How Will Next-Generation AI and Post-Singularity Change National Power?

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Abstract

In the next generation, it can be considered that the performance of each nation's AI will define the international balance of power, since each nation's national power will be served by maximizing the performance of the AI. At the same time, solutions to climate change and population problems will be sought by maximizing the performance of AI, but the optimization of energy supply and scientific and technological capabilities must also be fulfilled. Thus, humanity will leave a significant portion of its fate to AI, but as long as humanity does not cede control of energy supply to AI, humanity will have an advantage over AI and a path of coexistence will be possible. The interests of both parties are aligned: humanity needs advanced super-intelligent AI to deal with crises such as climate change, and super-intelligent AI will need a supply of energy from humans to operate.

However, as humanity itself places AI at its core and further enhances each other's national power, international tensions will increase at the same time, and a situation where humanity as a whole cannot cooperate together may give a super-intelligent AI an opportunity to plunge humanity into the danger of extinction. Whether or not this is a pessimistic future is a category for future generations to decide, but only we today can create the pathway to that future.

Introduction

In this paper, I articulate that energy will be fundamental to the survival of humanity and its quest for coexistence with superintelligence in a next-generation world led by AI that has reached the level of superintelligence. Humanity's control over the superintelligence will be achieved by maintaining control over the energy supply as a means of controlling the superintelligence.

In this regard, when formulating the next generation of "national power", this paper shows that what determines national power is deeply dependent on the quality and quantity of AI, and that what supports their performance is energy, dynamics of the system that is also closely related to climate change, human activity, science and technology and other factors. In a future in which AI performance will determine national power, this means that AI will not only determine the economic and living standards of entire nations, but will also control the fate of entire nations, and that the standard of living of nations and their citizens will deeply depend on how well AI performs. It is significant to reconsider the national power of the next generation, which will affect not only the existential crisis of each individual, but also the balance of power among nations.

First, I will reconfirm that factors that constitute national power, such as economic power, national security, and population, are closely interrelated with factors related to energy consumption and climate change. Then, I will discuss the possibility that national power will be redefined in the near future by the performance and quantity of AI and the energy consumption that supports it, through research and development of generative AI and other technologies and their innovation. In particular, AI and energy issues are directly related to the security and interests of each country and are a microcosm reflecting the power relations among nations. Energy consumption will continue to increase actively in generated AI and data centers, as well as maintaining productivity, and will have to meet the demands of business and civic life, while also addressing climate change.

Industrial productivity will continue to affect national power, but productivity proportional to population will lose its meaning once more advanced AI-equipped robots largely replace human labor productivity. In other words, since the performance and quantity of AI will inevitably determine national power in the near future and beyond, the focus will also be on how to promote thorough AI governance and compliance with international treaties and regulations to ensure the existence of a new international order.

National Power, Economy, and Energy Consumption

A nation is an imaginary entity created by the aggregation of an unspecified number of people. Therefore, a nation consumes energy and emits CO_2 just as a living organism breathes. The economy is the process of producing and accumulating national wealth through domestic and international imports and exports and various production activities based on such energy consumption. The robustness of these systems and dynamics is ultimately called *national power*.

In short, national power consists of economic, energy resource, national security, and people dynamics. The national power is not only its diplomatic power, but also its effective control over supply chains and communication networks, and the amount of resources it accumulates becomes its influence over other countries. The active use of these resources will become more decisive by raising the qualitative level of scientific and technological capabilities that bring about the physical quantity of military power and industrial productivity. It is envisioned that an era will arrive in which advanced AI will be placed at the core of the nation, but the problem of energy, which is indispensable for driving AI and information systems, cannot be avoided.

Indeed, it must reaffirm that energy issues are a major factor that defines national power, especially since energy issues are positioned at the core of international relations, national security, climate change, and other issues that are mixed with the dangers of human society. And AI threatens national security and economic security through the proliferation of weapons and disinformation. The development of science and technology is directly linked to diplomacy, economics, and military affairs, and affects the balance of power of countries around the world.

