ADAPTING TO THE DIGITAL TRANSFORMATION

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Society is undergoing a digital transformation as artificial intelligence (AI) and other technologies are developed to optimize decision-making and operational performance. This trend is particularly prevalent in the energy industry. The legal considerations of AI in the context of contract law, tort law, and regulatory law present unique challenges for lawyers attempting to advise on appropriate risk-management strategies. The current state of the law, and the different jurisdictional approaches to AI, demonstrate that how these legal challenges are addressed may have significant impacts on the risks and rewards realizable through AI. The rapid evolution of AI and its complex nature may hinder the effectiveness of societal institutions charged with legislating, regulating, and applying the law to AI-related matters.

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I. INTRODUCTION

Society is undergoing a digital transformation as artificial intelligence (AI) and other technologies are developed to optimize decision-making and operational performance. Digital transformation has been described as "the use of technology to radically improve performance or reach of enterprises,"[1] or the "radical rethinking of how an organization uses

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1 George Westerman, Didier Bonnet & Andrew McAfee, "The Nine Elements of Digital Transformation," online: *MIT Sloan Management Review* <sloanreview.mit.edu/article/the-nine-elements-of-digital-transformation/>.

technology, people and processes to fundamentally change business performance."[2] Fundamentally, digital transformation implies integrating new tools and technologies which rely on digital data into all areas of a business, thereby changing the way the business functions. Microsoft CEO, Satya Nadella, has described the process of digital transformation as four pillars that focus on the long-term benefits of digital technologies: empowering employees, engaging customers, optimizing operations, and transforming product or business.[3]

Although there are a variety of tools and technologies[4] that can be applied to advance digital transformation, this article will focus on artificial intelligence, including machine learning, and will highlight some contract, tort, and regulatory law issues for legal counsel in the energy industry to consider when advising on appropriate risk management strategies.

As a naturally data-driven industry, the energy sector stands to be revolutionized by AI. Data analytics and autonomous machines, vessels, and vehicles are but a few of the ways that the power of AI can be leveraged for improved corporate performance and efficiencies. Other applications include predicting equipment performance and maintenance requirements, modelling impacts of various strategies and actions, and making recommendations based on real-time data and events. While the use of AI technology brings great promise, it also introduces unknowns to the legal landscape.

II. AI AS PART OF THE DIGITAL TRANSFORMATION

Competitive advantage, through digitization or otherwise, has three dimensions: "by producing more at lower unit cost (scale), by achieving a greater production variety (scope), and by pushing for improvement and innovation (learning)."[5] AI technologies can help achieve scale, scope, and learning results in the energy industry, with operational efficiencies most likely achieved through impacts on scale and learning.

The practical importance of digital transformation, and the need to leverage AI and other technologies in operations, is certainly appreciated in industries. A recent survey of board members and senior executives found that technology risk was their primary concern in 2019. This risk factor surged to the top spot, up from being listed in tenth place in the same survey a year prior.[6] However, transformation poses significant challenges. Large energy companies with long histories, extensive operations, legacy infrastructure, and workplace dynamics that might be resistant to change may find it particularly difficult to adapt at the

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2 Clint Boulton, "What is Digital Transformation? A Necessary Disruption," online: *Chief Information Officer* <www.cio.com/article/3211428/what-is-digital-transformation-a-necessary-disruption.html>.

3 Alex Sessoms, "Making Sense of Digital Transformation," *Harvard Business Review* (26 March 2020), online: <laptrinhx.com/making-sense-of-digital-transformation-2607428649/>.

4 For example, 3D printing technologies and blockchain represent digitization of previously manual tasks based on non-digital data and information.

5 Marco Iansiti & Greg Richards, "Coronavirus is Widening the Corporate Digital Divide," online: *Harvard Business Review* <hbr.org/2020/03/coronavirus-is-widening-the-corporate-digital-divide>.

6 Protiviti & NC State University's Enterprise Risk Management Initiative, "Executive Perspectives on Top Risks 2019" at 24–25, online: <www.protiviti.com/sites/default/files/united_states/insights/nc-state-protiviti-survey-top-risks-2019.pdf> [Protiviti 2019].

pace required.[7] Resistance to change may also be a significant risk factor in the energy industry specifically, "considering that a large percentage of these organizations continue to depend on dated … legacy systems, processes and practices."[8] Even where the transition to, and use of, digital technologies is embraced by an organization, the successful adoption of digital technologies likely requires new talent or significant efforts to upskill or reskill existing talent.[9]

Many corporations are only at the beginning of their journey toward digital transformation. Researchers have created a digital transformation (DT) maturity model that scores corporations based on their use, attitude towards, and acceptance of the newest technologies. The DT maturity model has five stages of maturity: (1) promote and support; (2) create and build; (3) commit to transform; (4) user-centred and elaborated processes; and (5) data-driven enterprises.[10] Despite the various benefits of embracing DT, the creators of the maturity model suspect that only 1 percent of corporations are in the fifth and most mature stage, while the majority of corporations are between the second and third stage.[11] While this model and the results are not industry-specific, it seems reasonable to assume that these results would translate approximately to the energy industry.

The current global COVID-19 pandemic has put in sharp focus the need for corporations to embrace digital transformation. A March 2020 article from *Harvard Business Review* states that we are "seeing the most rapid organizational transformation in the history of the modern firm" as employees work from home, schools shift to online delivery, and restaurants transition to online ordering.[12] The necessity of DT within the energy sector is particularly acute in light of the depressed market prices currently facing the sector, and the prospect of another round of cost-cutting and downsizing. Operational flexibility and efficiency seem more urgent now than ever, making DT not just a tool to optimize performance, but instead, one that must be harnessed simply to ensure survival.

A. WHAT IS AI?

Technologies such as AI, 3D printing, and the Internet of Things are being heralded as the "fourth industrial revolution" because these technologies continue to rapidly merge with humans' physical lives. These changes are altering how individuals, companies, and governments operate, ultimately leading to a societal transformation similar to previous industrial revolutions.[13]

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7 Protiviti & NC State University's Enterprise Risk Management Initiative, "Executive Perspectives on Top Risks 2020" at 80–82, online: <protiviti.com/sites/default/files/nc-state-protiviti-surrvey-top-risks-2020.pdf>.

8 *Ibid* at 81.

9 Protiviti 2019, *supra* note 6 at 25.

10 Sabine Berghaus & Andrea Back, "Stages in Digital Business Transformation: Results of an Empirical Maturity Study" (Paper delivered at Mediterranean Conference on Information Systems, 2016) at 6–9, online (pdf): *Association for Information Systems* <aisel.aisnet.org/cgi/viewcontent.cgi?article=1022&context=mcis2016>.

11 *Ibid* at 10.

12 Iansiti & Richards, *supra* note 5.

13 Klaus Schwab, *The Fourth Industrial Revolution* (New York, NY: Crown Publishing Group, 2016).

Once thought to be a concept of science fiction, AI has become a relatively common technology with countless applications. However, AI is not a term of art and has no universally accepted definition.[14] Professor John McCarthy of Stanford University, who is sometimes considered to be the father of AI, coined the term in 1956. He explained AI as follows:

> It is the science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable.[15]

The English House of Lords preferred the following definition:

> Technologies with the abilities to perform tasks that would otherwise require human intelligence, such as visual perception, speech recognition, and language translation.[16]

However defined, the basis of any system that might qualify as AI is a series of complex algorithms (sequences of instructions to convert an input into an output) that allow large amounts of data to be processed, and the drawing of correlations, conclusions, and predictions from the same.[17] The ultimate goal when developing AI is to create a computer program that can solve problems and perform cognitive tasks as well as, or better than, humans. However, a machine may still have AI even if it falls short of this lofty goal.[18]

There is academic debate about the appropriate threshold or test for AI. In 1950, the famous mathematician Alan Turing outlined the "Turing Test" to determine whether a machine is intelligent.[19] The Turing Test involves three participants, a human, a machine, and an interrogator. The interrogator, who is isolated from the human and the machine, is allowed to ask both parties questions over text. Based on their responses, the interrogator must guess which participant is the machine. If the machine can fool the interrogator, then it is considered intelligent. However, McCarthy considers the Turing Test to be one-sided. A machine that passes the test is definitely intelligent, but a machine can still be intelligent without being able to imitate humans.[20] Therefore, in McCarthy's opinion, the threshold for AI is lower than the requirements of the Turing Test.

