. Davis and R. Socolow, [A growing commitment to future CO<sub>2</sub> emissions](#), Environmental Research Letters, 9(8):1104-1114, November 3, 2014. Also see: A. Revkin, [Accounting for the expanding carbon shadow from coal-burning plants](#), New York Times, August 28, 2014.

<sup>237</sup> K. Seto, *et al.* [Carbon lock-in: types, causes and policy implications](#), Annual Review of Environment and Resources, 41:425-52, 2016, p. 428.

The researchers noted:

*The decision to retire a device is usually based on an evaluation of economic competitiveness that incorporates mounting maintenance or looming retrofit costs, the costs of alternatives, and the current and anticipated social and policy context.*<sup>238</sup>

They stated, “Seizing opportunities before lock-in emerges or during moments of plasticity is far more likely to succeed than pushing for transitions in realms and during moments in which carbon lock-in is strong.”<sup>239</sup>

In the case of Line 5, the carbon lock-in is strong, but the turmoil over the tunnel project and re-route initiative presents an opportunity for re-evaluation of the current business-as-usual situation.

Enbridge has presented arguments for resistance to Line 5 shutdown, but a closer look should cause the company to reconsider. The conditions underlying Line 5’s economic rationale are changing, and can reasonably be expected to undergo further changes in the next few years.

The cost of the pipeline is increasing, as noted above, but the demand for the pipeline is likely to decrease.

## B. Market Demand for Line 5’s Oil Deliveries Can Reasonably Be Expected To Decline

Growing shifts in demand and competition threaten the business model of the tunnel pipeline project and Line 5. As noted above, the tunnel pipeline would not go into operation until at least 2030. By that time, the energy market will have changed significantly due to economic forces.

Macrotips Trading, in its analysis of Enbridge, cautioned, “It is conceivable that in a few years’ time, as global economies wean themselves off hydrocarbons, Canadian oil sands and Enbridge’s Mainline may become stranded assets.”<sup>240</sup>

Demand for oil is on a declining trajectory. Globally, the IEA expects oil demand to decrease to 97 million bpd by 2050 if the world merely continues with existing policies, but if governments meet their pledges in full and on time, the estimate drops to 55 million bpd.<sup>241</sup> The actual result may be somewhere between those two predictions, but regardless, the trajectory is steep and should not be ignored in corporate planning.

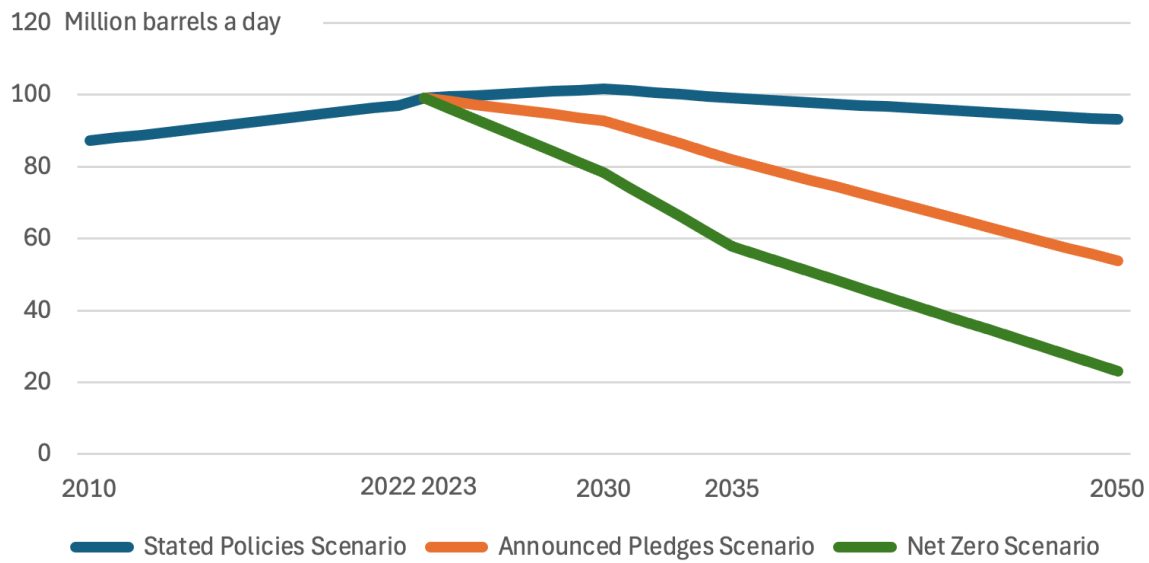
<sup>238</sup> *Ibid.*, p. 419. The researchers noted that “businesses and financial markets are motivated by profits but also desire the stability that increases predictable financial returns on long-lived capital investments.” *Ibid.*, p. 444.