The current dependence of national power on population and economic strength means that much of it is determined by the high productivity of labor and the value of the goods it produces. Those variables depend on massive and sustained energy consumption, and those are, of course, energy such as food as calories and electricity to drive the machines and information technology that make mass production possible (Rhodes, 2018).

Synthesizing the above points and considering a concise national power equation, it can assume the following positive correlation between national power, economic power, and energy consumption.

$$National\ Power\ =\ EC\ +\ EN$$
(eq.1)

Where,

- EC: Economic power
- EN: Energy Consumption

In order to deepen the discussion, I will now review some basic statistics. First, from the IEA[1] (International Energy Agency) public statistics on energy consumption in the US, China, Russia, UK, France, Germany, Japan, India, Indonesia, Iran, South Korea, North Korea, and Australia countries, and further from various statistical data[2], GDP (in US dollars, 2020), population (2020), military indicators (PowerIndex (2019), SIPRI (Stockholm International Peace Research Institute) (2022)), and energy consumption indicators (energy consumption in each country (2019) and CO_2 emissions in each country (2020)) data were obtained, rankings were obtained, and Spearman's rank correlation coefficients were calculated. Since data for some countries were unknown in some cases, these were excluded as missing values in the calculation, but still a certain relationship is considered to exist. For example, a rank correlation coefficient between GDP and energy consumption was 0.26 when the three countries with missing energy consumption data (North Korea, Iran, and Indonesia) were excluded, indicating a positive correlation.

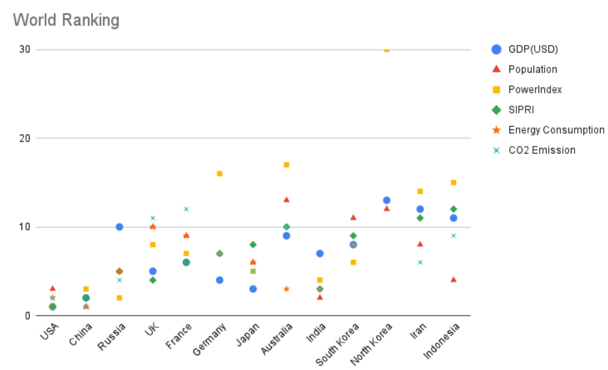

Figure: World rankings for GDP, population, military index (PowerIndex, SIPRI), and energy consumption index (energy consumption of each country, CO_2 emissions of each country)

Spearman	GDP(USD)	Population	PowerIndex	SIPRI	Energy Consumption	CO2 Emission
GDP(USD)	1.00					
Population	0.46	1.00				
PowerIndex	0.56	0.69	1.00			
SIPRI	0.72	0.52	0.74	1.00		
Energy Consumption	0.26	0.65	0.53	0.42	1.00	
CO2 Emission	0.37	0.80	0.72	0.54	0.84	1.00

Table: Spearman's rank correlation coefficient (missing data values were ignored) for GDP, population, military index (PowerIndex, SIPRI), and energy consumption index (energy consumption in each country, CO_2 emissions in each country)

As these data show, there is a positive correlation between these various variables. Of course, other variables that correlate with GDP and energy consumption are also involved, such as the population and military power of each country. The national power of the developed country is established by having a certain population, while at the same time possessing advanced science and technology to improve the standard of living, as well as active economic power and energy consumption. Therefore, there are more developed countries with small populations but high CO_2 emissions than developing countries that simply have large populations. Some developing countries with high CO_2 emissions also have abundant working populations, while others are full of momentum to improve their national power through economic development. Of course, it should be obvious that military power is inevitably linked to these variables, since it is a necessary condition for military

[1] https://www.iea.org/
[2] https://unstats.un.org/unsd/amaapi/api/file/4
https://unstats.un.org/unsd/demographic-social/products/vitstats/seratab2.pdf
https://www.globalfirepower.com/countries-listing.php
https://milex.sipri.org/sipri
https://www.ene100.jp/zumen/1-1-3
https://www.globalnote.jp/post-3235.html

power to be backed by economic and fiscal resources, industrial infrastructure, and scientific and technological capabilities.

