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**1AC — Innovation**

**Advantage 1 is Innovation —**

**Standards-Setting Organizations** [SSO’s] **are industry members who jointly establish standards for information tech defined by the adoption of standard-essential patents** [SEP’s]**, which are licensed to companies who wish to implement the tech in their product, called implementers, on Fair, Reasonable, and Non-Discriminatory** [FRAND] **terms. Current standards promote price gouging, FRAND enforcement is critical.**

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I. Standard Setting and the Competitive Process

The **fundamental economics** in the **information technology** sector, driven by **network effects**, implies that there is **enormous value** associated with establishing compatibility standards. Popular standards include the mobile broadband standards used in cell phones, which are established by the 3rd Generation Partnership Project (3GPP), and the Wi-Fi technology for wireless local area networks, which is enabled by the 802.11 standard established by the Institute of Electrical and Electronics Engineers (IEEE).4

There are many SSOs, and their rules and procedures differ considerably. In addition to IEEE, leading SSOs include the International Organization for Standardization (ISO), the International Telecommunication Union (ITU), the European Telecommunications Standards Institute (ETSI), the Internet Engineering Task Force (IETF), and the World Wide Web Consortium (W3C).5 SSOs generally establish standards by holding a series of committee meetings among industry participants. These meetings culminate in a vote on a technical specification that describes what features or attributes a product must have in order to comply with the standard. Most SSOs are open to all industry participants and seek to operate on a consensus basis, applying certain voting rules. SSOs do not normally engage in patent licensing, nor do they specify how patent royalties will be divided up among patent holders. They leave that to their members, which in some cases form patent pools to address these issues.6

SSOs adopt specific policies relating to intellectual property rights (IPRs).7 These IPR policies are generally intended to enable the SEP holders to obtain reasonable royalties for licensing their patents, while prohibiting them from charging excessive royalties after other industry participants have committed to the standard. At that point, firms committed to implementing the standard— which we call “implementers”—would find it **very costly** to avoid using the patented technology. For this purpose, most SSOs require SEP owners to license their SEPs on FRAND terms.8

FRAND policies are especially necessary because negotiations between SEP holders and implementers generally **take place only after** the implementers have used and infringed the technologies claimed by the SEPs. Standards involving information and communications technology can involve hundreds or even **thousands of SEPs**, many with **uncertain boundaries** for infringement. In addition, a time lag exists between patent application and patent issuance. For these and other reasons, it is **impractical** for implementers to enter into negotiations for patent licenses with all SEP owners prior to the establishment of a standard and to their implementation of it.9

The fact that patent negotiations generally do not take place until after implementers have used and infringed the technologies has several critical implications. First, at the time of negotiation, implementers are **locked into the standard** and the technologies claimed by the SEPs—that is, the **cost to switch** to an alternative technology or standard at that point—ex post—is **much greater** than it was ex ante, before the patented technology was first included in the standard. Ex post, the patent holder is no longer competing to have its technology included in the standard, nor is it competing to have implementers of the standard use its technology. Instead, because the patent holder owns an asset that is essential to the standard, implementers have no choice but to use the patented technology.

If the standard is commercially successful, implementers are willing to pay a much larger royalty for use of the patented technology than they would have paid ex ante, when the SEP holder faced competition from other technologies. In these circumstances, the SEP holder can be said to have obtained **monopoly power** in the market in which the patented technology is licensed for use in implementing the standard.10

Second, because of lock-in and the implementer’s ongoing infringement, the **potential for litigation looms large** in licensing negotiations. In effect, the parties are negotiating about how to settle an infringement suit, and that negotiation is **heavily influenced** by their predictions as to what the court will do if they cannot agree. This situation is not unique to SEPs; it arises frequently when firms are faced with patent infringement claims for products they have independently developed or technologies they have inadvertently infringed. Patent law addresses such instances by specifying that patent holders are entitled to “**reasonable royalties**,” defined as the royalties that the parties would have negotiated prior to the infringement and thus prior to lock-in.11 Those hypothetical ex ante royalties reflect the market value of the patent license. Notwithstanding the law’s embrace of this principle, however, as a practical matter, patent holders are **generally able to recover more** than the **ex ante value** of the patent when litigation occurs after the implementers are locked in. Further, negotiations in the shadow of litigation after lock-in tend to **result in royalties in excess** of the ex ante or **market value** of the patented technology.12

Third, the shadow of litigation is **particularly problematic** in the communications and technology sector, in which products typically include hundreds or **thousands** of **patented technologies**. A court-ordered injunction involving such products would deprive the implementer of not only the value of the technology covered by the patent-in-suit, but also the value of the **entire product**.13 Implementers that are forced to bear the risk of an injunction are thus **induced to agree to royalties** greater than those that would be **appropriate** if only the value of the patented technology were at stake. Those royalties **systematically provide** SEP holders with **excessive compensation** in comparison with the benchmark of ex ante royalties.

These implications of lock-in and ex post dealings are well-understood: they represent an example of the **general concept** of **lock-in** and **opportunism** developed by Oliver Williamson.14 The Federal Circuit has also recognized the market distortions caused by the inclusion of patented technologies in public standards and the resulting danger of patent holdup involving SEPs.15

For these and other reasons, the SEP holder has ex post monopoly power that, if left unchecked, would enable it to obtain royalties **far in excess** of the royalties that it could earn in a competitive market.16 To address this common problem and limit ex post opportunism by SEP holders, SSOs typically require participants that own SEPs to make certain FRAND commitments. In particular, by requiring a commitment to license on “fair and reasonable” terms, the FRAND requirement aims to prevent, or at least reduce, the **extent of monopoly pricing** by SEP holders. And by requiring a commitment to license on “nondiscriminatory” terms, the FRAND requirement can prevent SEP holders from **extracting monopoly premiums** by selective licensing or, more important, migrating their monopoly power from the FRAND-regulated market to unregulated standard-implementing product markets by licensing to only one or a few implementers or licensing to selected implementers on discriminatorily favorable terms.

**Patent holdup is accentuated by the Ninth Circuit’s recent decision in *FTC v. Qualcomm* that permits ICT firms to engage in innovation-stifling conduct with antitrust impunity.**

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Standards can enhance **competition** and **consumer choice**, but they also **massively inflate** the **value** of **patents** deemed **essential** to the standard, and give their owners the power to **sue companies** that implement the standard for **money damages** or **injunctions** to block them from using their SEPs. When standards cover critical features like wireless connectivity, SEP owners wield a huge amount of **“hold-up” power** because their patents allow them to effectively **block access** to the **standard** altogether. That lets them charge **unduly large tolls** to anyone who wants to implement the standard.

To minimize that risk, standard-setting organizations typically require companies that want their patented technology incorporated into a standard to promise in advance to license their SEPs to others on fair, reasonable, and non-discriminatory (FRAND) terms. But that promise strikes at a **key tension** between antitrust and patent law: patent owners have **no obligation** to let anyone use technology their patent covers, but to get those technologies incorporated into standards, patent owners usually have to promise that they will give **permission** to anyone who wants to implement the standard as long as they pay a reasonable license fee.

Qualcomm is one of the most **important** and **dominant** companies in the **history** of **wireless** communication standards. It is a multinational conglomerate that has owned patents on every major wireless communication standard since its first CDMA patent in 1985, and it **participates** in the **s**tandard-**s**etting **o**rganization**s** that define those standards. Qualcomm is somewhat unique in that it not only **licenses SEPs**, but also **supplies** the **modem chips** used by a wide range of devices. These include chips that **implement** wireless communication **standards**, which lie at the **heart** of every mobile **computing device**.

Although Qualcomm promised to license its SEPs (including patents essential to CDMA, 3G, 4G, and 5G) on FRAND terms, its conduct has to many looked **unfair**, **unreasonable**, and **highly discriminatory**. In particular, Qualcomm has drawn scrutiny for bundling tens of thousands of patents together—including many that are **not** standard-**essential**—and offering portfolio-only licenses no matter what licensees actually **want** or **need**; refusing to sell modem chips to anyone without a SEP license and threatening to **withhold chips** from companies trying to **negotiate** different license terms; **refusing** to license anyone other than original-equipment manufacturers (OEMs); and insisting on **royalties** calculated as a **percentage** of the **sale price** of a handset sold to end users for hundreds of dollars, despite the minimal contribution of any particular patent to the retail value.

In 2017, the U.S. Federal Trade Commission [sued](https://www.ftc.gov/news-events/press-releases/2017/01/ftc-charges-qualcomm-monopolizing-key-semiconductor-device-used) Qualcomm for violating both sections of the Sherman Antitrust Act by engaging in a number of anticompetitive SEP licensing practices. In May 2019, the U.S. District Court for the Northern District of California agreed with the FTC, identifying numerous instances of Qualcomm’s unlawful, anticompetitive conduct in a comprehensive [233-page opinion](https://www.eff.org/document/ftc-v-qualcomm-district-court-opinion). We were pleased to see the FTC take action and the district court credit the overwhelming evidence that Qualcomm’s conduct is corrosive to market-based competition and threatens to cement Qualcomm’s dominance for years to come.

But this month, a panel of judges from the Court of Appeals for the Ninth Circuit unanimously [overturned](https://www.eff.org/document/ninth-circuit-opinion-ftc-v-qualcomm) the district court’s decision, reasoning that Qualcomm’s conduct was “hypercompetitive” but not “anticompetitive,” and therefore not a violation of antitrust law. To reach that result, the Ninth Circuit made the patent grant more powerful and antitrust law weaker than ever.

According to the Ninth Circuit, patent owners don’t have a duty to let anyone use what their patent covers, and therefore Qualcomm had no duty to license its SEPs to anyone. But that framing requires **ignoring** the **promises** Qualcomm made to license its SEPs on **reasonable** and **non-discriminatory** terms—promises that courts in this country and around the world have **consistently** enforced. It also means ignoring antitrust principles like the essential facilities doctrine, which limits the ability of a monopolist with **hold-up power** over an **essential facility** (like a port) to **shut out** rivals. Instead, the Ninth Circuit held rather simplistically that a duty to deal could arise only if the monopolist had provided access, and then reversed its policy.

But even when Qualcomm restricted its licensing policies in critical ways, the Ninth Circuit found reasons to approve those restrictions. For example, Qualcomm stopped licensing its patents to chip manufacturers and started licensing them only to OEMs. This had a major benefit: it let Qualcomm charge a much **higher royalty rate** based on the **high retail price** of the end user devices, like smartphones and tablets, that OEMs make and sell. If Qualcomm had continued to license to chip suppliers, its patents would be “**exhausted**” once the chips were sold to OEMs, extinguishing Qualcomm’s right to assert its patents and control how the chips were used.

Patent exhaustion is a century-old doctrine that protects the rights of consumers to use things they buy without getting the patent owner’s permission again and again. Patent exhaustion is important because it **prevents price-gouging**, but also because it protects **space** for **innovation** by letting people **use things** they buy **freely**, including to build innovations of their own. The doctrine thus helps patent law serve its underlying goal—promoting economic **growth** and **innovation**. In other words, the doctrine of exhaustion is baked into the patent grant; it is not optional. Nevertheless, the Ninth Circuit wholeheartedly approved of Qualcomm’s efforts to avoid **exhaustion**—even when that meant **cutting off** access to **previous licensees** (chip-makers) in ways that let Qualcomm charge **far more** in **licensing fees** than its SEPs **could possibly** have **contributed** to the **retail value** of the **final product**.

It makes **no sense** that Qualcomm could **contract around** a fundamental principle like patent **exhaustion**, but at the same time **did not assume** any **antitrust duty** to deal under these circumstances. Worse, it’s **harmful** for the **economy**, **innovation**, and **consumers**. Unfortunately, the kind of harm that antitrust law recognizes is limited to harm affecting “competition” or the “competitive process.” Antitrust law, at least as the Ninth Circuit interprets it, doesn’t do nearly enough to address the **harm** downstream consumers experience when they pay **inflated** prices for high-tech devices, and miss out on **innovation** that might have developed from fair, reasonable, and non-discriminatory licensing practices.

We hope the FTC sticks to its guns and asks the Ninth Circuit to go en banc and reconsider this decision. Otherwise, antitrust law will become an even **weaker weapon** against **innovation-stifling conduct** in **technology markets.**

**Weakened antitrust enforcement emboldens firms to follow Qualcomm’s lead, which collapses FRAND integrity.**

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While the FRAND process has been highly productive, it is also **fragile**. Firms are tempted to make commitments at the beginning when the incentive to join is large, but **renege** on them **later** when they can profit by doing so. At least in this particular case, private FRAND enforcement **had not worked** very well. Qualcomm had been able to violate FRAND commitments in order to **exclude rivals** and obtain **higher royalties** than FRAND would permit, largely with **impunity**. Other firms will very likely **follow Qualcomm’s lead**. If that happens the **FRAND system** will **fall apart**, doing **irreparable injury** to the modern wireless telecommunications network or, at the very least, **diminishing** the **leadership role** of the United States in preserving effective **network competition**.

While governments can be heavily involved in standard set-ting,9 the implementation of technical standards in information technologies is largely the work of private actors. Government involvement is limited mainly to enforcement of contract, intellectual property, or antitrust law. As private actors, those involved in standard setting or compliance are fully subject to the federal antitrust laws.

This Article addresses one question: when is an SSO participant’s violation of a FRAND commitment an antitrust violation, and if it is, of what kind and what are the implications for remedies? It warns against two extremes. One is thinking that any violation of a FRAND commitment is an antitrust violation as well. In the first instance FRAND obligations are contractual, and most breaches of contract do not violate any antitrust law. The other extreme is thinking that, because a FRAND violation is a breach of contract, it cannot also be an antitrust violation. The question of an antitrust violation does not de-pend on whether the conduct breached a particular agreement but rather on whether it caused competitive harm. This can happen because the conduct restrained trade under section 1 of the Sherman Act, was unreasonably exclusionary under section 2 of the Sherman Act, or amounted to an anticompetitive condition or understanding as defined by section 3 of the Clay-ton Act.10 The end goal is to identify practices that harm com-petition, thereby injuring consumers.

The Ninth Circuit’s Qualcomm decision will make antitrust violations in the context of FRAND licensing much more **difficult to prove**, even in cases where **anticompetitive behavior** and consumer harm **seem clear**.11 Indeed, in this case the court itself acknowledged the harm to consumers but appeared to think that they were not entitled to protection.12 If this decision stands, FRAND obligations will to a **larger extent** have to be settled through private litigation and the federal antitrust enforcement agencies will have a **diminished role**. Anticompetitive behavior by one firm that is **not effectively disciplined** will lead **others** to do the **same thing**.

#### A trusted and credible system for ICT innovation is critical to rapid tech diffusion — absent FRAND, the system will collapse.

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It is easy to take a **pessimistic view** about whether the system will **break**. If the current trend continues, the system is **likely** to break at **some point** for the simple reason that companies will **not trust it** anymore. The series of legal disputes witnessed over the past years – sometimes referred to as the “smartphone patent wars” – has been fodder for a pessimistic reading of “the two tales of SEPs”. While it is common in the business world that disputes over patents and licenses are settled in courts, various SEP disputes have revealed **problematic** aspects of the SEP market that are different from those disputes that follow the normal stream of business and contracts. Often, the SEP disputes are less concerned about the rights and boundaries of patents, and more about **antitrust limits** to market **behavior**: they concern market **abusive practices** and **restrictions** to **competition** as much as they are about intellectual property.

If the SEP system actually **does break** at some point, the consequences would be **felt** throughout the **economy**. SEPs have been a **critical part** of the ICT revolution. SEPs have allowed for the **fast rates** of innovation **diffusion** that the world has witnessed over the **past quarter** of a **century**. All the computer and Internet related products and services that people are now dependent upon for their private and professional lives are **intricate webs** of intellectual property. As many as 250,000 patents can be used to claim ownership of some technical specification or design element in a single smartphone (NYT 2012). A laptop, suggests one calculation, implements more than 250 interoperability standards (Biddle et al. 2010), and the number of SEP holders for 3G and 4G standards grew from 2 in 1994 to 130 in 2013 while the number of SEPs rose from fewer than 150 in 1994 to more than 150,000 in 2013 (Galetovic and Gupta 2016). The standardization-body ETSI has registered more than 150,000 declarations of SEPs from companies, and ETSI is just one of many bodies in the world of ICT standardization. For the 3G standard, the same body has about 24,000 patents that have been declared essential. Now, with the economy yet again on the **threshold** of big technological change, a **trusted** and **credible system** for creators and users of technology to standardize proprietary technology would be a boon for **innovation**, **interoperability** and – ultimately – the **consumers**.

And there are reasons for optimism. Although many of the problems in the SEP regimes need to be addressed, the numbers above indicate that the SEP system is in fact attractive to patent holders and SEP implementers. It is easy to see why: neither holders nor implementers are presented with alternative options that on the face of it would be far more profitable for them. In other words, there simply would not be as many patents declared as essential if both creators and users of technology believed the SEP system worked to their disadvantage or was grossly unfair. While the reality for some companies may be that legal disputes and unpredictability prompt them to find other ways than SEPs to get access to key technologies for their products, it remains the case that most stakeholders have strong economic incentives to maintain a balanced SEP system that is trusted.

First, standard essential patents are an asset for creators of technology because, by becoming **essential** to a standard, their volumes of sales for technologies that users value rise **significantly**. As many holders want to raise more revenues for their SEPs and – ideally – have the freedom to contract with buyers on their terms, they can expand their customer base when they agree to sell patented technology in accordance with a set of rules that are designed to prevent SEP holders exploiting the weakness of a customer that has grown dependent on having access to their technology.

Second, SEPs are hugely **beneficial** also to those that buy the licenses – the implementers or users. Through the SEP system, they can access technologies that are **interoperable** and work with different **products** and **functionalities** – and they can do it under conditions that, if history is a guide, in most cases give them stable and predictable terms of contract. As a consequence, both creators and users can focus on their competitive advantages and profit on the economies of scale and specialization. Downstream firms do not need to develop their own upstream technology and upstream firms do not need to package their technologies in end-customer products in order to make their products valuable.

Third, standard-setting organisations (SSOs) also have a big stake in an SEP system that works well – and, like creators and users of technology, they would stand to lose significantly if the SEP system were to collapse.

Lastly, the biggest beneficiaries are individual consumers – those who buy the end products using FRAND-conditioned SEPs. The advent of SEPs and the rules represented by FRAND have enabled a **development** of fast technology creation and contributed to the **rapid diffusion** in ICT goods and ICT-based services. The SEP system has also allowed for new competition, both between existing technologies and brands, and from new ones that have stepped into the market with the ambition to disrupt it, again to the benefit of the consumer. It is **difficult** to imagine that the ICT and digital **development** would have been as **fast** as it has been if SEPs had not been a **central feature** of the **market**.

The changing fortunes of companies operating in the cellular and smartphone market would not have been possible if there had not been an SEP system that supported competition. Now that the **world economy** is on the **doorstep** of new innovations that are dependent on a great number of input technologies – e.g. the Internet-of-Things, transport connectivity and intelligent vehicles – it is **crucially important** for the consumer that a **balanced** and **functioning** SEP system is maintained and that actors in the system **converge** towards it – which would ultimately **meet** their **economic interests**.

**Emergence of smart cities depends on IoT applications of 5G interoperability standards---absent FRAND, excessive royalties will undermine sustainable development.**

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In December, we [outlined](https://actonline.org/2017/12/18/smart-cities-connecting-your-community-through-technology/%5d) the emergence of **Smart Cities** – cities that harness technological **innovations** like internet of things (**IoT**) devices and data analytics to improve essential infrastructure in growing urban centers. The technological foundation of Smart Cities aims to improve public safety, better allocate resources, and meet the needs of citizens more quickly.

A central element to Smart Cities is the comprehensive network of sensors and devices implemented within buildings, roads, traffic signs, and parking meters that allows them to interact with public, and potentially private-owned, infrastructure. These sensors will “speak” to one another, communicating information about energy usage, traffic density, or other elements of city management that have traditionally either been analyzed separately or not tracked at all. The potential of Smart Cities allows data to flow from previously disconnected branches of the city and be processed in real-time, unlocking previously unknown insights.

The powerful **interoperability** of Smart Cities will rely heavily on **standardized technologies** developed in organizations like the IEEE, which is responsible for standardizing the wi-fi technology we use every day. Standardized technologies often include standard-essential patents (**SEPs**), which, like their name suggests, are patents declared essential to an industry standard by a standards-setting organization. In simple terms, one cannot implement the standardized technology without using the patent.

Like regular patents, the users of SEPs must pay royalties or **licensing fees** to the patent owner before they may use it. For example, if a manufacturing company wants to make an IoT device interoperable with a 5G network, the manufacturer must pay a licensing fee to the owner of the SEP that is essential to the 5G standard. SEPs play a **vital role** in the new innovations we enjoy and have come to expect, and because of the value of these patents, SEP holders have the ability to demand **high license fees** from those who wish to implement the standard. To offset this **competition issue**, many SEP holders **voluntarily** agree to license their SEPs to any willing licensee under fair, reasonable, and non-discriminatory (**FRAND**) terms.

While wi-fi and LTE are standards that will be vital to Smart City deployment, countless new standardized technologies are being developed that will be integral to any fully-operational Smart City. With **reasonable access** to SEPs, assured by the FRAND commitment, innovators can enjoy the **legal** and **business certainty** they need to **compete**. While the meaning of the FRAND commitment continues to be refined – as evidenced by the development of SEP best practices recently launched by the App Association in Europe – its foundations are well-established.

