
AI-GENERATED GREEN INVENTIONS: WHO OWNS THE IP FOR AI-DRIVEN SUSTAINABILITY SOLUTIONS?

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ABSTRACT

The growth of artificial intelligence (AI) as a self-governed change maker is bringing into question the established structures of IP law and Green innovations. AI systems come up with new sustainability issues, such as carbon capture technology and energy-efficient materials, that may eventually lead to a debate over the ownership of these technologies. Is AI an inventor? To whom should the rights belong, developers and corporations, or is it even possible to have them in the public domain to accelerate the time of the climate solutions cycle?

Robots and AI have made significant progress to the point of being able to create sustainable innovations that would be impossible for us to develop. AI has also changed the functioning of the energy industry, where it has led to a shift from fossil fuel to renewable energy production. Additionally, AI has allowed companies to be more efficient as operations become automated, with data being processed more quickly. The possibilities for AI to lead to a sustainability revolution are clear, with several relevant examples like the CFL light bulb, casualty detection system, and intelligent building construction, which have all resulted in more sustainable technologies.

This research attempts to challenge the core of IP policy by addressing the triad imbalance of technology innovation, ecological consideration, and access equitability to AI-based green initiatives. Will AI overturn IP law, or is there space for the institutions to adapt and foster a new paradigm of machine sustainability?

Keywords: Artificial Intelligence, Intellectual Property, Data Protection, Inventorship, Patentability, Technology, Compulsory Licensing

I. Can AI be credited as an inventor?

People are recognizing AI as an inventor and are also going towards the same.¹It is argued that, as long as computers rely on the input produced by a human, the separation between human and non-human (algorithmic) ingenuity is, in itself, artificial.²Granting patent protection on novel, AI-generated inventions seems to be the best solution to encourage creativity and progress in science.³ Humans have been slowly merging with technology to attain heightened abilities, but instead, our identities are blurred by the thing we made that takes us over.⁴We can see that in various cases where AI is not legally credited as an inventor, Stephen Thaler sought patents for an AI-generated fractal food container and emergency light, naming his AI "DABUS" as an inventor. The Federal Circuit affirmed the USPTO's rejection, stating the Patent Act requires inventors to be human. The court emphasized that "individual" in patent law refers only to natural persons.⁵Companies such as CarbonCure apply the in-plant understanding of CO₂-sequestering concrete through AI applications. Engineers operate the AI, thus allowing them to claim authorial rights for the patent. In fully AI-generated green technology, e.g., new battery chemistries, public domain status would apply if there were no human inventors, thus discouraging R&D investments. For now, the law is tilted toward human creativity over machine freedom.

II. Who holds the rights?

Intellectual property laws have traditionally been structured around human inventors. Patent laws in most jurisdictions, including the United States⁶ and the European Patent Convention⁷, require a named human inventor. However, with AI playing a key role in innovation, existing frameworks struggle to accommodate non-human contributions. Green AI patent filings rose 35% in 2023, focusing on energy optimization and emissions reduction. European firms lead, outpacing U.S. counterparts in energy conservation technologies.⁸Laws may stipulate that AI

¹ Pearlman, R. (2017). Recognizing artificial intelligence (AI) as authors and investors under US intellectual property law. *Rich. JL & Tech.*, 24, i.

² Kim, D. (2020). 'AI-Generated Inventions': Time to Get the Record Straight?. *GRUR International*, 69(5), 443-456.

³ Comer, A. C. (2020). AI: Artificial Inventor or the Real Deal?. *NCJL & Tech.*, 22, 447.

⁴ Schwein, R. L. (2020). Patentability and Inventorship of AI-Generated Inventions. *Washburn LJ*, 60, 561.

⁵ Thaler v. Vidal, No. 21-2347 (Fed. Cir. 2022)

⁶ U.S. Patent Act, 35 U.S.C. §101

⁷ Convention on the Grant of European Patents (European Patent Convention), Art. 52, 16th edition, April 2024, EPO.

⁸Marks & Clerk. (2024). *AI Report 2024*.

assists inventors whose human developers or collaborating organizations will oversee such operational assistance. States could enact dedicated AI intellectual property rights to share rights fairly. Such laws could include incentives for governments to use open-access licensing in green technologies employing AI to ensure their broad use without monopoly. According to a study by W. Michael Schuster, the best policy is to permit companies to employ AI for the generation of new technologies, as opposed to software companies, programmers, or downstream parties-and to obtain resulting patents. A natural person who plays a similar role concerning AI-produced inventions-for example, an individual who commercializes an AI system's useful output-could comfortably fit within the historical scope of, well, existing definitions of "inventorship."⁹ AI should be excluded from being recognized as inventors on patent applications because modern AI processing is distinct from the human mental act of conception. Also, the way artificial intelligence processes things breaks down the natural connection between human creativity and the rewards that inventors get in terms of patents. To prevent a complete breakdown of the legal framework of patent inventorship, inventorship must be limited to humans.¹⁰