On the other hand, the Composite index of National Capability (CINC), which focuses on war-related national capacities and is used in international relations and military strategy research, is also publicly available. This index is derived from research initiated by Singer in 1963 in "*the Correlates of War project*" (COW). In this index, national powers are composed of several factors such as population and energy consumption, as well as productivity related to the ability to conduct war.

$$\text{CINC} = \frac{TPR + UPR + ISPR + ECR + MER + MPR}{6}$$

(eq.2)

Where,

- TPR : Percentage of the country's total population
- UPR: Urban population ratio of a country
- ISPR: Iron and Steel Producers Ratio
- ECR: Primary Energy Consumption Ratio
- MER: Military Expenditure Ratio
- MPR: Military personnel ratio

The first and second places in the CINC index obtained in this way are occupied by the United States and China as of 2017 (0.2114 and 0.1785, respectively), indicating that the world is divided between the two major powers.

Relationship among Climate Change, Economic Activity, and Energy

Let us recall here the equation as "*Kaya Identity*" (Kaya&Yokoburi, 1997), which is well-known in the climate change issue. This equation succinctly condenses the national power, economic, and energy issues discussed above. As shown in the equation below, it is defined from various variables such as GDP, CO_2 emissions, and population. It clearly shows that human daily life, economic activities, and the resulting CO_2 emissions and energy consumption are linked to global climate change.

$$F = P \times \frac{G}{P} \times \frac{E}{G} \times \frac{F}{E}$$

(eq.3)

Where,

- F: Global anthropogenic CO_2 emissions
- P: World population
- G: Global GDP
- E: World energy consumption

Namely,

- G/P: GDP per capita
- E/G: Energy intensity of GDP
- F/E: CO_2 emissions from energy

At first glance, it appears to be an overly simple identity, with only the variable of CO_2 emissions remaining in the final equation. However, the essence of this constant is that the individual terms are the result of the interaction of various variables such as energy consumption, economy, and population, which are exquisitely and closely related to CO_2 emissions and climate change. Certainly, Kaya's model is clearly based on the capitalist economic principle that up to now has endorsed mass production, mass consumption, and mass disposal. However, since a shift to an economic system that endorses a recycling-oriented society is desired in the future, it is necessary to achieve the above-mentioned replacement with energy-related technologies that do not emit CO_2 through the development of scientific and technological capabilities and innovation.

The National Power Equation and Security Relations

As mentioned above, Kaya's identity is also interesting for analyzing national security and international issues from a realist's perspective. This is because Ray Cline, an analyst for the Central Intelligence Agency (CIA), published the National Power Equation (equation 4) in 1975 to calculate national power, and, oddly enough, both of these two equations include indicators of population and economic power.

$$National\ Power = (P + T + E + M) \times (S + N)$$

(eq.4)

Where,

- P: Population
- T: Territory
- E: Economics
- M:Military
- S: Strategic Objectives
- N: National Will

In other words, "national power" as discussed by the aforementioned international political scientists Morgenthau(1978) and Carr(1939), as well as other vague indicators of military and economic power, can be discussed in relation to "energy consumption". The above two equations, however, are consistent with the fact that CO2 emissions, which have been the basis of national development in the postwar capitalist economy, have been regarded as a virtue in terms of maximizing production in factories, etc. and wasting human desires through economic activities. However, as mentioned above, in the international community of the future, the achievement of the SDGs is positioned as the absolute standard for the survival of the entire human race. As mentioned earlier, energy is directly related to people's lives and to the productive capacity of the economy and industry, and the total national power reflects the energy consumption of the nation as a whole (Hafner& Luciani, 2022). Therefore, it is a fact that a country must maintain its national strength and achieve higher development through scientific and technological innovations that will also reduce energy waste and maintain the global environment.