But what happens when SEP holders do not abide by the FRAND licensing commitment, or simply refuse to license at all? Sadly, small and medium-sized companies would be **forced** to accept **untenable** licensing terms, but more realistically, they would be **priced out** of using the standard **altogether**. As a result, it would impose a **barrier** to **innovation** that would result in **fewer products** offered to consumers or cities eager to implement **IoT technologies**. For example, many hope the rise of autonomous vehicles will be seamlessly integrated into the Smart City network. But how beneficial would it be if only some autonomous vehicle brands are able to license the technology needed to communicate with traffic lights, simply because of the market power of a chipmaker? The FRAND commitment is an important backstop to that unfortunate possibility.

It is vital for SEP holders to honor FRAND licensing terms, if not for small and medium-sized innovators, then for the sustainability of future Smart Cities. FRAND creates a platform for innovation, providing a floor on which companies can stand, innovate, and compete. If the foundation of the FRAND commitment is reneged, American innovators pay a **steep price** – not only do they lose a **key component** of product **development** and **market entry**, but they are also left with years of expensive negotiations and litigation if they choose to challenge the licensing practice. What’s more, the **confidence** developed in the open standards development system is **shaken**, and Smart Cities have fewer choices in IoT solutions for their future.

To achieve the promise of Smart Cities, a balanced standards ecosystem is essential. We must allow small and medium-sized developers to **leverage industry standards** for innovation and prevent cost-prohibitive royalty structures and negotiating practices that are **detrimental** to **competition**, while also ensuring that SEP owners can protect their intellectual property and be fairly compensated for its use. The FRAND commitment continues to be the **best framework** to achieve this balance, and **adherence** to its **principles** will determine the **future** and **success** of **Smart Cities**.

**Climate change is anthropogenic---5G-enabled smart cities are critical for mitigation and adaptation.**

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Currently, the **entire planet** is at risk due to continual **climate change** [1–3]. The recorded increase in average temperature across the world in the past hundred years, and the associated changes attributed to this, are known as global warming. Many scientists are convinced by the published evidence that this change is **anthropogenic** and resulted from the **elevated emission levels** of global greenhouse gases (GHGs) [4,5]. Gases such as water vapor, carbon dioxide, methane, nitrous oxide, and ozone are responsible for the absorption and emission of thermal radiation. These changes in the relative quantities of the GHGs induce a proportional change in the amount of preserved solar energy. Presently, the accepted indicator for global warming is the sustained rise in the mean temperature worldwide. This definition is designed to account for the fact that there may be some localized exceptions to this rise. For example, there may be cooling experienced in a region while the global temperature may increase altogether, hence the need for average temperature. A key concern with the GHGs trapping of more heat in the atmosphere is that it affects both climate and short scale weather patterns. Consequently, it results in **greater numbers** of **adverse weather events** such as storms, heat waves, cold snaps, droughts, and fires [6]. **Climate-related risks** to health, livelihoods, food security, water supply, human safety, and economic growth are projected to **increase** with global warming of 1.5 ◦C [7] and further increase further at 2 ◦C, as shown in Figure 1. In addition, the risks to global aggregated economic growth due to the climate change impacts are projected to be lower at 1.5 ◦C than at 2 ◦C by the end of this century.

Carbon dioxide has the most **substantial effect** on global warming [8]. Although it was once assumed to have an ~100 year lifespan in the atmosphere, careful studies revealed that the situation is far worse, with three-quarters of the gas expected to remain for a time in the region of up to ~1000 years, with the remainder lasting for an indefinite period of time [9]. It was indicated that the present impacts of humanity on the atmosphere can certainly cause a long term problem [10]. Carbon dioxide is released when oil, coal, and other fossil fuels are burnt for the energy we use to power our homes, cars, and smartphones. By **lessening** its **usage**, we can **curb** our own **contribution** to climate change while saving money. The first challenge is eliminating the burning of coal, oil, and, eventually, natural gas. Oil is the lubricant of the global economy as it is hidden inside such ubiquitous items as plastic and corn, fundamental to the transportation of both consumers and goods. Coal is the substrate, supplying roughly half of the electricity worldwide, a percentage that is likely to grow according to the International Energy Agency (IEA). In fact, buildings contribute up to 43% of all the greenhouse gas emissions worldwide [11], even though investing in thicker insulation and other cost-effective as well as temperature-regulating strategies can save money in the long run. Investment in **new infrastructures**, or radical **upgradation** of the existing highways and transmission lines, may help to **reduce** greenhouse gas **emissions**, yielding economic growth in the developing countries.

Nations across the globe have kept very **high targets** to reducing their GHG discharges [12,13]. In order to meet these goals, **considerable reductions** in city energy usage is required. At a global scale, urban communities represent over half (55%) of the population, which is predicted to reach **68%** by the middle of this century [14]. Urban areas claim ownership of the **highest levels** of energy use, gas emission, and also the largest local economy. As such, it is **crucial** for urban areas to **reduce** their **consumption** and utilize **renewable sources** wherever available to reduce their gas discharge levels. Smart cities often utilize **digital sensors** to measure and transmit data about the levels of GHGs in the city at that moment, as a means of tackling them [15]. The **efficacy** of such a system is thus **reliant** on the network used to collate and analyze the data collected as an extant network. The mobile telecommunications networks offer a **convenient solution** to this desire, as their pre-existence has the clear benefit of reducing costs compared to the design and implementation of a novel system. It is recognized that smart cities will certainly act as the key players meeting these ambitious targets [16,17]. In this study, we focused primarily on the potential applications of 5G network technology to control climate change in Singapore. In addition, a **clear overview** of the **sustainability benefits** of introducing **5G** technology **compatible** smart cities, buildings, and farms in all aspects of urbanization is provided. Herein, the main purpose is to tackle the **negative outcomes** associated with **anthropogenic climate change**, with a particular focus on the contributions that are best made by the telecoms network operators.

Climate change is one of the most **challenging problems** that humanity has ever faced. Presently, hundreds of millions of lives, innumerable species, entire ecosystems, health, economy, and the future habitability of this planet are at risk. Fortunately, climate change is **solvable**, we just need to **wisely exploit** the **existing technologies** and **sciences**. Climate change mitigation is a pressing international need in which many management actions are required. The development of 5G technology has been largely driven by smart mobile devices and advanced communication technologies. It may thus serve as a **technical enabler** for a whole new range of business opportunities, energy, and facilities management, together with industrial applications. Moreover, it may enable different devices to work together seamlessly. Definitely, the 5G cellular network technology is expected to **revolutionize** the **global industries** with **profound effects** on the savings of energy, waste generation and recycling, and water resources management, thus **reducing** the **climate change impacts**.

#### That devastates plants

St. George 21, reporter based in Baltimore. (Zach, June 17, 2021, As Climate Warms, a Rearrangement of World’s Plant Life Looms, https://e360.yale.edu/features/as-climate-warms-a-rearrangement-of-worlds-plant-life-looms)

As human-generated greenhouse gas emissions cause the world to rapidly warm, this movement is once again under way. Scientists have observed plants shifting toward the poles and upslope. They’ve noted old ecosystems suddenly replaced by new ones, often in the wake of fire, insect outbreaks, drought or other disturbances. They’ve observed an increase in the number of trees dying and watched as a growing number of the world’s biggest and oldest plants, including the baobabs of Africa and the cedars of Lebanon, have succumbed. Just this month, scientists announced that the Castle Fire, which burned through California’s Sierra Nevada last year, singlehandedly killed off more than 10 percent of the world’s mature giant sequoias.

#### AND animals

CNWF 21, (Climate Change, <https://www.nwf.org/educational-resources/wildlife-guide/threats-to-wildlife/climate-change>)

Climate change is quickly becoming the biggest threat to the long-term survival of America’s wildlife. No longer is climate change something only facing future generations—changes to our climate are being documented all across the planet today, and people, animals, and plants are already feeling the heat. This warming signal is also found in ocean temperatures, soil temperatures, melting glaciers, and melting polar ice caps. It has been linked to widespread impacts on ecosystems around the planet. This preponderance of evidence all points to the conclusion that our planet is warming, and natural systems are struggling to keep up.

#### Plants and animals have become climate refugees — that makes solving climate change an a priori issue for all

Yulsman 20, Environmental reporter for Discover, (Tom, 2/13/20, A Different Kind of Climate Refugee, https://www.discovermagazine.com/environment/a-different-kind-of-climate-refugee)

Thanks to human-caused climate change, countless plants and animals will also need to move in order to survive. But as disruptive as climate migration will be for humans, many of our fellow inhabitants of Earth will not have the options that will be open to us. That could be particularly true for plant species adapted to living in the Arctic — a region warming twice as fast as any other on Earth. At a certain point, they will not be able to move any farther north to find places safe from competition by shrubs and trees well adapted to warmer temperatures. That's because they'll simply run out of land before hitting the Arctic Ocean and surrounding waters. For plants adapted to living in the particularly harsh climate of mountainous areas in the Arctic, the prospect of a warming environment is particularly daunting: They can try migrating up mountainsides, but they will eventually reach the top and have nowhere else to go. "There is not so much space if you move too far up and go too far north," says Inger Greve Alsos, a scientist with The Arctic University Museum of Norway. "So will they survive this warming?" To preserve the diversity of these plant species facing the threat of human-caused warming, what helpful measures could we take? These questions are at the heart of her research, which Alsos described at the recent Arctic Frontiers conference in Tromsø, Norway. You might be wondering why anyone should care about plants that live in an environment so far removed from most of us. I wondered that too — so I asked Alsos about it. The threat is not unique to arctic-alpine plants, she noted. High altitude plants around the world are facing it too.

**1AC — Cybersecurity**

**Advantage 2 is Cybersecurity —**

**Aggressive patent strategies create structural flaws in 5G standardization that imperils domestic cybersecurity---market competition reduces the incidence of vulnerability and severity of attacks.**

**Duan 20**, \*Charles Duan is a senior fellow and associate director of tech & innovation policy at the R Street Institute, where he focuses his research on intellectual property issues; (2020, “OF MONOPOLIES AND MONOCULTURES: THE INTERSECTION OF PATENTS AND NATIONAL SECURITY”, Santa Clara High Technology Law Journal, 36(4), 369-405. Retrieved from <https://www2.lib.ku.edu/login?url=https://www.proquest.com/scholarly-journals/monopolies-monocultures-intersection-patents/docview/2442966690/se-2?accountid=14556>)

III. COMPETITION AND CYBERSECURITY

In addition to the historical review done so far, another approach to understanding the relationship among patents, competition, and national security is to consider the role of **cybersecurity**. There is little doubt that computer system vulnerabilities that enable **hacking** and **spread** of **computer exploits** are a **threat** to the **nation’s defenses**, so better cybersecurity is a **key part** of national security strategy.155

**Strong competition** can thus **complement** national security by enhancing domestic cybersecurity, and **patent assertion** that **unduly weakens** competition **detracts** from cybersecurity.156 Competition promotes better cybersecurity in at least two ways. First, multiple studies show that competition encourages firms to improve their products on multiple vectors including cybersecurity. Second, competition avoids a situation that security experts call a “monoculture,” which increases vulnerability to severe cyberattacks. As former Secretary of Homeland Security Michael Chertoff wrote recently, “We need **competition** and **multiple providers**, not a potentially vulnerable technological monoculture,” to **guarantee** national security.157 Thus, cybersecurity provides a **useful lens** for understanding how **unfettered** patent assertion and **licensing** can **detract** from **national security**.

A. Cybersecurity as Competitive Value-Add

Competition enhances national security by **reducing** the **incidence** of technical **vulnerabilities**. That effect is **especially important** for security **sensitive systems** such as **mobile telecommunications**.

Intuitively, a **causal chain** from **competition** to **cybersecurity** makes logical sense. Computer security is a value-added benefit to consumers, so firms in competitive markets are likely to use security to gain an edge over their competitors.158 In monopolized markets, though, there may be less **external impetus** to **test products** for flaws, and the **monopolist** may **choose** to **focus less** on **security** and more on new product features or increased product quality.

Economic research confirms these hypotheses about competition leading to better cybersecurity. A 2009 empirical study of web browsers considered the impact of market concentration on the amount of time that vendors took to fix security vulnerabilities as they were discovered.159 The study found that the **presence** of more **competitors** correlated with **faster cybersecurity** response—a reduction of 8–10 days in response time per additional market rival.160 Similarly, business researchers in 2005 modeled incentives for firms to engage in sharing of cybersecurity information, and concluded that the “**inclination** to **share information** and **invest** in **security technologies** increases as the **degree** of **competitiveness** in an industry increases.”161 Another study found that, where two software firms are in competition, at least one will be willing to take on **some degree** of **risk** and **responsibility** for cybersecurity, whereas a monopoly software firm will **consistently fail** to accept such responsibility.162 To be sure, an unpublished study from 2017 found that some market concentration can make firms more responsive to cybersecurity issues, but only to a point: “being in a dominant position reduces the positive effect of having less competitors on the responsiveness of the vendor,” and indeed the “more dominant the firm is, the less rapid it is in releasing security patches.”163 This research confirms that competition is more conducive to cybersecurity.

It is not hard to see how this applies to emerging communication technologies markets. In the absence of competition, the above research suggests that device manufacturers, chip makers, and software developers will **lack incentives** to **respond** to **vulnerabilities**, to **share information** about cybersecurity practices and issues, and to **take responsibility** for security matters. Mobile phone chips have had their share of cybersecurity failures already.164 **The best way to flush out ongoing and future cybersecurity issues is to maintain competitive pressure at all levels of the supply chain.**

B. Vulnerabilities of “Monocultures”

A second reason why monopoly undermines cybersecurity is that monopoly leads to a “**monoculture**” of single-vendor products, opening the door to **massive** systemic **failure** in the case of a **cyberattack**. Computer researchers developed the theory of software monocultures in the early 2000s, in response to the regular phenomenon of computer viruses and other attacks spreading rapidly by exploiting flaws in the dominant operating system at the time, Microsoft Windows.165 Where a computer system such as Windows has a commanding share of users, a virus that **exploits** a **flaw** in that system can quickly **spread** to **infect** a whole **interconnected ecosystem**. An operating system monopoly thus enables fast and easy spread of cyberattacks, and better cybersecurity would be achieved through greater diversity in online systems.166 As one research group posited, “a network architecture that **supports** a collection of **heterogeneous network** elements for the same **functional capability** offers a **greater possibility** of **surviving** security **attacks** as compared to **homogeneous networks**.”167

There has been considerable study of the theory that computer monocultures are **naturally** more **vulnerable** to attacks.168 In one study, computer science researchers reviewed a catalog of 6,340 software vulnerabilities recorded in 2007, to compare whether comparable software would share the same flaws.169 Of the 2,627 vulnerabilities applicable to application software (as opposed to operating systems, web scripts, and other software components), only 29 (1.1%) applied to substitute products from different vendors but providing the same functionality.170 By contrast, different versions of a single software product were found to share vulnerabilities 84.7% of the time.171 Thus, software monocultures share **exploitable flaws** even when there is some **variation** in **versions** across the **monoculture**; by contrast, diversity in software is almost **guaranteed** to **prevent** a **single flaw** from **affecting** all **users**.

In the case of 5G and wireless mobile communications, a monoculture is an **especially concerning** possibility. To the extent that systems such as smart city sensors or communication networks are **widely deployed** in a monoculture fashion, a **widespread attack** could have **devastating** consequences, potentially blacking out a region and affecting essential services such as 911.172 A monoculture that is vulnerable to so-called “**rootkits**” or “**backdoors**”—maliciously installed software that enable **bad actors** to commandeer systems—could also enable **mass surveillance** or **spying** by private hackers or foreign governments.173 The presence of systems from **multiple vendors** would mitigate these possibilities.

The monoculture theory is not without critics, but a review of those criticisms shows them to be inapplicable to contemporary communication technologies. Some critics suggest that software diversity imposes **unwarranted costs** on firms who must **forego** economies of scale and devise seemingly duplicative yet different setups of computer systems.174 But those concerns **largely focus** on the situation where a **single firm** produces and manages heterogeneous systems, concerns that are **avoided** where **heterogeneity** arises **naturally** through **competition** between two **unrelated** firms. Critics also argue that technological measures can create “artificial diversity” through automated randomization of software code, so software engineers can purportedly solve monoculture issues and device users need not worry about the issue.175 But even these critics acknowledge that artificial diversity techniques are often **insufficient** because they must make **assumptions** about what **aspects** of the **technology** are **most vulnerable** to **attack**, and they **concede** that artificial diversity **cannot stop** attacks involving operation of **legitimate** software functions in **undesirable** ways (sending spam emails or deleting document files, for example).176

It is widely recognized that a monoculture is **unavoidable** in at least one respect: Most connected devices will need to **conform** to technical **standards**.177 5G, for example, is a technical standard developed by a private industry consortium called 3GPP.178 A **flaw** in any such standard would render **all mobile devices** implementing the standard **vulnerable** to an **identical attack**.179 Avoiding these sorts of **systemic flaws** in standards requires rigorous **development**, **analysis**, and **testing** of the standard in the development process, which in turn requires ensuring that **as many firms** as **possible**, especially firms that share basic American values, are **involved** in the **development** of those **standards**.180 Thus, the necessary **standardization** of **information** and **communication technologies** is perhaps the most **important reason** why a **competitive** communication technology **market** is **essential** to **cybersecurity** and national security.

**Insecure technical standards cause inevitable systemic grid collapse — that’s necessary for basic societal functioning** — food, health care, etc.

**DeNardis 21**, \*Dr. Laura DeNardis, PhD in Science and Technology Studies from Virginia Tech, Dean of the School of Communication at American University, and Gordon M. Goldstein, Adjunct Senior Fellow at the Council on Foreign Relations, (March 1st, 2021, “The Real Lesson of the Texas Power Debacle”, Lawfare, 3/1/2021, https://www.lawfareblog.com/real-lesson-texas-power-debacle)

The infrastructure was essential, ubiquitous and providing basic functionality for everything in daily life from water to heat and transportation. And in an instant it was gone, plunging tens of thousands of residents into a life-threatening crisis. This is, of course, the narrative of the recent debacle in Texas, where a winter storm overwhelmed the state’s electrical grid and brought the state to a near-total blackout. But it should also be interpreted as a preemptive **warning** of what Americans will face from the next generation of the **internet** and the new realm of cybersecurity risk it will **dramatically** amplify.

Both forms of infrastructure—a state-run electrical grid and the **5G** and “**internet of things**” future to which we are rapidly hurtling—share three attributes. First, their construction reflects a lack of imagination about the danger that can quickly **coalesce** when seemingly remote threat scenarios become real. Second, compounding a lack of analytic imagination is an absence of preparedness. Third, for both the Texas electrical grid and the emerging internet, public policy protections are either meager or completely absent.

In planning for the resilience of its electrical grid, public officials in Texas **discounted** the potentially devastating disruption that could occur from **unpredictable** events—whether related to climate change or just a once-a-century anomaly. They also eschewed precautions other states take seriously by allowing for the interconnection of electrical grid supply chains across their borders, ostensibly because of their ideological rejection of federal regulatory oversight governing such arrangements.

As the United States builds out a new national **5G** cyber-physical communications network through private service providers, Americans similarly **discount** the **risks**—myriad in their diversity and severity—that are **orders** of **magnitude** more **significant** than what Texas confronted recently. More physical things than people are already connected. The super empowered internet of tomorrow, known among some in the field as the “internet of everything,” will exceed by **tens of billions** of devices the number of connections between individuals simply communicating via social media or digital screens.

This confronts policymakers with an imminent threat: A cyber outage is **no longer** about losing digital communications but about losing basic **societal functioning** and even **human life**. The failure of imagination is to think of the SolarWinds attack on U.S. federal agencies and tech companies as a **worst-case scenario**. The failure of imagination is to think of cybersecurity through a content-centric lens rather than as possible attacks on the material world. The emergence of internet-connected cardiac devices, digitally dependent cars, and internet-connected agriculture systems portend the stakes of a cyberattack to **health care**, economic and **social functioning**, and **food security.**

The United States should be prepared for, and certainly not be caught by surprise by, such cyberattacks. Yet, the internet of everything is notoriously **insecure**. Internet-connected physical objects are not necessarily upgradeable. Nor do they come with adequate default security and encryption. The 5G infrastructure that helps connect digital objects has been at the center of debates over Chinese espionage. Industrial cyber-physical **systems** are based on **technical standards** that have not been collaboratively vetted for **security** and **interoperability**. One of the most infamous cyberattacks—the so-called Mirai botnet that took down major media sites and corporations—hijacked these insecure objects in homes to carry out the assault. The United States is not yet prepared.

Finally, in the race to conceive and deploy effective public policy responses, the U.S. government as a whole is hardly more anticipatory or synthesized in its response to potential calamity than the state of Texas. The focus of U.S. cyber policy remains on information policy issues such as disinformation, manipulation and violent speech rather than securing the digital world that now powers our material day-to-day lives. The Biden administration confronts an enormous challenge in crafting a comprehensive strategy to the cybersecurity risks foreshadowed by the ruinous experience in Texas and its management of vital infrastructure. While the digital world has leapt from two-dimensional to three-dimensional space, cyber policy has not at all jumped from 2D to 3D.

