NUCLEAR ENERGY: TO BE OR NOT TO BE?

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PRAHA–STOCKHOLM

PRAGUE, CZ–AT ENERGY GROUP
FEBRUARY 2013

Is Nuclear Physics Expensive? Rudé Právo 9.8.1967

RP. 9. VIII. 67.

Je jaderná fyzika drahá?

MÁ SMYSL SE JÍ ZABÝVAT? ● MŮŽEME SI JI DOVOLIT? (I)

Podobné otázky se občas vynořují nad různými vědními obory v různých zemích při pohledu na sedmimístné až osmimístné číslice figurující v rozpočtech laboratoří a institucí. Těchto diskusí není ušetřeno ani Československo.

V době, kdy mluvíme o vědeckotechnické revoluci, o tom, že věda se stá-

Je tomu ale skutečně tak? Může jaderná fyzika přispět ještě něčím k praktickému obohacení lidstva? Nebo se oblast praktického využití jaderné fyziky již vyčerpala a jaderné fyzice je souzena budoucnost klasické universitní disciplíny, ve které jsou již všechny tečky nad i udělány, bez aspirací na řešení fundamentálních problémů?

Není obtížné ukázat, že tomu tak není. Jaderná fyzika má před sebou fundamentální problémy, jejichž řeše-

Kromě problému jaderných sil se jaderná fyzika setkává ještě s jedním problémem též fundamentálního charakteru: atomová jádra jsou totiž konglomerátem mnoha částic a teoretická formulace a její řešení problému mnoha částic je také velmi obtížná.

Vyřešením těchto hlavních otázek se dnes zabývají stovky a tisíce jaderných vědců z celého světa. Řešení těchto problémů asi nebude možné bez podrobné systematické znalosti co největšího počtu vlastností všech jader,

RNDr. F. JANOUCH, CSc.,
Ústav jaderného výzkumu ČSAV

Rudé Právo, 23.8.1967

What about the High Energy Physics?

RP 23. VIII. 67.

Co s fyzikou vysokých energií?

II.

»Kolik prostředků by plánovací či finanční orgány poskytly Isaaku Newtonovi na objev gravitačního zákona?« ironizoval jednou akademik Petr Kapica nepochopení důležitosti základního výzkumu a nemístný požadavek přímé návratnosti investic ve vědě. »A lze vůbec ocenit finančně či jinak důsledky tohoto objevu?«

Fyzika vysokých energií objevila v posledních letech, převážně na nových urychlovačích, kolem dvou set »elementárních« částic. Slovo elementární dáváme do uvozovek proto, že při takovémto množství je věru těžké mluvit o jejich elementárnosti. Jeden z hlavních problémů fyziky vysokých energií spočívá právě ve vyřešení problému této elementárnosti: Lze všechny elementární částice vysvětlit jako konglomerát z několika málo základních částic, podobně jako všechna atomová jádra jsou ale

Nebudeme zde mluvit o námětech, které jsou s oblibou uváděny ve fantastických románech — i když nechceme vylučovat, a je to dokonce pravděpodobné, že některé z nich mohou být a budou realizovány. Chtěli bychom ale ukázat, že již nyní fyzika vysokých energií přestává být izolovanou oblastí vědy a začíná, často zcela nečekaně, ovlivňovat rozvoj některých jiných vědních oborů. Nejde jenom o kosmologii, astrofyziku a podobné vědy, které zatímních po-

RNDr. F. JANOUCH, CSc.,
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František Janouch: Energy, Freedom, Independence. (in Swedish,1975)

František Janouch: Nuclear Energy: To be or not to be? (Stockholm, 1976)

Andrey Sacharov: Nuclear Energy and Freedom of the West, 1977-78)

My first public discussion of relation between „Energy, Freedom and Independence“ Summer 1975 (Swedish Trade Union journal Metallarbetaren, Summer 1975)

KÄRNKRAFT

Friare var den människa som ägde elden
Mer beroende var den som inte visste
att dagen blev längre med värmande ved
och att vilda djur ryggade ljuset.
Och den människa nådde nedströms längre,
snabbare och lättare sitt mål
än den som motströms sökte flodens källa.
På sin springare var jägaren
överlägsen vännen utan häst.
När det oftast sig hörande havet vilade
var ett skepp med bara segel
ett lätt byte för den farkost som oberoende
av vind roddes med hundra gulårer.
Och mera land brukade bonden med sina djur
än grannen som lutade till arm och rygg allena.

Energi, frihet och oberoende

Av FRANTIŠEK JANOUCH

■■■ Det lilla prosapoemet här intill antyder ett samband mellan energi — förmågan att utvärka arbete — och oberoende. Finns det ett sådant samband och går det att mäta detta? Det skulle samvetsgigen vara groteskt att mäta politiskt eller ekonomiskt oberoende i kilowattimmar eller i någon annan enhet som vi fysiker tycker om. Och likväl finns det ett sådant samband.

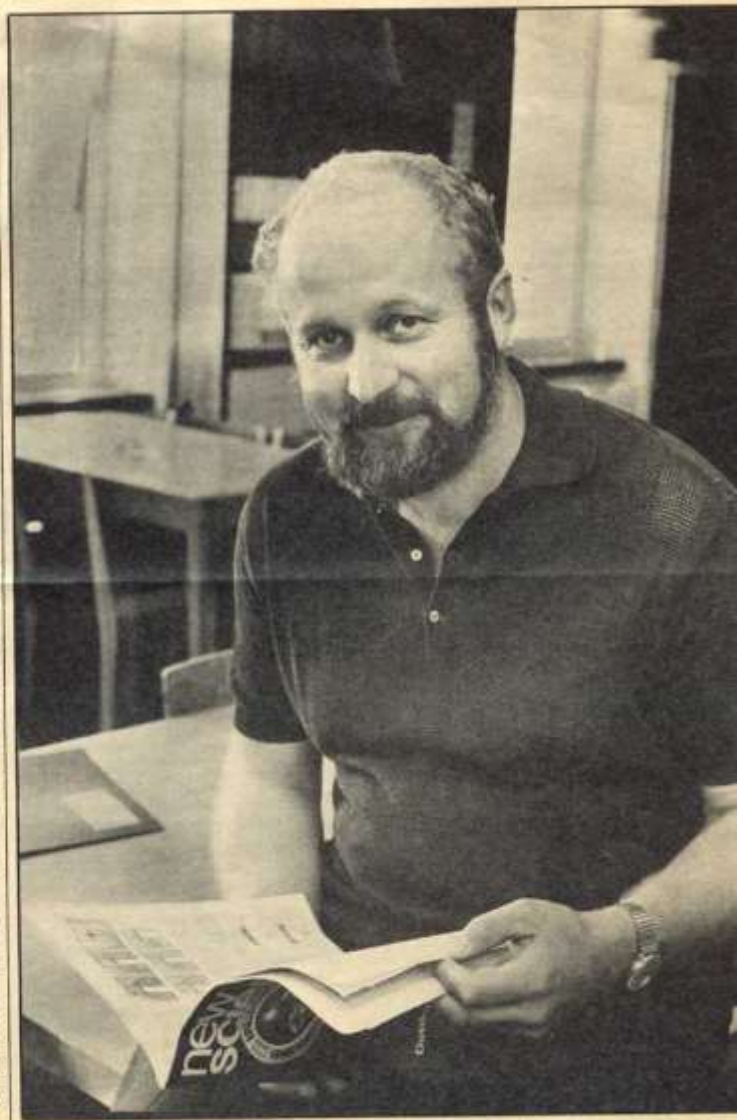
Om vi blickar tillbaka och framåt i tiden, finner vi att detta samband blir starkare och starkare och kanske kommer en stats framtida oberoende och medborgarnas friheter och rättigheter att avgöras av vår förmåga att lösa energiproblemen.

