



Energy Policies That Harmonize Three Securities

Based on the work of Arun Majumdar

“Energy Policies That Harmonize Three Securities,” an essay by Arun Majumdar, argues for a balanced approach to energy policy that considers economic, national, and environmental security. Majumdar emphasizes the need for both short-term and long-term strategies to address immediate security concerns while transitioning to a clean energy economy.

Key Points on US Energy Security

1. Economic security, national security, and environmental security produce conflicting demands. As a result, decisions and choices made by a nation regarding energy can often appear contradictory.
2. To harmonize energy policies across economic, national, and environmental security, it is useful to frame decisions in terms of short-term (within 5 years), mid-term (5-10 years), and long-term policies.
3. Some sectors of the economy, such as steel, cement, and chemicals, face greater challenges in decarbonization than others. These hard-to-abate sectors may require more time, innovation, and investment to achieve significant emissions reductions.
4. About 80% of global primary energy comes from fossil sources, with the remaining 20% from biomass, nuclear, and renewables. The scale of fossil fuel consumption is immense—about 5 gigatons (GT) of oil; 2.7 GT of natural gas; and 8 GT of coal in 2023. For comparison, the total weight of all humans alive today is .5 GT.
5. The Russian invasion of Ukraine highlighted Europe’s energy vulnerability, leading to significant shifts in oil and gas import patterns.
6. The global energy transition requires unprecedented scale and speed, with the International Energy Agency estimating it will require investments of \$4 trillion per year for 30 years.
7. To keep global average temperature rise below 2°C, the world has a remaining carbon budget of 800–1,000 gigatons of CO₂, which at current emission rates will be exhausted in less than 20 years.

Economic Realities

Massive scale: Global energy consumption was about 183 petawatt-hours in 2023, with fossil fuels (coal, oil, and natural gas) providing about 80% of this energy. A petawatt-hour is equal to one trillion kilowatt-hours. The average US home consumes about 10,000 kilowatt-hours of energy a year, which means a petawatt-hour could power 100 million American homes for one year.

Electrification challenge: Only about 15% of global energy was generated as electricity in 2022, highlighting the massive scale of energy that needs to be transitioned from fossil fuels to clean electricity.

Renewable growth: Solar and wind produced roughly 13% of global electricity in 2023 and are the fastest-growing segments.

Investment shift: In 2024, global investments in renewable energy and energy efficiency are expected to reach almost \$2 trillion, compared to \$1 trillion for fossil fuels.

Recommendation 1

Implement short-term policies (0–5 years) to address immediate security concerns. Countries that rely on oil and gas imports should:

- diversify their energy consumption mix to reduce dependence on any single source;
- improve energy efficiency across all sectors;
- accelerate renewable energy deployment through incentives and mandates; and
- preserve existing nuclear power plants to maintain a stable baseload power supply.

These measures aim to enhance energy security while laying the groundwork for longer-term transitions.

Recommendation 2

Develop mid- to long-term policies (5+ years) for the clean energy transition. These include:

- investing in clean energy innovations such as grid-scale storage and small modular nuclear plants;
- implementing carbon pricing mechanisms to create market incentives for emissions reduction;
- streamlining regulatory processes to expedite infrastructure development; and
- creating comprehensive climate adaptation and resilience strategies.

These policies should aim to balance economic growth with environmental protection and energy security.

Recommendation 3

Increase R&D investments in clean energy technologies. Nations should focus on game-changing innovations like:

- multiday grid-scale storage;
- net-zero industrial processes; and
- technologies that can operate at gigaton scales.

Investing in innovation is likely to be one of the most effective long-term climate policies and has the potential to avoid significant future climate-related economic losses.

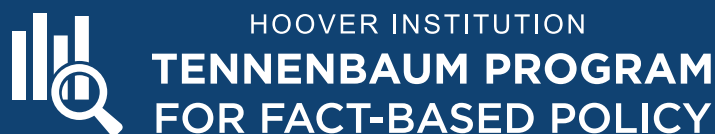
Recommendation 4

Balance emissions reduction with economic growth and energy security. Develop policies that create incentives for a clean energy transition while ensuring energy reliability and affordability. These may include:

- financial incentives for clean technologies;
- regulations that promote energy efficiency; and
- strategies to secure and diversify supply chains for the necessary critical materials.

The goal is to foster a transition that enhances economic prosperity while addressing climate change and energy security concerns.

**Based on “Energy Policies That Harmonize Three Securities,” by Arun Majumdar,
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