This failure of imagination, preparedness and policy protection must not be America’s cyber future; the stakes are far **too high** and the costs are far **too great.** The Texas disaster is a potent illustration of what has always been true: Our digital society and economy are extremely vulnerable and grow more porous and subject to penetration day by day. As digital sensors and cyber control systems become further embedded in physical infrastructure like energy systems, agriculture and transportation, there is no longer a separation between security of the **“real” world** and security of the **online world**. They are **entangled** and increasingly **enmeshed**—and policy has yet to catch up to either envisioning or mitigating the looming threats the U.S. confronts.

#### Cyberwar is increasingly likely---SolarWind emboldens hackers to undermine critical infrastructure and nuclear supply chains.

Bajema 21, \*Dr. Natasha Bajema is the Director of the [Converging Risks Lab at the Council on Strategic Risks](https://councilonstrategicrisks.org/programs/csw/dr-natasha-bajema/) and an IEEE Spectrum contributor. She has held long-term assignments at the National Defense University, in the U.S. Office of the Secretary of Defense, and at the U.S. Department of Energy’s National Nuclear Security Administration; (March 24th, 2021, “Today's Cyberattacks Foreshadow Wars to Come”, https://spectrum.ieee.org/riskfactor/aerospace/military/todays-cyberattacks-foreshadow-wars-to-come)

Cyberattacks are no longer just a matter of cybersecurity, they directly threaten a country’s national security. Cyberattacks alter the character of warfare—much like nuclear weapons once did, allowing adversaries to potentially cross enemy lines to harm large numbers of innocent civilians.

Today’s malicious actors can now seek to cause physical damage from remote locations through digital channels, wreaking devastation on a country at levels that previously would have required a kinetic attack.

On February 8, 2021, hackers breached the Bruce T. Haddock Water Treatment Plant in Oldsmar, Fla. using known software vulnerabilities in an attempt to poison the local water supply with sodium hydroxide—also known as lye. They accessed the plant through its industrial control system (ICS)—a system designed to allow for remote control and supervision of the plant. Taking over the plant’s controls, hackers increased parts of the chemical, used to [adjust the acidity and remove metals from drinking water](https://www.foxnews.com/politics/senate-intel-chairman-florida-water-plant-cyberattack), to one hundred times over the normal level. The system used an [old version of Windows, was accessible with a shared password, and had no firewall protection against intrusions](https://techgenix.com/florida-water-treatment-facility-cyberattack/). Thankfully, [a supervisor noticed the dangerous change in time whilst working remotely](https://www.govtech.com/em/safety/Cyberattack-on-Water-Treatment-Facility-Suggests-More-to-Come.html), averting a crisis that may have caused chemical burns and blindness among those exposed to the toxic chemical.

U.S. government officials have recently expressed concerns about similar vulnerabilities across water and energy sectors and other critical infrastructure including [health, emergency services, food and agriculture, and transportation systems](https://www.foxnews.com/politics/senate-intel-chairman-florida-water-plant-cyberattack). The cyberattack on the water plant occurred just a week before a major winter storm led to a widespread blackout and water crisis across Texas. [More than five million](https://time.com/5939633/texas-power-outage-blackouts/) went without power and running water for several days, illustrating the fragility of such interconnected infrastructure and the physical devastation that could be caused in the event of a cyberattack targeting the grid.

Critical infrastructure is not alone in its vulnerabilities to cyberattacks with physical implications—supply chains are also at risk. For at least a span of months (if not years), hackers have [exploited vulnerabilities](https://en.wikipedia.org/wiki/2020_United_States_federal_government_data_breach) in software from Microsoft, VMWare and the Texas-based company [SolarWinds](https://www.solarwinds.com/) to compromise data security in at least 200 organizations in the U.S. government and other agencies around the world.

Although the SolarWinds attack appears to be a [case of classic espionage by Russia](https://www.securityinfowatch.com/cybersecurity/article/21206223/more-questions-than-answers-as-solarwinds-breach-probe-expands) via the U.S. supply chain, there are aspects of the attack that also illustrate the potential for achieving physical effects via digital channels. As early as [March 2020](https://www.securityinfowatch.com/cybersecurity/article/21206223/more-questions-than-answers-as-solarwinds-breach-probe-expands), Russian hackers breached the Orion network management software designed by SolarWinds, a federal contractor, and planted malicious code likely intended to gain access to sensitive information. Evidence of malware was first detected [in December by a cybersecurity company](https://www.newsweek.com/colorado-representative-says-solarwinds-hack-could-cyber-equivalent-pearl-harbor-1555994) that also uses the Orion software. The impact of the SolarWinds cyberattack spanned [thousands of networks](https://www.securityinfowatch.com/cybersecurity/article/21206223/more-questions-than-answers-as-solarwinds-breach-probe-expands) at [nine federal agencies and 100 private sector companies](https://www.cyberscoop.com/solarwinds-cyber-espionage-russia-neuberger/), including the Department of Energy’s National Nuclear Security Administration (NNSA), which is responsible for overseeing the U.S. nuclear weapons stockpile.

Although NNSA claims there was no impact to classified systems, officials found [evidence of attempted intrusion](http://www.politico.com/news/2020/12/22/nuclear-weapons-agency-congress-hacking-450184) in unclassified systems—although, according to the NNSA Public Affairs office, the system in question was used for business purposes, not for transport of nuclear weapons and materials. The agency also detected attempts to gain access to servers at the Los Alamos National Laboratory—one of three nuclear weapons labs. [NNSA immediately disconnected the software from relevant networks](https://www.energy.gov/articles/doe-update-cyber-incident-related-solar-winds-compromise), removing the possibility for deleterious effects. While hackers were not likely targeting the transport of nuclear weapons, the [vulnerabilities of nuclear weapons](https://www.nap.edu/read/11538/chapter/6#112) [while en-route](https://www.osti.gov/servlets/purl/1409912) [between secure locations](https://www-pub.iaea.org/MTCD/Publications/PDF/Pub1348_web.pdf) are well known.

The exact objectives for the SolarWinds cyberattack remain unclear, but the vast extent of its reach may demonstrate to U.S. adversaries the significant potential of cyberattacks for achieving physical ends, including the possibility of stealing nuclear weapons. However, the incident is not the first major one from which malicious actors have deduced such capabilities—[consider the lessons from the NotPetya attack in 2017](https://spectrum.ieee.org/tech-talk/computing/it/notpetya-latest-ransomware-is-a-warning-note-from-the-future). Russian hackers spread malicious code through a popular accounting software developed by a Ukrainian business across many countries in Europe, eventually infecting tens of thousands of computers around the world. In addition to rendering infected computers useless, the attack shut down the global operations of the Maersk shipping company and caused major traffic congestion on the roads near ports in the United States. It also slowed operations of Merck & Co, Inc., a major producer of drugs and vaccines in the U.S., [reducing production capacity for a short period of time](https://www.fiercepharma.com/manufacturing/merck-has-hardened-its-defenses-against-cyber-attacks-like-one-last-year-cost-it). Even a classic espionage or sabotage incident may carry significant potential for physical damage.

The [Biden administration has already issued guidance](https://www.whitehouse.gov/briefing-room/presidential-actions/2021/02/24/executive-order-on-americas-supply-chains/) for shoring up vulnerabilities in U.S. supply chains, but much more needs to be done to protect critical infrastructure and dissuade malicious actors from exploiting digital channels to achieve physical ends. In an era of hybrid and gray zone warfare, cyberattacks are attractive to nations seeking to undermine their adversaries due to challenges of attribution and the associated benefit of deniability. In the future, these nations may also come to see cyberattacks with physical effects as a new form of warfare—a Trojan horse in the form of their adversary’s own infrastructure or supply chains. In so doing, they can cross enemy lines and cause damage and destruction without defeating any military forces.

**Actors have the means and motivations to strike critical infrastructure.**

**Wintch 21**, \*Timothy M. Wintch, an active-duty Major in the United States Air Force. He is currently a graduate student at the Oettinger School of Science & Technology Intelligence, National Intelligence University, in Bethesda, Maryland. Mr. Wintch has over 11 years of experience in command-and-control operations as an Air Battle Manager. He holds a Bachelor of Arts in Politics from the University of California, Santa Cruz, and a Master of Arts in Military Studies from American Military University. (April 20th, 2021, “PERSPECTIVE: Cyber and Physical Threats to the U.S. Power Grid and Keeping the Lights on”, https://www.hstoday.us/subject-matter-areas/infrastructure-security/perspective-cyber-and-physical-threats-to-the-u-s-power-grid-and-keeping-the-lights-on/)

Among critical infrastructure sectors in the U.S., energy is perhaps the most crucial of the 16 sectors defined by the Department of Homeland Security. This sector is **so vital** because it provides the energy necessary to run **every other** critical infrastructure sector. However, the U.S. power grid, the backbone of the energy sector, is built upon an aging skeleton that is becoming increasingly **vulnerable** every day. Whether from terrorists or nation-states like Russia and China, the power grid is susceptible to not just physical attacks, but also to **cyber** intrusion as well. However, much of this threat can be mitigated if the U.S. takes the appropriate steps to safeguard the power grid and avoid a potential catastrophe in the future.

Since Sept. 11, 2001, terrorism on U.S. soil has been at the forefront of American consciousness. Critical infrastructure provides an **appealing** target because of the disproportionally **large impact** even a **small attack** can have on the sectors. In particular, the power grid represents a particularly lucrative target, both in terms of the ease of access and the large impact it can make. The National Research Council stated that the U.S. power grid is “vulnerable to intelligent multi-site attacks by knowledgeable attackers intent on causing maximum physical damage to key components on a wide geographical scale.”[[1]](https://www.hstoday.us/subject-matter-areas/infrastructure-security/perspective-cyber-and-physical-threats-to-the-u-s-power-grid-and-keeping-the-lights-on/" \l "_ftn1) Additionally, the physical security of transmission and distribution systems is difficult due to the **dispersed** nature of these key components, which in turn is advantageous to attackers as it reduces the likelihood of their capture.[[2]](https://www.hstoday.us/subject-matter-areas/infrastructure-security/perspective-cyber-and-physical-threats-to-the-u-s-power-grid-and-keeping-the-lights-on/" \l "_ftn2) From 2002-2012, approximately 2,500 physical attacks occurred against transmission lines and towers worldwide and approximately 500 attacks against transformer substations.[[3]](https://www.hstoday.us/subject-matter-areas/infrastructure-security/perspective-cyber-and-physical-threats-to-the-u-s-power-grid-and-keeping-the-lights-on/" \l "_ftn3) Terrorists have the **motivation** to attack the U.S. power grid but the very nature of the grid makes it highly vulnerable. The power grid is not only at risk from physical attacks, but also nation-state cyberattacks.

One nation that has shown both the **capability** and **intent** to use attacks against critical energy infrastructure is Russia, as demonstrated in their 2015 annexation of Crimea from Ukraine. A Russian cyber threat group known as Sandworm, which used its BlackEnergy malware, attacked Ukrainian computer systems that provide remote control of the Ukraine power grid.[[4]](https://www.hstoday.us/subject-matter-areas/infrastructure-security/perspective-cyber-and-physical-threats-to-the-u-s-power-grid-and-keeping-the-lights-on/" \l "_ftn4) This attack, and another in 2016, each left the capital Kiev without power, prompting cyber experts to raise concern about the same malware already existing in NATO and the U.S. power grids.[[5]](https://www.hstoday.us/subject-matter-areas/infrastructure-security/perspective-cyber-and-physical-threats-to-the-u-s-power-grid-and-keeping-the-lights-on/" \l "_ftn5) In any conflict between Russia and NATO, not only would similar cyberattacks pose a threat, but so would potential physical attacks severing fuel oil and natural gas lines to Western Europe. Russia has both the capability and intent to attack critical infrastructure, particularly power grids, during future conflicts in their “hybrid warfare” approach.

Another nation that has the capability to attack critical energy infrastructure is China, representing a threat to not just the U.S. energy infrastructure but also that of our allies whose support would be vital in a major conflict. A recent NATO report highlighted this threat from China’s Belt and Road Initiative, stating that “[China’s] foreign direct investment in strategic sectors [such as energy generation and distribution] …raises questions about whether access and control over such infrastructure can be maintained, particularly in crisis when it would be required to support the military.”[[6]](https://www.hstoday.us/subject-matter-areas/infrastructure-security/perspective-cyber-and-physical-threats-to-the-u-s-power-grid-and-keeping-the-lights-on/" \l "_ftn6) Like Russia, China has been **active** with cyber **intrusions** in U.S. energy **infrastructure**. The Mission Support Center at Idaho National Laboratory characterized these as attacks as “multiple intrusions into US ICS/SCADA [Industrial Control Systems/Supervisory Control and Data Acquisition] and smart grid tools [that] may be aimed more at intellectual property theft and gathering intelligence to bolster their own infrastructure, but it is likely that they are also using these intrusions to develop capabilities to attack the [**bulk** electric system], as well.”[[7]](https://www.hstoday.us/subject-matter-areas/infrastructure-security/perspective-cyber-and-physical-threats-to-the-u-s-power-grid-and-keeping-the-lights-on/" \l "_ftn7) China, therefore, has both the **capability** and **intent** to conduct cyber intrusions and attacks for myriad reasons.

Another arm of this threat is the reliance the U.S. energy industry has on imports from China, especially transformers. In early 2020, federal officials seized a transformer in the port of Houston that had been imported by the Jiangsu Huapeng Transformer Company before sending it to Sandia National Laboratory in Albuquerque. Sandia is contracted by the U.S. Department of Energy for mitigating national security threats.[[8]](https://www.hstoday.us/subject-matter-areas/infrastructure-security/perspective-cyber-and-physical-threats-to-the-u-s-power-grid-and-keeping-the-lights-on/" \l "_ftn8) The Wall Street Journal reported that “Mike Howard, chief executive of the Electric Power Research Institute, a utility-funded technical organization, said that the diversion of a huge, expensive transformer is so unusual – in his experience, unprecedented – that it suggests officials had significant security concerns.”[[9]](https://www.hstoday.us/subject-matter-areas/infrastructure-security/perspective-cyber-and-physical-threats-to-the-u-s-power-grid-and-keeping-the-lights-on/" \l "_ftn9) Previously destined for the Washington Area Power Administration’s Ault, Colo., substation, the transformer is believed to have been seized due to “backdoor” exploitable hardware emplaced by the Chinese prior to shipment.[[10]](https://www.hstoday.us/subject-matter-areas/infrastructure-security/perspective-cyber-and-physical-threats-to-the-u-s-power-grid-and-keeping-the-lights-on/#_ftn10) Shortly after these events, President Trump issued Executive Order 13920, “[Securing the United States Bulk-Power System](https://trumpwhitehouse.archives.gov/presidential-actions/executive-order-securing-united-states-bulk-power-system/),” essentially limiting the import of Chinese-built critical energy infrastructure components due to concerns about cybersecurity.[[11]](https://www.hstoday.us/subject-matter-areas/infrastructure-security/perspective-cyber-and-physical-threats-to-the-u-s-power-grid-and-keeping-the-lights-on/#_ftn11) Interestingly, Jiangsu Huapeng “boasted that it supported 10 percent of New York City’s electricity load.”[[12]](https://www.hstoday.us/subject-matter-areas/infrastructure-security/perspective-cyber-and-physical-threats-to-the-u-s-power-grid-and-keeping-the-lights-on/#_ftn12)

Franklin Kramer, the former Assistant Secretary of Defense for International Security Affairs, testified before a U.S. House of Representatives Energy and Commerce subcommittee during an energy and power hearing in 2011 and said that a “highly-coordinated and structured cyber, physical, or blended attack on the **bulk power** system, however, could result in long-term (**irreparable**) damage to key system components in multiple simultaneous or near-**simultaneous strikes**.” He added that “an outage could result with the potential to affect a wide geographic area and cause large population centers to lose power for **extended** periods.”[[13]](https://www.hstoday.us/subject-matter-areas/infrastructure-security/perspective-cyber-and-physical-threats-to-the-u-s-power-grid-and-keeping-the-lights-on/#_ftn13) Even the inclusion of features such as smart grids to the overall grid structure poses new **vulnerabilities** through their connectivity. Kramer stated that “such connectivity means that the **distribution** system could be a **key vector** for a national security attack on the grid.”[[14]](https://www.hstoday.us/subject-matter-areas/infrastructure-security/perspective-cyber-and-physical-threats-to-the-u-s-power-grid-and-keeping-the-lights-on/#_ftn14)

**Those attacks cause accidental nuclear escalation.**

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Yet another pathway to escalation could arise from a cascading series of **cyberstrikes** and **counterstrikes** against **vital national infrastructure** rather than on military targets. All major powers, along with Iran and North Korea, have developed and deployed cyberweapons designed to disrupt and destroy major elements of an adversary’s key **economic systems**, such as **power grids**, **financial systems**, and **transportation networks**. As noted, Russia has **infiltrated** the U.S. **electrical grid**, and it is widely believed that the United States has done the same in Russia.[12](https://www.armscontrol.org/act/2019-11/features/cyber-battles-nuclear-outcomes-dangerous-new-pathways-escalation#endnote12) The Pentagon has also devised a plan known as “Nitro Zeus,” intended to immobilize the entire Iranian economy and so force it to capitulate to U.S. demands or, if that approach failed, to pave the way for a crippling air and missile attack.[13](https://www.armscontrol.org/act/2019-11/features/cyber-battles-nuclear-outcomes-dangerous-new-pathways-escalation#endnote12)

The danger here is that **economic attacks** of this sort, if undertaken during a period of tension and crisis, could lead to an **escalating series** of **tit-for-tat attacks** against ever more **vital elements** of an adversary’s critical infrastructure, producing **widespread chaos** and **harm** and eventually leading one side to initiate **kinetic attacks** on **critical** military **targets**, risking the **slippery slope** to **nuclear conflict**. For example, a Russian cyberattack on the U.S. power grid could trigger U.S. attacks on Russian energy and financial systems, causing widespread disorder in both countries and generating an impulse for even more devastating attacks. At some point, such attacks “could lead to major conflict and possibly nuclear war.”[14](https://www.armscontrol.org/act/2019-11/features/cyber-battles-nuclear-outcomes-dangerous-new-pathways-escalation#endnote14)

These are by no means the only pathways to escalation resulting from the offensive use of cyberweapons. Others include efforts by **third parties**, such as **proxy states** or **terrorist organizations**, to provoke a global nuclear crisis by causing **early-warning systems** to generate **false readings** (“spoofing”) of missile launches. Yet, they do provide a **clear indication** of the **severity** of the **threat**. As states’ reliance on cyberspace grows and cyberweapons become more powerful, the **dangers** of **unintended** or **accidental escalation** can only grow more **severe**.

**Cyber-compromised NC3 causes nuclear war.**

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The Nuclear-Cyber Connection

These links exist because the NC3 systems of the United States and other nuclear-armed states are **heavily dependent** on **computers** and other **digital processors** for virtually **every aspect** of their **operation** and because those systems are **highly vulnerable** to cyberattack. Every nuclear force is composed, most basically, of weapons, early-warning radars, launch facilities, and the top officials, usually presidents or prime ministers, empowered to initiate a nuclear exchange. Connecting them all, however, is an extended network of **communications** and **data-processing** systems, all reliant on **cyberspace**. Warning systems, ground- and space-based, must constantly watch for and analyze possible enemy missile launches. Data on actual threats must rapidly be **communicated** to decision-makers, who must then weigh possible responses and **communicate** chosen outcomes to launch facilities, which in turn must provide attack vectors to delivery systems. All of this involves **operations** in **cyberspace**, and it is in this domain that great power rivals seek **vulnerabilities** to exploit in a constant struggle for advantage.

The use of cyberspace to gain an advantage over adversaries takes many forms and is not always aimed at nuclear systems. China has been accused of engaging in widespread **cyberespionage** to steal technical secrets from U.S. firms for economic and military advantages. Russia has been accused, most extensively in the Robert Mueller report, of exploiting cyberspace to **interfere** in the 2016 U.S. presidential election. Nonstate actors, including terrorist groups such as al Qaeda and the Islamic State group, have used the internet for **recruiting** combatants and spreading fear. Criminal groups, including some thought to be allied with state actors, such as North Korea, have used cyberspace to **extort money** from banks, municipalities, and individuals.[4](https://www.armscontrol.org/act/2019-11/features/cyber-battles-nuclear-outcomes-dangerous-new-pathways-escalation#endnote04) Attacks such as these occupy most of the time and attention of civilian and military cybersecurity organizations that attempt to thwart such attacks. Yet for those who worry about strategic stability and the risks of nuclear escalation, it is the threat of cyberattacks on NC3 systems that provokes the greatest concern.