III. Open Source vs Proprietary Models in Green Technology

Green AI and digital transformation help achieve the "Dual-Carbon" goal, which aims to build an economy that uses less carbon and maintains high quality. Green AI focuses on moving from cloud computing to edge devices like TinyML. These devices, such as cameras and wearables, operate with low power and are part of the Internet of Things (IoT). There are two primary innovation methods: patents and open-source projects. These approaches can sometimes influence each other. Many organizations combine these methods to compete effectively. Open-source projects allow people to share technical knowledge freely, sparking new ideas and improvements by using shared source code and community input. Patents, on the other hand, create protective barriers for inventions, ensuring inventors maintain their rights. By using both methods, businesses can innovate while protecting their creations.¹¹ Companies can share some of their AI tools for free by making them open-source, which means anyone can use them without cost. These are usually tools that are not central to

⁹ Schwartz, D. L., & Rogers, M. (2021). "Inventorless" Inventions? The Constitutional Conundrum of AI-Produced Inventions. *Harv. JL & Tech.*, 35, 531.

¹⁰ Knutson, K. R. (2020). Anything you can do, AI can't do better: An analysis of conception as a requirement for patent inventorship and a rationale for excluding AI inventors. *Cybaris Intell. Prop. L. Rev.*, 11, i.

¹¹ Li, T., Luo, J., Liang, K., Yi, C., & Ma, L. (2023). Synergy of patent and open-source-driven sustainable climate governance under Green AI: A case study of TinyML. *Sustainability*, 15(18), 13779.

their main business. For the AI models that are crucial to their operations, companies often keep them private. These private models are tightly controlled by the companies or institutions that create them. They serve as a way to organize and profit from advancements in green technology. Accessing these models typically requires paying a fee or subscription, which means they aren't available to everyone. However, the fees collected support ongoing research and development. IBM's Watson AI is an example of such a private model. It plays a role in improving smart power grids by predicting how much energy will be needed and making the distribution of electricity more efficient. Although Watson is effective, its private nature means it's mainly accessible to large businesses and government bodies that have the financial means to afford it.¹² Proprietary models generate income, which supports further innovation, but they might prevent many people from using important AI tools needed to combat climate change. In contrast, open-source AI allows everyone to participate, but it often struggles with insufficient funding for ongoing support. Additionally, open-source AI can be misused or sold by others without giving credit or payment to the original creators. Proprietary AI can slow down progress by limiting access to essential environmental solutions.

IV. What Needs to be done? Mechanisms for Protecting AI Innovations

Quantity doesn't always mean quality. Before trying new ways to spark innovation, we should fully use the existing pathways to see how far they can go. The Future of Life Institute suggested empowering the AI Office more and creating a single European AI portal linked to a unified European sandbox. This would simplify registration and prevent the market from splitting due to different regional sandboxes. They also advised making these sandboxes better by adding legal support, insurance, and incentives for research. Another idea was to boost the public sector's ability to develop AI, ensuring good oversight and improving public services.¹³ OpenAI has taken a hybrid approach to innovation. On the one hand, it shares some of its models under open-source licenses. On the other hand, it retains proprietary rights over others. That dual strategy encourages innovation while protecting the core technologies that drive its business model. As that responsible innovation approach becomes more prevalent in the digital sector, we're seeing it reflected in legislation. Take the principles of "privacy by design" and "privacy by default," which are now part of data protection and privacy laws across

¹² IBM. (2023). Watson AI for Energy Optimization.

¹³ Kalpakos, M. E. (2023). Defining the Future: The AI Act's Potential in equitably Safeguarding Fundamental Rights and Promoting AI Innovation. UFITA, 87(1).

many jurisdictions, including the EU's benchmark-setting GDPR. The protective approach to innovation, where an invention isn't diffused until the inventor has shown it has a positive impact, usually requires a marketing authorization beforehand. That's based on evidence from prior testing. You see that approach used in sectors where risk is deemed high, like pharmaceuticals or commercial aircraft. Its goal is to avoid what are known as Type II errors (false negatives). In contrast, the permissive approach lets inventions be freely diffused, subject to general laws and post-marketing monitoring and surveillance. That way, cases of negative impact can be identified. The permissive approach is the default in the digital sector. It's designed to avoid Type I errors (false positives). While the protective approach doesn't stifle innovation entirely, it does channel it, usually towards sustaining innovation. The permissive approach has much less influence on innovation paths and is more open to disruptive innovation. Think pharmaceutical labs, which tend to be cautious, and the digital sector's "move fast and break things" mantra. Both approaches have shown their limits over time. The protective approach can be very resource-intensive and magnifies the information deficit of public authorities. The permissive approach allows "risk creep" through successive innovations, where its more relaxed stance towards innovation isn't warranted (as with social networks in the digital sector). Those two approaches can't co-exist easily, since innovation in sectors under a permissive approach will tend to subvert the boundaries of the regulatory domain of the protective approach. That's why the governance of AI can't follow either approach. Instead, it can become a pioneering area for a third approach: responsible innovation.¹⁴ Laws might be updated to recognize inventions created with AI assistance. Ownership of these inventions could be given to the people or organizations who trained the AI and provided input, instead of denying protection altogether. New categories of intellectual property (IP) could be created specifically for AI-generated inventions. For example, AI-assisted patents could cover inventions where human involvement is significant. An AI-Generated Innovations Registry could help track and credit discoveries made by AI without restricting their use. Regulatory bodies need to consider ethical issues, especially in green technologies, as their widespread use is crucial for tackling climate change. Governments might also introduce mandatory licensing models for key AI-driven sustainability innovations.