AI is fundamentally a prediction technology, in that it allows for predictions to be made and, in many instances, automatically acted upon. The economic shift that is anticipated to

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14 Paulius Čerka, Jurgita Grigienė & Gintarė Sirbikytė, "Liability for Damages Caused by Artificial Intelligence" (2015) 31 Computer L & Security Rev 376 at 378.

15 John McCarthy, "What is Artificial Intelligence?" at 2, online: *Stanford University* <jmc.stanford.edu/articles/whatisai/whatisai.pdf>.

16 UK, House of Lords, Select Committee on Artificial Intelligence, *AI in the UK: Ready, Willing and Able?* (HL Paper 100) (16 April 2018) at 14, citing UK, Department for Business, Energy, and Industrial Strategy, *Industrial Strategy: Building a Britain for the Future* (Industrial Strategy White Paper) (London, UK: Department for Business, Energy, and Industrial Strategy) at 37.

17 Marta Infantino & Weiwei Wang, "Algorithmic Torts: A Prospective Comparative Overview" (2019) 28:2 Transnat'l L & Contemp Probs 309 at 312–13, 316.

18 McCarthy, *supra* note 15 at 4.

19 AM Turing, "Computing Machinery and Intelligence" (1950) 59:236 Mind: A Quarterly Review of Psychology & Philosophy 433 at 433–34, online (pdf): <academic.oup.com/mind/article/LIX/236/433/986238>.

20 McCarthy, *supra* note 15 at 4.

come with the proliferation of AI "will center around a drop in the cost of prediction."[21] As the cost of prediction falls, not only will activities that were historically prediction-oriented become cheaper — like inventory management and demand forecasting — but prediction will also be used to solve new problems.[22]

In the energy industry, machine learning and data science will be the prominently utilized techniques and technologies of AI. Machine learning is a subset of AI. The fundamental characteristic of machine learning is that it allows computer programs to modify their responses as they accumulate more data.[23] The program "learns" from its prior actions as well as the data it has accumulated independent of the designer, programmer, or user.

Data science is not properly considered a subset of AI, but instead, is a field of study that uses AI to "extract information and insights from data, using neural networks to link related pieces of data together and form more comprehensive pictures from existing information."[24] "Data analytics" is a term often used to describe the process and its use in predictive forecasting. While most organizations are "drenched in data," the organizations that succeed are those that most quickly use data to adapt to the insights provided in that data.[25] One illustration of data analytics in oil and gas operations is the examination of the voluminous and complex data used for oil and gas exploration and production, which makes that data more accessible, and "allows companies to discover new exploration opportunities or make more use out of existing infrastructures."[26]

III. APPLICATIONS IN THE ENERGY INDUSTRY

AI and the energy sector are becoming increasingly interconnected. It is anticipated that AI will "revolutionize the way we produce, transmit, and consume energy," and can also be leveraged to limit the industry's environmental impact.[27] Outlined below are just some of the many applications of AI that are already being implemented in the energy industry.

A. FAILURE PREDICTION AND PREVENTION

Using artificial intelligence to monitor equipment in order to predict and detect failure, as well as to detect and schedule maintenance as required and at maximum efficiency, is a common and effective AI application. Human intervention requires constant inspection of equipment, whereas the application of AI can instantaneously process and utilize round-the-

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21 Ajay Agrawal, Joshua Gans & Avi Goldfarb, "The Simple Economics of Machine Intelligence," *Harvard Business Review* (17 November 2016), online: <hbr.org/2016/11/the-simple-economics-of-machine-intelligence>.

22 *Ibid*.

23 Mariette Awad & Rahul Khanna, *Efficient Learning Machines: Theories, Concepts, and Applications for Engineers and System Designers* (New York: Apress Media, 2015) at 1.

24 Celeste Roberts, "How AI is Keeping Critical Infrastructure Safe During COVID-19," online: <submar.com/how-ai-is-keeping-critical-infrastructure-safe-during-covid-19/>.

25 Jonathan Cornelissen, "The Democratization of Data Science," *Harvard Business Review* (27 July 2018), online: <hbr.org/2018/07/the-democratization-of-data-science>.

26 Umar Ali, "Exploring the Impact of Artificial Intelligence on Offshore Oil and Gas," online: <www.offshore-technology.com/features/application-of-artificial-intelligence-in-oil-and-gas-industry>.

27 Franklin Wolfe, "How Artificial Intelligence Will Revolutionize the Energy Industry," *Harvard University: Science in the News* (28 August 2017), online:<sitn.hms.harvard.edu/flash/2017/artificial-intelligence-will-revolutionize-energy-industry/>.

clock sensor data. AI has nearly endless applications in this respect. For example, in a plant environment, on major pieces of operating equipment (shovels, trucks, wells), and on transmission lines to predict system overloads and warn operators of potential transformer breakdowns.[28] When used properly, predictive maintenance technologies can greatly improve safety, while also reducing downtime and maintenance costs.

For example, ExxonMobil uses predictive maintenance to evaluate upstream, midstream, and downstream assets through the use of sensors that capture data on equipment condition. This data is then analyzed to ensure optimal performance and detect potential failures. ExxonMobil has partnered with Microsoft to take advantage of its Azure cloud computing platform and data analytics tools that collect real-time data from the corporation's oil field assets, with the intent of preventing incidents through advanced detection and repair.[29]

B. DIGITAL TWIN TECHNOLOGY

Digital twin technology is being increasingly adopted across industries, including the energy sector. "A digital twin is a digital representation of a physical asset, process, or system," including "the engineering information that allows us to understand and model" the performance of that asset.[30] Digital twins are advancing beyond building information modeling to enabling organizations to converge their engineering, operational, and information technologies for immersive visualization and analytics visibility.[31] This can allow an organization to monitor key performance indicators in finite detail, thereby optimizing the operation and maintenance of physical assets, systems, and processes. In addition to monitoring existing conditions, digital twin technology also has the ability to simulate operating parameters which can impact decision-making processes.[32] This feature can be especially useful for predictive maintenance to extend the life of an ageing asset.[33]

BP, for example, has created "a highly-sophisticated simulation and surveillance system called APEX," which creates virtual models of all BP production systems.[34] APEX permits engineers to use real-time data to optimize the performance of assets, including offshore assets, by assessing the impact of their operational decisions with the digital twin.[35] Shell Chemical has also used digital twin technology to evaluate the construction of a large project in the United States. Twice weekly, Shell used drones to capture 3D images for reality modeling of the plant as it was being constructed. This permitted the construction team and other stakeholders to use the digital twin to monitor progress and identify any issues.[36]

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28 Janica San Juan, "How Artificial Intelligence is Powering the Energy Industry," online: <www.cognillo.com/blog/artificial-intelligence-powering-energy-industry/>.

29 XTO Energy Taps Into IoT and the Cloud to Optimize Operations and Drive Growth with Azure and Dynamics 365," online: <customers.microsoft.com/en-us/story/exxonmobil-mining-oil-gas-azure>.

30 Anne-Marie Walters, "How Digital Twins Will Drive Innovation in the Energy Sector" at 2, online (pdf): <www.bentley.com/en/perspectives-and-viewpoints/topics/viewpoint/2019/ps-digital-twins-energy-sector>.

31 Jonah Baker, "Digital Twins are Propelling the Oil and Gas Industry into the Future of Asset Optimisation," online: <www.nsenergybusiness.com/features/digital-twins-oil-gas/>.

32 *Ibid*.

33 Andrew Young, "Life Extension through Predictive Maintenance," online: <www.hartenergy.com/exclusives/life-extension-through-predictive-maintenance-179799>.

34 Baker, *supra* note 31.

35 *Ibid*.

36 Aditya Chaturvedi, "Digital Twin, AI to Drive Innovation in Energy Sector," online: <www.geospatialworld.net/blogs/digital-twin-ai-to-drive-innovation-in-energy-sector/>.