This concern stems from the fact that, despite the immense effort devoted to protecting NC3 systems from cyberattack, no enterprise that relies so extensively on computers and cyberspace can be made 100 percent invulnerable to attack. This is so because such systems employ many devices and operating systems of various origins and vintages, most incorporating numerous software updates and “patches” over time, offering multiple vectors for attack. Electronic components can also be modified by hostile actors during production, transit, or insertion; and the **whole system** itself is **dependent** to a **considerable degree** on the **electrical grid**, which itself is **vulnerable** to cyberattack and is far **less protected**. Experienced “**cyberwarriors**” of every major power have been working for years to probe for **weaknesses** in these systems and in many cases have devised cyberweapons, typically, malicious software (**malware**) and computer viruses, to exploit those weaknesses for military advantage.[5](https://www.armscontrol.org/act/2019-11/features/cyber-battles-nuclear-outcomes-dangerous-new-pathways-escalation#endnote05)

Although activity in cyberspace is much more difficult to detect and track than conventional military operations, enough information has become public to indicate that the major **nuclear powers**, notably China, Russia, and the United States, along with such secondary powers as Iran and North Korea, have established **extensive** cyberwarfare capabilities and engage in **offensive cyberoperations** on a **regular basis**, often aimed at **critical** military **infrastructure**. “Cyberspace is a contested environment where we are in constant contact with adversaries,” General Paul M. Nakasone, commander of the U.S. Cyber Command (Cybercom), told the Senate Armed Services Committee in February 2019. “We see near-peer competitors [China and Russia] conducting sustained campaigns below the level of armed conflict to erode American strength and gain strategic advantage.”

Although eager to speak of adversary threats to U.S. interests, Nakasone was noticeably but not surprisingly reluctant to say much about U.S. offensive operations in cyberspace. He acknowledged, however, that Cybercom took such action to disrupt possible Russian interference in the 2018 midterm elections. “We created a persistent presence in cyberspace to monitor adversary actions and crafted tools and tactics to frustrate their efforts,” he testified in February. According to press accounts, this included a cyberattack aimed at paralyzing the Internet Research Agency, a “troll farm” in St. Petersburg said to have been deeply involved in generating disruptive propaganda during the 2016 presidential elections.[6](https://www.armscontrol.org/act/2019-11/features/cyber-battles-nuclear-outcomes-dangerous-new-pathways-escalation#endnote06)

Other press investigations have disclosed two other offensive operations undertaken by the United States. One called “Olympic Games” was intended to disrupt Iran’s drive to increase its uranium-enrichment capacity by sabotaging the centrifuges used in the process by infecting them with the so-called Stuxnet virus. Another left of launch effort was intended to cause malfunctions in North Korean missile tests.[7](https://www.armscontrol.org/act/2019-11/features/cyber-battles-nuclear-outcomes-dangerous-new-pathways-escalation#endnote07) Although not aimed at either of the U.S. principal nuclear adversaries, those two attacks demonstrated a willingness and capacity to conduct cyberattacks on the nuclear infrastructure of other states.

Efforts by **strategic rivals of** the United States to **infiltrate** and eventually **degrade** U.S. **nuclear infrastructure** are far **less documented** but thought to be **no less prevalent**. Russia, for example, is believed to have planted **malware** in the U.S. electrical utility grid, possibly with the intent of **cutting off** the **flow** of **electricity** to critical **NC3 facilities** in the event of a major crisis.[8](https://www.armscontrol.org/act/2019-11/features/cyber-battles-nuclear-outcomes-dangerous-new-pathways-escalation#endnote08) Indeed, every major power, including the United States, is believed to have **crafted cyberweapons** aimed at critical **NC3 components** and to have implanted malware in enemy systems for potential use in some future confrontation.

Pathways to Escalation

Knowing that the NC3 systems of the major powers are constantly being probed for weaknesses and probably infested with malware designed to be activated in a crisis, what does this say about the risks of escalation from a nonkinetic battle, that is, one fought without traditional weaponry, to a kinetic one, at first using conventional weapons and then, potentially, nuclear ones? None of this can be predicted in advance, but those analysts who have studied the subject worry about the emergence of dangerous new pathways for escalation. Indeed, several such scenarios have been identified.[9](https://www.armscontrol.org/act/2019-11/features/cyber-battles-nuclear-outcomes-dangerous-new-pathways-escalation#endnote09)

The first and possibly most **dangerous path** to **escalation** would arise from the **early use** of **cyberweapons** in a great power **crisis** to ~~paralyze~~ **undermine** the vital command, control, and communications capabilities of an adversary, many of which serve nuclear and conventional forces. In the “**fog of war**” that would naturally ensue from such an encounter, the recipient of such an attack might fear more punishing follow-up kinetic attacks, possibly including the use of nuclear weapons, and, **fearing** the **loss** of its own **arsenal**, **launch** its weapons **immediately**. This might occur, for example, in a confrontation between NATO and Russian forces in east and central Europe or between U.S. and Chinese forces in the Asia-Pacific region.

Speaking of a possible confrontation in Europe, for example, James N. Miller Jr. and Richard Fontaine wrote that “both sides would have **overwhelming incentives** to go **early** with **offensive** cyber and counter-space **capabilities** to **negate** the other side’s military capabilities or **advantages**.” If these early attacks succeeded, “it could result in huge **military** and **coercive advantage** for the attacker.” This might induce the recipient of such attacks to back down, affording its rival a major victory at very low cost. Alternatively, however, the recipient might view the attacks on its critical command, control, and communications infrastructure as the **prelude** to a **full-scale attack** aimed at **neutralizing** its **nuclear capabilities** and choose to strike first. “It is worth considering,” Miller and Fontaine concluded, “how even a very limited attack or incident could set both sides on a slippery slope to rapid escalation.”[10](https://www.armscontrol.org/act/2019-11/features/cyber-battles-nuclear-outcomes-dangerous-new-pathways-escalation#endnote10)

What makes the insertion of **latent malware** in an adversary’s NC3 systems so **dangerous** is that it may not even **need** to be **activated** to **increase** the **risk** of **nuclear escalation**. If a nuclear-armed state comes to believe that its critical systems are infested with enemy malware, its leaders might **not trust** the information provided by its early-warning systems in a crisis and might **misconstrue** the **nature** of an **enemy attack**, leading them to **overreact** and possibly **launch** their **nuclear weapons** out of **fear** they are at **risk** of a **preemptive strike**.

“The **uncertainty** caused by the unique character of a cyber threat could **jeopardize** the **credibility** of the **nuclear deterrent** and **undermine strategic stability** in ways that advances in nuclear and conventional weapons do not,” Page O. Stoutland and Samantha Pitts-Kiefer wrote in 2018 paper for the Nuclear Threat Initiative. “[T]he introduction of a **flaw** or **malicious code** into nuclear weapons through the **supply chain** that **compromises** the **effectiveness** of those **weapons** could lead to a **lack** of **confidence** in the **nuclear deterrent**,” undermining strategic stability.[11](https://www.armscontrol.org/act/2019-11/features/cyber-battles-nuclear-outcomes-dangerous-new-pathways-escalation#endnote11) Without confidence in the reliability of its nuclear weapons infrastructure, a nuclear-armed state may misinterpret confusing signals from its early-warning systems and, fearing the worst, launch its own nuclear weapons rather than lose them to an enemy’s first strike. This makes the scenario proffered in the 2018 NPR report, of a nuclear response to an enemy cyberattack, that much more alarming.

**1AC — Plan**

**Plan: The United States federal judiciary should substantially increase prohibitions on private sector conduct that is more restrictive of competition than reasonably necessary to enable creation of information technology standards.**

**1AC — Solvency**

**Solvency —**

**The plan requires SSO’s to administer reasonable action to prohibit ex post opportunism---that strengthens FRAND effectiveness while enabling SEP holders to capture appropriate royalties---which is the best competition-innovation balance.**

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3. Application of the Basic Legal Principles

The antitrust principle is **straightforward**: industry-wide collaboration through SSOs to establish procompetitive standards is **permitted** only if it is **no more restrictive** of competition than **reasonably necessary** to enable creation of the standards. When standard setting predictably creates technology **monopolies** that, if unrestrained, will enable **anticompetitive** ex post **opportunism** that would otherwise not occur, an SSO that **does not** take **effective** measures to prevent or minimize such ex post opportunism engages in conduct that is **more restrictive** of competition than necessary. In that case, the SSO and, in appropriate cases, its members, may well **violate Section 1** of the **Sherman Act**.

Under this principle, SSO procedures and FRAND rules should be **evaluated** based on whether they lead to **reasonable** SEP **royalties**, using the competitive ex ante licensing standard discussed above, which has been **adopted** by the courts in patent law. Put differently, FRAND rules should be evaluated based on their ability to prevent SEP holders from obtaining **more** than the **ex ante value** of their **technology** from implementers.

This limitation **would not** prevent a SEP holder from **proﬁting**, perhaps **greatly**, from participating in the SSO and having its patented technology included in the standard. The SEP holder **continues** to be **rewarded** for its technology because the inclusion of its technology in the standard can still **greatly increase** the volume of licensing opportunities available to the SEP holder.

Whether a particular set of FRAND rules are sufficiently effective in preventing ex post opportunism will depend on the particular circumstances. The procedural unfolding of the case will also depend upon the circumstances. As a general matter, the case would probably be structured as an ordinary **Rule of Reason** case.82

First, the plaintiff would have to demonstrate **harm** to **competition** as a result of the collaboration of the SSO’s members, many of which compete with one another. In this case, the harm to competition would stem from the ability of the SEP holder to exercise **monopoly** power by obtaining royalties in **excess** of the **competitive**, ex ante level. The decision to include patented technologies in the standard would be the allegedly **unlawful** agreement. Notably, the court **need not** determine what a FRAND royalty is; it would **suffice** to **determine** that **market power** has been **created** or **exercised**, and that existing SSO rules and policies were **not adequate** to prevent the competitive harm. The defendant, which could be the SSO or perhaps one or more SSO members, would win at this point if the plaintiff failed to show harm to competition. If might fail if the standard faces substantial competition and the court concludes that the SEP holder therefore does not have market power or if the SSO’s rules and policies are found to be effective in preventing ex post opportunism, even if the plaintiff or even the court thinks that other rules and policies would be preferable.

Second, if the plaintiff makes the requisite showing of harm to competition, the **defendant(s)** would then have to show some **procompetitive justiﬁcation**— in this case, the **beneﬁts** of the standard. These two initial steps should be straightforward.

Third, if as is likely the defendant is able to show a procompetitive justiﬁcation, the plaintiff would have to show that the SSO could have used available, reasonable **alternatives** to realize the **efficiency beneﬁts** with less or **none** of the competitive **harms**. The plaintiff might identify reasonable **alternatives** that would have led to a **different** standard, based on including **unpatented** technology in the standard or perhaps involving **fewer SEPs** or **fewer owners** of SEPs, which would be **less subject** to patent holdup. More likely, the plaintiff could suggest alternative SSO rules that would not change the standard, but would **reduce** the **likelihood** or extent of ex post **opportunism**. For example, the plaintiff might suggest more rigorous FRAND-type rules, such as rules that set forth more precise principles on which FRAND royalties are to be determined and the circumstances under which SEP holders might seek injunctions.

Fourth, the burden would then shift to the defendant(s) to show that the beneﬁts of the standard **could not** have been **realized** if the SSO had adopted any of the proffered **alternatives** or that those alternatives were unrealistic.83 The plaintiff would be entitled to judgment if the court concludes that those beneﬁts could have been realized with less competitive harm if the SSO had adopted the standard with different IPR rules or policies.

Our overall sense, based on experience and the empirical literature, is that the extant FRAND rules are generally useful, but tend to be **inadequate** because they are **imprecise** and leave **unresolved** such critical issues as (a) the meaning of a **reasonable** royalty, even conceptually; (b) the meaning of “**non-discriminatory**;” (c) to whom licenses must be offered; and (d) under what circumstances may a SEP holder obtain an injunction.84 These **imprecise** FRAND commitments are therefore **not sufficient** to adequately prevent ex post opportunism. The recent revisions to IEEE’s FRAND policy represent a signiﬁcant step in the right direction, but even this advance leaves important questions **unanswered**.85 If FRAND rules are inadequate in these ways, litigation involving extant FRAND rules would likely be resolved only at the ﬁnal, fourth step. The defendant would be able to **demonstrate** the **beneﬁts** created by the standard; the plaintiff would be able to demonstrate the **creation** of **market power** and that other reasonable and practical rules or policies would **ameliorate** the problem. The case would thus turn on whether the defendant is able to demonstrate that signiﬁcant beneﬁts associated with standardization could not have been realized if the SSO had adopted those other rules or policies.

The court would have **available** a **variety** of **possible remedies** if the plaintiff prevails. Implementers that paid supracompetitive royalties or were unlawfully excluded in whole or in part from product markets as a result of the inadequate FRAND policies would be **entitled** to **damages** and, in some cases, to **treble damages**.86 If the unlawful SSO conduct is regarded as the **collective action** of the SSO and its members, which is likely to be the case in most instances, SSO members would be **jointly** and **severally liable** for the damages. Forward-looking injunctive relief aimed at restoring competition would need to be fashioned to the requirements of the individual case. For example, a court could order the SSO to adopt a new rule or policy proposed by the plaintiff. If the court is reluctant to take on that governance role, it might give the SSO a period of time—maybe ninety days—to develop a rule, subject to the court’s ultimate approval, which would adequately ameliorate the competitive problem created by the SSO. Alternatively or in addition, the court might order the parties to attempt to **negotiate** a **rule** or policy on which they can agree. And, depending on the circumstances, the court might order SEP holders, including at least those that were defendants in the case, to comply with the new SSO rules and policies.

**Threatening antitrust liability lures SSO’s into adopting best practices.**

**Lemley & Shapiro 13**, \*Mark Lemley is the William H. Neukom Professor at Stanford Law School and a partner at Durie Tangri LLP; \*Carl Shapiro is the Transamerica Professor of Business Strategy at the Haas School of Business, University of California at Berkeley and a Senior Consultant at Charles River Associates; (2013, “A SIMPLE APPROACH TO SETTING REASONABLE ROYALTIES FOR STANDARD-ESSENTIAL PATENTS”, (https://faculty.haas.berkeley.edu/shapiro/frand.pdf)

Under our approach, many of these issues should become moot, since the patentee cannot obtain an injunction (or transfer the patent to someone who can) against a willing licensee, and since competitors are not involved in jointly setting the reasonable royalty rate. If SSOs set clear, reasonable rules following the best practices we recommend, and parties follow those rules, there should be **little** or **no need** for **antitrust** to **intervene**. Indeed, even the risk of non-disclosure of a patent is lessened, since the patentee has committed to license its essential patents whether or not it discloses them. For the most part, the rules we have described are **self-executing**, meaning that even if a party tries to break the rules set by the SSO there still may be no need for antitrust to intervene. Thus, we suggest that **parties** who **abide** by these **procedures**—patentees, implementers, and the SSOs themselves—should be **immune** from **antitrust liability** for activities that merely follow those rules.107 They have entered into an arrangement that is **on balance good** for **competition**, one that allows patentees to receive **reasonable royalties** but **prevents holdup** and **reduces** the risk of **monopolization** by **trickery**.

The fact that antitrust remains a last resort available when SSOs don’t follow best practices may have two practical benefits, however. First, under our approach the **promise** of **avoiding** the risk of **antitrust liability** will be a **powerful incentive** for both SSOs and patent owners to **adopt** the **best practices** we propose. Second, the risk of antitrust liability may be relevant when an individual patentee wants to adopt best practices but the SSO governing the standard has not yet done so. We propose that a patentee that unilaterally commits to the FRAND procedures we describe here should be immune from antitrust liability for following these procedures.108 A patentee’s unilateral binding commitment to arbitration could be enforced whether or not it was elicited by an SSO. Thus, just as the prospect of antitrust immunity might **lure SSOs** to **adopt best practices**, it might also lure **patentees** to **implement** those **practices** even if the SSO has not done so. Given the large number of standard-essential patents based on preexisting standards,109 and given that SSOs tend to update their IP rules rather slowly,110 this is **not** a **small matter**.

**Only antitrust enforcement creates a consumer-action feature that counterbalances SSO’s conspiratorial incentives---private action fails.**

**Melamed & Shapiro 18**, \*A. Douglas Melamed is Professor of the Practice of Law at Stanford Law School; \*Carl Shapiro is the Transamerica Professor of Business Strategy at the Haas School of Business at the University of California at Berkeley; (May 2018, “How Antitrust Law Can Make FRAND Commitments More Effective”, <https://www-cdn.law.stanford.edu/wp-content/uploads/2018/05/How-Antitrust-Law-Can-Make-FRAND-Commitments-More-Effective.pdf>)

2. Why Antitrust Enforcement Is Necessary

Some SSO members have an interest in ensuring that the SSO takes steps to minimize the potential harms from the SEP holders’ monopoly power, and this undoubtedly explains in part why most SSOs have adopted FRAND policies or similar requirements. But, as shown in the economic model in the Appendix,73 SSOs **cannot** in general **be counted on** to adopt effective FRAND policies. The bases for this conclusion, which is central to our argument for the applicability of Section 1 to SSO FRAND rules, can be summarized as follows.74

First, the SSO members **collectively have an interest** in permitting SEP holders to charge supracompetitive royalties that elevate the downstream price of compliant devices to the monopoly level. Doing so will enable the members **in aggregate** to collect **increased revenues** from consumers, and thus to generate **increased profits** that in theory could be **shared by all** the members. In other words, supracompetitive royalties can enrich industry participants as a group at the expense of final consumers. This fact alone should serve as a **clear and strong signal** regarding the **dangers** of counting on SSOs to implement effective FRAND policies: if the SSO members negotiate **efficiently**, the outcome will be **just as bad** for consumers as if the members agreed to **fix downstream prices**.75 The **fundamental problem** is that **final consumers** are **not at the table** when the SSO rules are negotiated.

Second, SSO members that own SEPs but earn little or no profits as implementers have a **powerful self-interest** in being able to exercise the ex post monopoly power associated with their SEPs. Because SSO policies are usually determined by a **consensus** process, these members will likely be able to **block the adoption** of **fully effective FRAND policies**. Moreover, these SSO members often have the greatest interest in SSO patent policies. Since much of their income may be attributable to patent licensing, they can be expected to devote substantial resources to block the adoption of FRAND policies that effectively prevent patent holdup.

Third, even SSO members that earn **significant profits** as implementers may have **mixed incentives** if they also own SEPs, which can also lead to **weak or in-effective FRAND rules**. In the Appendix, we show that, if the **requisite share** of votes in the SSO are cast by firms whose **share of SEP royalties** is at least as large as their share of **downstream profits**, and if these firms can coordinate their voting over the FRAND rules, then an SSO **unconstrained** by antitrust laws will establish FRAND rules leading to an outcome **no better for consumers** than would result from an **integrated monopolist** controlling all SEPs and all downstream sales.76

Fourth, even SSO members that are **downstream implementers** and own few, if any, SEPs may have only a **modest interest** in promoting effective policies to restrict ex post opportunism. Because all implementers will be subject to the opportunism, all of them will face **increased licensing costs**, and therefore will likely be able to **pass on** most or all of the **increased costs** to their customers.77 Furthermore, these implementers might not be **especially active** or **effective** in the standard-setting process for **free-riding** or **public-good** reasons, especially if SEP royalties constitute only a **relatively small portion** of the costs of their standard-implementing products. Public choice theory predicts that the highly motivated SEP holders are likely to have the **greatest influence** over **patent policies**.

Empirical evidence bears out these concerns. As a starting point, we find it striking that SSO FRAND rules are almost **always quite vague**.78 Notably, SSOs in which SEP holders are more prevalent tend to have weaker FRAND rules.79 Further, to our knowledge, SSOs have made almost **no effort** to enforce their FRAND rules and have, instead, **left enforcement** efforts to **others**.80 This evidence raises serious doubts about the effectiveness of the existing FRAND rules in preventing ex post opportunism.

#### Antitrust is critical---the broad standing and available remedies afforded are vastly superior to any other types of law.

Cary et al. 11, \*Messrs. George Cary and Alex Sistla are members of the California and District of Columbia Bars. Mr. Mark Nelson is a member of the New York and District of Columbia Bars. Mr. Steven Kaiser is a member of the New Jersey and District of Columbia Bars; (2011, “THE CASE FOR ANTITRUST LAW TO POLICE THE PATENT HOLDUP PROBLEM INSTANDARD SETTING”, <https://www.clearygottlieb.com/~/media/organize-archive/cgsh/files/publication-pdfs/the-case-for-antitrust-law-to-police-the-patent-holdup-problem-in-the-standard-setting.pdf>)

III. CONCLUSION

Patent holdup where a patentee has deceived an SSO in order to secure a position in the standard is, at its core, an antitrust problem. In this context, patent holders harm consumers by exploiting the competition-reducing aspects of standard setting to their own private advantage. In addition to being the body of law directed toward anticompetitive conduct, antitrust provides numerous practical advantages, including the possibility of governmental enforcement, and appropriately broad standing.

Remedying the patent holdup problem exclusively through non-antitrust legal remedies would be perverse. Indeed, it would be a bit like remedying patent infringement through the doctrine of common law conversion. In some instances, it might work, but there certainly would be under-enforcement.

To be sure, there are instances where deceptive conduct by the patentee does not harm competition and, in those instances, there is no antitrust claim. Often there will be patent remedies in that situation, or contract or even tort remedies. The legal regimes can and do coexist peacefully.

Those who argue that the marginal benefit of antitrust remedies do not out-weigh the cost of antitrust litigation both understate the benefits (broad standing and ready remedies where appropriate) and overstate the costs (the potential, however unknown, of “false positives,” i.e., condemning behavior that is not anticompetitive). In addition to being overstated, the false positives concern is also misplaced in this context. Unlike an antitrust attack on price cutting or a securities offering, the risk of a false positive here is not the over-deterrence of desired behavior, but rather that over-deterrence of deceptive and opportunistic behavior. Fretting about that form of over-deterrence seems itself to be a misallocation of resources. And preventing that form of over-deterrence by reliance on the competitive outcomes under legal regimes not designed to protect competition strikes us as unwise.