Slav- och feodalsamhällena utmärktes av en nästan fördelning av energi. Minoriteten — faraoner, kejsare, kungar och feodalherrar — använde nästa tusentals slavars och tjänares arbetskraft. Deras rikedomar, oberoende och makt var baserat på en stor insats av energi, i form av mänsklig arbetskraft. De privilegierade hade tillräckligt med mat, värme och därtill överskottsenergi som möjliggjorde förverkligandet av förmuftiga idéer (byggande av skepp, bevattningssystem, kanaler, befästningar osv) och mindre förnuftiga sådana (pyramider, palats, tempel, monument).

En vanlig, indirekt krigsorsak i svunnen tid var just brist på energi. Att ha makt innebar förfoganderätt över människor, förfoganderätt över deras arbetskraft och energi.

Slaveexpeditionerna i Afrika under 1700- och 1800-talet var kanske ett tecken på den första energikrisen i mänskligheten historia. Koloniseringen av den Nya Världen krävde en enorm insats av energi — och den viktigaste energikällan — den mänskliga arbetskraften — var sällsynt i Amerika. Tekniken fanns ännu inte något alternativ för mänsklig arbetskraft och den ofrie slaven fick ta konsekvenserna.

forts på nästa sida



● Frantisek Janouch, gästforskare vid atomforskningsinstitutet i Stockholm, menar att medborgarnas friheter och rättigheter är beroende av statens förmåga att lösa energiproblemet. Han utvecklar sina tankar i den här artikeln som är nummer två i Metallarbetarens serie om forskarnas syn på kärnkraften.

ENERGY, FREEDOM AND INDEPENDENCE

socialdemokraterna PARTISTYRELSEN
105 60 STOCKHOLM TELEFON 08/14 03 00 POSTGIRO 1 07-3 TELEX 10603

1977-01-19

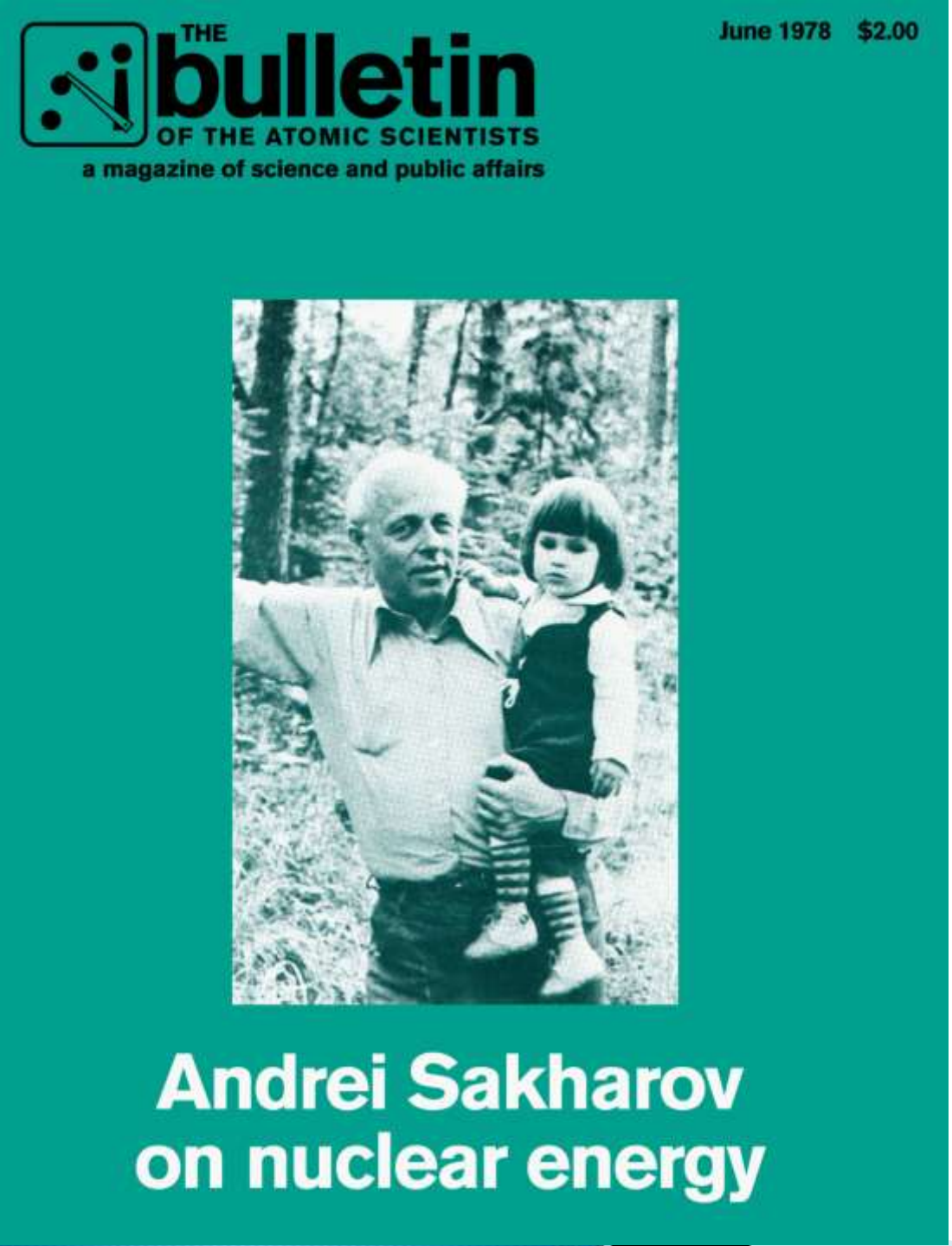
Professor
Frantisek Janouch
Bergtorpsvägen 62, 2 tr
183 64 TÄBY

Dear Professor Janouch,

Thank you for your kind letter and your very illuminating article that I have read carefully. I definitely think that you should publish it and I hope that you will continue to take part in the energy debate that certainly will continue during the coming years.