C. CONNECTING THE LONE WORKER

AI also offers many solutions to connect a lone worker to a support team in another location. There are now devices that can be worn by a lone worker to permit a support team in another location to see exactly what the lone worker is seeing and doing, and speak to the worker to provide specific instructions in real time. The technology acts as worker support (for example, information access in the field to drawings), and reduces travel time and costs for the entire support team. It also increases the ability of low skilled workers to perform skilled tasks because they have the real time support of subject matter experts in another location.

The application of next-generation Industrial Internet of Things (referred to as IIOT) technology, such as cloud-based, mobile, or wireless monitoring solutions, can also relay essential information about a worker's location, biometric data about the worker (including fatigue monitoring), and the presence of dangerous gases back to a support team.[37] In addition to improving productivity, this technology significantly enhances safety in the field.

D. AUTOMATION AND ROBOTICS

The deployment of autonomous robots and vehicles, including autonomous heavy haul vehicles, to perform work is another significant opportunity for the energy industry. Autonomous robots are able to carry out inspections on equipment or infrastructure, analyze data, and make logical decisions. An obvious benefit of this approach is the ability to remove workers from potentially dangerous tasks and use robotics technology instead. Minimizing the geographical remoteness of workers and the costs associated therewith is another opportunity presented by this type of AI application.

An example of the use of this aspect of AI in the energy sphere is the widely reported use of self-driving haul trucks by major oil sands operators, including Canadian Natural, Suncor Energy, and Imperial Oil.[38] The case for deployment of an autonomous haulage system is that it enables efficiencies, while also improving safety and reducing collisions. The depressed conditions currently facing the energy market have actually caused Suncor to accelerate the rollout of autonomous trucks as it will further reduce costs.[39]

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37 Ken Schmidt & Brent Moore, "No Worker Left Behind: Protecting Lone Workers in the Oil and Gas Industry," *EHS Today* (12 June 2017), online: <www.ehstoday.com/safety/article/21919068/no-worker-left-behind-protecting-lone-workers-in-the-oil-and-gas-industry>.

38 Vincent McDermott, "Imperial Plans Deployment of Seven Automated Trucks by Year's End, CNRL to Start Pilot in 2019," *Fort McMurray Today* (31 July 2018), online: <www.fortmcmurraytoday.com/news/local-news/imperial-plans-deployment-of-seven-automated-trucks-by-years-end-cnrl-to-start-pilot-in-2019>.

39 Paul Moore, "Suncor Speeds Up Komatsu 980E Fleet Automation at Fort Hills to Reduce Costs," online: *International Mining* <im-mining.com/2020/06/02/suncor-speeds-komatsu-980e-fleet-automation-fort-hills-reduce-costs/>.

IV. LEGAL CONSIDERATIONS

A. CONTRACT LAW CONSIDERATIONS

A number of distinct considerations arise when drafting contracts for the purchase and sale of AI technologies and products incorporating AI. Such contracts seek to transfer property rights and allocate related risks. In the AI context, two of the more critical and difficult issues to be considered will be defining the scope of rights being acquired, and what terms as to performance risks might be implied in the sale or licence of the AI technologies or products incorporating AI.

Due to the nature of AI systems, determining the precise rights of the acquirers/users of such technology has some unique challenges and implications. For example, in purchasing an autonomous vehicle or other machine incorporating AI, the buyer may expect to purchase rights amounting to total ownership. However, the AI system incorporated in order to give the vehicle its autonomous nature may be subject to a variety of intellectual property rights that are not conveyed, and may not always be apparent to the energy company as the end-user. Similarly, ownership of the work product and the data gathered by the AI program in operation may not be clear.

Where not incorporated into a physical product like an autonomous vehicle, AI technology is generally software-based and acquired in a licensing structure. The nature of a licence to an AI technology implies that any interests in that technology are revocable and non-exclusive unless otherwise specified. This may create complications. The nature of AI is that it learns and adapts to new information that it acquires in the course of functioning or that is provided to it by the user. For example, many machine learning and data science AI programs require substantial investments from the energy company to obtain, organize, and input data to "teach" the AI program to function properly. In these instances, the energy company may wish to acquire more secure rights than a mere licence in order to maintain the value of its "teaching" investment and the competitive advantage it represents. Further, in a licensing model, energy companies must carefully consider terms and conditions as they relate to the property rights of data inputted into the software. It is generally advisable to restrict the vendor's ability to use the energy company's proprietary data to ensure that such data remains confidential and that competitors do not benefit from it. Data privacy is also an important consideration with statutory obligations imposed on the party gathering such data.[40] Therefore, the terms and conditions relating to the term of the licence, the vendor's ability to revoke the licence, and the property rights in the user's data, and in the "taught" AI model are of particular importance, should be drafted to protect the energy company's interests.

Finally, the sale of AI technology rights may be subject to risk allocation terms and conditions beyond the express terms and conditions in the contract for sale. Through common law and provincial legislation,[41] a number of implied terms may also be imported.

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[40] See e.g. *Personal Information Protection and Electronic Documents Act*, SC 2000, c 5; *Personal Information Protection Act*, SA 2003, c P-6.5.

[41] See *Sale of Goods Act*, RSA 2000, c S-2 [*SGA*]; *Sale of Goods Act*, RSBC 1996, c 410; *Sale of Goods Act*, CCSM, c S10; *Sale of Goods Act*, RSO 1990, c S.1; *Sale of Goods Act*, RSS 1978, c S-1.

Most notably, in Alberta, the sale of goods is subject to the *Sale of Goods Act*.[42] The *SGA* applies to the selling of "goods," which is defined as:

> (i) [A]ll chattels personal other than things in action or money, and
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> (ii) emblements, industrial growing crops and things attached to or forming part of the land that are agreed to be severed before sale or under the contract of sale.[43]

If the AI product is considered a "good," the *SGA* and similar statutes in other jurisdictions imply fundamental warranties that the product is of "merchantable quality" and of "reasonable fitness" for its intended purpose. In many cases, the purpose of the good is understood and apparent due to its very nature.[44] Where the nature of the good is complicated, the intended purpose can be more nuanced and may require clear expression.

> When the buyer expressly or by implication makes known to the seller the particular purpose for which the goods are required so as to show that the buyer relies on the seller's skill or judgment and the goods are of a description that it is in the course of the seller's business to supply, whether the seller is the manufacturer or not, there is an implied condition that the goods are reasonably fit for that purpose.[45]

Three aspects of the *SGA* are critical to note. First, if the AI is not a "good," the statutory warranty for purpose does not apply, and the subject of fitness or purpose and associated risks should be addressed expressly.[46] Second, there is strict liability in contract for breach of the *SGA* implied warranties.[47] There is no "due diligence" or other defence.[48] Third, the application of the *SGA* warranties is limited to the parties to the sale contract itself.[49] These warranties and associated liabilities do not resonate "up the supply chain." Therefore, if AI software is purchased from a distributor, the *SGA* warranties (if applicable) provide no remedy against the manufacturer/designer or any other party that may be at fault where the product is of unacceptable quality or is not fit for its intended use. The buyer must turn to tort law if any remedy is to be obtained against a manufacturer or designer of the technology in that scenario, or if recovery is otherwise sought against any other party beyond the privity of a contractual relationship.