#### \*Ex ante disclosure solves lock-in, improves transparency and openness.

Contreras 13, \*Jorge L. Contreras is a Presidential Scholar and Professor of Law at the University of Utah with an adjunct appointment in the Department of Human Genetics. He is a graduate of Harvard Law School (JD) and Rice University (BSEE, BA); (Contreras, J. L. (2013). TECHNICAL STANDARDS AND EX ANTE DISCLOSURE: RESULTS AND ANALYSIS OF AN EMPIRICAL STUDY. Jurimetrics, 53(2), 163-211. Retrieved from https://www2.lib.ku.edu/login?url=https://www.proquest.com/scholarly-journals/technical-standards-ex-ante-disclosure-results/docview/1428261870/se-2?accountid=14556)

Ex ante disclosure of licensing terms could potentially alleviate the causes of such disputes by making a patent holder's royalty rate known before lock-in of a standard. Thus, if maximum royalty rates were known in advance, it would be more difficult for an implementer to argue that such rates were unreasonable (as the SDO could have chosen an alternative technology if this were the case).148 Lacking this potential defense against an infringement claim by the patent holder, implementers might be more inclined to negotiate with patent holders before the adoption of a standard. By the same token, if a patent holder knew that its maximum royalty rate would be scrutinized before the approval of a standard, and that SDO participants would be free to consider alternative, less costly technologies, it would have an incentive to disclose a royalty rate that was as reasonable (or low) as possible.149

Ex ante disclosure of licensing terms has an intuitive appeal. Like the prices of menu items at a restaurant, it has been argued that the royalty rates for standards-essential patents should be disclosed before product vendors (diners) are locked into costly technology choices. But critics of ex ante disclosure have argued that requiring early disclosure of licensing terms will impede standards-development processes and create additional legal risks for participants. To assess the validity of these complaints, we studied ex ante licensing disclosures at VITA, IEEE and IETF and found no evidence that such policies resulted in measurable negative effects on the number of standards started or adopted, personal time commitments or quality of standards, nor was there compelling evidence that ex ante policies caused the lengthening of time required for standardization or the depression of royalty rates. There was evidence to suggest that the adoption of ex ante policies may have contributed to positive effects observed on some of these variables. In addition, a significant majority of participants in VITA, the only SDO adopting a mandatory ex ante policy, felt that the information elicited by the organization's ex ante policy improved the overall openness and transparency of the standards-development process. Thus, while there are numerous areas in which further study and analysis may be warranted, and other organizations in which the implementation of ex ante policies may have different effects, we concluded that the process-based criticisms of ex ante policies and the predicted negative effects flowing from the adoption of such policies are not supported by the available evidence.

#### Use consequentialism---evaluating causal outcomes is most ethical. “You link, you lose” diverts political responsibility for atrocity---which turns the alternative.

Zanotti 17, \*Laura Zanotti, Associate Professor Department of Political Science, Virginia Tech, (January 13th, 2017, “Reorienting IR: Ontological Entanglement, Agency, and Ethics,” International Studies Review)

Furthermore, if we accept Barad’s position that we are “of the world” and not above the world, theorizing looks more like a practice endowed with performative political effects than a quest for the discovery of the “true nature” of what exists. Therefore, intellectual undertakings are a form of political agency and come with great responsibility. Such responsibility requires the need for exercising prudence in making truth statements about what is universally good or naturally inevitable. Assumptions about linearity of causal relations, universal laws of history, or ontological properties of entities yield two problematic effects. On the one hand, they may stifle political imagination; on the other hand, they could encourage actions based upon abstract prescriptions rather than upon careful diagnosis of the forces that obtain in the situation at hand. In an entangled world, there are no externalities. Arguments that divert responsibility by basing political choices upon abstract principles or aspirations and, as a result, that treat what happens on the ground as “unintended consequences” or “collateral damage,” are ethically thin and politically dangerous.

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In fact, unintended consequences may well be the result of irresponsible political decision-making that does not include a competent assessment of the practical configurations that constitute the context of action and the means necessary to achieve stated goals. Such attitudes, Amoureux and Steele (2014) have suggested, have led to disastrous initiatives, such as the Bush administration’s invasion of Iraq. Likewise, Kennedy (2006) has shown that the bland rhetoric of jus in bello that provides standardized criteria regarding the number of acceptable civilian casualties (conveniently called collateral damage) produces the effect of diverting responsibility from those who conduct war while assuaging their consciences concerning the injuries and deaths their choices are inflicting. Kennedy (2004) has also shown that as a result of the preference for universal normativity, the human rights profession (which he calls “the invisible college”) is more concerned with protecting abstract norms than with acting politically so as to devise viable solutions to specific problems.

Universal norms and bureaucratic routines play a major role in prescribing and justifying UN peacekeeping interventions. As Jean Marie Guehe ́nno argued more than a decade ago, strategies of international intervention based upon assumptions of causal linearity and invariance may amount to hubris. Norms and rules can also offer grounds for appeasement. The massacres that occurred in Rwanda and Srebrenica in the 1990s provide examples of how, by uncritically following institutionalized rules, United Nations peacekeepers permitted atrocities. UN employees are not cold-blooded monsters or extremely callous individuals. They follow norms and rules, key examples of which include the principle of “impartiality,” Security Council mandates, and “rules of engagement.” By doing so, however, they have often fallen short of considering the possible consequences of decisions in specific situations. The United Nations’ failure to take action to prevent the Rwanda and Srebrenica genocide testifies to the fact that following universal norms (i.e., the imperative to preserve impartiality) and bureaucratic reasoning (i.e., the rules of engagement prescribing not to intervene to disarm any party of the conflict) set the stage for avoiding a careful assessment of what was at stake on the eve of the massacres. These ways of reasoning also appeased consciences for not making decisions accountable to the people in danger (Zanotti 2014).

# 2AC

## Adv — Innovation

#### Patent holdup is real and necessitates intervention, even if it can’t be systemically proven.

Contreras 19, \*Jorge Contreras, Professor, University of Utah S.J. Quinney College of Law; (2019, “MUCH ADO ABOUT HOLD-UP”, <https://www.illinoislawreview.org/wp-content/uploads/2019/08/Contreras.pdf>)

B. Protective Measures May Already Be Working to Reduce Hold-Up

Another important factor that should be considered regarding the purported lack of empirical evidence of systemic hold-up is the effect that existing policy measures have already had in reducing hold-up. As noted above, the threat of patent hold-up was a primary motivating factor for many SDOs to adopt policies requiring the disclosure and licensing of SEPs. These policies have been in place for decades. In the United States, the first such policy was adopted in 1959 by the American Standards Association (the predecessor to today’s American National Standards Institute (ANSI).102 Today, every one of the more than 200 ANSI-accredited developers of American National Standards must adhere to ANSI’s essential requirements, including the adoption of such a licensing policy for SEPs. Similar policies have existed in European and international standards organizations since at least the 1980s.103 These policies, which were developed by SDOs in large part to reduce the likelihood of hold-up within standard-setting systems, have had several decades to work, and it is likely that the lack of observed hold-up in some studies can be attributed to the successful operation of these policies.

Similarly, antitrust and competition enforcement agencies in the U.S. and Europe have been aware of the potential for hold-up connected with standardization for many years. Accordingly, they have brought enforcement actions when it has been alleged that hold-up behavior has resulted in a violation of the antitrust laws. High-profile enforcement actions against patent holders such as Rambus, 104 Google 105 and Qualcomm106 send powerful deterrent signals to the market and warn others not to engage in similar behavior lest they, too, become the subject of agency enforcement. Like SDO policies, it is likely that the general market awareness of agency interest in standard-setting and hold-up has, to a degree, limited the amount of hold-up that is actually attempted in the marketplace, thereby limiting the direct evidence of hold-up as a systemic problem.

But do the deterrent effects of SDO and agency efforts to reduce hold-up signify that hold-up is not a problem? Certainly not. To reach such a conclusion would be perverse: akin to claiming that burglary is not a problem in a neighborhood that experiences reduced burglary rates after it has implemented an active neighborhood watch program and enhanced policing.

C. Indicia of Healthy Markets do not Prove the Absence of Anticompetitive Conduct

As noted above, one of the principal arguments advanced by commentators seeking to refute the “hold-up theory” is that markets for telecommunications products, namely smart phones, are robust – evidenced by increasing product functionality, decreasing consumer prices and rapid innovation -- and that this degree of robustness indicates that hold-up cannot be a problem in these markets.107 If hold-up were a problem in these markets, they reason, we would see product stagnation, stable (but high) prices, and a lack of competition – features associated with classic examples of hold-up in markets for products such as natural resources and agricultural goods.108

But this argument relies on a false syllogism: hold-up results in market dysfunction; if a market functions well, then it cannot be subject to hold-up. The weaknesses in this argument are multifold. First, hold-up may exist in individual instances without sufficient weight to affect overall market characteristics, particularly in a large global market such as mobile telecommunications. Thus hold-up may exist, even in a market that outwardly appears to be functioning well. Second, there is no valid counterfactual to use to compare the health and robustness of the market for mobile telecommunications products.109 Other consumer electronics devices, such as televisions and DVD players, do not compare well with mobile telecommunications devices, which have taken on a unique character in the modern networked economy. Thus, observing the strength of the market fails to answer the critical questions “compared to what?” and how much stronger the market might be (through more product diversity, functionality, price reduction) without hold-up?

A simple historical illustration is useful in this context. During the decade leading up to the enactment of the Sherman Antitrust Act of 1890, several major U.S. commodity markets (e.g., steel, salt, petroleum, coal, sugar, lead, and others) came under intense scrutiny for a variety of allegedly anticompetitive industrial arrangements. One might have argued that these markets, had they been subject to the sorts of anticompetitive collusion that the Sherman Act sought to address, should have seen reductions of output and increases in price. Yet, between 1880 and 1890, U.S. output of salt, petroleum, steel, and coal all increased significantly, and prices of steel, sugar and lead all dropped significantly.110 Do these positive market indicia demonstrate that the subject markets were not subject to anticompetitive collusion, and that the Sherman Act was not necessary? Certainly, investigations of these industries revealed significant cartel behavior. I would suggest that few commentators today would argue that the coal, steel, sugar and other major industrial producers of the late nineteenth century were innocent of collusive and anticompetitive conduct, or that the Sherman Act was not a necessary and beneficial measure for the U.S. economy.111 Yet, had we relied solely on the positive characteristics exhibited by these markets as proof that anticompetitive conduct did not exist, then perhaps the Sherman Act never would have been enacted.

By the same token, the fact that global markets for standardized products such as computers and smart phones appear to be thriving does not itself refute the possibility of hold-up nor the existence of anticompetitive conduct in these markets. Nor does it allow regulators and policy makers to drop their guard or cease to monitor these important industries.

#### Patent holdup is true even if it can’t be empirically verified.

Shapiro & Lemley 20, \*Carl Shapiro is the Transamerica Professor of Business Strategy Emeritus at the Haas School of Business, University of California at Berkeley; \*Lemley is the William H. Neukom Professor at Stanford Law School and a partner at Durie Tangri LLP; (2020, “THE ROLE OF ANTITRUST IN PREVENTING PATENT HOLDUP”, https://faculty.haas.berkeley.edu/shapiro/patentholdup.pdf)

E. Actual Holdups Are Very Difficult to Measure

As just noted, the extensive empirical support for the general theory of holdup consists primarily of studies showing that firms structure their relationships to avoid or minimize the adverse effects of holdup. Critically, the evidence does not involve quantifying the magnitude of actual ex post holdups.36 Indeed, the empirical literature on holdup has relatively few documented examples of large-scale actual holdups.37 This will be important below when we turn to evaluating the empirical evidence regarding patent holdup in particular.

Anticipating the arguments being made by those who deny that the patent holdup problem is real and significant, it is instructive to ask why the empirical literature on the general holdup problem has not proceeded by measuring the frequency or magnitude of actual holdups.

In part this is for a very good conceptual reason: the theory predicts that market participants will structure their affairs to avoid or mitigate actual holdups. As stressed above, the social costs caused by the holdup problem can be large even if large-scale holdups are very infrequent. The validity of the general theory of holdup, and the importance of the holdup problem, do not hinge on the frequency or magnitude of actual holdups.

But practical considerations also play a big role in explaining why the very large empirical literature on the holdup problem includes few documented instances of actual holdups. Even in situations where such holdups take place, they are exceedingly difficult for researchers to reliably detect and quantify. To see why, denote the holdup (ex post monopoly) price by 𝑃𝐻 and the ex ante competitive price by 𝑃 ∗ . The (perunit) magnitude of the actual ex post holdup is equal to (𝑃𝐻 − 𝑃 ∗ ). Measuring either component of this difference can pose quite a challenge for researchers. Actual transaction prices in complex business-to-business transactions are rarely observable by researchers. Plus, even when a measure of price is available, it typically is confounded by other terms and conditions, making 𝑃𝐻 very hard to observe. Coming up with a good measure of the competitive benchmark price 𝑃 ∗ is even harder, since it reflects a counterfactual and since the transactions at issue are by nature idiosyncratic. Practical considerations also explain why the empirical literature on the holdup problem includes few documented instances in which the prospect of holdup has discouraged investment. The resulting reduction in investment typically will not normally be observable to researchers, much less attributable to holdup.

For all of these reasons, scholars studying the holdup problem widely agree that the general theory of holdup is very well supported empirically without expecting, much less demanding, a body of empirical work measuring actual holdups. This same sensible approach should be applied to patent holdup.

When we turn to look at patent holdup below, we will examine the two types of evidence used in the more general empirical literature on holdup. First, we look for evidence identifying situations in which the patent holdup problem is significant. The telltale marker that the patent holdup problem is significant in a given setting is the presence of substantial investments specific to a given patent or patent portfolio. Second, we look for evidence that the mechanisms used to manage the patent holdup problem are costly or imperfect. There is clear evidence that the mechanisms used by SSOs to manage SEP holdup are costly and imperfect.

## Adv — Cyber

## Solvency

#### Warming magnifies settler impositions

Whyte 16. Kyle Powys Whyte, Michigan State University Timnick Chair in the Humanities, Associate Professor of Philosophy and Community Sustainability In Press. “Is it Colonial Déjà Vu? Indigenous Peoples and Climate Injustice” November 2016. . Humanities for the Environment: Integrating Knowledges, Forging New Constellations of Practice. Edited by Joni Adamson, Michael Davis, and Hsinya Huang. Earthscan Publications. Pages 88-104. ckm-eg.

Climate change fits succinctly within this pattern. For this reason, many contemporary Indigenous peoples are concerned about their vulnerability, or susceptibility to be harmed, by impacts associated with the observed rise of global average temperature, or climate change. That is, they are concerned about climate risks as they are increasingly confronted by change stemming from the carbon intensive economic activities of settler and other colonial societies. Climate change impacts can be seen through the lens of forms of containment (among other forms of domination), this time arising from settler contributions to increasing the concentration of greenhouse gases in the atmosphere. Warming waters and receding glaciers affect the fish habitats in Indigenous territories all over the world, such as on the Pacific coast of North America where many Tribal nations harvest salmon for economic and cultural purposes (Bennett et al.). Sea level rise is pushing people living in the Village of Kivalina in Alaska, the Isle de St. Charles in the Gulf of Mexico, and the Carteret Atoll in Papua New Guinea to relocate (Maldonado et al.). In these cases we see 8 both shrinking habitats and relocation occurring again. The Loita Maasai peoples in Africa face droughts that affect the rain conditions required for performing many of their ceremonies (Saitabu). Indigenous women, girls and two spirit persons in the Arctic and Great Plains regions are subject to greater sexual violence, abuse and trafficking as work camps for oil and gas extraction, such as ‘fracking,’ bring in male contractors to profit from the resources found within Indigenous territories (Sweet). Climate change impacts and drivers represent another form of inflicted anthropogenic environmental change. Scientific reports confirm many of the threats just described. In 2014, the U.S. National Climate Assessment states that Indigenous peoples face the ‘loss of traditional knowledge in the face of rapidly changing ecological conditions, increased food insecurity… changing water availability, Arctic sea ice loss, permafrost thaw, and relocation from historic homeland’ (Bennett et al. 2). The Intergovernmental Panel on Climate Change’s Fifth Assessment Report claims Indigenous peoples face ‘challenges to post-colonial power relations, cultural practices, their knowledge systems, and adaptive strategies’ (Adger et al.). Indigenous peoples’ own descriptions of climate risk indicate that settler and other colonial societies are imposing rapid environmental change that generates otherwise preventable harms. The Mandaluyong Declaration quotes Miskito women in the Americas who say, in response to changing environmental conditions, that “We now live in a hurry and daughters do not cook as grandmothers… We do not catch fish as before, do not cook as before; we cannot store food and seeds as before; the land no longer produces the same; small rivers are drying up… I think that along with the death of our rivers, our culture dies also.” (300-01). For many Indigenous peoples, these rapid changes are experienced as a continuation of settler colonialism and other forms of colonialism that they have endured for many years. For we have experienced these types of environmentally-related impacts before— from dietary change to relocation to sexual violence—though caused by different factors, such as multiple settler institutions of containment. Though institutions of containment represent just one limited example of a much more complex history with settler colonialism. Anthropogenic climate change is of a piece with forms of nonconsensual and harmful environmental change inflicted on our societies in the past. Some Indigenous peoples look at futures of 9 rampant climate injustice as looking to the cyclical history of settler and other colonial inflictions of anthropogenic environmental change on Indigenous peoples in order to instantiate erasure. Yet what is more insidious about climate injustice against Indigenous peoples is that the settler institutions such as those of containment, that inflicted environmental change in the past, are the same institutions that fostered carbon-intensive economic activities on Indigenous territories. That is, containment strategies, such as removal of Indigenous peoples to reservations or the forced adoption of corporate government structures, all facilitated extractive industries, deforestation and large-scale agriculture. What is more, and as I will discuss in more detail in later sections, these are the same institutions that today make it hard for many Indigenous peoples to effectively cope with climate change impacts. In this way, climate injustice against Indigenous peoples refers to the vulnerability caused by ongoing, cyclical colonialism both because institutions facilitate carbon-intensive economic activities that produce adverse impacts while at the same time interfering with Indigenous people’s capacity to adapt to the adverse impacts

#### Climate change represents another removal – the disproportionate effects on reservation land and the denial of federal disaster assistance condemns natives to disparate climate impacts

Flavelle 2021

Christopher Flavelle and Kalen Goodluck, New York Times, “Dispossessed, Again: Climate Change Hits Native Americans Especially Hard” July 1, 2021 <https://www.nytimes.com/2021/06/27/climate/climate-Native-Americans.html>

In Chefornak, a Yu’pik village near the western coast of Alaska, the water is getting closer.

The thick ground, once frozen solid, is thawing. The village preschool, its blue paint peeling, sits precariously on wooden stilts in spongy marsh between a river and a creek. Storms are growing stronger. At high tide these days, water rises under the building, sometimes keeping out the children, ages 3 to 5. The shifting ground has warped the floor, making it hard to close the doors. Mold grows.

“I love our building,” said Eliza Tunuchuk, one of the teachers. “At the same time, I want to move.”

The village, where the median income is about $11,000 a year, sought help from the federal government to build a new school on dry land — one of dozens of buildings in Chefornak that must be relocated. But agency after agency offered variations on the same response: no.

From Alaska to Florida, Native Americans are facing severe climate challenges, the newest threat in a history marked by centuries of distress and dislocation. While other communities struggle on a warming planet, Native tribes are experiencing an environmental peril exacerbated by policies — first imposed by white settlers and later the United States government — that forced them onto the country’s least desirable lands.

And now, climate change is quickly making that marginal land uninhabitable. The first Americans face the loss of home once again.

In the Pacific Northwest, coastal erosion and storms are eating away at tribal land, forcing native communities to try to move inland. In the Southwest, severe drought means the Navajo Nation is running out of drinking water. At the edge of the Ozarks, heirloom crops are becoming harder to grow, threatening to disconnect the Cherokee from their heritage.

Compounding the damage from its past decisions, the federal government has continued to neglect Native American communities, where substandard housing and infrastructure make it harder to cope with climate shocks.

The federal government is also less likely to help Native communities recover from extreme weather or help protect them against future calamities, a New York Times review of government data shows.

Interviews with officials, members and advisers at 15 federally recognized tribes portray a gathering climate crisis and a test of the country’s renewed focus on racial equity and environmental justice.

Many tribes have been working to meet the challenges posed by the changing climate. And they have expressed hope that their concerns would be addressed by President Biden, who has committed to repairing the relationship with tribal nations and appointed Deb Haaland, the first Indigenous cabinet secretary, to run the Interior Department. But Mr. Biden has announced few specific policies or actions to directly reduce the climate risk already facing Native communities, and Ms. Haaland’s office declined repeated requests for an interview.

“The stakes are very, very high,” said Fawn Sharp, president of the National Congress of American Indians. “We’re running out of time.”

Forced Off Their Land, Again

The Quileute Nation is a collection of about 135 homes on a narrow slice of land at the edge of the Olympic Peninsula that juts into the Pacific, about 100 miles west of Seattle.