With best reguards
Yours sincerely

Olof Palme



1978

Nuclear Energy and The Freedom of the West

Nuclear energy and the freedom of the West

A.D. Sakharov

This article by the distinguished Russian physicist, Andrei Sakharov, came to me in the following way. I observed during 1976–77—and am still observing—with growing discomfort the explosion of anti-nuclear activities in Sweden, West Germany, Great Britian and France. I was shocked by the lack of accurate information and the political shortsightedness of the anti-nuclear activitists. These observations brought me into the debate. I had been trying not only to explain that nuclear energy is much less dangerous and much more healthy than the energy produced from fossil fuels, but also to convince the critics that nuclear energy is a conditio sine qua non for the political freedom and independence of the West and for the creation of a more favorable international political climate. In several discussions I had been asked: "What is the attitude of Andrei Sakharov toward nuclear energy?" My reply was not very convincing; I could merely guess that his view would be similar to my own. Therefore, I sent the text of my lecture to Sakharov with an invitation for his comments. The following article is Sakharov's reply, which I received in December 1977— Frantisek Janouch
Editor's note: Professor Janouch is now working in Stockholm. Formerly, he was head of the theoretical nuclear physics department at the Nuclear Research Institute in Prague, a professor of theoretical physics at Charles University and Vice-Secretary of the European Physical Society.

One often hears on the radio or reads in the press about demonstrations involving thousands of people, about speeches by well or not well-known statesmen, about various campaigns in the Western countries—all directed against the development of nuclear energy production, against construction of nuclear power stations, against breeders, etc. Although I felt rather amazed by this and even somewhat indignant, for a long time I restrained myself from any public statement, especially since, naturally, nothing of this kind takes place in the USSR. Gradually, however, I came to the conclusion that this subject deserves attention and that I have something to say about it.

The basic reason for anti-nuclear feelings among people is probably the fact that they do not have sufficient information about the complex and very specialized problems involved. Due to this lack of information, the natural and legitimate concern of contemporary man for preservation of his environment is misdirected.

It is difficult to explain to a non-specialist (though it is actually true) that the nuclear reactor of a nuclear power station is nothing like an atomic bomb, that the power station burning coal or oil offers much greater danger and harm to the environment as well as a biological threat to people than does a nuclear station or breeder reactor of the same capacity rating.

Many responsible statesmen of the West, industrial leaders and nuclear scientists have now come to understand (though belatedly) that it is necessary to bring the basic technical facts to the attention of the public. They now understand the need for large-scale scientific and technical propaganda. This is truly very important. Hans Bethe, Nobel laureate in physics, wrote an excellent, well-argued article on "The Necessity of Fission Power," which was published in the *Scientific American* in January 1976. Bethe is the author of theoretical works on thermonuclear processes in the stars, on quantum electrodynamics and nuclear physics. His works are a part of the history of physics. European readers probably know also the name of the physicist F. Janouch who has repeatedly expressed himself on the same subject.

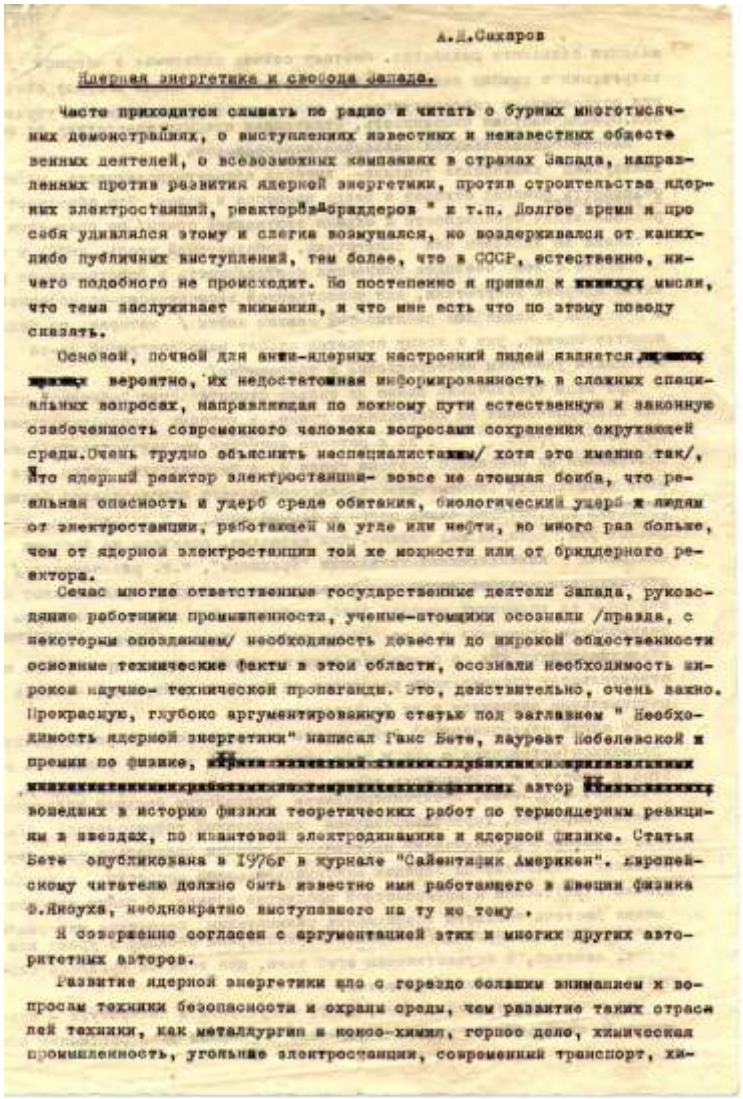
I am in complete accord with the reasoning of these and many other authoritative writers.