The precise boundaries of the *SGA* warranties have been explored in countless cases and commentaries.[50] The subtleties of their application and precise application to different circumstances are beyond the scope of this article. However, as a threshold issue, it is unclear whether sales of AI systems will fall within the definition of sales of "goods" and thus be subject to the *SGA*. The underlying rationale for the strict liability imposed under sale of goods legislation across Canada does not apply to goods that are not manufactured in the

42 *SGA*, *ibid*.
43 *Ibid*, s 1(h).
44 For example, the purpose of lawn mowers is to mow lawns.
45 *SGA*, *supra* note 41, s 16(2).
46 *Ibid*.
47 *Ibid*, s 52(2).
48 *ter Neuzen v Korn*, [1995] 3 SCR 674 at para 93 [*ter Neuzen*].
49 *SGA*, *supra* note 41, s 52(1).
50 See e.g. *ibid*; *Gunner Industries Ltd v HyPower Systems Inc* (1994), 127 Sask R 194 (QB); see also Lawrence Theall et al, *Product Liability: Canadian Law and Practice*, (Toronto: Carswell, 2001).

ordinary sense of creating a physical item.[51] Some AI products would seem to satisfy this rationale while others may not. For example, the sale of a 3D printer or an autonomous vehicle incorporating AI technology is almost certainly a "good" under the *SGA* definition, but it is much less clear whether a cloud-based AI program is also a "good." The relevant jurisprudence indicates that an AI program's status as a "good" may depend on context.[52]

The issue of how the *SGA* concept of a "good" applies to software-based programs has been judicially considered in the United Kingdom. Those cases established a distinction between software sold on a physical disk or other physical media, as opposed to software that is downloaded via the internet. The former is captured under sale of goods legislation, while the latter is not. In *Computer Associates*,[53] this distinction was affirmed, despite some recognition that this may be contrary to what would seem to be a common sense inference as to the legislator's intent.[54] The Court stated that "it is [not] open to this court to impute what many might think was a common-sense meaning of 'goods' to the legislators."[55] The result has led to calls for statutory reform to expand the application of sale of goods legislation in the UK to include downloadable, non-physical products.[56]

Though the distinction drawn in *Computer Associates* between programs delivered on physical media versus those only delivered electronically has not been directly considered in Canada, it may be time for Canadian provinces to consider some pre-emptive updating of sale of goods legislation to account for the increasing volume of products (including AI systems and licences) sold without any physical item changing hands.[57] It is difficult to imagine a reasoned rationale for the *SGA* application to AI programs to depend on the mode by which that product is delivered. The mode of delivery would seem to have little or no significance for the consumer. Expectations as to quality and appropriateness should be the same regardless of whether the program is delivered electronically or on a disk, data stick, or other physical media.

Where it is not clear that an AI system or product is a "good," energy companies contracting to acquire and use these technologies should carefully consider the degree to which quality and fitness-related warranties must be expressly included in the relevant contract. The *SGA* expressly states that subject to its specific provisions, "there is no implied warranty or condition as to the quality or fitness for any particular purpose of goods supplied under a contract of sale."[58] Therefore, the principle of *caveat emptor*, or buyer beware, will largely govern the sale of merchandise that is not captured by the *SGA*'s definition of "goods." Given the uncertainty surrounding the applicability of that *SGA* definition to many

51 *ter Neuzen*, *ibid* at para 94.
52 *Computer Associates UK Ltd v The Software Incubator Ltd*, [2018] EWCA Civ 518 at paras 19, 68 [*Computer Associates*]; *Accentuate Ltd v Asigra Inc,* [2009] EWHC 2655 (QB) at paras at 55–56; *Your Response Ltd v Datateam Business Media Ltd*, [2014] EWCA Civ 281 at paras 18–20.
53 *Computer Associates*, *ibid* at para 19.
54 *Ibid* at para 52.
55 *Ibid* at para 55.
56 Althaf Marsoof, "Digital Content and the Definition Dilemma Under the Sale of Goods Act 1979: Will the Consumer Rights Bill 2013 Remedy the Malady?" (2014) 9:4 J Intl Commercial L & Technology 285 at 288.
57 *Computer Associates*, *supra* note 52.
58 *SGA*, *supra* note 41, s 16(1).

AI products, it is advisable that energy companies seek to expressly incorporate into the sale or licence agreements all warranties that they seek to rely on.

B. TORT LAW CONSIDERATIONS

Beyond contractual relationships, tort law will be called upon to respond when AI functions in a program or product result in injury or loss. Tort law in Canada is common law and fault-based with very few exceptions. It has developed incrementally over centuries, evolving continually to accommodate technological advances in society. Fundamental among the varied purposes of tort law are compensation, deterrence, and education.[59]

These and other purposes of tort law are served by a largely fault-based system of liability that allows the cause of the loss to be identified, and for liability to be imposed on the party or parties responsible for that cause. Members of the public are encouraged to exercise care to prevent harm to others, and to take care to avoid harm to themselves. Injured parties are compensated to the extent that the injuries are not of their own making. The complexity of AI technology, as well as the way AI systems are developed and operated, will provide fresh challenges to this fault-based paradigm of tort liability.

The tort of negligence is the most common, and often the only avenue of recovery available for technology-related injuries. John Kingston, a senior lecturer in cyber security at Nottingham Trent University, has considered the applicability of the negligence law model to an AI program.[60] In doing so, Kingston applies the framework that is generally referred to as the "ABC rule."[61] Under the ABC rule, the plaintiff is required to establish three elements:

1. a duty of care is owed to the plaintiff;

2. there has been a breach of that duty; and

3. damage has resulted from that breach.[62]

A duty of care is defined by foreseeability of harm, relational proximity, and lack of any policy reason to exclude application of such a duty.[63] The concepts of reasonable foreseeability and relational proximity have generally been sufficiently malleable to ensure that a duty of care is imposed on product manufacturers for harm caused by the use (and often even the misuse) of their products.[64] The same should be true of AI products. Kingston agrees that there is little debate that a software manufacturer or designer owes a prima facie

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59 Allen Linden & Bruce Feldthusen, *Canadian Tort Law*, 10th ed (Markham: LexisNexis Canada, 2015) at paras 1.8-50.

60 Lewis N Klar et al, *Remedies in Tort* (Toronto: Thomson Reuters, 2020) at vol 2, 16,II.1.

61 *Ibid*.

62 JKC Kingston, "Artificial Intelligence and Legal Liability" (Paper delivered at the 36th SGAI International Conference on Innovative Techniques and Applications of Artificial Intelligence, in Cambridge in December 2016) in Max Bramer & Miltos Petridis, eds, *Research and Development in Intelligent Systems XXXIII*, (Cambridge, UK: Springer, 2016) at 272.

63 *Cooper v Hobart*, 2001 SCC 79 at para 30.

64 *Lambert v Lastoplex Chemicals Co*, [1972] SCR 569 at 574–75; see also *Donoghue v Stevenson*, [1932] UKHL 100; Linden & Feldthusen, *supra* note 59 at paras 16.6, 16.13-16.

duty of care to the public, and this duty of care will almost always be breached if the AI program is faulty or unsafe.[65] The strictness of tort law, when applied against product manufacturers, is perhaps illustrated by the ubiquity of sometimes obvious warnings on product labels noting the potential damages relating to normal use of the product, as well as various foreseeable misuses.

Similarly, a prima facie duty of care will generally be imposed on distributors, vendors, and users of AI systems and products that incorporate AI where such use has the potential to cause injury to third parties or property. As with manufacturers, it should be considered reasonably foreseeable that any person whose interests are directly affected by the operation of an AI system may be harmed by it.[66]

The limits of the duty of care imposed on developers, manufacturers, vendors, and users of AI systems in Canada will be defined by established policy related guidelines. The most important of these for present purposes involves the reluctance in tort law to allow recovery of "pure" economic loss,[67] including the cost of repair or replacement of a defective product.[68] The law in this area has been evolving rapidly since the middle of the 20th century to broaden recovery rights, and recovery for pure economic loss has been the subject of considerable scrutiny before the Supreme Court of Canada.[69] Five categories of pure economic loss have been recognized as exceptions to the general rule against recovery:

1. Negligent misrepresentation — recovery requires a reasonable reliance on a representation of a third party, in which the representation is untrue, with losses resulting. In the AI context, representations made about the capabilities or performance of an AI system to or by an energy company could result in recovery for pure economic loss on this basis.

2. Negligent performance of a service — closely related to negligent misrepresentation except that the culpable action is the performance of a service relied upon by the plaintiff, rather than the provision of advice or information.[70] Recovery for such an economic loss outside of a contractual relationship requires that the defendant undertake to perform the service for the benefit of the plaintiff and the negligent performance of the same, resulting in loss. An AI system used to screen job applicants might attract liability to a rejected job

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65 Kingston, *supra* note 62 at 273.

66 Linden & Feldthusen, *supra* note 59 at paras 16.13-16.

67 Pure economic loss is a financial loss that is not causally connected to physical injury to the plaintiff's own person or property: Lewis N Klar et al, *Remedies in Tort* (Toronto: Thomson Reuters, 2020) at vol 2, 16.IV.1(b).