As temperatures rise, the atmosphere holds more water, producing more frequent and intense storms. High winds now regularly knock out the electricity, while homes along the main street are vulnerable to flooding. The single road that connects the community to the outside world is often rendered impassable by water.

“The village is 10 to 15 feet above sea level,” said Susan Devine, a project manager who is working with the Quileute. During major storms “those waves are bigger than you,” she said.

Hundreds of years ago, the reservation was a fishing village, among many locations used by the Quileute as they moved according to the demands of the weather.

That changed in 1855 when a treaty stripped the tribe of most of its land; President Grover Cleveland later issued an executive order confining the Quileute to a single square mile — all of it exposed to flooding.

“No one chose to be in a seasonal fishing area year-round,” Ms. Devine said.

The resulting vulnerability has pushed the tribe to pursue a solution that few non-Native towns in the United States have seriously considered: Retreating to higher ground.

“Climate change has forced us to make the heart-wrenching decision to leave the village,” Doug Woodruff, chairman of the Quileute Tribal Council, said in a December statement. “Without a cohesive national and international strategy to address climate change, there is little we can do to combat these impacts.”

Through a spokeswoman, Mr. Woodruff and other members of the council declined repeated requests to be interviewed.

In 2012, Congress gave the tribe permission to relocate inside the adjacent Olympic National Park. But without a tax base to pay for its move, the tribe sought federal money. Progress has been slow: The Quileute received about $50 million in grants to build a new school farther from the coast, but the total cost to relocate homes and other facilities could be two or three times that much, according to Larry Burtness, who manages federal grant applications for the Quileute.

Forty miles south, the Quinault tribe has been working on its own plan to retreat from Taholah, the reservation’s main town, for almost a decade. Tucked between a driftwood-strewn beach and a coastal rainforest, Taholah is exposed to storms, flooding and frequent power outages. That tribe has also struggled to get federal help.

“There’s no single source of revenue, at a state level or congressionally, to undertake these kinds of projects,” said Ms. Sharp, who was president of Quinault Nation until March.

A Struggle for Federal Aid

The federal government offers help to communities coping with the effects of climate change. But Native Americans have often been less able to access that help than other Americans.

“We’re the most disproportionately impacted by climate, but we’re the very least funded,” said Ann Marie Chischilly, executive director of the Institute for Tribal Environmental Professionals at Northern Arizona University.

The Federal Emergency Management Agency is less likely to grant requests for aid from native tribes recovering from disaster, compared to non-Native communities, according to FEMA data.

Native Americans are also less likely to have flood insurance, making it harder to rebuild. Of 574 federally recognized tribes, fewer than 50 participate in the National Flood Insurance Program, according to a review of FEMA data.

That’s partly because the federal government has completed flood maps for just one-third of federally recognized tribes, compared with the vast majority of counties. Flood maps can help tribal leaders more precisely understand their flood risks and prompt residents to purchase flood insurance.

But insurance premiums can be prohibitively expensive for Native Americans.

Individual households on Native lands are also less likely to get federal help girding for disasters. Of the 59,303 properties that have received FEMA grants since 1998 to prepare for disasters, just 48 were on tribal lands, according to Carlos Martín, a researcher at the Urban Institute.

FEMA said it is committed to improving tribal access to its programs.

Chefornak’s efforts to relocate its preschool illustrate the current difficulties of dealing with the federal government.

While FEMA offers grants to cope with climate hazards, replacing the school wasn’t an eligible expense, according to Max Neale, a senior program manager at the Alaska Native Tribal Health Consortium, who helped Chefornak search for federal aid.

The Department of Housing and Urban Development has a program to pay for infrastructure on tribal lands, but the maximum amount available wasn’t enough for a new school, and the agency wouldn’t grant money until the village had found other ways to make up the difference, Mr. Neale said.

HUD declined to comment on the record.

Replacing the preschool would only begin to address Chefornak’s troubles. Some two dozen homes need to be relocated, potentially costing more than $10 million, according to Sean Baginski, an engineer working with the village. And Chefornak is just one of more than 100 Native villages in Alaska alone that are exposed to significant climate risks.

“If the intent is for the government to find a way to fund this stuff,” Mr. Baginski said, “now would be a good time.”

Living Without Water

Damian Cabman, a member of the Navajo tribe, filled buckets of water to take home at the Bataan water loading station in Gallup, N.M. Many tribe members had relied on wells that have run dry with climate change.

Damian Cabman, a member of the Navajo tribe, filled buckets of water to take home at the Bataan water loading station in Gallup, N.M. Many tribe members had relied on wells that have run dry with climate change. Credit...Kalen Goodluck for The New York Times

Twice a week, Vivienne Beyal climbs into her GMC Sierra in Window Rock, a northern Arizona town that is the capital of Navajo Nation, and drives 45 minutes across the border into New Mexico. When she reaches the outskirts of Gallup, she joins something most Americans have never seen: a line for water.

Ms. Beyal’s destination is a squat concrete building that looks like a utility shed, save for the hoses that extend from either side. Once there, she waits as much as half an hour for her turn at the pump, then fills the four 55-gallon plastic barrels in the back of her truck.

The facility, which is run by the city of Gallup, works like an air pump at a gas station: Each quarter fed into the coin slot buys 17 gallons of water. Most of the people in line with Ms. Beyal are also Navajo residents, crossing into New Mexico for drinking water. “You can show up whenever you want,” she said. “As long as you can pay for it.”

Ms. Beyal has lived in Window Rock for more than 30 years and once relied on the community well near her home. But after years of drought, the water steadily turned brown. Then last year, it ran dry. “It’s on us to get water now,” she said.

Like much of the American West, Navajo Nation, the largest tribe in the country, has been in a prolonged drought since the 1990s, according to Margaret Hiza Redsteer, a professor at the University of Washington.

“As snowfall and rain levels have dropped, so have the sources of drinking water,” Dr. Redsteer said. “Surface streams have disappeared, and underground aquifers that feed wells are drying up. Conditions are just continuing to deteriorate.”

The federal government says the groundwater in the eastern section of Navajo Nation that feeds its communal wells is “rapidly depleting.”

“This is really textbook structural racism,” said George McGraw, chief executive officer of DigDeep, a nonprofit group that delivers drinking water to homes that need it. Navajo Nation has the greatest concentration of those households in the lower 48 states, he said.

The federal government is working on a billion-dollar project to direct more water from the San Juan River to a portion of the reservation, but that work won’t be finished until 2028.

The drought is also changing the landscape. Reptiles and other animals are disappearing with the water, migrating to higher ground. And as vegetation dies, cattle and sheep have less to eat. Sand dunes once anchored by the plants become unmoored — cutting off roads, smothering junipers and even threatening to bury houses.

“We’ve got to adapt to these conditions,” said Roland Tso, an official in the Many Farms area of Navajo Nation, where high temperatures hovered near 100 degrees for much of June. “We’re seeing the weather going crazy.”

New Administration, New Promises

As a presidential candidate last year, Mr. Biden highlighted the connection between global warming and Native Americans, saying that climate change poses a particular threat to Indigenous people.

But Mr. Biden’s most ambitious climate proposal, written into his $2 trillion infrastructure plan, included just two references to tribal lands: unspecified money for water projects and relocation of the most vulnerable tribes.

A White House spokesman, Vedant Patel, declined to comment on the record.

Ms. Haaland’s role as interior secretary gives her vast authority over tribal nations. But the department declined to talk about plans to protect tribal nations from climate change.

Instead, her agency provided a list of programs that already exist, including grants that started during the Obama administration.

“At interior, we are already hard at work to address the climate crisis, restore balance on public lands, and waters, advance environmental justice, and invest in a clean energy future,” Ms. Haaland said in a statement.

Heritage at Risk

Beyond the threats to drinking water and other basic necessities, a warming planet is forcing changes in the ancient traditions.

In Northern California, wildfires threaten burial sites and other sacred places. In Alaska, rising temperatures make it harder to engage in traditions like subsistence hunting and fishing. And on Cherokee Nation land, at the northeastern corner of Oklahoma, changing precipitation and temperature patterns threaten the crops and medicinal plants that connect the tribe with its past.

In 1830, President Andrew Jackson signed the Indian Removal Act, which resulted in the forced relocation of five tribes, including the notorious march of the Cherokee, from the Southeastern United States to Oklahoma, known as the Trail of Tears.

Despite losing their land, the Cherokee retained part of their culture: Heirloom beans, corn, and squash, as well as a range of medicinal plants such as ginseng, which they continued to grow in the temperate highlands at the eastern tip of their reservation.

“There was certainly a lot lost, but there was also a lot that was able to be maintained,” said Clint Carroll, a professor at the University of Colorado and a citizen of Cherokee Nation.

Now, drought and heat make it harder to grow the plants and crops of their ancestors.

“It can be seen as another removal,” Dr. Carroll said. But this time, he said, “Cherokee people aren’t moving anywhere — it’s the environment that’s shifting.”

In March, Pat Gwin, senior director for Cherokee Nation’s environmental resources group, showed a visiting journalist the tribe’s heirloom garden in Tahlequah, an enclosed plot the size of a tennis court where traditional squash, tobacco, corn, beans and gourds grow.

Seeds from the plants are distributed to Cherokee citizens once a year, a link to centuries of culture and existence that is dimming.

“Our access to and use of the land is so tied up with identity,” said Anton Treuer, professor of Ojibwe at Bemidji State University in Minnesota. “It’s who we are as a people.”

## K — Honorable Harvest

#### Their alt author calls for political action to solve climate change as an enactment of the Honorable Harvest—

Kimmerer 20, enrolled member of the Citizen Potawatomi Nation and an American Distinguished Teaching Professor of Environmental and Forest Biology; and Director, Center for Native Peoples and the Environment, at the State University of New York College of Environmental Science and Forestry. (December 2020, Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge, and the Teachings of Plants Excerpts by Barbara Keating, https://uumankato.com/wp-content/uploads/2020/12/B-Keating-Braiding.Sweetgrass.Notes\_.pdf)

Maple Nation: A Citizenship Guide Page 169: Both of my parents have been active in their town government for years, so I’ve seen how stewardship of a community happens. “Good communities don’t make themselves,” my dad said. “We’ve got a lot to be grateful for, and we all have to do our part to keep it going.” Page 172: (Maple sap harvester) “Of course sugaring is a gamble every year. It’s not like you can control the sap flow. Some years are good and some aren’t. You take what you get and be grateful for it. It all depends on the temperature, and that’s out of our hands.” But that’s not entirely true anymore. Our addiction to fossil fuel and current energy policies accelerate carbon dioxide inputs every year, unequivocally causing a global rise in temperatures. Spring comes nearly a week earlier than it did just twenty years ago. Pages 173-4: Maples face a grave enemy. The most highly regarded models predict that the climate of New England will become hostile to sugar maples within fifty years.… Rising temperatures will reduce seedling success and regeneration will thereby start to fail. It is already failing. Insects will follow, and the oaks will get the upper hand. ¶ … maples will become climate refugees. To survive they must migrate northward to find homes at the boreal fringe. Our energy policy is forcing them to leave. They will be exiled from their homelands for the price of cheap gas. ¶ We do not pay at the pump for the cost of climate change, for the loss of ecosystem services provided by maples and others. Cheap gas now or maples for the next generation? ¶ … we get the government we deserve. … (Maples) deserve you and me speaking up on their behalf. To quote our town council woman, “Show up at the damn meeting.” Political action, civic engagement – these are powerful acts of reciprocity with the land.

#### Any claim of “mutual exclusivity” inhibits resistance against settlerism; even if there’s a structure, it’s under construction

Svirsky 17, lecturer in international studies at the School of Humanities and Social Inquiry, University of Wollongong (Marcelo Svirsky, 2017, “Resistance is a structure not an event,” Settler Colonial Studies, Volume 7, Issue 1, pp. 19-39)

Though the key for Wolfe is to shed light on the mechanisms of elimination, Veracini takes Wolfe’s position that ‘we should not view the logic of elimination as solely a drive to exterminate Native human beings’, and suggests that we should focus on what the structure actualising the logic fails to accomplish.37 The difference between the two highlights the incompleteness of the settler project. If settler colonialism is not a fait accompli but an incomplete project invested in a continuing structuration of life actualising the logic of elimination, then we may expect the settler colonial paradigm to take seriously phenomena of struggle, resistance and confrontation, and hence to align itself with the idea of power not just as coercion or repression but as a complex multiplicity. This is simply because the incompleteness of elimination must be explained, and it cannot be explained just in terms of the oppressor’s self-error or strategic deferment. The methodological imperative that derives then, is to trace the forces that cause the settler structure to fail and remain incomplete – forces that work either by compelling retreat in specific policy areas, or because of the ineffectiveness of the settler structure in territorialising its logic and imposing its discourse, codifications, and meanings in all areas of life. As Macoun and Strakosch note, ‘[e]xposing the settler colonial project as fundamentally incomplete – and unable to be completed in the face of Indigenous resistance – has the potential to be a profoundly liberating and destabilizing move’. 38 This is because this move leads research to deal with liberatory forces. Some Palestinian scholars have taken the analysis of the Israeli settler state in this direction. Recently, Nadera Shalhoub-Kevorkian draws on Wolfe’s logic of elimination but not without combining her analysis of surveillance and fear with an account of practices of resistance.39 Similarly, Mazin Qumsiyeh notes that the brutal removal of villagers during Ottoman and later the British and, finally, Israeli rule over the past thirteen decades would have proceeded much faster and certainly would have resulted in a far more homogeneous Jewish state had it not been for Palestinian resistance.40 Explaining strategic and tactical changes in the continuing implementation of elimination only by means of the subject’s determination to eliminate appears as an act of theoretical cannibalism. The vicissitudes of elimination are the vicissitudes of the struggle, of resistance; or, as Veracini recently put it: the ‘settler colonial present is also an indigenous one’. 41 Settler stability, in other words, needs to be explained not just by way of the discourse of settler inscription but by taking seriously Veracini’s insistence that the settler colonial situation is best described in terms of a ‘permanent movement’. 42 Movement here needs to be conceived as a constantly changing composition of forces – those which seek to eliminate indigenous life together with those that either cause some of these attempts to fail, or that institute forms of life contiguous to settlerism – in both cases compelling settler colonialism to rework itself. The benefit of adopting the perspective of a field of forces lies, in the words of James Williams, in its questioning of ‘the evolution of things in order to sense how they have become what they are and how they may become something other’. This analytical sensibility, as he rightly adds, ‘sets things in movement above the secure foundation of an unchanging given’, enabling a view of political life which emphasises the variations occurring within a social order – though always in the making – claiming to be established.43 This logical development and contribution to the settler colonial paradigm is inspired mainly by the works of Gilles Deleuze and Félix Guattari. However, the objections to their works among some scholars of settler colonialism, warrant a more extended response. The opposition to Deleuze and Guattari in settler colonial studies may be seen as originally deriving from Gayatri Chakravorty Spivak’s famous ‘Can the Subaltern Speak?’ 44 The short answer to that question is that the charges raised by Spivak cannot stand, especially if we take into account Deleuze and Guattari’s own political activism in indigenous struggles, particularly with specific Palestinian and Algerian anticolonial campaigns.45 Spivak hinged her critique of Deleuze and Foucault on a conversation between them.46 According to Spivak, Deleuze is ‘a dangerous [ … ] first world intellectual masquerading as the absent non-representor who lets the oppressed speak for themselves’, where in fact, so the story goes, he is ascribing to a Western philosophy and politics of anti-difference.47 As Robinson and Tormey rightly explain, Deleuze and Guattari focus not on the authenticity of the voice but on ‘whether the subaltern is “speaking” so as to be added as an axiom, or is “speaking” in a manner disruptive of processes of capture and control’. 48 Namely, in Deleuze and Guattari, questions of representation are relegated in favour of strategic questions of decolonisation. As Robinson and Tormey put it, for Spivak, ‘Subalternity is thus a condition of inaccessibility and radical otherness that in turn escapes the clutches of anthropology and the “human sciences”. They cannot speak and we cannot “know” them – though of course the subaltern can be represented’. 49 Agreed: if the subaltern can speak, it is certainly not through the theorisations of Western white intellectuals. This is where, to some extent, Wolfe’s critique of white ventriloquism and the resonances of this form of representation with the settler project, finds an ally. Moreover, the relegation of the study of resistance to that of domination and the belief on the inevitability of oppression is also common to both. As Spivak states, the question is not of female participation in insurgency, or the ground rules of the sexual division of labour, for both of which there is ‘evidence’. It is, rather, that, both as object of colonialist historiography and as subject of insurgency, the ideological construction of gender keeps the male dominant.50 The inevitability of power, so to speak, seems to be the Spivak’s standpoint, from where, as Andrew Robinson explains, she opposes the openness of theories such as those of Deleuze and Foucault, who leave space for resistance and ‘lines of flights’, insisting instead that the system is a total trap which can actually go as far as to foreclose the possibility of subaltern colletivities emerging.51 This reading of Deleuze, Guattari and Foucault turned into a springboard for others, and has influenced the works of a number of scholars in settler colonial studies, such as Jodi Byrd, and Alex Trimble Young. Eyal Weizman’s works have also been marked as critical of Deleuze and Guattari.52 Byrd and Young share a similar critique – that Deleuze and Guattari ‘reproduce frontier tropes’, particularly in their engagement with the US west and with some American writers.53 According to Byrd, A Thousand Plateaus ‘performs a global, nomadic reframing in which the frontier becomes, again, Frederick Turner’s site of transformation, possibility, and mapping’. 54 The disavowal of Deleuze and Guattari in these authors is fashioned by means of three techniques: decontextualisation, adjectivation, and bad association. In the first technique, passages from A Thousand Plateaus are disassociated from the general method according to which there are no good or bad rhizomes, nomads, transformations, or possibilities – but rather a Spinozean ethics of movements and forces as a problem of what can a system do. Thus, to imply that Deleuze and Guattari are not offering theoretical tools but rather celebrate white-led deterritorialisations – as ‘US imperialism has always celebrated “pioneers” who would “go across, get out, break through” new frontiers’ – is to join Spivak in her critique.55 The second technique is an exercise on appropriating Deleuze and Guattari’s concepts to enliven depictions of settler domination. In a bid to prove the natural suitability of Deleuze and Guattari’s concepts to speak power, Young deploys their work to animate descriptions of settler domination. For instance: ‘For Wolfe, there is a parallel between nationalist historiography [ … ] which imagines the frontier as the site where a diverse assemblage of settlers is forged into a “composite nationality”’. 56 A similar form of adjectivation takes place in Young’s analysis of Eyal Weizman’s ‘Walking through Walls’. There, Young designates Israeli power in terms of settlers following ‘“lines of flight” made possible by the “smoothing” of indigenous space’. 57 In this narrative, ‘assemblage’, ‘rhizomes’, and ‘lines of flights’ are produced or experimented by villains – whether the legendary frontier addict Frederick Jackson Turner, Kerouac’s characters, or IDF general Kohavi. With the third technique Young condemns Deleuze and Guattari for citing authors such as Leslie Fiedler, and Jack Kerouac, who imagined ‘the West as a site of national significance’. 58 What matters, however, is how we use a thing and not how others use, or who these others are. Deleuze and Guattari are important for a focus on resistance. Pivotal to a DeleuzianGuattarian ontology is that its ‘elements’ – defined in terms of forces, fluxes and their relations – exist in a processual state. For them, ‘the general theory of society is a generalized theory of flows’. 59 It may be argued that the settler colonial paradigm does investigate processes, as, for instance, in Wolfe’s three-phased genealogy of settler domination. But the problem with this genealogy is the majoritarian role the monologue of oppression plays in it. To become a truly critical enterprise, settler colonial theory must foster an ethical sensibility towards the coexistence and competition of the myriad forces that aggregatively produce transformation or its arrest, and to translate this sensibility into a new methodology. Deterritorialisations and reterritorialisations occur, as Deleuze and Guattari explain, as ‘strictly complementary and coexistent, because one exists only as a function of the other’. 60 This ontological perspective may promote in settler colonial studies interpretations that acknowledge the multiplicity of the field of forces manufacturing the social. Deleuze and Guattari add: ‘It is in terms not of independence, but of coexistence and competition in a perpetual field of interaction, that we must conceive of exteriority and interiority, war machines of metamorphosis and state apparatuses of identity’. 61 The question is how to translate this ontology of social forces and flows into a model for what we commonly term ‘resistance’. The problem of theory with ‘phenomena of resistance’ is not only how we conceptualise the material and discursive manifestations of these phenomena and their potentialities, but also how we carry the linguistic burden of a concept – resistance – that etymologically and semantically, in all its various fields of application, speaks of ‘opposition to’ an acknowledged arrangement of organised force (electrical current, motion of solids or fluids, erosion, political power, and so forth). This convention is indeed problematic not only because there is more to ‘phenomena of resistance’ than operations of counterattack, but also because operations of counterattack have a low liberatory theoretical status, or as Wolfe puts it, because ‘in generating its own resistance, settler-colonial power also contains it’. 62 In my attempt to develop a model for ‘phenomena of resistance’, I propose firstly to retain the term resistance as employed in public discourse, and also in the humanities and the social sciences. In retaining the name of resistance for ‘phenomena of resistance’, I aim to challenge not only the straightjacket of designation (or denotation), but also the cuff of existent significations that make resistance as ‘opposition to’ to be the condition of truth and falsehood of the phenomena.63 Secondly, beyond controversies over the term resistance, what matters is the sense of ‘phenomena of resistance’, that is, an affection of dis-alignment of bodies (material and non-material bodies) in relation to common sense and the consensual patterns and directions of society.64 In resistance, as Deleuze put it, we resist ‘the temptation against being forced’ in the majoritarian directions of society and popular opinion.65 To move this discussion one step forward, we would need to provide an answer to the problem of the location of the initial gesture of dis-alignment. Given the arrangements of power, I would like to argue that ‘phenomena of resistance’ or dis-alignment may take place both before and after processes of capture, organisation and signification by forces operating in the space of interiority of systems. This suggestion risks being seen as going against Deleuze and Guattari’s choices: in 1977 Deleuze writes to Foucault in a letter, I myself don’t wonder about the status resistance phenomena may have, since flights line are the first determinations, since desire assembles the social field, power arrangement are both products of these assemblages and that which stamps them out or seal them up.66 Lines of flights come first, power stratifies them after. Three years after, in A Thousand Plateaus Deleuze and Guattari ratify this view that ‘power is a stratified dimension of the assemblage’, and that ‘lines of flight are primary’, that lines of flights ‘are not phenomena of resistance and counterattack’. 67 Hence, here they distinguish between flow/forces that in their nature are pre-capture, and other forces – of resistance or counterattack – operating as a reaction to power arrangements. Again, it is commonplace to see this distinction as a cautionary measure against mixing up always-already reterritorialised challenges of power with the exteriority of lines of flights. But this distinction omits some materialisations of ‘phenomena of resistance’. I would like to suggest that three modus operandi under the general name of resistance derive from this view on social flows and forces. The first form of resistance is Deleuze and Guattari’s lines of flights, or resistance ‘A’: as Ronnen Ben-Arie explains following Deleuze and Guattari, ‘there is always an excess of flows and forces that escape the mechanisms of organisation, codification and management’ of power;68 ‘there is always something that flows or flees; that escapes the binary organizations’. 69 It is this excess, produced as external to the operations of systems, that eludes the attempts of power to organise and codify it. In their nature, these movements of life do not retaliate directly against state power – though doubtless they do not dwell in a state of unawareness in relation to it. But they challenge power by speaking and acting outside of the common institutional and normative boundaries. One example of this resistance is the Boycotts, Divestments and Sanctions movement (BDS), led by Palestinian civil society since 2005. BDS weakens the dominance of the normative discourse about IsraelPalestine in the international arena because it refuses to engage with the traditional topics and assumptions of that discourse while at the same time it confronts Israel’s violence on a new terrain of action in which Israel finds itself struggling.70 The Palestinian efforts to build economic and social self-sufficiency and independence in the West Bank and Gaza is yet another example of civil resistance that does not face Israeli power directly, and in fact, it is a form of resistance that forces Israel to react.71 Yet, these forms do not exhaust the entirety of forces misaligning with state power; the two remaining forms of resistance gesture their motion as countering forces. Resistance ‘B’: these are displays of resistance compelling majoritarian forces to adjust and at times to redefine themselves, even if this is a countering operation still functioning within the space of interiority of state power. In the Palestinian case, Supreme Court appeals countering unjust laws and policies, is a classic attempt to actualise this type of resistance. Resistance ‘C’: these displays of resistance become actualised in the way Wolfe conceives it, that is, they remain locked in the space of interiority of state power (or other systems) without affecting bodies in any significant way.72 For instance, the main aspects of the actions led by the Zionist left in Israel fall into this category. These operations take the name of resistance in vain. Whether we produce lines of flight or adjacent existential territories to the system (resistance ‘A’), or we force it to deflect (resistance ‘B’), we create dis-alignments in relation to the arrangements of power. It is in this way I suggest listening to Deleuze in L’Abécédaire, seven years after the publication of A Thousand Plateaus, when answering Claire Parnet’s question (‘what do we resist exactly?’): ‘whenever one creates, one resists’. 73 A caveat and a conclusion in regard to this model of resistance are of relevance at this point: we should not see the three modes as each corresponding to a different homogenous and shut-off operation of resistance. That is, the three modes of affection of resistance are not mutually exclusive, and in fact, are to be found always-already intermingling at different and changing intensities and degrees in any action that at prima facie is claimed to challenge power. We rarely find a pure operation of resistance. For instance, elsewhere I have analysed the operations of resistance of the Arab-Jewish bilingual schools in Israel and there I noted that while some aspects of these assemblages invest in weaving new forms of cooperation and lifestyles, these are being partially stifled by the interests of identity and ethnicity.74 The history of the Palestinian armed struggle is replete with lines of flights and reterritorialisations; the undertakings of legendary leader Izz al-Din al-Qassam who in the early 1930s called for armed revolt were ground-breaking both in creating alternative territories of leadership (i.e. rural vs. urban), and in organising farmers displaced by Zionist takeovers of land.75 More generally, Yezid Sayigh’s thesis is that the armed struggle was pivotal in the building a national Palestinian persona, even though it proved many times to carry a too high price for the Palestinian people to bear.76 Therefore, acts of resistance need to be analysed in their complexity to diagnose how and to what extent they submit to, confront or evade power. In other words, betrayal, confrontation, and escape are forms of affection specific of forces misaligning with state power. In addition, we can already see where this model of resistance is taking us in terms of conducting a full analysis of social formations: for such an analysis not to be deficient, it must take account of resistance in all its forms, of the organisations of power, and of the dynamics between the two forms of arrangement. How can various ‘phenomena of resistance’ be positioned in relation to Patrick Wolfe’s axiom (‘settler invasion is a structure not an event’)? Wolfe’s axiom is accurate in the sense that settler invasion is in no way an episode, or a single event. Yet, a structure, Deleuze explains, is defined ‘by the nature of certain [ … ] elements which claim to account both for the formation of wholes and for the variation of their parts’. 77 As Deleuze and Guattari explain, the ‘word “structure” may be used to designate the sum of these relations and relationships, but it is an illusion to believe that structure is the earth’s last word’. 78 The question is then, what are the forces that bring about the variation of the parts of the structure and their relations, redefining it anew? From this point of view, there need be little hesitation in granting that it is wrong to assume that the forces responsible for the structure are to be sought in a uniform series of unidirectional power strategies conceived as always already signifying domination, as if settler colonialism were a smooth logarithmic function asymptotic to elimination. Furthermore, it is not that a structure has things as its extremities – a categorical organised body – since a ‘structure is a living part of things’. 79 If a structure can be seen as the symbolic resultant of a series of combinations of relations that give life to practices, institutions, subjectivities, imaginations, and so forth, then it is crucial to understand that ‘there are always more combinations beyond those that have happened’. 80 This is what makes a structure the necessary condition for the transformation of things, rather than a structured thing.81 Alongside its endurance and consistency, a structure is always traversed by movements of excess, deficiencies, withdrawals, displacements, and bifurcations. Theory must account for them. The significant questions, then, concern what the limits of the structure are, where the structure is forced to bifurcate, and where old determinacies lose their consistency and endurance such that they have to be replaced or changed. In other words, taking a cue from Veracini’s point about ‘intention’, we should ask: what are the forces causing the logic of elimination to fail, and how do they operate?82 Strictly speaking, a structure is defined by what escapes it, not by its violence. This is because what the structure fails to capture, discipline and codify is what defines its thresholds, its limits, or more exactly, the limitations of its functions. And ‘methodologically’, as Srnicek explains, ‘this entails that we look not to classify political entities by their characteristic qualities, but rather by the processes which produce and continually function to sustain them’. 83 For instance, more can be learnt (in terms of political work done and to be done) from a study that classifies Israel as a settler system affected by boycotts and other modes of resistance than from approaches that portray it in terms of some sort of supreme settler violence. The political ontology that provides the necessary infrastructure to take account of this method of study of structures is given by the model of resistance elaborated above, one that complicates the study of the arrangements of power with that of the different modes of resistance. From this methodological viewpoint, for example, education in Israel is defined not only by Zionist forces of militarism and segregationism but by the fragile forms of Arab–Jewish education struggling to create shared spaces of life that trouble these forces and compel them to readjust.84 It is by looking into such leakages that we learn more comprehensively about the ordinariness and upheavals of the functions of the system.