<sup>239</sup> *Ibid.*, p. 444.

<sup>240</sup> Enbridge’s economic moat weakening.

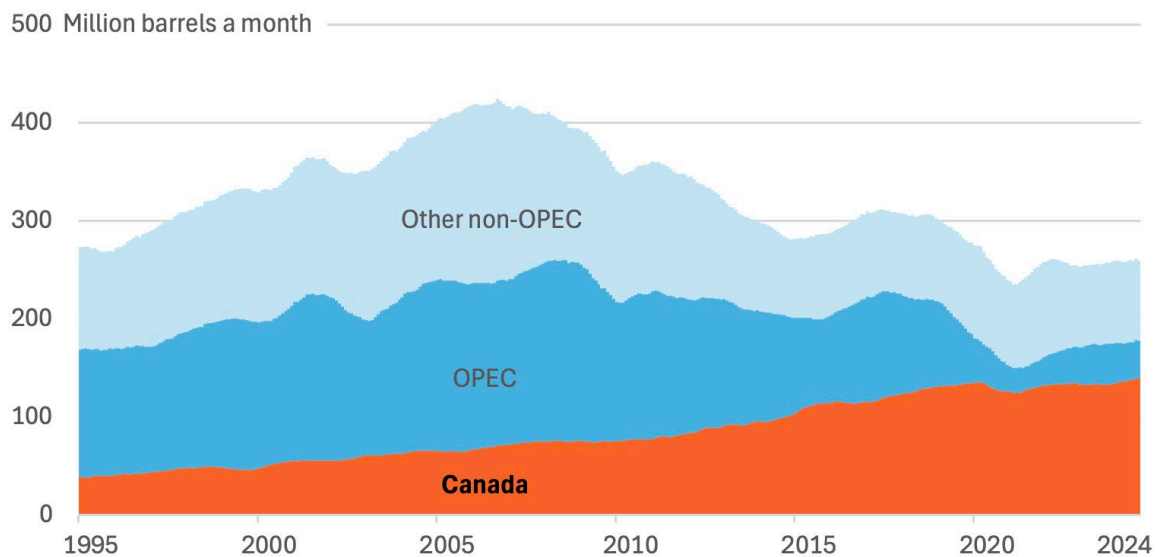
<sup>241</sup> IEA. *World Energy Outlook 2024*. October, 2024.

**Figure 6: IEA Estimates of Global Oil Demand to 2050**



Source: IEA

Figure 7 below illustrates the extent to which U.S. demand for oil imports has already plummeted in the past 20 years—and although Canada’s share of exports to the U.S. rose during the same period, the trajectory of such exports has plateaued in the last five years.

**Figure 7: U.S. Petroleum Imports From OPEC, Canada and Other Non-OPEC Countries<sup>242</sup>**

Source: EIA

Further change is coming for the oil market in both Canada and United States that will have a significant combined impact on demand. Primary drivers for this change in the transportation sector are improved fuel efficiency and mileage in gasoline-powered cars, and growing competition from electric vehicles (EVs) and hybrids, as well as federal and state/provincial mandates to blend gasoline with ethanol or biofuels.