68 Meaning financial loss unconnected to physical damage to the plaintiff's own person or property. Financial losses causally connect to physical damage to the plaintiff's own person or property are generally referred to as "consequential" economic loss.

69 See *D'Amato v Badger*, [1996] 2 SCR 1071; *Bow Valley Husky (Bermuda) Ltd v Saint John Shipbuilding Ltd*, [1997] 3 SCR 1210 [*Bow Valley Husky*]; *Canadian National Railway v Norsk Pacific Steamship Co*, [1992] 1 SCR 1021; *Winnipeg Condominium Corp No 36 v Bird Construction Co*, [1995] 1 SCR 85 [*Bird Construction*]; *Design Services Ltd v Canada*, 2008 SCC 22; Linden & Feldthusen, *supra* note 59 at para 12.3.

70 Linden & Feldthusen, *ibid* at para 12.74.

seeker if it wrongfully discriminates due to race, religion, and so on.[71] Similarly, if an independent certifying agency is relied upon to ensure safety and product performance, a failure to do so could lead to recovery of pure economic loss under this theory.

3. Repair or replacement of defective products — this type of pure economic loss recovery is generally only permitted when the defective product in question is dangerous to persons or other property.[72] For example, if a licenced AI system is defective in that it does not perform its intended function, but such defect causes no danger to other aspects of the licensee's operations or property, recovery will be prohibited.[73] Conversely, if the defect involves a safety function, recovery may be allowed. For example, in *Hughes v. Sunbeam Corp. (Canada) Ltd.*, defective smoke alarms which posed no danger to persons or properties themselves were considered dangerous so as to allow for pure economic loss recovery.[74] An analogy to AI failure prediction and prevention applications seems apt in this respect.

4. Relational economic loss[75] — the Supreme Court of Canada has settled on a general exclusionary rule against recovery for such losses, subject to three narrow recognized exceptions:

(a) Where the claimant has a possessory or proprietary interest in the damaged property.
(b) General average cases.[76]
(c) Where the relationship between claimant and property owner constitutes a joint venture.[77]

5. Independent operational liability of statutory public authorities — where a public authority undertakes or assumes an obligation to inspect or certify, recovery may be made for the cost of repair or replacement where such tasks are negligently performed.[78] These situations are recognized as unique to public duties and could be relevant in the AI context

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71 Simon Johnson et al, "Liability for AI: Considering the Risks," online: *Corrs Chambers Westgarth* <corrs.com.au/insights/liability-for-ai-considering-the-risks>. See also Greg Meckbach, "The Downside Risk of Machine Learning," online: <www.canadianunderwriter.ca/technology/the-downside-risk-of-machine-learning-1004161697/>.

72 *Bird Construction*, *supra* note 69 at para 12.

73 *Ibid* at para 12; *Sentinel Self-Storage Corp v Dyregrove*, 2003 MBCA 136 at para 64. The Supreme Court of Canada recently affirmed this rule in *1688782 Ontario Inc v Maple Leaf Foods Inc*, 2020 SCC 35 at paras 41–56.

74 [2002] OJ No 3457 (CA), leave to appeal to SCC refused, 29440 (22 May 2003). Defective smoke alarms were in issue. The Court of Appeal refused to strike the action on the basis that, while the defect themselves posed no danger to person or property, reliance on the defective product might well result in serious damage to persons or property.

75 Relational economic loss refers to economic loss suffered by a plaintiff as a result of personal injuries or property damage caused to a third party. The plaintiff suffers pure economic loss by virtue of a relationship, usually contractual, with the injured third party or the damaged property. Common law courts have traditionally regarded many types of relational economic loss as not recoverable because economic interests have been seen as less worthy of protection than bodily security and property; see Klar et al, *supra* note 67 at vol 2, 16.IV.1(b).

76 "General average" is a maritime law concept "where in the event of emergency, if cargo is jettisoned or expenses incurred, the loss is shared proportionately by all parties with a financial interest in the voyage" (*Duhaime's Law Dictionary*, (Victoria, British Columbia) sub verbo "general average," online: <duhaime.org/LegalDictionary/G.aspx>).

77 *Bow Valley Husky*, *supra* note 69 at para 46; see also Russell Brown, *Pure Economic Loss and Canadian Negligence Law*, 5th ed (Markham: Lexis Nexis Canada, 2011) at 90.

78 *Kamloops v Nielsen*, [1984] 2 SCR 2 at 56; *Just v British Columbia*, [1989] 2 SCR 1228 at 1244–45.

where regulatory requirements of government approval, inspection, or certification of AI systems are imposed.[79]

As many of the risks involved with AI functions in the energy industry are purely economic in nature (for example, operational efficiency related risks involved with AI-driven failure prediction and prevention systems and digital twin technology), these principles limiting pure economic loss recovery in tort may prove to be of considerable importance in determining the ultimate significance of tort law in regulating AI development and use in the decades to come.

Significant barriers to demonstrating a breach of a duty of care are present in the context of AI-related losses as well. The first significant barrier is the traditional tort law burden of proof on a "but for" basis. The diffuse mode of AI development, the often complex nature of AI, and the ability of AI systems to "learn" and to adapt performance will make it extremely difficult (and expensive) for a plaintiff to prove what went wrong and why an AI system caused loss. If the mechanism of harm and the party responsible cannot be identified after the fact, the operation of tort law will be stymied and its societal role undermined.

An understanding of the nature of the technology and its operation is likely needed to determine why an accident occurred. This may be very difficult or even impossible to discern in the context of AI. Injury or loss sustained as a result of actions taken by an AI system might be due to a flaw or feature of an underlying algorithm, or in how the various algorithms underlying the system interact with one another.[80] The cause could instead be flawed or unrepresentative inputs provided to or gathered by the AI system, a failure by the operator to ensure data is up to date, or a defect in some part of a larger product that incorporates the AI system. Similarly, accidents might occur where an algorithmic AI product is used in an environment where it cannot gather appropriate and necessary data for correct and reliable decision-making. The operator may be unaware of the characteristics and possible drawbacks of an AI system in these circumstances. An example might be an autonomous vehicle being unable to read and react to improperly maintained road surfaces or unique external conditions.[81]

Where an accident occurs because the nature and quality of data provided to or gathered by the AI system is erroneous or non-representative, an additional challenge may arise in assigning fault under tort law. That is because the data on which an AI system makes decisions or predictions may not be controllable by the designer, manufacturer, or operator. It may be derived from data inputted deliberately by the operator, or from data gathered independently by the system through operation or a connection of the system to other sophisticated systems. Given the huge volume of data that can be processed by an AI system, identifying erroneous data and its source may be difficult.[82] The autonomous nature of data gathering by such a system may also render application of the tort law concept of fault for the erroneous or non-representative data difficult to justify. At the very least, the tort law

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79 Linden & Feldthusen, *supra* note 59 at para 17.41.
80 See Infantino & Wang, *supra* note 17 at 319.
81 *Ibid* at 321.
82 *Ibid* at 319.

concept of fault will be extremely difficult to apply where an AI system obtains data from a variety of open sources, independent of the operator (end user).

Similar practical challenges will be faced when seeking to prove the third element of a successful tort case, causation of damage. The complexity of AI systems may make it extremely difficult or even impossible to prove on a balance of probabilities that one potential causative factor resulted in the AI system's actions under the standard "but for" test on legal causation in tort. This is particularly true when the AI system is incorporated as part of a larger product or service. That is, it may be possible to isolate flaws in underlying algorithms, incomplete, erroneous, or non-representative data, or other flaws, but tracing back whether one or more of these flaws in fact caused the AI system actions may not be possible.[83]

In this respect, established tort law principles for causation may provide a solution, at least in some cases. As noted by the Supreme Court of Canada in *Snell v. Farrell*, causation should be approached as a "practical question of fact which can best be answered by ordinary common sense rather than abstract metaphysical theory."[84] This approach to the evidentiary burden in negligence encourages causation to be inferred even without evidence of the specific mechanism of injury where the circumstances suggest a causative relationship and any potential evidence to the contrary is in the hands of the defendant. On this basis, causation has been inferred in numerous cases where the precise reason for the accident or mechanism of injury was not, or could not be, proven on the evidence available to the plaintiff. There is some similarity to the now jettisoned doctrine of res ipsa loquitur,[85] which allowed negligence to be found without direct proof where the happening of the event itself, as a matter of human experience and common sense, made negligence probable. However, this "common sense causation" still requires the identification of a negligent act and identification of a negligent party. As noted, these requirements may present acute challenges where AI-related injuries are concerned.