#### --It attends to their beauty and their pain—the plan is an act of reciprocity

Steel 21, Reporter for Windspeaker.com. (Deb, Botanist reclaims Indigenous ways of knowing plants as persons and family, https://windspeaker.com/buffalo-spirit/botanist-reclaims-indigenous-ways-knowing-plants-persons-and-family)

This thinking persists today, but Kimmerer believes that the concept of plants as objects strips us of our responsibility to them. “They are just stuff.” But in Indigenous ways of knowing, plants are not viewed as the lowest, but as esteemed and respected persons. Kimmerer said she didn’t mean anthropomorphized versions of humans, but beings with their own gifts to share, their own intentions, sovereign and capable of charting their own pathways. Today, this way of knowing plants is on the cutting edge of contemporary plant science. Plants are the oldest of our teachers, Kimmerer said. “Let’s remember tonight as we go forward that one of the hallmarks of Indigenous ways of knowing is that we are blessed by being surrounded by intelligences other than our own,” she said. “In this year, which is the warmest ever recorded on the planet, and in this time when we have entered into the age of the sixth extinction… it is important to remember that we humans can’t innovate our ways out of this alone. It’s a good thing that we have our plant teachers.” Elder plants know everything needed to know about surviving into the future,” Kimmerer said. There is a lot they can teach us in this time of dramatic change and adaptation. Kimmerer joked that plants are not in endless meetings debating carbon tax structures, nor have they abandoned the Paris Accord. Plants have already converted completely to a solar economy, a model for human transformation. She talked of the lofty goal of entrepreneur Richard Branson’s Virgin Earth Challenge and its $25 million prize for someone to come up with a new technology that would take carbon dioxide out of the atmosphere, removing greenhouse gases. Kimmerer said there already is a system that does this. It’s takes carbon out of the atmosphere and emits oxygen, it purifies water, and builds soil. “Of course, that invention is the forest,” said Kimmerer. Science is starting to learn that plants can communicate, make choices, learn, strategize, and hear and respond to what they hear. They have their own stories, intentions and gifts. “Science is catching up to our traditional understanding of the personhood of plants,” she said. Plants are intrinsically valuable with gifts to share. They are more than objects, natural resources or things that can be turned into commodities. “I want to challenge my colleagues that work in departments of Natural Resources and ask them wouldn’t you rather teach in the department of Earthly Gifts.” The words we use really matter, Kimmerer said, like the word “sustainability”. Potawatomi Elders, upon hearing a number of definitions for the word sustainability said it sounded like a word that meant a way to keep on taking. It’s not right to keep on taking, they said. People should be thinking about what they have that they can give back. We should have mutually beneficial interactions, said Kimmerer. Those kinds of teachings are largely missing from schools on natural resources, she said. “So the question that really focuses us now is this one: In return for all of the gifts of the plants, how do we reciprocate? How do we give back?” Kimmerer said this was the most pressing question of our time. It’s the way the world actually works. “We know through ecosystem function that you can’t just take without replenishing. That’s not possible… Reciprocity among all the parts of the living world is what produces the conditions in which life can flourish.” Human beings seem to be the only species which pretends that such a necessity of function does not exist. Ancient wisdom tells us, said Kimmerer, that “the hallmark of an educated person is a person who knows what their gift is and how to give it in the world.” There are gifts that humans can offer in return for the wealth of gifts that plants have provided, including the act of paying attention, a unique human gift that can be given back to the plant world as an ongoing act of reciprocity. “Attention generates wonder which generates more attention and more joy which leads us to gratitude.” She said paying attention requires that we see not only the beauty, however, but also the pain, to celebrate the old growth and mourn the clearcut, to see the mountain and to see the mine. “Paying attention to the suffering in the world sharpens our ability to respond, to be responsible.” When you fall in love with the living world, you can’t be a bystander to its destruction, said Kimmerer.

#### Kimmerer advocates the perm—they endorse embracing indigenous knowledge and science and policy change to help preserve species

Kimmerer 2, enrolled member of the Citizen Potawatomi Nation and an American Distinguished Teaching Professor of Environmental and Forest Biology; and Director, Center for Native Peoples and the Environment, at the State University of New York College of Environmental Science and Forestry. (Robin, May 02, Weaving Traditional Ecological Knowledge into Biological Education: A Call to Action, <https://www.esf.edu/nativepeoples/documents/weaving.pdf>)

Recognition of traditional ecological knowledge increases opportunities for productive partnerships between Western scientists and indigenous people. Understanding of traditional knowledge can foster creative collaborations between indigenous and local peoples and tribal governments and Western environmental scientists, nongovernment organizations (Weber et al. 2000), policymakers, and natural resource managers. Many case histories document such cooperation, such as the biocultural restoration work of the Indigenous Peoples Restoration Network, the Intertribal Bison Cooperative, wolf restoration in Nez Perce territory (Robbins 1997), and Peoples Biodiversity Registers Program (Gadgil et al. 2000). Nabhan (2000) proposes partnerships with indigenous peoples to integrate their extensive knowledge bases for endangered species recovery efforts.

#### Even if tech’s dangerous, it’s the only thing that stops massive die offs — plus it maximizes value to life.

Haeberlin, 4 – nuclear engineer, led the Nuclear Safety and Technology Applications Product Line at the Pacific Northwest National Laboratory (Scott, A Case for Nuclear-Generated Electricity, p. 31-40)

Well, then let's not do that, huh? Well, no, not hardly, because without that use of fertilizers we couldn't produce the food to feed the population. We just couldn't do it. Here are some comparisons."

If you used no fertilizers or pesticides you could get 500 kilograms of grain from a hectare in a dry climate and as much as 1000 kilograms in a humid cli­mate. If you got organic and used animal manure as fertilizer, assuming you could find enough, you might get as much as 2000 kilograms per hectare. For a sense of scale, the average in the United States, where recall we only get half the food value to hectare as the intensively farmed Chinese crop land, we get about 4500 kilograms per hectare on the average. In serious cornfields with fertilizer, irrigation, and pesticides, the value is 7000 kilograms per hectare.

Modern mechanized, chemically supported agriculture produces 7 to 14 times the food that you would get without those advantages. Even the best organic farming would produce only 30 to 45% of the food value you would get from the same sized chemically fertilized farm, and that is assuming you could get the manure you needed to make it work.

In very stark terms, without the chemically enhanced farming we would have probably something like one-fifth the food supply we have now. That means four-fifths the population would not be fed, at least as we are organized now. So, no, just giving up on fertilizers is not in the deal.

However, we could get the hydrogen and energy from sources other than natural gas. Nuclear energy could be used to provide electricity to extract hydrogen from water and produce the process heat required to combine the hydrogen and nitrogen from the air. That is just a thought to stick in your mind. While we are looking at energy use in agriculture, here are a few more numbers for you.10 If you look at the energy input into agriculture and the energy you get out, you see some interesting facts. By combining the energy used to make fertilizers and pesticides, power irrigation, and run the farm machinery in the United States, we use about 0.7 kcal of fossil fuel energy for each 1 kcal of food we make. This doesn't include the energy needed to process and transport the food. In Europe where they farm more intensely, the amount of energy out is just about the same as energy in. In Germany and Italy the numbers are 1.4 and 1.7 kcal energy input to each 1 kcal output respectively. The point is you need energy to feed people, well at least a lot of people.

Which gets us back to Cohen and his question. One of the studies he examined looked at a "self-sustaining solar energy system." For the United States, this would replace all fossil energy and provide one-fifth to one-half the current energy use. The conclusion of the study was that this would either produce" a significant reduction in our standard of living ... even if all the energy conservation measures known today were adopted" or if set at the current standard of living, "then the ideal U.S. population should be targeted at 40-100 million people." The authors of that study then cheerfully go on to point out that we do have enough fossil fuel to last a least a century, as long as we can work out the pesky environmental problems. So, you can go to a "self-sustaining" energy economy as long as you are willing to shoot between 2 out of 3 and 6 out of 7 of your neighbors.

And this is a real question. The massive use of fossil fuel driven agriculture to provide the fertilizers and pesticides, and power the farm equipment, is a) vitally important to feed everyone, and b) something we just can't keep up in a business-as-usual fashion. Sustainable means you can keep doing it. Fossil energy supplies are finite; you will run out some time. Massive use of fossil energy and the greenhouse gases they produce also may very well tip the planet into one of those extinction events in which a lot of very bad things happen to a lot of the life on the earth.

O.K. to Cohen's big question, how many people can the earth support? What it comes down to is that the "Well, it depends" answer depends on

• what quality of life you will accept,

• what level of technology you will use, and

• what level of social integration you will accept.

We have seen some of the numbers regarding quality of life. Clearly if you are willing to accept the Bangladesh diet, you can feed 1.8 times more people than if you chose the United States diet.

If you choose the back-to-nature, live like our hearty forefathers, level of technology, you can feed perhaps one-fifth as many people as you can with modern chemical fertilized agriculture. The rest have to go.

And here is the tough one. You can do a lot better, get a lot more people on the planet, if you just force a few things. Like, no more land wasted in growing grapes for wine or grains for whiskey and beer. No cropland used for tobacco. No more grain wasted on animals for meat, just grain for people. No more rich diets for the rich countries, share equally for everyone. No more trade barriers; too bad for the farmers in Japan and France, those countries would just have to accept their dependence on other countries for their food. It is easy to see that at least some of those might actually be a pretty good thing; however, the kicker is how do you get them to happen? After all, Mussolinill did make the trains run on time. How could you force these things without a totalitarian state? Are you willing to give up your ability to choose for yourself for the common good? It is not pretty, is it?

Cohen looked at all the various population estimates and concluded that most fell into the range of 4 to 16 billion. Taking the highest value when researchers offered a range, Cohen calculated a high median of 12 billion and taking the lower part of the range a low median of 7.7 billion. The good news in this is 12 billion is twice as many people as we have now. The bad news is that the projections for world population for 2050 are between 7.8 and 12.5 billion. That means we have got no more than 50 years before we exceed the nominal carrying capacity of the earth. Cohen also offers a qualifying observation by stating the "First Law of Information," which asserts that 97.6% of all statistics are made up. This helps us appreciate that application of these numbers to real life is subject to a lot of assumptions and insufficiencies in our understanding of the processes and data.

However, we can draw some insights from all of this. What it comes down to is that if you choose the fully sustainable, non-fossil fuel long-term options with only limited social integration, the various estimates Cohen looked at give you a number like 1 billion or less people that the earth can support. That means 5 out of 6 of us have got to go, plus no new babies without an offsetting death.

On the other hand, if you let technology continue to do its thing and perhaps get even better, the picture need not be so bleak. We haven't made all our farmland as productive as it can be. Remember, the Chinese get twice the food value per hectare as we do in the United States. There is also a lot of land that would become arable if we could get water to it. And, of course, in case you need to go back and check the title of this book, there are alternatives to fossil fuels to provide the energy to power that technology.

So given a positive and perhaps optimistic view of technology, we can look to some of the high technology assumption based studies from Cohen's review. From the semi-credible set of these, we can find estimates from 19 to 157 billion as the number of people the earth could support with a rough average coming in about 60 billion. This is a good time to be reminded of the First Law of Information. The middle to lower end of this range, however, might be done without wholesale social reprogramming. Hopefully we would see the improvement in the quality of life in the developing countries as they industrialize and increase their use of energy. Hopefully, also this would lead to a matching of the reduction in fertility rates that has been observed in the developed countries, which in turn would lead to an eventual balancing of the human population.

The point to all this is the near-term future of the human race depends on technology. If we turn away from technology, a very large fraction of the current and future human race will starve. If we just keep on as we are, with our current level of technology and dependence on fossil fuel resources, in the near term it will be a race between fertility decrease and our ability to feed ourselves, with, frankly, disaster the slight odds-on bet. In a slightly longer term, dependence on fossil fuels has got to lead to either social chaos or environmental disaster. There are no other end points to that road. It doesn't go anywhere else.

However, if we accept that it is technology that makes us human, that technology uniquely identifies us as the only animal that can choose its future, we can choose to live, choose to make it a better world for everyone and all life. This means more and better technology. It means more efficient technology that is kinder to the planet but also allows humans to support large numbers in a high quality of life. That road is not easy and has a number of ways to screw up. However, it is a road that can lead to a happier place, a better place.

Two Concluding Thoughts on the Case for Technology

Two more points and I will end my defense of technology. First, I want to bring you back from all the historical tour and all the numbers about population to something more directly personal. Let me ask you two questions.

What do you do for a living?

What did you have for breakfast?

Don't see any connection between these questions or of their connection to·the subject of technology? Don't worry, the point will come out shortly. I am just trying to bring the idea of technology back from this grand vision to its impact on your daily life.

Just as a wild guess, your answer to the first question was something that, say 500 years ago, didn't even exist. If we look 20,000 years ago, the only job was" get food." Even if you have a really directly socially valuable job like a medical doctor, 20,000 years ago you would have been extraneous. That is, the tribe couldn't afford you. What, no way! A doctor could save lives, surely a tribe would value such a skill. Well, sure, but the tribe could not afford taking one of their members out of the productive */I* getting the food" job for 20 years while that individual learned all those doctor skills.