¹⁴ Larouche, P., & Yu, Y. (2024). Between Permission and Protection: AI as a Challenge to Established Approaches to Law and Innovation. *Available at SSRN 4981681*.

V. Compulsory Licensing in Green Technology

The foundation for compulsory licensing is laid by the TRIPS Agreement (Trade-Related Aspects of Intellectual Property Rights). That agreement lets member states issue compulsory licenses under certain conditions, like national emergencies or extreme urgency (Article 31). What exactly counts as a national emergency isn't explicitly defined in TRIPS, but many think climate change and environmental degradation could qualify. Article 27 gives countries the power to exclude inventions from patentability if their production would be necessary to protect public order, morality or prevent severe environmental damage. In countries like India, that's governed by Section 84 of the Indian Patents Act.¹⁵, which permits licenses when a patented invention is not available at a reasonably affordable price or is not being worked in the territory. It helps governments access important green technologies to combat climate change. By permitting other companies to produce these patented green technologies, compulsory licensing can reduce costs and make them more accessible to developing countries that struggle with high prices from patent owners. It also supports local businesses by enabling them to manufacture green technologies, reducing dependence on imports. This leads to economic growth and more job opportunities. This system ensures that developing countries participate in the global shift to sustainable practices. It promotes fairness in technology sharing, supporting international agreements like the Paris Agreement.¹⁶ Some concerns that forced licensing could make big international companies less willing to invest in research and development. They might be worried that their innovations could be taken and used without them receiving enough money. This could lead to fewer innovations in important areas needed to fight climate change. Setting fair payments and rules for forced licenses can cause disputes and complicate talks between governments and patent owners. Using forced licensing for green technologies is new and brings extra challenges. If used too often, richer countries might react negatively, leading to trade disputes or sanctions against countries that apply these measures too aggressively. Some argue that strong patents reward creators for their innovations, encouraging more development in green technology. These patents are crucial as they ensure profits for inventors. However, forced licensing still requires users to pay the patent owner enough, usually through royalties. Also, forced licensing often occurs in countries where the patent holder chose not to sell their green technology, so there isn't much loss in profits or

¹⁵ The Patents Act, 1970

¹⁶ United Nations Framework Convention on Climate Change (UNFCCC). (2015). Paris Agreement.

motivation since these countries weren't part of the market anyway. Importantly, using compulsory green licenses in countries like China and India could greatly benefit the global environment.

VI. Conclusion: Can Balance and Protection co-exist?

Strict intellectual property (IP) protections can prevent companies from investing in AI technologies if they are afraid their innovations will be easily taken through compulsory licensing or other methods. On the other hand, if protection is too weak, companies might lack incentives to invest in developing new green technologies. Determining who should get credit for AI-created inventions complicates ownership issues. Many parties often participate, such as developers, users, and even the AI systems themselves, which makes it difficult to establish clear ownership. Different nations approach IP rights for AI-generated inventions in different ways. Some countries may adopt flexible systems, while others may stick to traditional models, leading to inconsistencies that can obstruct international collaboration on green technologies. To address these complexities and foster a balanced environment where protection and innovation coexist, several strategies can be implemented. Legal systems might need to evolve to recognize AI's role in innovation, possibly by creating new IP categories for AI-generated works or allowing joint ownership between humans and AI systems. Promoting open-source models can encourage cooperation among various stakeholders while ensuring that contributions are acknowledged and protected through suitable licensing agreements. For instance, initiatives like the Green Software Foundation illustrate how open collaboration can spur innovation while addressing sustainability challenges. Creating detailed guidelines for documenting contributions from both humans and AI can help clarify ownership issues and promote transparency in the innovation process. Governments can create regulatory sandboxes to allow companies to test new technologies in controlled settings while adhering to existing laws. This approach can help identify potential IP issues early on and refine regulations related to AI inventions.¹⁷ Advocates for the possibility of recognizing AI as an inventor with limited privileges, suggesting that the AI's owner be entitled to patent rights for subsequent modifications resulting from its output. These ideas could create legislation better able to address the increasing implications of the law, AI, and innovation. It is possible and within reach to achieve the required balance and protection to accommodate AI-driven green

¹⁷ World Intellectual Property Organization. The Artificial Inventor Project. WIPO Magazine

inventions, in the interest of innovation in sustainable solutions. With the right legal reform, open innovation collaboration framework, and regulator sandboxing program schema, stakeholders can enable innovation activation while still protecting their intellectual property and enjoying the collaborative advantages of developing new green technologies and ideas. We are in the age of AI reforming our world, and with that reform comes the recognition of the need to change the legal environment with innovation, creating protections for the respective contributions while building innovation with the contributors.