When causation on the "but for" standard cannot be demonstrated by utilizing the types of common sense inferences referenced by the Supreme Court of Canada in *Snell*, an alternative doctrine allows legal causation to be found if only a "material contribution" to the loss can be shown. Where negligence by a particular party can be shown, but the complexities of AI make proof of probable causation practically impossible for a plaintiff, Canadian courts may allow recovery if the negligence of the defendant is shown to have created an unreasonable risk of injury of the type occurring.[86] However, the Supreme Court has urged caution in applying this relaxed test for causation, indicating that recourse to it will be "necessarily rare," and only employed where fairness demands it and the facts justify such a departure from normal tort law principles.[87] Though precise boundaries of this "material contribution" doctrine are not well defined, the Supreme Court has indicated that it may only

83 Michael L Rich, "Machine Learning, Automated Suspicion Algorithms, and the Fourth Amendment" (2016) 164 U Pa L Rev 871 at 886.

84 [1990] 2 SCR 311 at 328 [*Snell*], citing *Alphacell Ltd v Woodward*, [1972] 2 All ER 475 at 490 (HL).

85 Res ipsa loquitur was translated by the Supreme Court of Canada as "the thing speaks for itself" in *Fontaine v British Columbia (Official Administrator)*, [1998] 1 SCR 424 at para 17.

86 *Clements v Clements*, 2012 SCC 32 at para 34 [*Clements*]; *Resurfice Corp v Hanke*, 2007 SCC 7 at paras 24–25 [*Hanke*].

87 *Clements*, *ibid* at paras 13–16.

apply where all possible "material contributions" to loss involve negligence, and not where the injury may have occurred without negligence.[88]

Given the comments of the Supreme Court of Canada concerning the application of this "material contribution" test, it should be difficult for those suffering AI-based injury or loss to utilize that doctrine where obstacles to proof on a "but for" basis are significant. However, the lack of clarity and the precise boundaries of the application of this doctrine may provide an avenue for tort law to evolve to address some of the challenges presented by the proliferation of AI in public and private life. Analogies could be drawn between the many facets of AI development and functioning to the multiple employer mesothelioma cases, where the mechanism of causation was clear but the specific source of the causative agent was impossible to determine, tobacco liability cases with a similar dynamic, and the various other cases where relaxed approaches to causation first considered in *McGhee v. National Coal Board*,[89] have been applied.

Determining the mechanism of an AI-related loss will also often require a high degree of specialized technical knowledge, which judges and civil juries typically do not possess. Extensive and very complex expert evidence (possibly from a number of witnesses) could be required to show why the AI system functioned as it did. The potential costs involved in proving the mechanism of an AI-based loss would seem to be considerable, making all but the largest claims economically unfeasible, and effectively confining tort law remedies to the wealthy. Further, decision-makers may be ill-equipped to even understand the evidence required to demonstrate how and why a loss occurred. Perhaps the most daunting barrier to the application of the tort law concept of fault to AI claims is that fact that for some AI-based technologies that incorporate machine learning features, "even the original programmers of the algorithm have little idea exactly how or why the generated model creates accurate predictions."[90]

Once the mechanism of damage is proven, it may still be difficult to determine who is responsible for any AI underperformance or malfunction. AI systems often have intricate origins with many different parties contributing to development outside of any formalized structure of co-operation. There may be no clear records as to how each aspect of the system was developed.[91] The tort law doctrines that allow recovery in certain circumstances where causation on the usual "but for" basis is not capable of being proven on a balance of probabilities due to the circumstances of loss,[92] would not seem to assist in cases where a negligent party cannot be identified.

As a partial solution to these causation challenges, Kingston has suggested that causation as between an AI system and an operator or user may often turn on whether the AI system recommends an action or takes an action.[93] However, this seems to presuppose that reliance

88 *Ibid*; see also Russell Brown, "Cause in Fact and the Supreme Court of Canada: Developments in Tort Law in 2012–2013," (2014) 64 SCLR (2d) 327 at 351.

89 [1972] 3 All ER 1008 (HL).

90 Rich, *supra* note 83 at 886.

91 Infantino & Wang, *supra* note 17 at 318; Rich, *ibid* at 886.

92 *Clements*, *supra* note 86 at para 13; *Hanke, supra* note 86 at para 25; see Linden & Feldthusen, *supra* note 59 at paras 16.90–94.

93 Kingston, *supra* note 62 at 273.

on the AI-fuelled recommendation is negligent if harm results. While that may be true in some cases, it would seem like a failure to take an AI-recommended course of action would be a more likely source of negligence. The entire rationale for using AI is to enhance the quality of decision-making by allowing the process to be informed by more complete data. Assuming negligence and causation where human reliance on AI leads to loss would seem inconsistent with the concept of fault and the reasonable person standard of care. Kingston's suggestion also seems to avoid the fact that allowing the AI system to take action without human approval is itself a human choice and may be entirely reasonable in many circumstances.

The practical challenges to the application of tort law principles to AI-related injuries are significant. Perhaps more daunting is the challenge AI presents to the very concept of fault that underlies much of Canadian tort law and advances its fundamental purposes. Given the nature of AI (and particularly machine learning aspects), an AI system itself may be beyond the effective context of designers, manufacturers, or users. This scenario is not amenable to current concepts of fault and causation in tort law.

While the common law of tort may well meet these various challenges, that process may take decades or even centuries due to the necessarily reactive nature and culture of incrementalism in common law. Canadian legislatures may therefore feel compelled (as, perhaps, they should) to address some of the troubling uncertainties via regulation.

C. REGULATORY CONSIDERATIONS

Energy development, production, and distribution often involve difficult operating environments and hazardous processes. The sector, therefore, tends to be highly regulated, and extensive regulatory approvals are often required for new technologies. As broad societal goals, including those represented in Canadian contract and tort law, are challenged by the complexity and rapid pace of AI innovation, governments will seek to regulate as a means to align AI development and use in the energy sector and elsewhere with those societal goals.

In regulating civil liability, development, and utilization of AI, a balance must be struck between addressing legitimate concerns about AI, such as data protection and privacy, and avoiding policies that protect incumbent firms from innovative or technology-driven competition, frequently called "regulatory capture."[94] This balance will require sufficient flexibility to be extended to start-up firms to develop new products that do not fit into the existing regulatory framework. This facilitates the creation of disruptive new applications of AI that boosts productivity and output. Balanced against this is the need for rules that ensure AI technology conforms to the economic and public safety goals of regulation. This process is similar in theme to the debate in much of the world about the "correct" amount of regulation of mature internet firms.

The regulatory process is by nature deliberative, and a certain amount of time is required to develop and pass legislation or adopt rules to govern commercial conduct. The rapid pace

94 Wulf A Kaal & Erik PM Vermeulen, "How to Regulate Disruptive Innovation — From Facts to Data" (2017) 57:2 Jurimetrics 169 at 182.

of AI innovation and the complexity of AI technology may outpace the ability of governments and regulators to respond to AI-related issues, resulting in a gap between what is technically possible and what is permitted.[95] This is unfortunate, as transformative technologies, like AI, have the potential to significantly boost productivity and thereby benefit society as a whole. An additional risk is that when innovation outruns the ability of regulators to consider its potential impacts, AI technology may be used with impunity to undermine societal goals and even to accommodate the violation of rights and the commission of criminal acts.[96] Obviously these outcomes should be avoided as well through regulations that seek to strike an optimal balance to accommodate productivity and growth, while minimizing the risk of negative consequences.