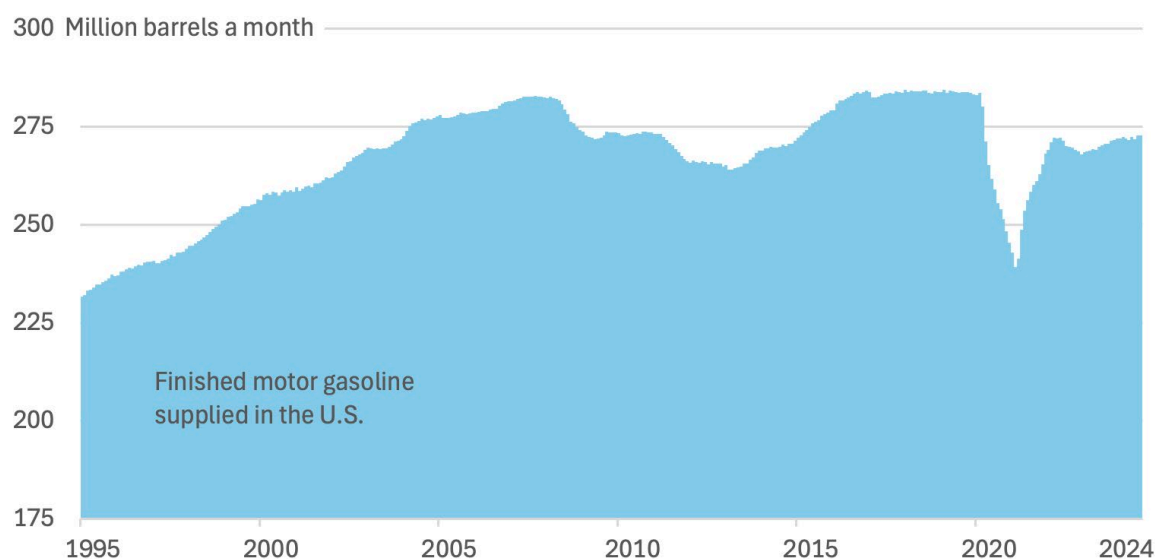
The EIA estimates generally that roughly 41% of a barrel of oil typically is directed toward producing motor gasoline for transportation (as opposed to powering other machinery), and 15% toward producing diesel fuel for transportation.<sup>243,244</sup>

In the United States, according to the EIA, total gasoline consumption peaked in 2016 and has already fallen more than 6%—even though the population has grown. Per capita gasoline demand, adjusted for population growth, has dropped by 12% from 2016 through 2023.

<sup>242</sup> Source of data: EIA. [Petroleum and other liquids](#). Accessed October 31, 2024.

<sup>243</sup> EIA. [Oil and petroleum products explained: Use of oil](#). Accessed December 12, 2024.

<sup>244</sup> The EIA reported that in the northern region spanning North Dakota to Ohio, 51.2% of refined oil was marketed for motor gasoline (including transportation and other uses) in 2023. EIA. [Midwest PADD 2 refinery yield of finished motor gasoline](#). Accessed December 12, 2024.

**Figure 8: U.S. Gasoline Consumption Down From Peak of 2016**

Source: EIA

The numbers in 2024 do not indicate an upward trend to be likely: The IEA reports that gasoline use in the United States declined year-over-year in five of the first six months of this year.<sup>245</sup>

EVs will likely cut demand substantially further. Market demand for crude oil is already changing as EVs take an increasing share of the automotive market. According to the IEA Global EV Outlook 2024, around one in nine cars sold in the United States are expected to be electric this year.<sup>246</sup>

Although the EV industry faces challenges, such as the need for more charging stations, it is still having a growing impact. IEA Executive Director Fatih Birol projects the EV portion of car sales by 2030 will almost double in the United States, reaching nearly one in five by 2030, similar to the European Union, and China will reach almost one in three.<sup>247,248</sup>

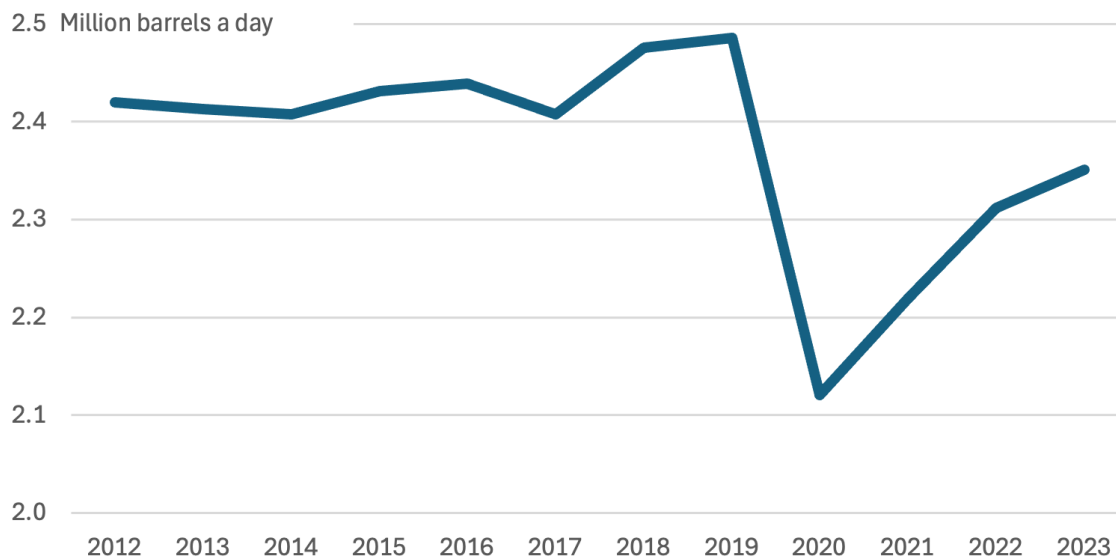
In Canada, oil consumption has not recovered from its pre-COVID pandemic levels.