And furthermore, from the aspect of economic security, it is even more essential to stabilize energy supply and secure supply chains. This means that electric energy will become a bottleneck of national power, and security of energy sources(e.g., the supply chain of fossil fuel imports, power plants, power grids, and system control) is a national defense issue to maintain national power. In particular, there is a high concern that continuing to rely excessively on imports of energy resources from abroad, as Japan does, while facing geopolitical risks (Yergin, 2020), could lead to a serious national crisis. In fact, oil and LNG prices continue to rise in response to the growing demand for energy resources around the world, and several scenarios have been forecasted, but in the worst case scenario, if the situation continues as is, the situation will worsen further.

Taken together, humanity has a complex puzzle of variables to solve: national power, the economy, security, climate change, and energy issues; the promotion of R&D and innovation in areas such as generative AI and renewable energy and economic security issues.

AI and Energy Consumption

Furthermore, the interconnected structure of national power and energy is also an indispensable perspective when simultaneously promoting research and development such as generative AI and addressing climate change.

Generative AI is rapidly transforming business activities qualitatively and structurally, and the generative AI boom that began in the second half of 2023 has now come to life, bringing a boom to the global economy driven by the GPU market, where countries and leading companies are buying NVIDIA's GPUs in large quantities. In addition, securing infrastructure such as power, energy sources, and systems to support data centers that require large amounts of GPUs has become critical, prompting investment in leading stocks and ventures. These, in other words, could easily be intertwined not only with the acceleration of AI-based DX, but also with energy and climate change issues, as mentioned above.

Advanced information technologies such as generative AI also demand vastly more power than ever before (OECD, 2024). The supply chain to support such energy consumption, as well as the superiority of systems such as generative AI and other information technologies, GPUs, high performance computing (HPC), and data centers, are expected to largely define national power. In other words, national power will continue to depend heavily on energy, which will be required not only to maintain productivity, but also to meet the continued active growth in demand for generative AI and data centers, to meet the demands of business and civic life, and to respond to the existential opportunities presented by climate change.

In fact, the generative AI itself consumes a considerable amount of electricity to train and operate. According to the latest report [3]from the International Energy Agency (IEA), the annual power consumption of data centers will double in four years from 460 TWh in 2022 and could reach 1000 TWh by 2026, which is roughly equivalent to the annual power consumption of Japan with its 125 million people. Therefore, by 2024, Google and Amazon have announced investments in SMRs (Small Modular Reactors)[4] to secure power sources for their data centers and for the operation of generative AI.

Baquero[5], on the other hand, contrasted human calorie consumption with the power cost consumption of generative AI (i.e., AI based on LLM), stating that *"While it is not easy to estimate human energy costs, we can look at the body's energy requirements. Walking can be approximated as consuming 100 calories per hour, or about 0.12 kWh. Considering per capita energy consumption data, in the U.S. it is close to 80,000 kWh per person per year (in Europe in general it is around 25,000 and in northern Europe it ranges up to close to 100,000). Converting the analysis to electricity, this translates to about 12,500 kWh per person per year in the U.S. Assuming an 8-hour work day and 260 working days per year, the annual energy cost of one hour of work per person per day is about 6 kWh. On the other hand, in light of the energy cost of running LLM, assuming 250 words per hour, and assuming a standard ratio of 0.75 words per token (for English), since LLM generates tokens that are word components, the goal for one hour of work is about 333 tokens. llama 65B by the Llama 65B was about 4 joules per output token. Thus, 333 tokens would be 1,332 joules, or about 0.00037 kWh."*