The importance of the necessary balancing process required in regulation is magnified in the energy sector where many actors operate in numerous countries with regulatory regimes. Even within Canada, provincial regulatory regimes can differ significantly, and provinces may not have the resources or political will to consider and accommodate AI-based applications at the same pace or with the same level of understanding. Against this backdrop, the Canadian energy sector seeks to rapidly innovate as it faces the current challenges of a low-price environment and increasing publicly-imposed costs such as taxation of greenhouse gas emissions. The sector seeks a consistent and principled regulatory approach to allow optimal leveraging of AI-based technology to maintain and enhance profitability.

1. ENVIRONMENT OF CHANGE

Academic literature generally accepts that regulation has not kept pace with technological change in the field of AI.[97] Industry commentators have noted that Canada lags behind many jurisdictions in the development of AI regulation, notably the United States and the European Union. This has led to suggestions that Canada's cautious approach will force it to eventually align its regulations with those crafted by other jurisdictions as industries adopt these foreign regulations as best practices.[98] The opportunity to influence the global regulation of AI toward Canadian priorities may be lost.

The regulation of AI in Canada (as elsewhere) is further hampered by the lack of any agreed upon formal definition of what constitutes AI.[99] Perhaps as a result, current regulatory oversight of AI is piecemeal and minimal. A broad consideration of what AI regulatory oversight is appropriate will raise a number of questions for policy-makers, including: what are the goals of AI regulation, both generally and in the energy sector? What is the priority among those goals? What are the permitted limits of AI applications? What data is

95 *Ibid* at 1275. See also Daniel Malan, "The Law Can't Keep Up with New Tech. Here's How to Close the Gap," online: *World Economic Forum* <www.weforum.org/agenda/2018/06/law-too-slow-for-new-tech-how-keep-up/>.

96 Emilie Schwarz, "Human vs. Machine: A Framework of Responsibilities and Duties of Transnational Corporations for Respecting Human Rights in the Use of Artificial Intelligence" (2019) 58:1 Colum J Transnat'l L 232 at 276–77.

97 Matthew U Scherer, "Regulating Artificial Intelligence Systems: Risks, Challenges, Competencies, and Strategies" (2016) 29:2 Harv JL & Tech 353 at 355–56.

98 Christopher Alam, "When it Comes to AI Regulation, Canada Can Do Better," *Canadian Lawyer* (27 June 2019), online: <www.canadian lawyermag.com/inhouse/news/opinion/when-it-comes-to-ai-regulation-canada-can-do-better/276197>.

99 Scherer, *supra* note 97 at 359.

acceptable to feed into an AI learning algorithm? The answers to these questions will be reflected in the regulatory approaches and models chosen. Some approaches to addressing these questions are considered below.

2. DIVERGENT APPROACHES

Early attempts to regulate AI in different jurisdictions have yielded divergent approaches. The US has favoured a reactive "light-touch" regulatory approach, believing that the development of AI is a strategic imperative and that over-regulating AI while it is still in relative infancy would risk stifling innovation.[100] In effect, innovation is presumptively prioritized over the risks of negative outcomes from the use of AI under this approach. This mirrors the American approach to regulation of the internet, where a policy of regulatory forbearance was established in order to foster a fledgling industry.[101] Some point to the success of this approach in arguing for a similar "light-touch" approach to AI regulation. However, there are concerns in other jurisdictions that, if AI is lightly regulated, there will be an erosion of public trust in AI due to public safety risks, commercial risks, and potential breaches of employment and human rights.[102] Realization of these risks would undermine the very industry that a "light-touch" approach seeks to foster.[103]

There have already been incidents where an error made by AI has resulted in a severe clampdown on the use of that technology. Most famously, in March 2018, a self-driving car was being tested on the roads of Arizona when it struck and killed a cyclist as a result of an error made by the AI piloting the car.[104] Within a week of the accident, the governor of Arizona banned the car's owner from all testing of autonomous cars in the state, and other autonomous vehicle firms voluntarily removed their cars from roads across the US as a pre-emptive measure.[105] Incidents such as these illustrate the harsh response that can be expected if citizens and their governments believe that the development and use of AI-based technology is not subjected to proper vetting and oversight.

In contrast with the American "light-touch" approach, the EU has been more interventionist in acting to protect the digital rights of citizens through regulations such as the *General Data Protection Regulation* (GDPR).[106] These attempts at pre-emptive codification may be reflective of the civil law, as opposed to the common law, tradition in some of the leading EU jurisdictions.[107] The EU approach seems to give greater prominence

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100 Brandon W Jackson, "Artificial Intelligence and the Fog of Innovation: A Deep-Dive on Governance and the Liability of Autonomous Systems" (2019) 35:4 Santa Clara Comp & High Tech LJ 35 at 42–44.

101 "Eroding Exceptionalism – Internet Firms' Legal Immunity is Under Threat," *The Economist* (11 February 2017), online: <www.economist.com/business/2017/02/11/internet-firms-legal-immunity-is-under-threat>.

102 Matjaž Perc, Mahmut Ozer & Janja Hojnik, "Social and Juristic Challenges of Artificial Intelligence" (2019) 5:1 Palgrave Communications 1 at 2.

103 Jackson, *supra* note 100 at 63.

104 Phil McCausland, "Self-Driving Uber Car that Hit and Killed Woman Did Not Recognize That Pedestrians Jaywalk," *NBC News* (9 November 2018), online: <www.nbcnews.com/tech/tech-news/self-driving-uber-car-hit-killed-woman-did-not-recognize-n1079281>.

105 Faiz Siddiqui, "Tech Firms, Government Officials Put the Brakes on Testing Self-Driving Vehicles After Fatal Uber Crash," *The Washington Post* (27 March 2018), online:<www.washingtonpost.com/ news/dr-gridlock/wp/2018/03/27/arizona-governor-suspends-testing-of-ubers-self-driving-cars-i-was-very-disturbed-by-video-of-fatal-crash/>.

106 Jackson, *supra* note 100 at 44.

107 France, Germany, Italy, and Spain.

to values of public safety and protection against the fostering of an innovation-friendly environment. In a recent white paper, the EU discussed the creation of AI regulations that would be similarly broad in scope to the data protection laws brought in through the GDPR.[108] Other EU publications discuss the need for citizens to trust AI, and that to achieve this trust AI must "respect ethical standards reflecting our values" and the decisions made by AI "must be understandable and human-centric."[109] These proposals and comments have generated fear that restrictions on the use of data already imposed by the EU's tight rules coupled with a similar approach to AI will stifle EU-based AI innovation, sapping the competitiveness of the Eurozone economy.[110]

This type of concern has a reasonable basis. The minimal amount of physical infrastructure required and high degree of portability of AI development will allow AI developers to quickly respond to regulatory changes and jurisdictional differences in order to gain an advantage. In other words, sufficiently intrusive regulation will likely result in a prompt movement of Al development work to other, less onerously regulated, jurisdictions to the extent that is possible.[111] Such "jurisdiction shopping" has the potential to create the proverbial "race to the bottom" as firms can move development of AI systems to jurisdictions with the most favourable regulations. Similarly, where the permitted use of AI technology in one jurisdiction may be unacceptable or require significant compliance and reporting obligations in another, disincentives to developing and deploying AI in that other jurisdiction will be strengthened. Consistency with other jurisdictions, particularly where commercial trade ties with the other jurisdiction are extensive, is therefore a vital regulatory consideration.

Canada seems to be leaning towards an American rather than a European approach to AI regulation, with "light-touch" oversight of the industry.[112] This likely reflects Canada's close commercial ties to the United States and the apparently strong interest of the Canadian federal government to develop Canada's AI industry. This interest was noted in the federal government's May 2019 announcement that it would create the Advisory Council on Artificial Intelligence (ACIA). The Council is to provide recommendations on how AI can create more jobs in Canada, support entrepreneurs, and improve Canada's global position in AI research and development.[113] Its mandate seems to suggest that presumptive priority will be given to AI development, innovation, and application, proactively addressing potential negative impacts. However, many groups, including the Office of the Privacy Commissioner of Canada, are pushing for stronger oversight of the industry, with some commentators suggesting an increasing appetite in Canada for greater regulation of AI and its

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108 "The Brussels Effect, cont – The EU Wants to Set the Rules for the World of Technology" *The Economist* (20 February 2020), online: <www.economist.com/business/2020/02/20/the-eu-wants-to-set-the-rules-for-the-world-of-technology>.