If you examine the "what you do for a living" just a bit I think you will see a grand interconnectedness of all things. I personally find it pretty remarkable that we have a society that values nuclear engineers enough that I can make a living at it. Think about it. Somehow what I have done has been of enough value that, through various taxpayer and utility ratepayers, society has given me enough money for food and shelter. The tribe 20,000 years ago wouldn't have put up with me for a day.

You see, that is why we as humans are successful, wildly successful in fact. We work together. "Yeah, sure we do," you reply, " read a newspaper lately?" Well, *O.K.,* we fuss and fight a good deal and some of us do some pretty stupid and pretty mean things. But the degree of cooperation is amazing if you just step back a bit.

O.K., what did you have for breakfast: orange juice, coffee, toast, maybe some cereal and milk? Where do these things come from? Orange juice came from Florida or California. Coffee came from South America. Bread for the toast came perhaps from Kansas; cereal, from the Mid-West somewhere. The jam on the toast may have come from Oregon, or maybe Chile. Milk is probably the only thing that came from within a hundred miles of your breakfast table. Think about it. There were hundreds of people involved in your breakfast. Farmers, food-processing workers, packaging manufacturers, transportation people, energy producers, wholesale and retail people. Perhaps each one only spent a second on their personal contribution to your personal breakfast, but they touch thousands of other people's breakfasts as well. In turn, you buying the various components of your breakfast supported, in your part, all those people. They in turn, in some way or another, bought whatever you provide to society that allowed you to buy breakfast. Pretty amazing, don't you think?

Now when you look at all that, think about what ties all the planetwide interconnection, Yep, you guessed it: technology. Without technology, you get what is available within your personal reach, and what you produce is available only to those who are near enough that you can personally carry it to them on your own two feet. Technology makes our world work. It gives you personally a productive and socially valuable way to make both a living and to provide your contribution to the rest of us**.**

I want you to stop a minute and really think about that. What would your life be like without technology? Could you do what you currently do? Would anyone be able to use what you do? Would anyone pay you for that? "But I am a school teacher," you say, "of course, they would pay me!" Are you sure? Why do you need schools if there is no technology? All I need is to teach the kid how to farm and how to hunt. Sons and daughters can learn that by working in the fields along with their parents. See what I mean?

Now, I have hopefully reset your brain. Sure, you are still going to be hit with daily "technology is bad" messages. Hopefully, you are a bit more shielded against that din, and you have been given some perspective to balance that message and are prepared to see the true critical value of technology to human existence. The point is that technology is what makes us human. Without it, we are just slightly smarter monkeys.

You may feel that 6 billion of us are too many, and that may very well be. I personally don't know how to make that value decision. Which particular person does one select as being one of the excess ones?

However, the fact is that there are 6 billion of us, and it looks like we are headed for 10 to 12 billion in the next 50 years, Without not only the technology we have, but significantly better and more environmentally friendly technology, the world is going to get ugly as we approach these numbers,

On the other hand, with the right technologies we can not only support those numbers, we can do it while we close the gap between the haves and have-nots. We can make it a better place for everyone. It takes technology and the energy to drive it. Choosing technology is what we have to do to secure the evolutionary selection of us as a successful species, Remember, some pages back in discussing the unlikely evolutionary path to us, I said we are not the chosen, unless. Unless we choose us. This is what I meant. We are totally unique in all of evolutionary history. We humans have the unique ability and opportunity to choose either our evolutionary success or failure. A choice of technology gives us a chance. A choice rejecting technology dooms us as a species and gives the cockroaches the chance in our place. Nature doesn't care what survives, algae seas, dinosaurs, humans, cockroaches, or whatever is successful. If we care, we have to choose correctly.

As an aside, let me address a point of philosophy here. If any of this offends your personal theology, I offer this for your consideration. Genesis tells us God gave all the Earth to humanity and charged us with the stewardship thereof. So it is ours to use as well as we can. That insightful social philosopher Niccolo Machiavelli put it this way in 1501:

"What remains to be done must be done by you; since in order not to deprive us of our free will and such share of glory as belongs to us, God will not do everything Himself."

*O.K.,* you are saying, "I give." You have beaten the socks off me. Technology is good; technology is the identifying human trait and our only hope. But what is this stuff about choosing technology or not? Technology just happens doesn't it? I mean, technology always advances, it always has, so why the big deal?

#### Technological innovation successfully dematerializes growth and solves warming

McAfee 19, \*Andrew Paul McAfee, a principal research scientist at MIT, is cofounder and codirector of the MIT Initiative on the Digital Economy at the MIT Sloan School of Management; (2019, “More from Less: The Surprising Story of How We Learned to Prosper Using Fewer Resources and What Happens Next”, https://b-ok.cc/book/5327561/8acdbe)

There is no shortage of examples of dematerialization. I chose the ones in this chapter because they illustrate a set of fundamental principles at the intersection of business, economics, innovation, and our impact on our planet. They are:

We do want more all the time, but not more resources. Alfred Marshall was right, but William Jevons was wrong. Our wants and desires keep growing, evidently without end, and therefore so do our economies. But our use of the earth’s resources does not. We do want more beverage options, but we don’t want to keep using more aluminum in drink cans. We want to communicate and compute and listen to music, but we don’t want an arsenal of gadgets; we’re happy with a single smartphone. As our population increases, we want more food, but we don’t have any desire to consume more fertilizer or use more land for crops.

Jevons was correct at the time he wrote that total British demand for coal was increasing even though steam engines were becoming much more efficient. He was right, in other words, that the price elasticity of demand for coal-supplied power was greater than one in the 1860s. But he was wrong to conclude that this would be permanent. Elasticities of demand can change over time for several reasons, the most fundamental of which is technological change. Coal provides a clear example of this. When fracking made natural gas much cheaper, total demand for coal in the United States went down even though its price decreased.

With the help of innovation and new technologies, economic growth in America and other rich countries—growth in all of the wants and needs that we spend money on—has become decoupled from resource consumption. This is a recent development and a profound one.

Materials cost money that companies locked in competition would rather not spend. The root of Jevons’s mistake is simple and boring: resources cost money. He realized this, of course. What he didn’t sufficiently realize was how strong the incentive is for a company in a contested market to reduce its spending on resources (or anything else) and so eke out a bit more profit. After all, a penny saved is a penny earned.

Monopolists can just pass costs on to their customers, but companies with a lot of competitors can’t. So American farmers who battle with each other (and increasingly with tough rivals in other countries) are eager to cut their spending on land, water, and fertilizer. Beer and soda companies want to minimize their aluminum purchases. Producers of magnets and high-tech gear run away from REE as soon as prices start to spike. In the United States, the 1980 Staggers Act removed government subsidies for freight-hauling railroads, forcing them into competition and cost cutting and making them all the more eager to not have expensive railcars sit idle. Again and again, we see that competition spurs dematerialization.

There are multiple paths to dematerialization. As profit-hungry companies seek to use fewer resources, they can go down four main paths. First, they can simply find ways to use less of a given material. This is what happened as beverage companies and the companies that supply them with cans teamed up to use less aluminum. It’s also the story with American farmers, who keep getting bigger harvests while using less land, water, and fertilizer. Magnet makers found ways to use fewer rare earth metals when it looked as if China might cut off their supply.

Second, it often becomes possible to substitute one resource for another. Total US coal consumption started to decrease after 2007 because fracking made natural gas more attractive to electricity generators. If nuclear power becomes more popular in the United States (a topic we’ll take up in chapter 15), we could use both less coal and less gas and generate our electricity from a small amount of material indeed. A kilogram of uranium-235 fuel contains approximately 2–3 million times as much energy as the same mass of coal or oil. According to one estimate, the total amount of energy that humans consume each year could be supplied by just seven thousand tons of uranium fuel.

Third, companies can use fewer molecules overall by making better use of the materials they already own. Improving CNW’s railcar utilization from 5 percent to 10 percent would mean that the company could cut its stock of these thirty-ton behemoths in half. Companies that own expensive physical assets tend to be fanatics about getting as much use as possible out of them, for clear and compelling financial reasons. For example, the world’s commercial airlines have improved their load factors—essentially the percentage of seats occupied on flights—from 56 percent in 1971 to more than 81 percent in 2018.

Finally, some materials get replaced by nothing at all. When a telephone, camcorder, and tape recorder are separate devices, three total microphones are needed. When they all collapse into a smartphone, only one microphone is necessary. That smartphone also uses no audiotapes, videotapes, compact discs, or camera film. The iPhone and its descendants are among the world champions of dematerialization. They use vastly less metal, plastic, glass, and silicon than did the devices they have replaced and don’t need media such as paper, discs, tape, or film.

If we use more renewable energy, we’ll be replacing coal, gas, oil, and uranium with photons from the sun (solar power) and the movement of air (wind power) and water (hydroelectric power) on the earth. All three of these types of power are also among dematerialization’s champions, since they use up essentially no resources once they’re up and running.

I call these four paths to dematerialization slim, swap, optimize, and evaporate. They’re not mutually exclusive. Companies can and do pursue all four at the same time, and all four are going on all the time in ways both obvious and subtle.

Innovation is hard to foresee. Neither the fracking revolution nor the world-changing impact of the iPhone’s introduction were well understood in advance. Both continued to be underestimated even after they occurred. The iPhone was introduced in June of 2007, with no shortage of fanfare from Apple and Steve Jobs. Yet several months later the cover of Forbes was still asking if anyone could catch Nokia.

Innovation is not steady and predictable like the orbit of the Moon or the accumulation of interest on a certificate of deposit. It’s instead inherently jumpy, uneven, and random. It’s also combinatorial, as Erik Brynjolfsson and I discussed in our book The Second Machine Age. Most new technologies and other innovations, we argued, are combinations or recombinations of preexisting elements.

The iPhone was “just” a cellular telephone plus a bunch of sensors plus a touch screen plus an operating system and population of programs, or apps. All these elements had been around for a while before 2007. It took the vision of Steve Jobs to see what they could become when combined. Fracking was the combination of multiple abilities: to “see” where hydrocarbons were to be found in rock formations deep underground; to pump down pressurized liquid to fracture the rock; to pump up the oil and gas once they were released by the fracturing; and so on. Again, none of these was new. Their effective combination was what changed the world’s energy situation.

Erik and I described the set of innovations and technologies available at any time as building blocks that ingenious people could combine and recombine into useful new configurations. These new configurations then serve as more blocks that later innovators can use. Combinatorial innovation is exciting because it’s unpredictable. It’s not easy to foresee when or where powerful new combinations are going to appear, or who’s going to come up with them. But as the number of both building blocks and innovators increases, we should have confidence that more breakthroughs such as fracking and smartphones are ahead. Innovation is highly decentralized and largely uncoordinated, occurring as the result of interactions among complex and interlocking social, technological, and economic systems. So it’s going to keep surprising us.

As the Second Machine Age progresses, dematerialization accelerates. Erik and I coined the phrase Second Machine Age to draw a contrast with the Industrial Era, which as we’ve seen transformed the planet by allowing us to overcome the limitations of muscle power. Our current time of great progress with all things related to computing is allowing us to overcome the limitations of our mental power and is transformative in a different way: it’s allowing us to reverse the Industrial Era’s bad habit of taking more and more from the earth every year.

#### 1---Ballantyne votes for the permutation.

their author, Ballantyne 14 – Dechinta Bush U, Dechinta Bush University: Mobilizing a knowledge economy of reciprocity, resurgence and decolonization [Erin Freeland; *Decolonization: Indigeneity, Education & Society* Vol. 3, No. 3; 2014; pg 67-85]

At the crux of this decolonization and anti-capitalism process, is the ongoing tension that in order to access the bush we are now dependent on ski-doo, bush planes and rifles that require us to participate in capitalist economies to acquire. This signals a necessary involvement and tension with capitalism. With this tension clearly in our sights, Dechinta exists at the edge of flexibility. We borrow tools that are useful from academic institutions, and leave those which do not serve our mandate. We are making new tools and using them in new ways, breathing into spaces which did not exist before, breathing into spaces that have not been nurtured for too long. At this time, Dechinta exists and operates within the spheres of settler capitalism, realigning, repurposing and reasserting capital to get in the way of and to disrupt settler colonization. We are not just getting in between settlers and their money (Coulthard, 2014a), we are taking settler money and reorganizing the purpose and distribution of capital to disrupt its flow. The new circulations are part of processes, a dance to build up force, to accumulate power in transformed articulations resulting in different expressions. Investment of capital through Dechinta perverts capitalism. In Massumi’s (1992) eloquent dissection, “Capitalism infinitizes a body’s debt to society: all but the richest must slave away being “productive members of society,” everyone must “pay back her debt to society”, day in and day out, or starve. The unequal equivalence that is set up operates on a continual basis rather than punctually (rites of passage) or serially (punishments for particular crimes): it is institutionalized as the everyday equation between habitual suffering and regular paychecks (work)” (p. 189). In this way, the abstract machine of capitalism both encodes and operationalizes the original sin the priests so aptly prepared us for. The mission of transformation of souls by the Church was simply a precursor strategy to prepare the colonized body for the infection of capital. In Denendeh (and certainly elsewhere) The State-Church strategy was thus: children forcibly removed from families on the land into schools. Parents where gifted the option to come live ‘for free’ near the schools in settlements (where you could see your child through the fence). Upon arrival, bills for both rent and heating fuel quickly arrived, thus trapping families in the indentured servitude of debt (Asch, 1977). The small game around settlements quickly disappeared, as did the reciprocal wealth of land-based harvesting and sharing, as men were poached by petro-capitalists, offering easy access to cash (to pay debts), another ‘gift’ offered by the settler to the Indigenous body politic in a syphillic cloak of Christian duty. This loan-debt power relation exemplifies an important transition from spaces of enclosure to Deleuze’s societies of control, where ‘man is no longer man enclosed but man in debt’ (1992, p. 6). Thus, networks of support (are) mutated(ing) from family to commercial insurance. We no longer owe our souls to the church for salvation - we owe our life’s work to the bank, and somewhere along the line freedom, health and well-being have become inextricably linked with profit (or at minimum, access to short-term cash deepening debt).

Thus, when we speak of resistance to settler capitalism we then must speak about how to remove bodies from both enclosure and debt. Operating within capitalism while simultaneously articulating anti-colonial and decolonization goals is a given, but we must also imagine how we push back the enclosures of capital to take back places and spaces, both materially and beyond. This mission is critical given the growing numbers of Indigenous partnerships with industry, particularly in extractive-resource mineral rich territories like Denendeh. These relationships signal that both settler capitalism and Indigenous self-determination can exist copasetically. Indeed many First Nations articulate the Helinian ideal that emancipation from colonization will come through the freedoms promised by capital gain, that somehow magically, through the attainment of wealth, the fundamental inequalities of settler colonialism dissipate (even if just from view, onto another Nation’s territory).

#### 2---Ballantyne is basically an advertisement for Dechinta Bush University, which is an interesting program for field research, but woefully inadequate to challenge structural settler colonialism---Ballantyne’s hunting example is rhetorically patriarchal.

their author, Ballantyne 14 – Dechinta Bush U, Dechinta Bush University: Mobilizing a knowledge economy of reciprocity, resurgence and decolonization [Erin Freeland; *Decolonization: Indigeneity, Education & Society* Vol. 3, No. 3; 2014; pg 67-85]

For example, hunting is herein a complex example of theory-to-practice. It has been articulated that decolonizing the diet is a worthy endeavour, and everyone agrees that bush food is better than industrial meat and that hunting is a worthy practice. Hunting, as it moves from a statement to practice becomes complex. To ‘go hunting’ requires the collaborative knowledge of generations who have signalled where moose like to be in specific times of year, how they move, and how they are impacted by snow or water conditions and temperature. At Dechinta, factors like Elders’ guidance and knowledge (both direct and passed on), climate change (this winter the snow is heavier and wetter than ever before, willows are in deeper snow for food access), the nearby invasion of a rare-earth metal exploration (the moose does not like being near the cut lines or the exploration road, nor the sound of the drill), factor into our deliberations about the hunt. Who will go on the hunt (a small group for fast mobility, no women on their moon time, etc.), what we need to bring with us (tarps, small axes, knives, rifle, etc) are group conversations, which actively teach self-governance. These deliberations are woven with reflections of books and readings but give real context and place to the academic work. Groups comprised of different Indigenous nations and settlers, Elders and children, bring forward new considerations and difficult questions which are worked through in never ending cycles – getting deeper and deeper.

While divided into separate courses to meet university requirements, as a whole the curriculum is designed to open spaces to think and be radically sustainable, healthy and selfdetermining. Collaborative teaching between Elder professors, university professors, leaders and community experts is fundamental, as is our KidsU program so that families remain central to intergenerational learning on-site. Establishing practices of governance though daily governance circles establishes values through Dene Law, as well as the shared traditions of the students present and their respective traditions and Nations. Though the process of establishing governance, many of the core challenges of self-determination are encountered. Coming from a colonized framework, there is often struggle over dependence and reliance on the program facilitators - what is their role, what is their inherent power and how can these be made more horizontal and shifted through processes of self-governing? The disruption of daily activities usually circumscribed into the practice of capitalism - such as the exchange of money - is at first jarring, then celebrated. The lack of a cash economy and ability to purchase can be both uncomfortable and strange. There is much discussion around how desires are tied to the ability to purchase, or feelings of worth and engagement linked to buying.

The process of Dechinta is intensive, with up to 8 weeks spent in the bush with a small, intergenerational group doing very hard physical, mental and spiritual work, day in day out. Through this process, one of the most common feelings encountered, alongside rage and peace, is guilt. It is the guilt of having been raised in small communities and not having the land-based skills by which so many thinkers ground Indigeneity and Indigenous-ness. Some students have never actually lit a fire, let alone spent significant time in the bush. While many are raised in sedentary communities located in heart of their motherlands, they do not have access to land. Deterritorialization has been so effective that kids can grow up in Denendeh having never practiced skills which two generations ago would have been fundamental to survival. The colonial apparatus has been this effective in removing people from their land while leaving them physically on it. During the process of Dechinta, many bush skills are learned with Elders who share the collective knowledge of what has been remembered. Learning these practices evokes the anger of never having been taught, as well as provokes exploring why those teachings where severed and how learning them revitalizes and rekindles. These skills are complex in their meaning and application. They always involve reaching back to the teaching of ancestors to share what was learned, where, and from whom. Thus, bush pedagogy is always rooted in place and in relationships and stories. Through the learning of skills, what is experienced is a shift from guilt to gift. This is what has been called ‘the Dechinta Transformation’ (Sterriah, 2014), whereby the forces of Indigenous theory and practice merge and result in students who can articulate processes of decolonization on paper as well as engage in decolonization through an active process of becoming rooted in land based practices. This space of exchange is critical, especially given the increasingly popular and problematic call to ‘decolonize’ and ‘indigenize’ the academy. As Dechinta students receive credit in Native Studies courses from the University of Alberta, it is important to give pause to the role universities play in decolonization, and how we can manipulate the university as an idea to recentralize the land in learning.

#### Their mythological grouping of indigeneity and the land justifies romantic myths about cultural identities that provoke militarization and scapegoating; treating the global as a commons where no one is entitled to property is crucial to build institutions capable of solving violence against Natives and the environment

Dean 15, Professor of Humanities and Social Sciences at Hobart and William Smith Colleges (Jodi Dean, 3-17-2015 “This Changes Some Things,” Politics, Theory, Action, <http://jdeanicite.typepad.com/i_cite/2015/03/this-changes-some-things.html>)

The second problem is Klein's association of communities with indigeneity and land. Klein writes, "communities with strong ties to the land have always, and will always, defend themselves against businesses that threaten their ways of life" (309). Here again she denies division, as if everyone in a community agreed on what constituted a threat, as if they were all similarly situated against a threat, as if they were never too deluded, tired, or exploited to defend themselves, as if they could never themselves constitute a threat to themselves. Cities, towns, states, and regions make bad decisions all the time; they stimulate industries that destroy them. Klein, though, has something else in mind, "a ferocious love" that "no amount of money can extinguish." She associates this love "with an identity, a culture, a beloved place that people are determined to pass on to their grandchildren, and that their ancestors may have paid for with great sacrifice." She continues, "And though this kind of connection to place is surely strongest in Indigenous communities where the ties to the land go back thousands of years, it is in fact Blockadia's defining feature" (342). Participants in my seminar found this description racist or fascist. Even though this is not Klein's intent, her rhetoric deploys a set of myths regarding nature, and some people's relation to nature, that make some people closer to nature (and further from civilization) than others. It also justifies an intense defense of blood and soil on the part of one group's attachment to a place such that others become foreign, invaders, rightly excluded as threats to our way of life, our cultural identity. Given that climate change is already leading to increased migration and immigration and that the US and Europe are already responding by militarizing borders, a language of cultural defense and ties to the land is exactly what we don't need in a global movement for climate justice. Klein's argument, though, gets worse as it juxtaposes indigenous people's love of place with the "extreme rootlessness" of the fossil fuel workforce. These "highly mobile" pipefitters, miners, engineers, and big rig drivers produce a culture of transience, even when they "may stay for decades and raise their kids" in a place. The language of rootless echoes with descriptions of cosmopolitan Jews, intellectuals, and communists. Some are always foreign elements threatening our way of life. In contrast, I imagine climate politics as breaking the link between place and identity. To address climate change, we have to treat the world itself as a commons and build institutions adequate to the task of managing it. I don't have a clear idea as to what these institutions would look like. But the idea that no one is entitled to any place seems better to me as an ethos for a red-green coalition. It requires us to be accountable to every place.