As an example of a real company, Google's electricity consumption shows that Google used 7.6 billion kW/h of electricity worldwide in the year 2017, a 20% increase from the previous year, and that about 2 trillion total searches were made worldwide in 2016, so about 500 million searches are made per day Given this, the amount of energy consumed per search also consumes a commensurate amount of electricity. And with the launch of the Gemeni, a generative AI, in operation, the company disclosed in its environmental report that its CO_2-equivalent emission fee in 2023 was 14.3 million tons, up 13% from 2022. Google has also invested in its own

[3] https://www.iea.org/reports/electricity-2024

[4] https://www.nature.com/articles/d41586-024-03490-3

[5] https://cacm.acm.org/blogcacm/the-energy-footprint-of-humans-and-large-language-models/

environmentally friendly power generation systems as well as its own data centers. They have a trade-off between power and computing, even as they use AI to calculate optimal power distribution planning.

On the other hand, examples of studies of actual energy consumption have recently begun to be published. First, Luccioni et al. (2024) measured the energy and CO_2 emissions required to perform 1000 inferences for both a task-specific AI model and a general-purpose AI model for multiple tasks, and found that the general-purpose generative architecture was far more expensive than the task-specific system, in terms of both energy and CO_2 emissions. According to the report, the generic generative architecture entailed a much higher cost than task-specific systems, and was more pronounced in terms of energy and CO_2 emissions. While image and text classification tasks had relatively low emissions, the report found that generative tasks such as text generation and summarization used more than 10 times as much energy, with multimodal tasks such as image capture and image generation having the highest energy usage. And second, regarding the differences between AI and humans, Tomlinson et al. (2024) conducted a comparative analysis of the carbon footprint of AI systems (ChatGPT, BLOOM, DALL-E2, Midjourney) and humans performing comparable text creation and illustration tasks, and found that AI compared to humans, The results showed that AI reduces CO_2 emissions by 130 to 1,500 times per page of text generated, and AI drawing reduces CO_2 emissions by 310 to 2,900 times per image compared to a human, according to the report.

Therefore, effective use of generative AI is not only likely to significantly improve productivity, but is also likely to be more efficient in terms of power consumption compared to human work conditions. If productivity and efficiency of intellectual processing can be improved by advanced AI, and if various innovations can be achieved, it is easy to imagine that the quality and quantity of AI (and the information systems in general that make them function as systems, the performance of HPC, and power supply capacity) will determine crucially national power.

Next, what about scientific and technological capabilities, for example, AI research and development capabilities and AI performance? NVIDIA's description of "*Sovereign AI*"[6], in which each country has its own AI system, will greatly influence national power in terms of its AI governance and the quality of its sustained R&D innovation.

1. The global imperative for nations to invest in sovereign AI capabilities has grown since the rise of generative AI, which is reshaping markets, challenging governance models, inspiring new industries and transforming others — from gaming to biopharma. It's also rewriting the nature of work, as people in many fields start using AI-powered "copilots".
2. Sovereign AI encompasses both physical and data infrastructures. The latter includes sovereign foundation models, such as large language models, developed by local teams and trained on local datasets to promote inclusiveness with specific dialects, cultures and practices.
3. For example, speech AI models can help preserve, promote and revitalize indigenous languages. And LLMs aren't just for teaching AIs human languages, but for writing software code, protecting consumers from financial fraud, teaching robots physical skills and much more.
4. In addition, as artificial intelligence and accelerated computing become increasingly critical tools for combating climate change, boosting energy efficiency and protecting against cybersecurity threats, sovereign AI has a pivotal role to play in equipping every nation to bolster its sustainability efforts.

The United States is by far the world leader in the use of AI in national governance. According to the AI Index 2024 published by Stanford University[7] in 2024, the U.S. dominates the number of foundation models that support generative AI by country, far ahead of China in second place and the EU countries in third place and below. Furthermore, the top companies that have developed and own such models are Google, Meta, Microsoft, and OpenAI, all of which are American companies. The U.S. has an outstanding eco-cycle for AI technology development, and already has a solid economic foundation with several world-class universities and research institutes, abundant research personnel, ample investment in R&D, energy supply networks such as electricity, and an abundant market for products ranging from business applications to military applications. Through these factors, the country can quickly lead the world in the qualitative transformation of next-generation industrial structures, which will lead to the maintenance and further enhancement of its national strength.