<sup>245</sup> IEA. [Oil Market Report – September 2024](#). September 12, 2024 (hereafter, [IEA Oil Market Report – September 2024](#)).

<sup>246</sup> IEA. [Global EV Outlook 2024: Moving towards increased affordability](#). April 23, 2024, p. 29.

<sup>247</sup> Statement of IEA executive director Fatih Birol, in IEA. [The world's electric car fleet continues to grow strongly, with 2024 sales set to reach 17 million](#). April 23, 2024.

<sup>248</sup> The IEA estimates that more than half of all Chinese car sales in July and August 2024 were electric, and trucks increasingly are powered by natural gas rather than diesel. China also continues to expand high-speed rail. [IEA Oil Market Report – September 2024](#).

**Figure 9: Canada Oil Consumption<sup>249</sup>**

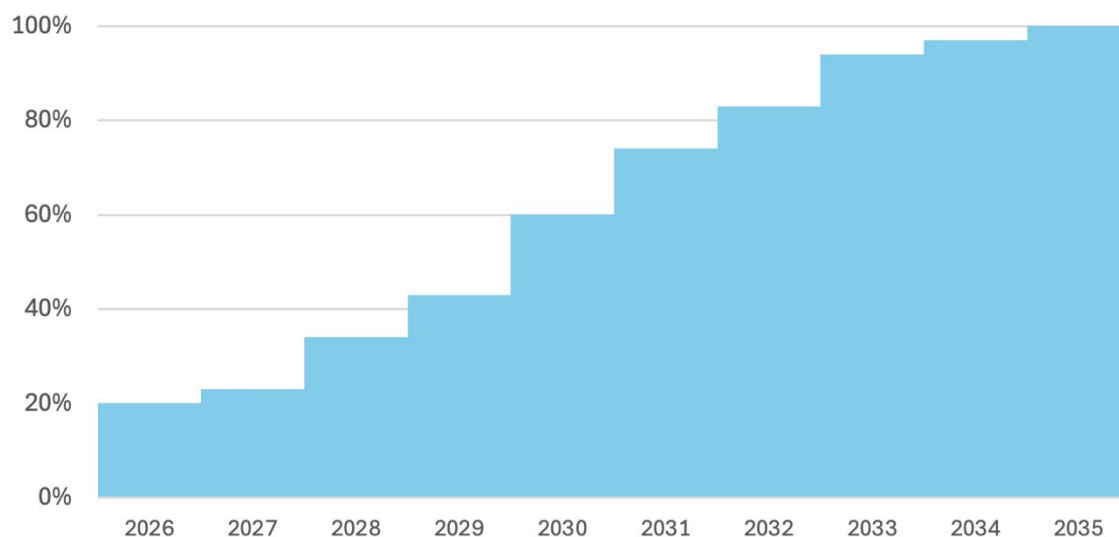
Source: Energy Institute, Statistical Review of World Energy 2024 and 2023

In the meantime, Canada is seeing an uptick in zero-emission vehicles. The share of new registrations of light-duty zero-emission vehicles in Canada reached 13.3% (or one in eight new vehicles) in the third quarter of 2023, a 40% increase from the third quarter of the prior year.<sup>250</sup> Canada plans to achieve a goal that 100% of light-duty cars and passenger trucks offered for sale will be zero-emission by 2035, with incremental targets to reach the goal.

<sup>249</sup> Energy Institute, Statistical Review of World Energy 2024, and 2023.

<sup>250</sup> Government of Canada. News release: [New electric vehicle availability standard will give Canadians better access to more affordable cars and cleaner air](#). December 19, 2023.