The development of nuclear technology has proceeded with much greater attention on the problems of safety techniques and preservation of the environment than the development of such branches of technology as metallurgy, coke chemistry, mining, chemical industry, coal power stations, modern transportation, chemicalization of agriculture, etc. Therefore, the present situation in nuclear power is relatively good from the point of view of safety and possible effects on the environment. The ways to improve it further are also quite clear. The basic peculiarity that distinguishes nuclear technology from that using chemical fuels is the high concentration and small volume of the dangerous by-products and the small size of the process as a whole. This makes it easier to solve the safety and environmental problems for a nuclear power station than it is for a power station using coal, oil, etc.

At the same time it is obvious that it is necessary to force the pace of development of nuclear technology, since it is the only economically feasible method—available in the next few decades—of replacing the use of oil. (According to most estimates, oil will become both too expensive and scarce by the end of the century due to the exhaustion of convenient deposits and increased extraction costs.) Moreover, it is very important not only to construct "conventional" nuclear power stations working on enriched uranium, in which the rare uranium isotope uranium-235 is used, but also to solve the problem of producing fissionable material from the main uranium isotope and eventually from thorium.

This will make it economically feasible to utilize poor uranium ores, large deposits of which are found in the Earth's crust. Later this will make it possible to utilize thorium ores,

For Sakharov it was clear already in 1978 that the nuclear energy and the freedom of the West are interrelated. When this simple truth will be finally accepted by the EU?



А.Д.Сахаров

Ядерная энергетика и свобода запада.

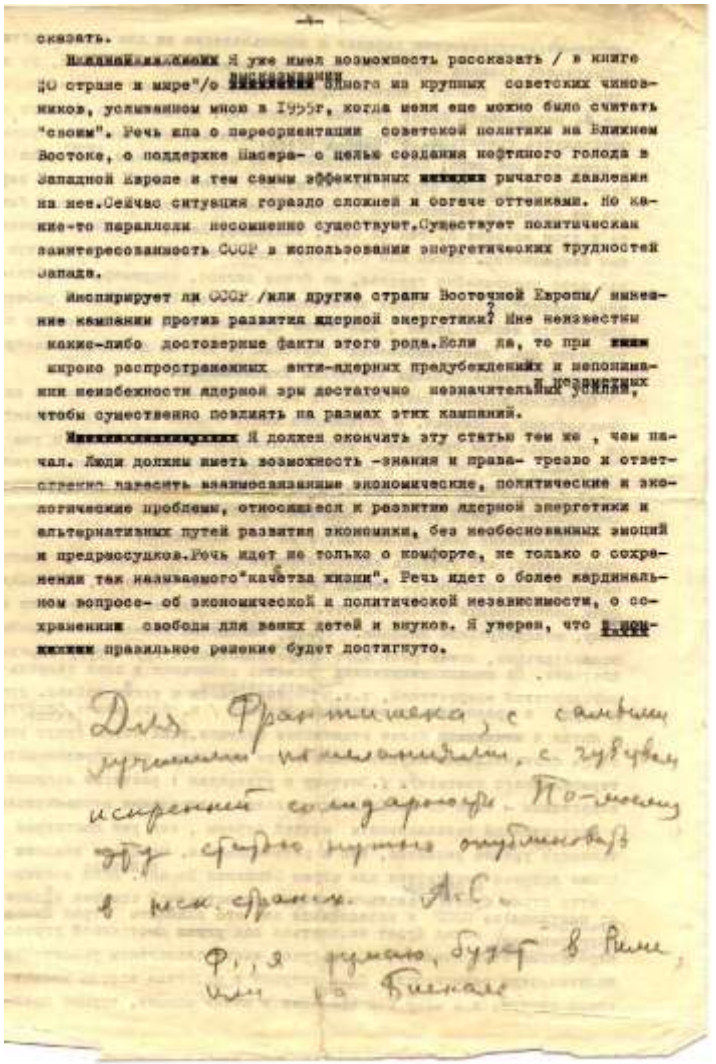
Часто приходится слышать по радио и читать о бурных многотысячных демонстрациях, о выступлениях известных и неизвестных общественных деятелей, о всевозможных кампаниях в странах Запада, направленных против развития ядерной энергетики, против строительства ядерных электростанций, реакторов-бридеров " и т.п. Долгое время и про себя удивлялся этому и слегка возмущался, но воздерживался от каких-либо публичных выступлений, тем более, что в СССР, естественно, ничего подобного не происходит. Но постепенно я пришел к мысли, что тема заслуживает внимания, и что мне есть что по этому поводу сказать.

Основой, почвой для анти-ядерных настроений людей является, вероятно, их недостаточная информированность в сложных специальных вопросах, направляющая по ложному пути естественную и законную озабоченность современного человека вопросами сохранения окружающей среды. Очень трудно объяснить неспециалистам/ хотя это именно так/, что ядерный реактор электростанции- вовсе не атомная бомба, что реальная опасность и ущерб среде обитания, биологический ущерб людям от электростанции, работающей на угле или нефти, во много раз больше, чем от ядерной электростанции той же мощности или от бридерного реактора.

Сейчас многие ответственные государственные деятели Запада, руководящие работники промышленности, ученые-атомщики осознали /правда, с некоторым опозданием/ необходимость довести до широкой общественности основные технические факты в этой области, осознали необходимость широкой научно- технической пропаганды. Это, действительно, очень важно. Прекрасную, глубоко аргументированную статью под заглавием " Необходимость ядерной энергетики" написал Ганс Бете, лауреат Нобелевской премии по физике, автор [redacted] вошедших в историю физики теоретических работ по термоядерным реакциям в звездах, по квантовой электродинамике и ядерной физике. Статья Бете опубликована в 1976г в журнале "Сайентаик Америкен". европейскому читателю должно быть известно имя работающего в области физика Ф.Яноуха, неоднократно выступавшего на ту же тему .

Я совершенно согласен с аргументацией этих и многих других авторитетных авторов.

Развитие ядерной энергетики идет с гораздо большим вниманием к вопросам техники безопасности и охраны среды, чем развитие таких отраслей техники, как металлургия и нефте-химия, горное дело, химическая промышленность, угольные электростанции, современный транспорт, хи-



сказать.

Я уже имел возможность рассказать / в книге "О стране и мире"/о многих из крупных советских чиновников, услышанном мной в 1955г, когда меня еще можно было считать "своим". Речь шла о переориентации советской политики на Ближнем Востоке, о поддержке Насера- с целью создания нефтяного голода в Западной Европе и тем самым эффективных рычагов давления на нее. Сейчас ситуация гораздо сложней и богаче оттенками. Но какие-то параллели несомненно существуют. Существует политическая заинтересованность СССР в использовании энергетических трудностей Запада.

