

LADIES AND GENTLEMEN:

It is a great honor indeed to speak in front of such an august audience in the magnificent Paris. I do not have much time, so I will immediately get down to business.

My role is to remind you of the slim benefits of agrofuels to the EU and world economy that are far, far outweighed by their tragic impacts on the global food supply, the life-preserving and food-giving ecosystems on the Earth, and on the global climate.

Following **Aristotle**, I have three choices in deciding how to persuade you: Logos, Pathos, and Ethos.

Logos is appeal based on reason. My work paper distributed to you by OECD is logos-driven, and I hope that it will stand on its own merit.

Pathos is appeal based on emotion. Since I am not advertising anything here and I am talking to a very rational audience, I will use Pathos with great caution.

Ethos is appeal based on the character of the speaker. An ethos-driven speech relies on the reputation of the author and the people she associates with. I will start from serving you Ethos as an appetizer.

I will start from a story I was told by my dear friend and mentor, a world-famous mathematician and earth scientist, **Grigory Isaakovich Barenblatt**, a member of 5 academies of sciences, and a professor of mathematics at Berkeley. Among a myriad of

his achievements, Professor **Barenblatt** is the father of modern theory of fracture generation and propagation, a detail relevant here.

This story is about **Anatoliy Petrovich Alexandrov**, a famous Soviet physicist. In 1960, **Alexandrov** became director of the Kurchatov Institute of Atomic Energy. He was the chief administrator responsible for the design of the Chernobyl-type RBMK reactors. In 1975, he was elected President of the Soviet Academy of Sciences, the highest honor bestowed on any Soviet scientist.

Alexandrov was fired from this position on October 16, 1986, almost to the day 6 months after the Chernobyl disaster, which started on April 26, 1986.

Today Chernobyl is almost completely forgotten.

Back to Professor **Barenblatt's** story. In 1974 and 1976 - just after the introduction of the RBMK reactors - Professor **Gustaf Östberg** of the Lund University, a fracture and risk management specialist, warned Professor **Barenblatt** about a probable mode of failure of these reactors and urged him to speak to the chairman of the Soviet Council of Ministers. Of course this could not be done, but Professor **Barenblatt** asked his friend, a great nuclear physicist **Mikhail Alekseevich Leontovich** to speak with **Alexandrov**. In 1974, the first reply from **Alexandrov** was that Professor **Barenblatt** was insufficiently occupied with his job and this should be fixed. It was. In 1976, on the second try, Professor **Alexandrov** got angry and said that he personally would put an RBMK reactor

in the garden of his dacha and on the Red Square, because it was so safe. In early 1986, just at the time of the Chernobyl explosion, **Valeri Alekseevich Legasov**, who worked for **Alexandrov**, published a paper in “Energy,” one of the journals of the Soviet Academy of Sciences. In it, he discussed risk and security and made a point that for better quality of life, men should take risks. He ended the paper with the famous words of **Hecate** in Shakespeare’s *Tragedy of Macbeth*: “Security is mortals’ chiefest enemy.”

Let’s analyze these words of the goddess of witchcraft, **Hecate**. In public policy, we strive for “security.” Agrofuels are a simple addition to the existing fuel infrastructure, and they promise “energy security,” the term used most mindlessly in the United States.

Everyone likes “security,” don’t we?

But today’s common meaning of the word “security” is not what **Hecate** meant. In Scene 5 of Act III, **Hecate** scorned the three Witches for not involving her in crafting the downfall of **Macbeth**. She promised to produce apparitions - or spirits - that "by the strength of their illusion" would lead **Macbeth** to conclude that he was safe. She then uttered these immortal words:

“And you all know, security/Is mortals' chiefest enemy.”

Hecate knew that **Macbeth's** belief in being untouchable would make him arrogant and careless, and ultimately would lead to his downfall.

Hecate's "security" is the security of mega-scale industrial agrofuels. They are false apparitions, which "by the strength of their illusion" will lead the US, EU, and the global economy to their downfall, while solving none of the overwhelming problems we face. Just like in the case of the Chernobyl reactors, many well-connected scientists, publishing in best journals, will be shown by history to be tragically wrong. As to Professor **Barenblatt**, he ended up giving a series of lectures entitled "*Shakespeare in the safety of atomic reactors and responsibility of scientists.*" As to **Legasov**, he successfully committed suicide after two trials. People say that he could not bear living with the knowledge of what he did in the RBMK reactor project.