**Figure 10: Annual Zero-Emission Vehicle (ZEV) Regulated Sales Targets For Canada<sup>251</sup>**

Source: *Canada's Electric Vehicle Availability Standard (regulated targets for zero-emission vehicles)* from Environment and Climate Change Canada

Also, the government of Canada is taking action that will likely shift more of the vehicle fuel market away from oil. Its Clean Fuel Regulations require gasoline and diesel suppliers to gradually reduce the carbon intensity from the fuels they produce and sell for use in Canada. The carbon intensity reduction requirement started at 3.5 grams of carbon dioxide released per megajoule of energy (gCO<sub>2</sub>e/MJ) in 2023, and will increase by 1.5 gCO<sub>2</sub>e/MJ each year until it reaches 14 gCO<sub>2</sub>e/MJ in 2030.<sup>252</sup> Although such fuel suppliers can use a variety of methods to meet the carbon intensity reduction requirements (targeted to achieve a decrease of approximately 15% below 2016 levels), including lifecycle emissions control and credits, fuel blending will be an important strategy. Canada seeks to incentivize production and increase demand for low carbon intensity fuels, including ethanol and biofuels derived from canola and other agricultural crops, creating opportunity for farmers and clean energy jobs.<sup>253</sup>

Ontario requires that fuel suppliers blend renewable content in gasoline at a rate of 10% in 2024, rising to 11% in 2025, 13% in 2028 and 15% in 2030. Quebec has a similar incremental requirement to achieve the goal of 15% low-carbon fuel content by 2030.

<sup>251</sup> Government of Canada. [Canada's electric vehicle availability standard \(regulated targets for zero-emission vehicles\): Background](#). December 2023. The regulations define zero-emission vehicles as battery-electric, fuel-cell, or plug-in hybrid electric vehicles.

<sup>252</sup> Canada Consolidated Regulations. [Clean Fuel Regulations, SOR/2022-140](#). Updated August 18, 2024.

<sup>253</sup> Government of Canada. [What are the Clean Fuel Regulations?](#) Accessed December 12, 2024.

The Canada Energy Regulator, in its profile of the Enbridge Mainline system with which Line 5 is connected, notes that the Mainline tolls are fixed in a negotiated settlement, although they are adjusted annually relative to the gross domestic product index and other factors. The agency cautions, “Because tolls are fixed, if throughput decreases Enbridge faces additional financial risks compared to the previous cost of service tolling method.”<sup>254</sup>

In this context, the tunnel pipeline investment raises serious questions. The project is required to be built with a design life of 99 years.<sup>255</sup> The tunnel pipeline would stay in place no matter how much the demand for its products declines. The Wisconsin re-route project poses a similar dilemma. Given the trends indicated for oil demand in Canada, the United States and globally, by the time both of these projects are completed, the decline in oil demand could be substantial.

In contrast, the alternative scenarios rely on existing pipeline infrastructure, potentially enhanced by compression, buttressed by tanker loading/storage reactivation and possibly rail infrastructure. The alternatives are much more flexible and adaptable to energy transition forces.

## C. Market Demand for Line 5’s Deliveries of Propane, Butane and Other NGLs Can Reasonably Be Expected To Decline

The MPSC estimates that over 8% of Michigan’s population relies on propane for heating, but in certain counties of the Upper Peninsula and northern Lower Peninsula, the percentage of household reliance is much higher, edging above 50%.<sup>256</sup> According to the MPSC, about 326,681 Michigan households use bottled, tanked, or liquified propane as their primary heating source, and Line 5 provides 87.6% of the propane used in Michigan’s Upper Peninsula and 42.9% of the propane used in Michigan’s Lower Peninsula.<sup>257</sup>

Although this level of dependency represents a near-term need for propane supply that a non-tunnel-pipeline alternative must address, it also represents a health and safety concern that should not be ignored. A 2023 study of home stoves found that propane burners set on high and ovens set at 350°F emitted detectable levels of benzene, a cancer-causing chemical, and in some homes raised indoor benzene concentrations above well-established health benchmarks.<sup>258</sup>

Of particular concern, the study also found that benzene produced by propane stoves migrated throughout homes, in some cases elevating bedroom benzene concentrations above chronic health benchmarks for hours after the stove was turned off. The researchers, who also found similar results

<sup>254</sup> Canada Energy Regulator. [Pipeline Profiles](#). Section updated April 1, 2024.

<sup>255</sup> [Enbridge application to MPSC](#), p. 9.

<sup>256</sup> MPSC. [2023-24 Winter Energy Appraisal](#). November 8, 2023, p. 3.

<sup>257</sup> [Testimony of MPSC witness Alex Morese](#), 12 TR 1780, cited in MPSC 2023 Order, p. 81.