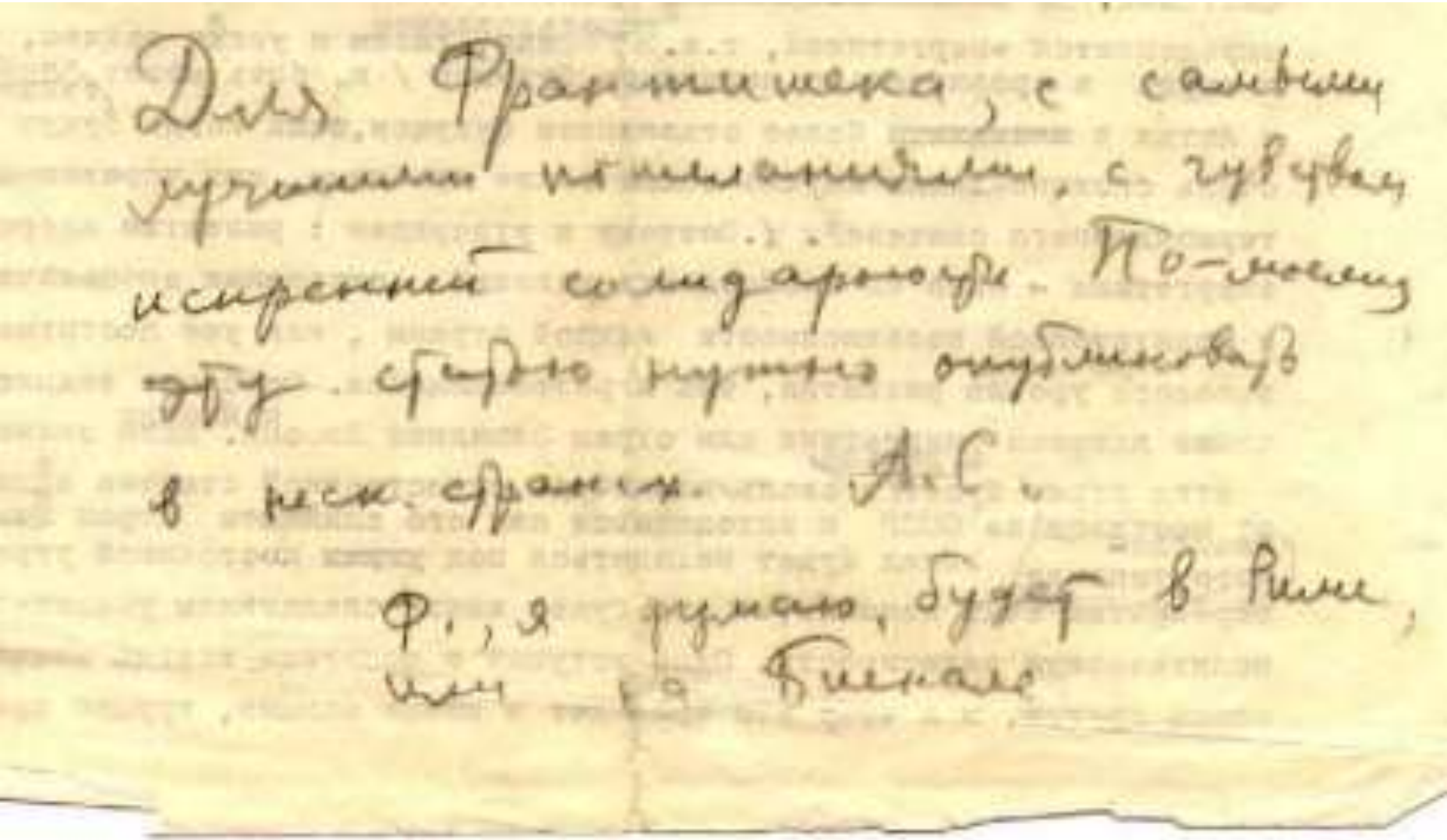
Инспирирует ли СССР /или другие страны Восточной Европы/ нынешние кампании против развития ядерной энергетики? Мне неизвестны какие-либо достоверные факты этого рода. Если да, то при широко распространенных анти-ядерных предубеждениях и непонимании неизбежности ядерной эры достаточно незначительных усилий, чтобы существенно повлиять на размах этих кампаний.

Я должен окончить эту статью тем же , чем начал. Люди должны иметь возможность -знания и права- трезво и ответственно решать взаимосвязанные экономические, политические и экологические проблемы, относящиеся к развитию ядерной энергетики и альтернативных путей развития экономики, без необоснованных эмоций и предрассудков. Речь идет не только о комфорте, не только о сохранении так называемого "качества жизни". Речь идет о более кардинальном вопросе- об экономической и политической независимости, о сохранении свободы для наших детей и внуков. Я уверен, что в конечном правильное решение будет достигнуто.

Для Франтишека, с самым лучшим настроением, с глубоким искренним солидарностью. По-моему эту статью нужно опубликовать в нем. странах. А.С.

Ф., я думаю, будет в Риме, или в Вене

Manus of Andrey Sakharov paper smuggled out from Russia to me with instructions how to publish it.


Для Франкфурта, с самыми
лучшими пожеланиями, с глубоким
искренним солидарностью. По-моему
это сейчас нужно опубликовать
в наших сборниках. А.С.

Ф., я думаю, будет в Риме,
или на Бинале

To save paper Andrey Sakharov wrote greetings and instructions at the last page of his article.

Andrey Sakharov (1921–1989)

is not only a Nobel Peace prize laureate (1975) but he is also:

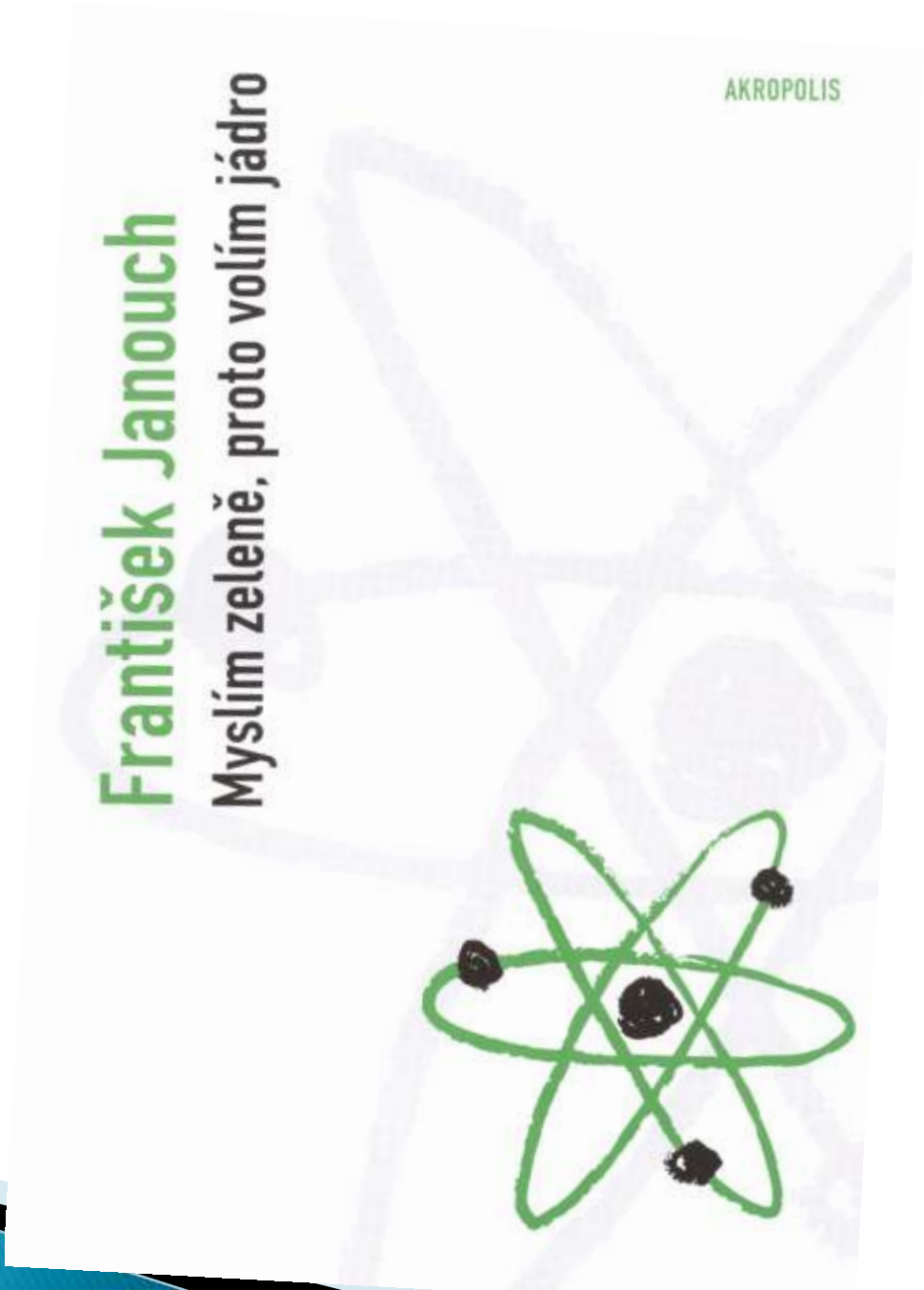
the „father“ of the Soviet Hydrogen Bomb (the Soviet Union produced a H-bomb as a combat weapon prior to USA);

the author of Tokamak idea which lays in the EU program to master the Thermonuclear reaction – EU is spending on this scientific programs many billions of €;

Victor F. Weisskopf, an Austrian physicists, once said that Andrey Sakharov knew answers to problems when the rest of us does not understand yet that problems even exist…

EU only now slowly starts to understand now what Sakharov said and proposed already 30 years ago!

Published Prague, 1981
Forword: Jiřina Jílková and Stefan Schleicher



END OF FOSSILS?

OIL IS NOT A FUEL!
BETTER TO HEAT WITH PAPER MONEY!

(НЕФТЬ НЕ ТОПЛИВО!
ТОПИТЬ МОЖНО АССИГНАЦИЯМИ!)

Dmitry Mendeleev,

(1896 - more then 100 years ago)

Unfortunately, mankind is still using fossils as source of energy and not as an important raw material!

END OF FOSSILS?

TABLE 1 - WORLD RESERVES* 1999

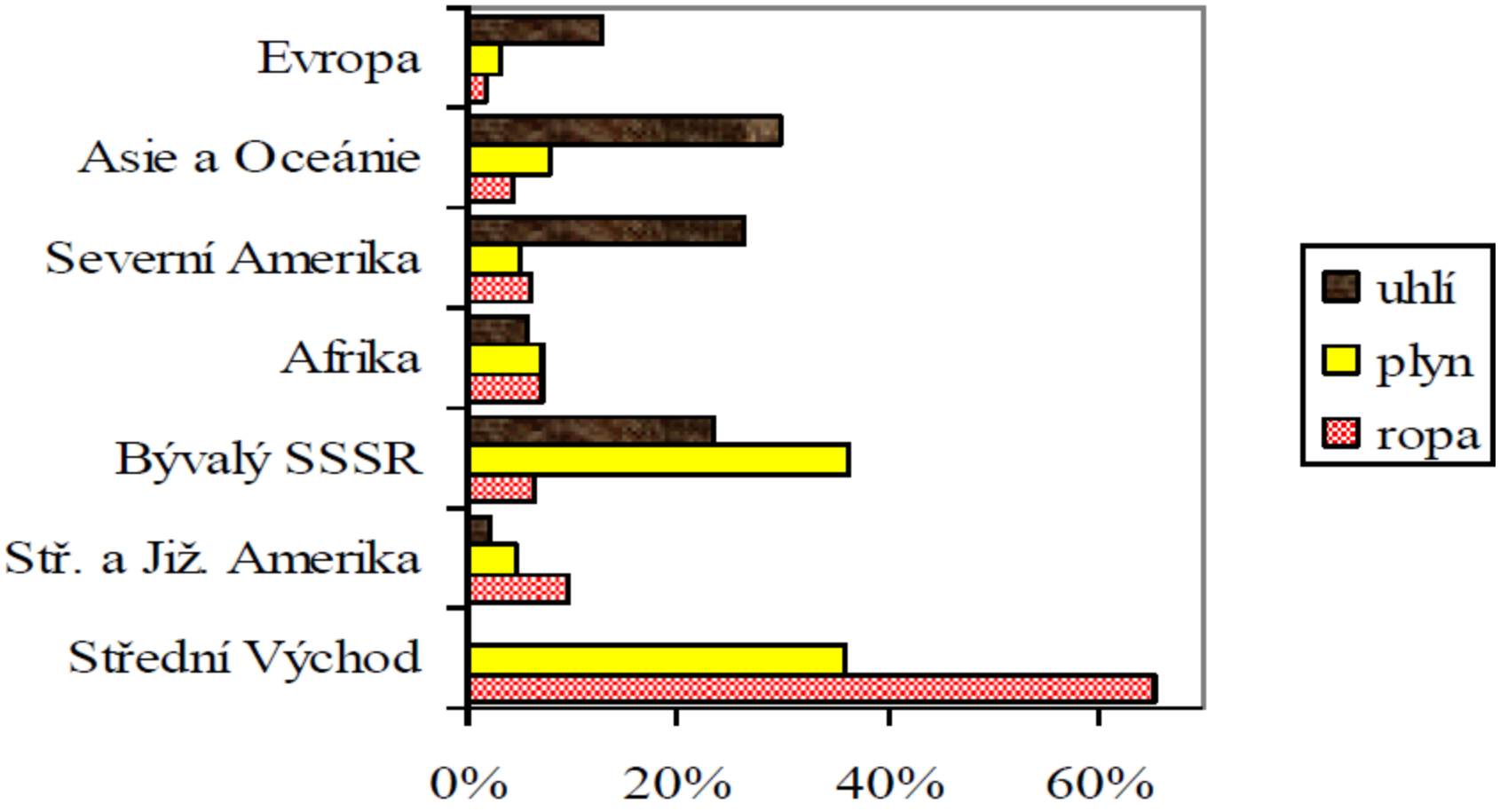
	World Reserves * Gtoe	World Production Gtoe	Reserves in years	Percentage of reserves in world regions									
				Europe	Former Soviet Union ****	Middle East	China	India	Australia	North America	Japan	Central South America	Africa
Oil	140,4	3,45	40,6	2,0%	6,3%	65,4%	2,3%	0,5%	0,3%	8,0%	0,0%	8,6%	7,2%
Natural Gas	134	2,1	66	3,5%	38,7%	33,8%	0,9%	0,4%	0,9%	5%	0,0%	4,3%	7,7%
Coal *****	984211#	2,1	156	12,4%	23,4%	0,0%	11,6%	7,6%	9,2%	26,1%	0,1%	2,2%	6,2%
Uranium**	40->2000	0,35	60->2500***	3%	29%	NA	NA	2%	20%	18%	< 1%	7%	17%