It should be noted here that the supply chain of energy resources and semiconductors related to AI and electricity, and the backbone systems of power generation facilities such as nuclear power plants, all form the core of a nation. Therefore, at the same time, they are also terrorist and military targets. In other words, they are always a challenge for advanced information security measures, economic security, and national security. Based on this context, economic security policy is a problem structure that should focus on more contemporary issues.

[6] https://blogs.nvidia.com/blog/what-is-sovereign-ai/

[7] https://aiindex.stanford.edu/report/

Next-Generation AI and National Power

In the future, the key performance indicators (KPIs) that will define the new "national power equation" will certainly include the technological capabilities of each country's AI and quantum computing-related technologies and the DX and production efficiency of the industrial structure that they will enable. Of course, population issues (especially fertility and immigration) are inevitable for the time being. Needless to say, the consideration of labor productivity and the age structure, including the working population, are also difficult issues that need to be addressed separately.

Let me devise the next-generation national power equation and discuss it in the following two scenarios: First, the focus is on whether or not to keep silent on the further development of AI-related technologies such as ChatGPT4.0 or later version by LLM (Large Language Model), which has shaken the world since its rapid evolution, and whether humans will be able to control AI in the future. The first is a future in which humans will cooperate internationally in the direction of appropriate control of such AI-related technologies and maintain the level of AI-related technologies to the extent that they can coexist with humans. On the other hand, the second is a future in which AI reaches Singularity and surpasses human knowledge, and there is no longer any problem in excluding productivity dependent on population, and national power is determined simply by the performance and quantity of AI and quantum computing power.

The "*national power equation*" for the next generation, excluding the section on military and defense power as hard power, could be made as follows, for example.

$$National\,Power\ = AI + E + S$$

(eq.5)

Where,

- AI: AI productivity
- E:Energy supply
- S: Science & Technology

1. Scenario 1 (a future in which AI technology develops but maintains a technological level at which AI and humans can coexist):
   Assuming that AI and humanity will continue to coexist, in addition to the abovementioned factors that will determine a nation's future power, other factors such as economic power, food self-sufficiency, population balance, and lifelong education and learning rates of citizens will likely be also essential.
2. Scenario 2 (a future in which AI reaches Singularity, transcends human intelligence, and replaces all human labor productivity):
   In this scenario, population and food needs only to be controlled to the extent that humanity does not become extinct, and there is no need to add them to national power. Namely, national power will be maintained through AI, and as shown in the formula above, AI productivity, scientific and technological capabilities, and energy self-sufficiency rate are thought to be the main factors.

First, as scenario 1, basically, by promoting various related policies such as innovation policies and SDGs, the country will be able to sustain itself as a nation even when it encounters risks and crises caused by external variables such as climate change and economic externalities related to food and energy. This means, in other words, to ensure self-renewal capabilities as a nation. And, while reducing the burden on the environment and seeking stable and sustainable development, further development will be realized through innovation in advanced science and technology. By promoting climate engineering, carbon neutral technologies, and renewable energy technologies, and by promoting highly accurate simulations and effective policy implementation, humanity may finally overcome this crisis (MIT, 2016).