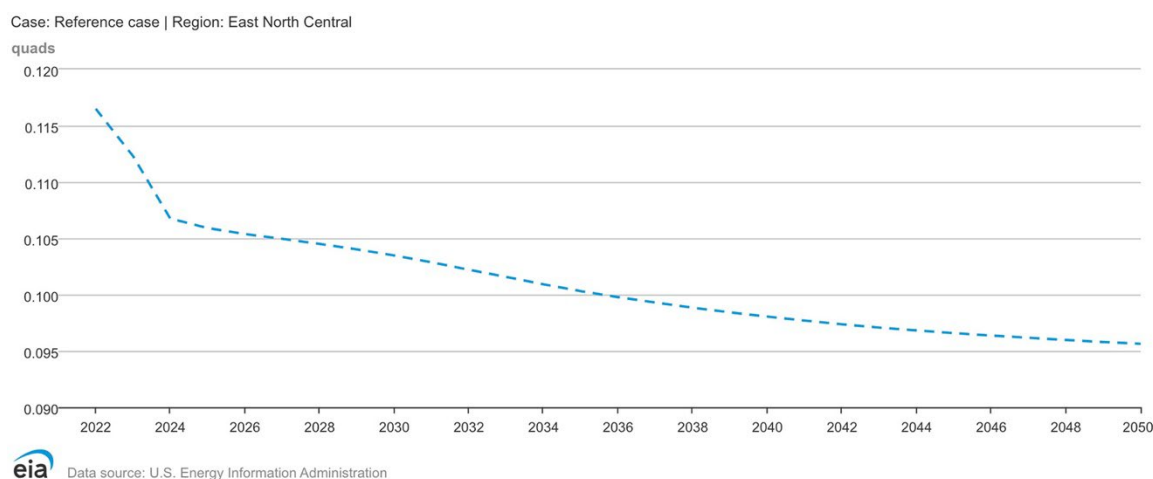
<sup>258</sup> Y.S. Kashtan, *et al.* [Gas and propane combustion from stoves emits benzene and increases indoor air pollution](#). *Environmental Science & Technology* 57(26):9653-9663. June 15, 2023. The journal is published by the American Chemical Society.

for natural gas, concluded that combustion of propane from stoves may be a substantial benzene exposure pathway and can affect indoor air quality.<sup>259</sup>

Facilitating an energy transition in home heating that reduces demand for and reliance on propane could have significant health and safety benefits.

The EIA projects that residential use of propane in the East North Central region of the United States, which includes Michigan and Wisconsin, will plummet.

**Figure 11: EIA Projection of Residential Consumption of Propane<sup>260</sup>**



Source: *Annual Energy Outlook 2023, Table 2. Energy Consumption by Sector and Source, Case: Reference case | Region: East North Central*

In the MPSC proceeding, a witness for the Michigan Propane Gas Association, Michael Sloan, criticized testimony about strategies to reduce propane use in homes through electric heat pumps. He claimed hopes that government assistance would be provided to help cover upfront costs for conversion were speculative.<sup>261</sup> But substantial government assistance for conversion costs is exactly what is happening now.

The federal Department of Energy operates a Home Energy Rebate Program of incentives for home heating and energy efficiency. Both Michigan and Wisconsin were early applicants to receive funds to set up a state program, and both states' programs now have grants available.<sup>262</sup>

<sup>259</sup> *Ibid.*

<sup>260</sup> EIA. [Annual Energy Outlook 2023, Table 2: Energy consumption by sector and source. Energy Use: Residential: Propane, reference case for east north central region.](#) March 16, 2023.

<sup>261</sup> [Testimony of Michael Sloan](#). 12 Tr. 915. January 24, 2022, cited in [MPSC 2023 Order](#), p. 149.

<sup>262</sup> U.S. Department of Energy. [Power your home—and save money—with Home Energy Rebates.](#) Accessed December 12, 2024.

Michigan received \$210 million for the program, with \$105.7 million allocated for the Home Efficiency Rebates and \$105.3 million allocated for the Home Electrification and Appliance Rebates. Both single-family and multifamily households are eligible. Households with incomes at or below 80% of area median income will be eligible for higher percentage rebates, capped at \$8,000. Rebates apply to insulation, space heating/cooling heat pumps and water heater heat pumps, among other initiatives.<sup>263</sup>