* economically recoverable
** depending on technology used; figures are for 1998
*** based on consumption of 0,65 Gtoe and not on production
**** Russia + other CIS countries
***** Including sub-bituminous and lignite.
# million tonnes

Source : BP Amoco (excluding nuclear)

Source: Green Book on Energy, EU, 2000

Rozložení ověřených zásob fosilní energie



Reserves of Nuclear Fuel

Fuel	Reserves	Years of Use*
Uranium	2.0×10^6 t	40-50*
Uranium (breeders)		cca 3000*
Thorium with ADT	3.7×10^9 t	$>3 \times 10^6$ **

* Current rate of consumption

** Assuming 100 times the present USA level (Bowman, 1992)

FUSION ENERGY RESOURCES

Fusion Fuel	Energy content (TWyr)	Years of supply world electricity needs*
D	5×10^{11}	150×10^{9} years
Li (known reserves)	5×10^{3}	3000 years
Li (in sea water)	1.7×10^{8}	60×10^{6} years

* At 1995 production level

Comparison of coal, oil and nuclear PP 1.000 MW(e)

Annual cons. (t)	**Coal**	**Oil**	**Nuclear**
Fuel	2520000	1520000	27,2
Oxygen	6500000	4800000	0 (almost)

COAL POWER STATION (1000 MW(e))

FUEL PER YEAR: 2 500 000 t COAL

WASTE PER YEAR: 6 500 000 t CO_2, 9000 t SO_2, 4500 t NO_x, 450 t HEAVY METALS (INCLUDING HUNDRED OF KG OF RADIOACTIVE ELEMENTS)

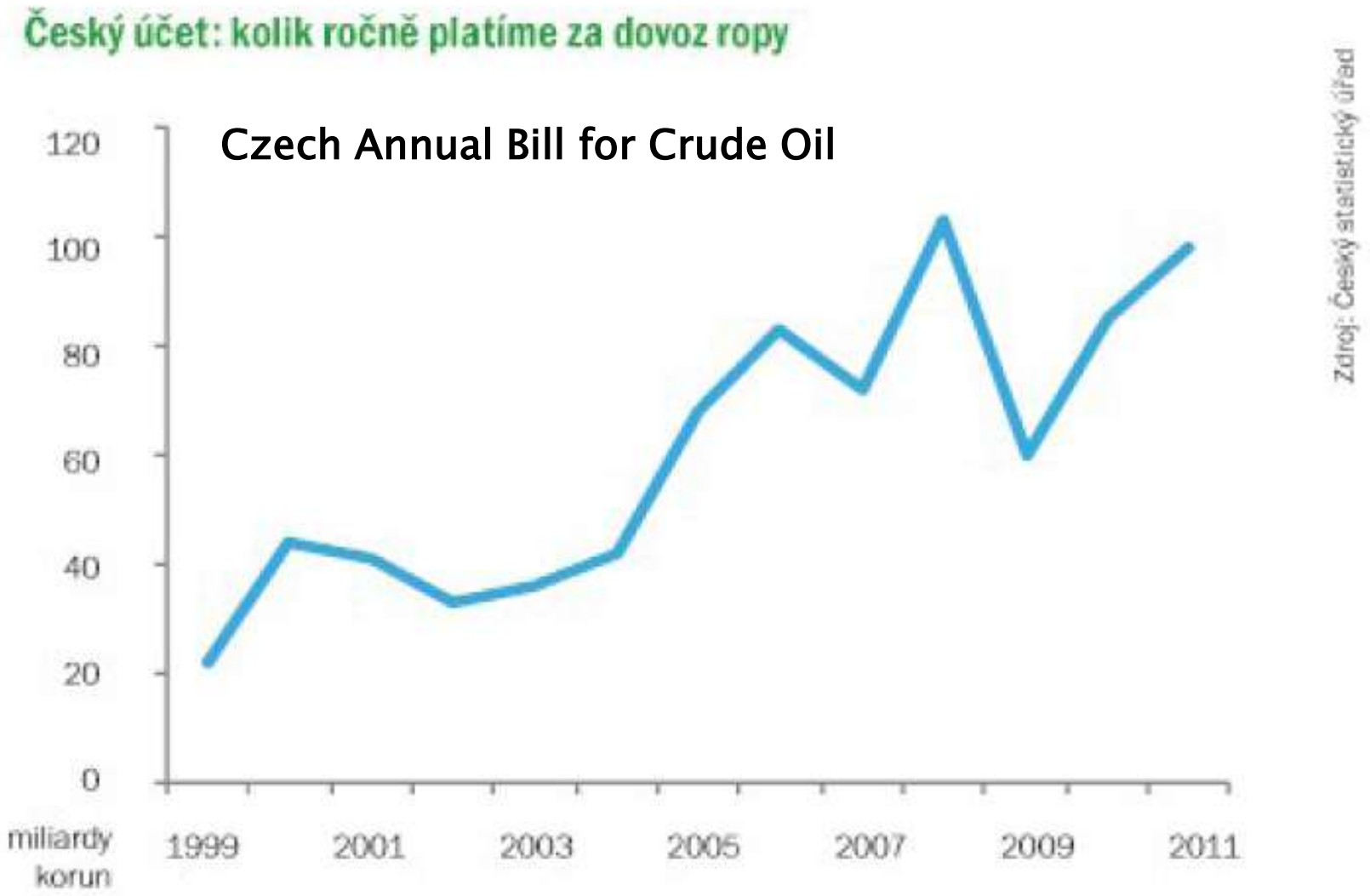
ASH: 500 000–700 000 t (20–30 % OF THE BURNED COAL)