Now, I will serve you Logos as the main course. I will tell you briefly why I have made such radically negative statements about agrofuels. My reasons are threefold: (1) Agrofuels will never deliver enough volume to quench our thirst, (2) Agrofuel plantations will destroy most of what remains of the pristine ecosystems on the Earth, and (3) Agrofuel plantations and refineries cause carbon dioxide and nitrous oxide emissions that are larger than those from crude oil and natural gas burned in equivalent quantities. These excessive GHG emissions from agrofuel systems will accelerate global warming more than even business as usual.

Before becoming negative again, I will start on a positive note. I shall recommend to really replace liquid transportation fuels with a transportation system built around photovoltaic cells, and increasingly rechargeable hybrid vehicles, all the way up to electric vehicles in a more distant future. With conservative assumptions, this system is

some 100 times more efficient than the current agrofuel systems, including sugarcane and tropical tree plantations. A factor of 100 is equivalent to the difference between running and flying a jet. Based on physics, a technology that is 100 times more energy-efficient must win in the long run.

The reasons for the impossibility of ever producing enough agrofuels go all the way back to how our finite planet Earth works. The Earth is powered by the sun's radiation that crosses the outer boundary of her atmosphere and reaches her surface. The Earth can export low-quality heat into outer space. But, because of her size, the Earth holds on to all mass of all chemical elements.

There are important consequences of this fact.

If all mass must stay on the Earth, all her households must recycle everything; otherwise internal chemical waste would build up and gradually kill them. Mother Nature does not usually do toxic waste landfills and spills.

In mature ecosystems, one species' waste must be another species' food and no net waste is ever created! Modern agriculture negates this principle and is utterly unsustainable.

In summary, the seven major agrofuel impacts on the Earth and humans are as follows:

1. Agrofuels cannot possibly satisfy our insatiable appetite for transportation fuels because there is not enough suitable land on the Earth to grow them.

2. Even if there were enough land area, there would not be enough good soil and water.
3. Even if there were enough soil and water, there would not be enough fossil-fuel-derived fertilizers and fossil phosphates.
4. Even if there were enough fertilizers, we would need to use so much field chemicals – toxic deadly poisons – that they would suppress biological productivity of the Earth by killing off or incapacitating the nitrogen fixing bacteria, and nutrient producing fungi and earthworms.
5. Even if all these crucial show stoppers for agrofuels were overcome, there would still be excessive nitrous oxide emissions from all major agrofuel systems, up to twice the corresponding emissions from burning crude oil and natural gas.
6. Agrofuels intrude upon pristine ecosystems, forests and savannahs, especially in the tropics. If their production continues, agrofuels will generate - through deforestation and swamp peat oxidation - 2 to 10 more carbon dioxide than the burning of an energy-equivalent quantity of crude oil and natural gas.
7. Agrofuels have already encroached on all major food production schemes and are causing more suffering of the poor - often starving - ½ of humanity. Price increases of basic food staples, or simple lack of food, are bound to cause massive unrest among the poor.

Remember Chernobyl? Its global impact has been a child's play compared with the damage we are doing now - in real time – to the essential life-preserving services of the Earth. The total number of people impacted by Chernobyl was miniscule compared with

the impending dislocation of hundreds of millions of people in Africa, Asia, and South America.

By reviewing and restricting the role of agrofuels in its transportation system, and encouraging 100 times more efficient solutions, the EU has a historic opportunity of averting a major global crisis and worsening global warming.

The European Union ought to assert its leadership and fill in the intellectual and moral vacuum left by the agrofuel policies of the United States. I say this with great pain, but a spade is a spade is a spade.

In closing, I would like to say that - regardless of the past sins - it would be a real shame for our magnificent cities and culture to wither, together with the civilization that shaped them. Unless we learn quickly how to use less of everything, starting from the ubiquitous plastic water bottles and plastic bags, soon there will not be enough energy left for the societies to devote their caring attention to the beauty that surrounds us so extravagantly and light-heartedly in Paris.

Thank you very much.