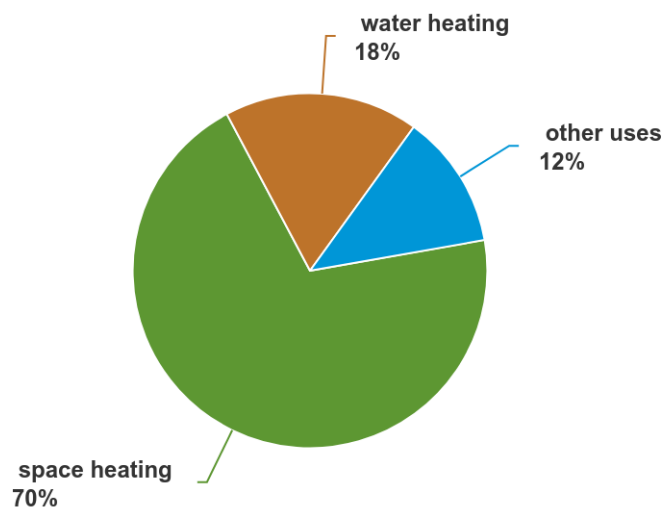
During the MPSC proceeding, MPSC witness Alex Morese testified that a typical cost for converting a home from propane to electric heat pump was more than \$9,000.<sup>264</sup> Under the Michigan EGLE program, the maximum rebate for a heat pump for space heating or cooling is \$8,000 for most households, and higher for households with incomes at or below 80% AMI.<sup>265</sup>

Even smaller-scale changes, such as conversion of a propane-fired water heater, can have a significant impact. A sizeable 18% of propane in homes—nearly one-fifth of a home’s propane consumption—is used just to operate water heaters.<sup>266</sup>

**Figure 12: Water Heating as a Percentage of Residential Use of Propane**<sup>267</sup>

### U.S. residential propane consumption by end use, 2020

Total = 4.28 billion gallons



Source: U.S. Energy Information Administration. 2020 Residential Consumption Survey. Table CE4.1

<sup>263</sup> Michigan EGLE. [Home Energy Rebate Programs](#). Accessed December 12, 2024 (hereafter, [Michigan Home Energy Rebate Programs](#)).

<sup>264</sup> [Testimony of MPSC witness Alex Morese](#), 12 Tr. 1796, cited in [MPSC 2023 Order](#), p. 137.

<sup>265</sup> Michigan EGLE. [Residents and Community Organizations—About the Home Energy Rebate Programs](#). Accessed December 12, 2024.

<sup>266</sup> [EIA Hydrocarbon gas liquids explained](#). Last updated December 26, 2023.

<sup>267</sup> [Ibid.](#)

Michigan's Home Electrification and Appliance rebates offer a maximum rebate of \$1,750 for a heat pump water heater and, again, a higher rebate for households with incomes at or below 80% AMI.<sup>268</sup>

Modern heat pump water heaters have a hybrid function—the system is designed to operate efficiently in temperatures ranging from 35°F to 120°F, then automatically switch from heat pump mode to electric resistance heating when temperatures drop below 35°F.<sup>269</sup>

Technology for cold climate heat pumps (CCHP), such as would be needed in Michigan, has successfully achieved a new milestone. DOE announced on October 23 that all eight manufacturers in its Residential Cold Climate Heat Pump Challenge completed field testing to demonstrate efficiency and performance in cold weather. DOE stated:

*The CCHPs were installed in various configurations and spaces successfully as replacements for old furnaces, thereby indicating their strong retrofit potential in the push towards residential decarbonization. In the field, the CCHPs were observed to be reliable and were able to provide equal or better comfort to the homes compared to the previous furnace systems.*<sup>270</sup>

Utilities in Alaska, Maine, Michigan and Wisconsin—which are no strangers to cold weather—among other states, were involved in the project.<sup>271</sup> DOE reported new cold climate heat pumps developed through its project will provide heat with little assistance from auxiliary elements even during the coldest winter months.<sup>272</sup>

Butane, the second most significant NGL transported by Line 5, is primarily used as a gasoline blending component.<sup>273,274</sup> Demand for butane likely will be substantially affected by the trend in reduction of gasoline consumption discussed above.

Although propane and other NGLs can be used in manufacturing petrochemicals, and oil producers have been hoping to expand petrochemical production to make up for shifts in gasoline demand,<sup>275</sup> demand trends for petrochemical products and the cost profile for petrochemical production increasingly weigh against the profitability of this option. IEEFA research has documented the current market for petrochemicals is in decline, as oversupply and slow growth in the industry combine with increased amounts of sustainable substitution products to erode the need for growth in virgin plastics

<sup>268</sup> Michigan EGLE. [Residents and Community Organizations—About the Home Energy Rebate Programs](#). Accessed November 4, 2024.