109 "Artificial Intelligence – Shaping Europe's Digital Future," online: <ec.europa.eu/digital-single-market/en/artificial-intelligence>.

110 Jackson, *supra* note 100 at 44.

111 Scherer, *supra* note 97 at 372.

112 Chris Reynolds, "Canada Lacks Laws to Tackle Problems Posed by Artificial Intelligence: Experts," *Global News* (19 May 2019), online: <globalnews.ca/news/5293400/canada-ai-laws/>.

113 Jaclin Cassios, "Canada Announces Advisory Council on Artificial Intelligence," online: <www.dentonsdata.com/canada-announces-advisory-council-on-artificial-intelligence/>.

applications.[114] The ultimate recommendations of the ACIA[115] should prove influential in determining the balance to be struck between innovation and public protection in Canada.

3. MODELS OF REGULATION

Where active regulation of an industry is considered necessary, legislatures can either choose to conduct the regulatory oversight directly (in the form of passing laws and regulations) or to delegate rule making authority to appointed agencies with more general mandates and structures as directed by the legislature. Academic literature is generally supportive of the latter approach, particularly where the subject is one in which innovation is both rapid and critically important for economic survival. The legislative process tends to be purely reactive, slow, and often subject to the political interests of the legislators with little expertise in the subject area.[116] Agencies can more readily utilize subject matter expertise, react quickly to emergent threats and opportunities, and be proactive when required.[117]

Many have suggested that the optimal model involves the creation of an agency to oversee AI regulation, set standards for AI development and use, and perhaps offer certification of AI systems that meet its standards as a prerequisite to implementation.[118] In Canada, this might involve the creation of an agency that is to AI what the Alberta Energy Regulator is to the Alberta oil and gas industry: a "single-window" agency, staffed by experts, to oversee all aspects of AI within the country. The risk of regulatory gridlock (a complaint often made within the energy sector as well as in communications and other sectors) would need to be carefully considered in designing the mandate, jurisdiction, and processes of such an agency, particularly given the stated federal priorities of creating jobs, "supporting entrepreneurs, and improving Canada's global position in [AI] research and development."[119]

Rather than active governmental oversight, a detailed report by the English House of Lords has suggested instead a self-regulatory model based on the development of an "AI Code." Such a code would be developed by government and would outline ethical standards for the development and deployment of AI across sectors. An appropriate organization would be assigned to oversee the adherence of participants. The code would be founded in the overarching principles for the development of AI technology, including such lofty goals as requiring that AI be developed for the common good and for the benefit of humanity.[120] The report considered that such a code would help reassure the public that AI is beneficial, which in turn would create an environment where AI innovation can flourish, rather than be villainized and hampered by a mistrustful public. Where it becomes necessary, the code would function as a building block for future active regulation around the design of AI systems.[121]

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114 Lyndsay A Wasser, "How Should AI be Regulated in Canada? Speak Now, or Forever Hold Your Peace!" online: <www.mcmillan.ca/How-Should-AI-be-Regulated-in-Canada-Speak-now-or-forever-hold-your-peace>.
115 At this time, there is no set date for the release of the ACIA's recommendations.
116 Jackson, *supra* note 100 at 51.
117 Kaal & Vermeulen, *supra* note 94 at 173–74.
118 Jackson, *supra* note 100 at 40; see also Scherer, *supra* note 97 at 395.
119 Cassios, *supra* note 113.
120 House of Lords, *supra* note 16 at para 417.
121 *Ibid* at para 420.

4. POTENTIAL ACCOUNTABILITY MECHANISMS

An effective regulatory model should also ensure that firms that develop and use AI are accountable for the products they design, produce, sell, and operate. One suggested means of delivering that accountability is a certification/licensing regime. Uncertified AI would attract strict liability (either strict liability of the user, vendor, or developer), providing an incentive for firms to licence their AI and for users to buy certified AI products.[122] AI that is certified would enjoy limited tort liability, fostering AI development by providing protection to users, vendors, and developers.[123] Other suggestions to ensure accountability include imposing on manufacturers a "reasonable computer" standard of care for AI conduct,[124] and treating AI systems as employees of their owner for purposes of vicarious liability.[125] All of these are potential regulatory means of removing some of the barriers to accountability under existing tort law principles. The House of Lords has called for the establishment of clear principles of accountability and intelligibility in this area as soon as possible.[126]

V. CONCLUSION

The proliferation of AI technology presents tremendous opportunity for the energy industry to increase efficiency in operations and quality in decision making. However, it also presents many challenges to the Canadian legal system. These challenges should be appreciated and understood by energy firms and policy makers when considering AI-related strategies, as well as when using or otherwise relying on AI systems. How these challenges are addressed may have significant impacts on the risks and rewards realizable through AI.

AI systems present a variety of practical issues in the contract, tort, and regulatory areas. The complexity of AI systems and the nature of the risks involved with AI will test the capacities and ingenuity of those drafting contracts involving AI purchase and usage. Further, the rapid evolution of AI technologies, their often diffuse development practices, and their complex nature may hinder the effectiveness of societal institutions charged with legislating, regulating, and applying the law to AI-related matters. These institutions may not be sufficiently nimble and resourced to effectively respond to AI-related issues from positions of optimal knowledge and expertise. The relatively slow moving (as compared to the pace of technological development in AI) processes of decision-making, policy development, legislating, and regulating within these institutions risks allowing injustice at the individual commercial level in making contract and tort claims regarding AI extremely difficult to prosecute. It also risks divergence between the use of AI and the interests and values that society purports to hold as fundamental, such as economic efficiency, public safety, access to justice, fairness, and equality.

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[122] Scherer, *supra* note 97 at 394.
[123] *Ibid*.
[124] Ryan Abbott, "The Reasonable Computer: Disrupting the Paradigm of Tort Liability" (2018) 86:1 Geo Wash L Rev 1 at 5–6.
[125] Jason Chung & Amanda Zink, "Hey Watson – Can I Sue You for Malpractice? Examining the Liability of Artificial Intelligence in Medicine" (2018) 11:2 Asia Pacific J Health L & Ethics 51 at 68.
[126] House of Lords, *supra* note 16 at para 318.

In order to adapt to AI related claims and to provide a means by which they can be "fairly and justly resolved in or by a court process in a timely and cost-effective way,"[127] the common law will be pressed to consider the applicability of established approaches to proof and economic loss recovery. Certain established doctrines may provide an opportunity for the common law to adapt to AI incrementally, but those opportunities seem relatively narrow.

The challenges presented by AI go beyond the practical and include some fundamental concepts of common law. Most notably, the nature of AI may render inapplicable the underlying concept of fault on which negligence law is based. Once operating, an AI system may be beyond the effective control of any human agent, and function in such a way as to cause injury, financial loss, breaches of human rights, or injury to privacy-related interests. Such incidents might occur even where designers, manufacturers, and users of such AI systems took all reasonable precautions to ensure such consequences would not materialize. This type of scenario (arguably already presented by the 2018 Arizona cycling fatality caused by a self-driving car)[128] presents conflict among some of the fundamental values underlying tort law. Uncertainty as to accountability for the actions of AI systems risks negative impacts on AI development and implementation, as well as to public safety and access to justice.

Regulatory responses in this realm seem to have more immediate promise than the incremental development of the common law — at least in terms of providing some level of civil accountability in a manner consistent with established law. For example, it may be relatively simple to amend sale of goods legislation to apply to AI systems or to provide for vicarious liability on the owner of an AI system (as with an employer/employee) where such system fails to function properly and loss or injury results. Broader regulation of AI development and use involves a more complicated balancing of interests and will need to be approached with great care given the long-term impacts of the underlying policy choices required.

127 Using the terminology of the "Foundational Rules" (Rule 1.2 specifically) of the *Alberta Rules of Court* to describe the purpose of such rules: Alta Reg 124/2010, Rule 1.2(1).

128 Siddiqui, *supra* note 105.

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