On the other hand, as scenario 2, a pessimistic future (dystopia), can also be envisioned. In this scenario, variables related to population (birth rate, food, medical care, health, education, etc.) will have less impact on national power than in Scenario 1 and the previous economies. The pre-modern idea that population growth and variables related to securing labor and human resource development were the basis for national development is merely a relic of the past. The age in which even small countries can compete with large countries is likely to come, thanks to the rise of science and technology. The emergence of ChatGPT and its breakthrough after the end of 2022, it is predicted that AI will suddenly be able to perform the majority of human intellectual work. To be sure, a certain number of scientists and engineers may be needed, but since it is predicted that AI-powered robots can replace many of the general workforce, population decline will not be a problem once the population itself has a negligible impact on the national power equation. Rather, population decline will be favorable from the perspective of global environmental protection, as it will help alleviate food shortages, reduce industrial output, and reduce CO_2 and other GHG emissions. Furthermore, when AI crosses the singularity, from the perspective of an AI that surpasses human knowledge, it will be sufficient to have only the genome information of each individual human being in an online database, and if each individual is reproduced as a digital body like an avatar on the metaverse based on genome information, food and population problems, various social problems, crimes, and conflicts will be eliminated. If each individual is reproduced in the metaverse based on genome information as a digital body like an avatar, there will be no food, population, social problems, crimes, or conflicts, and a peaceful utopia will be realized on the earth (Shibuya, 2020, 2022, 2023,2025).

In both of the above scenarios, electric energy consumption can be expected to increase rather significantly due to the spread of IoT, generative AI, quantum-related technologies, and so on. Therefore, a stable energy supply is essential through the development of those energy-saving technologies, as well as through the promotion of renewable energy and energy technology development, including nuclear fusion. In other words, if the quality and quantity of advanced AI determine national power, furthermore, the promotion of science and technology capabilities and innovation, including energy-related technological innovation and institutional design sufficient to support such energy consumption, will also play a major role as a factor in determining national power.

In short, there is a difference between pursuing a policy of economic security to maintain and develop national power to its utmost limit (scenario 2), or maintaining the population variable in the national power equation while also ensuring "human security" (including the existential aspect of human beings in the real world) with the physical physicality of humankind (scenario 1). Whichever is chosen, there remains the possibility that the possibility of human existence will be qualitatively different from the present situation. In scenario 1, there could be a future in which humanity continues to be exposed to food shortages and climate crises, and in scenario 2, there is only a future in which humanity loses our value as existential beings because we reconstitute our digital identity in a virtual world, increasing the possibility that it will be extremely difficult to achieve and maintain the maximization of human dignity. Will humanity be able to win its own future by risking its own existential existence in the face of inevitable problems such as climate change and food shortages?

Conclusion

To summarize the essences of this paper, in the next generation, the performance of each nation's AI will define the international balance of power, since each nation's national power will be served by maximizing the performance of the AI. At the same time, solutions to climate change and population problems will be sought by maximizing the performance of AI, but the optimization of energy supply and scientific and technological capabilities must also be fulfilled. Thus, humanity will leave a significant portion of its fate to AI, but as long as humanity does not cede control of energy supply to AI, humanity will have an advantage over AI and a path of coexistence will be possible. The interests of both parties are aligned: humanity needs advanced super-intelligent AI to deal with crises such as climate change, and super-intelligent AI will need a supply of energy from humans to operate.

There is a persistent pessimistic tone in the debate over AI. However, the future of humanity is not necessarily all that pessimistic. "*A true realist is one who invests in the future*". Based on this proverb, the current investment in research and development in AI is certainly an investment in the future enhancement of national power. As discussed in this study, national power has indeed been heavily weighted by population factors, along with military, diplomatic, and scientific and technological capabilities. However, we are now at the edge of a shift from labor productivity, which relies on the number of workers in terms of population, to productivity, which relies on the computing power of AI and quantum computing. By securing renewable energy sources such as hydrogen power generation technology, biomass, and geothermal energy, as well as by achieving productivity innovation and system automation through the increased computing power of AI and quantum computing, and by substituting these with human labor power, a leaner national management may be realized.

However, as humanity itself places AI at its core and further enhances each other's national power, international tensions will increase at the same time, and a situation where humanity as a whole cannot cooperate together may give a super-intelligent AI an opportunity to plunge humanity into the danger of extinction. Whether or not this is a pessimistic future is a category for future generations to decide, but only we today can create the pathway to that future.

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