

# Energy Choices and Vulnerability of Nations\*

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## Abstract

The connection between energy choices and the vulnerability of nations is established. Distributed generation from local resources is put forward as the desirable features of a resilient national energy system.

## Introduction

Vulnerability of nations has become a priority issue since the September 11, 2001 terrorist attack on the United States of America. The event showed, that even the strongest nations have built-in vulnerabilities, which cannot be defended by the strength of an army. The loss of life, the social, and economic cost to the victim of the attack is disproportionately higher than the cost to the malevolent attacker.

Without any weapons of their own, a few suicidal terrorists have inflicted enormous damage to the American economy, caused wide spread fear, and severe disruption in the life style of the people in America. Defense is much harder, and more costly than attack. Security measures taken by a government are more than an economic problem, and an inconvenience; they curtail many cherished civil liberties, and cause violations of the human rights and freedoms of citizens. The fear of terror has spread beyond the United States; it is now a global phenomenon.

Nations should learn a lesson from observed terrorist activities in recent years. In addition to increased vigilance, nations must avoid building vulnerability into their own territory. The stability and resilience of a nation's infrastructure will reduce the cost of

defense not only against terrorist attacks, but also in case of a war.

## Energy and Vulnerability

Energy is of vital importance for a nation. Any interruption of power represents a severe handicap for daily life. In particular, a failure of the electrical system makes a nation immediately dysfunctional. Central power stations, electrical transmission lines, oil and gas pipelines, oil depots are vulnerable spots within a nation.

It is said that WW2 would have ended a year earlier, if the allied forces had focused their air attacks on the destruction of the power stations in Germany, instead of bombing the cities.

After WW2 the German-speaking population of the Italian Province of South Tyrol wanted to achieve cultural sovereignty. Lacking any other political leverage, the activists placed explosives to the masts of the electrical transmission lines. There are thousands of masts high up in the Alps, and the police were unable to control the situation. The boycott ended only when the people of South Tyrol were given the right to run their own schools and newspapers.

Fossil fuel scarcity creates volatile international markets, and economic vulnerability of nation who depend on imports.

It is important to note that scarce resources are not the only problem fossil fuel based power. Collectively, those nations who burn coal, oil, and gas hurt all nations around the globe through greenhouse gas production.

The US administration was up to now in climate change denial mode. However, a secret Pentagon report was recently leaked to the public, and it warns the United States government that weather catastrophes could cause global chaos and international violence, much more dangerous to the United States security, than the threat of terrorism. [1]

Nuclear power stations add several additional vulnerabilities to a nation. Nuclear installations may be considered enemy-weapons amplifiers. The radioactivity stored in a reactor or, in spent fuel storage places is equivalent to the radioactivity of hundreds of nuclear fission bombs. Dispersal into the atmosphere and the environment can paralyze a whole continent for many years. The human suffering, the environmental, social, and economic cost of a cleanup operation can be anticipated by comparison with data available from the Chernobyl accident in 1986. Estimates for health cost alone of the Chernobyl disaster in the Ukraine are around 60 billion US\$ [2]. Total cost estimates for cleaning up the Chernobyl accident range up to 600 billion US\$. Considering the high cost of damages resulting from the destruction of nuclear installations, it is clear that even superpowers, which rely on nuclear energy, are vulnerable.

There are a variety of ways the accumulated radioactive material in a nuclear power station can be dispersed into the atmosphere. A small nuclear weapon exploded at a nuclear power station can lead to the paralysis of a continent. It is suspected, that Al-Qaeda terrorists have access to tactical nuclear weapons [3]. Even conventional explosives can interrupt the cooling of spent fuel storage and cause a fire, which will disperse the contents into the environment [4].

I have presented similar ideas on the risks of nuclear energy to the Royal Commission on Electrical Power Planning for Ontario 34 years ago [5]. That presentation has been

gathering dust in the Archives. We suggested at that time, that nuclear power stations should be build deep under ground into mountains, which would reduce their vulnerability to outside attack, but increase the cost by some 20 %. After the Chernobyl accident, Andrei Sakharov in Russia has made such a suggestion as well [6]. The authority of Sakharov lends credibility to the idea of building all nuclear power stations under ground. Unfortunately, Sakharov's genius failed to recognize the abundance of solar energy, and the potential of solar technology, which makes nuclear power unnecessary altogether.

The spread of nuclear power technology has an additional risk factor for the security of nations. The proliferation of nuclear weapons is closely correlated with the peaceful use of nuclear energy. Unfortunately, some think that the globalization of nuclear energy technology is necessary for preventing climate change, in spite of the associated risk of nuclear weapons proliferation [7].

### **Reducing the Vulnerability**

Distributed power generation systems are less vulnerable than centralized power stations. The damage per terrorist act is reduced. For a terrorist fighting 1000 windmills is much more difficult, than destroying a single target in form of a central power station.

The distributed generation shortens the distance between the producer and the consumer electric power, and thus reduces the vulnerability of the system. An electrical network based on distributed generation is much more resilient, than one based on central power generation. Failure of one or several generators need not disrupt the electricity supply for the consumers integrated in the grid.

Co-generation in industry, and other places where heat is required, makes for a more resilient less vulnerable energy system. Renewable energy resources are distributed,

and therefore, renewable resources based energy systems are naturally decentralized.

Furthermore, using renewable resources of energy make a nation independent of imports, and the volatile world market for coal, oil, gas, or nuclear fission material. Hence, nations with economies based on renewable energy resources will be less vulnerable.

### **Conclusion**

Nations must avoid building vulnerability into their own territory. In a world plagued by terrorism, climate change, wide spread poverty, scarcity of food, water, and other resources the likelihood for chaotic conflicts will increase in the future. Therefore, vulnerability must be an essential factor in energy planning. A resilient energy system based on distributed generation and local resources serves the independence, defense and security interests of a nation well.

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