<sup>269</sup> EPA. Energy Star. [Busting myths about heat pump water heaters](#). Accessed December 12, 2024.

<sup>270</sup> Pacific Northwest National Laboratory, Guidehouse and U.S. Department of Energy. [Rising Up to the Challenge: Cold climate heat pumps in the field](#). October 2024, p. 15.

<sup>271</sup> *Ibid.*, p. 5.

<sup>272</sup> DOE. [DOE efforts send new and improved cold-climate heat pumps to the market](#). October 23, 2024. Also see: S&P Global Commodity Insights. [Cold climate heat pumps head to market after completing DOE challenge](#). October 23, 2024.

<sup>273</sup> [Testimony of MPSC witness Alex Morese](#), 12 TR 1780, also cited in [MPSC 2023 Order](#), p. 81.

<sup>274</sup> The MPSC notes butane also serves, to a much lesser extent, as a fuel source in some commercial and industrial settings. *Ibid.*

<sup>275</sup> See E&E News. [Why the oil industry may thrive without gasoline](#). February 28, 2024.

production.<sup>276</sup> The cost hike for petrochemical plant construction discussed in Part I is significant in this context. In analyzing a proposed petrochemical project proposed for Louisiana, Standard and Poor's not only deemed the project ill-advised but expanded its concern to address all petrochemical companies planning new facilities. The same Standard and Poor's opinion contained a rarely-used formulation that pursuit of Formosa's Louisiana-based petrochemical mega complex would most likely lead to a downgrade, and the company would be better positioned using capex to finance energy transition-related investments in electronics.<sup>277</sup>

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<sup>276</sup> IEEFA. [Why a production cap on plastics makes financial sense](#). Briefing Note, September 2024. The report discusses the cap as a method to manage the declining demand for primary plastic polymers that is occurring.

<sup>277</sup> See S&P Global. [Ratings on Formosa Plastics Corp. and three associated companies affirmed at 'BBB+' on low debt leverage; outlook stable](#). October 7, 2021. Also see: S&P Global. [Formosa Plastics Companies Outlook Revised To Negative From Stable On Weak Profitability; 'BBB+' Ratings Affirmed](#). October 30, 2023.



## Conclusion

Enbridge Energy L.P. should reconsider its current business strategy of pouring billions of dollars into redesigning troubled segments of the Line 5 oil/NGL pipeline. An expeditious but well-planned approach for closing Line 5 would not only relieve Enbridge of debt burdens and significant litigation battles related to the projects, but also would allow the company to chart a more flexible energy transition course.

Both the United States and Canada, as well as the administrative agencies involved in the tunnel pipeline project, should also consider the substantial advantages of a non-Line-5 solution. Considering the no-Line-5 alternative makes sense given the risks and policy implications of building the tunnel pipeline.

## About IEEFA

The Institute for Energy Economics and Financial Analysis (IEEFA) examines issues related to energy markets, trends and policies. The Institute's mission is to accelerate the transition to a diverse, sustainable and profitable energy economy. [www.ieefa.org](http://www.ieefa.org)

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### Tom Sanzillo

Tom Sanzillo, director of financial analysis for IEEFA, is the author of numerous studies on the oil, gas, petrochemical and coal sectors in the U.S. and internationally, including company and credit analyses, facility development, oil and gas reserves, stock and commodity market analysis and public and private financial structures. Sanzillo has experience in public policy and has testified as an expert witness, taught energy industry finance and is quoted frequently in the media. He has 17 years of experience with the City and the State of New York in senior financial and policy management positions. As the first deputy comptroller for the State of New York Sanzillo oversaw the finances of 1,300 units of local government, the annual management of 44,000 government contracts, and over \$200 billion in state and local municipal bond programs as well as a \$156 billion global pension fund.

**David Schlissel**

David Schlissel, director of resource planning analysis for IEEFA, has been a regulatory attorney and a consultant on electric utility rate and resource planning issues since 1974. He has testified as an expert witness before regulatory commissions in more than 35 states and before the U.S. Federal Energy Regulatory Commission and Nuclear Regulatory Commission. He also has testified as an expert witness in state and federal court proceedings concerning electric utilities. His clients have included state regulatory commissions in Arkansas, Kansas, Arizona, New Mexico and California. He has also consulted for publicly owned utilities, state governments and attorneys general, state consumer advocates, city governments, and national and local environmental organizations.

Schlissel has undergraduate and graduate engineering degrees from the Massachusetts Institute of Technology and Stanford University. He has a Juris Doctor degree from Stanford University School of Law.