NUCLEAR POWER REACTOR (1000 MW(e))

FUEL PER YEAR : 26 t of U^{235} + U^{238}

WASTE PER YEAR 30t of U^{235} + U^{238}, including about 500 kg of highly radioactive and long-living fission products and actinides;

Fossil prices on the world market: more and more expensive

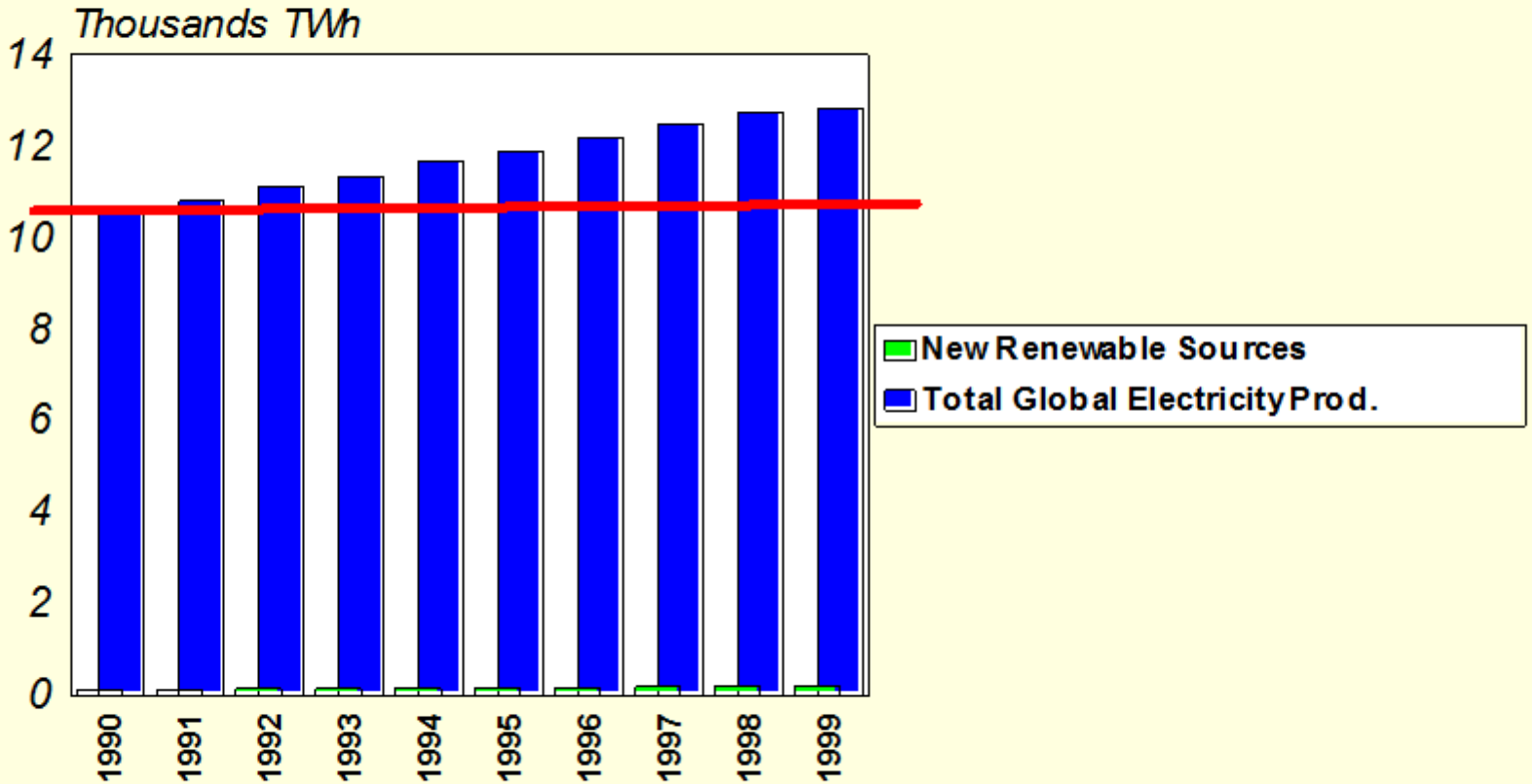

Český účet: kolik ročně platíme za dovoz ropy
Czech Annual Bill for Crude Oil
120
100
80
60
40
20
0
miliardy korun
1999
2001
2003
2005
2007
2009
2011
Zdroj: Český statistický úřad

Meeting with my old friend.

Invoice for gas for 2012 117.000 Kč. She lives in a nice vila, last year she warmed only two rooms – the rest of heatings was switched off.

Her pension – together with her widow‘s pension – is 11.800 Kč!!!

Total Global Electricity Production and Global Electricity Production from the New Renewable sources



During the decade 1990-2000 the new renewables were most generously suported from state budgets

Source: DOE, 2000-2001

Austrian electricity imports:

2006 6TWh*

6 TWh – yearly production of electricity by one Temelín reactor

AUSTRIA IS PLANNING TO CONSTRUCT LNG POWER PLANTS

2010 2200 MW(e)

2015 2400 MW(e)

Fuel – LNG, costs about 2.5 bilion €

<u>Three question:</u>

Energy security (see LNG crisis January 2009)

Environments, Alexej Miller, Gazprom

Fuel costs

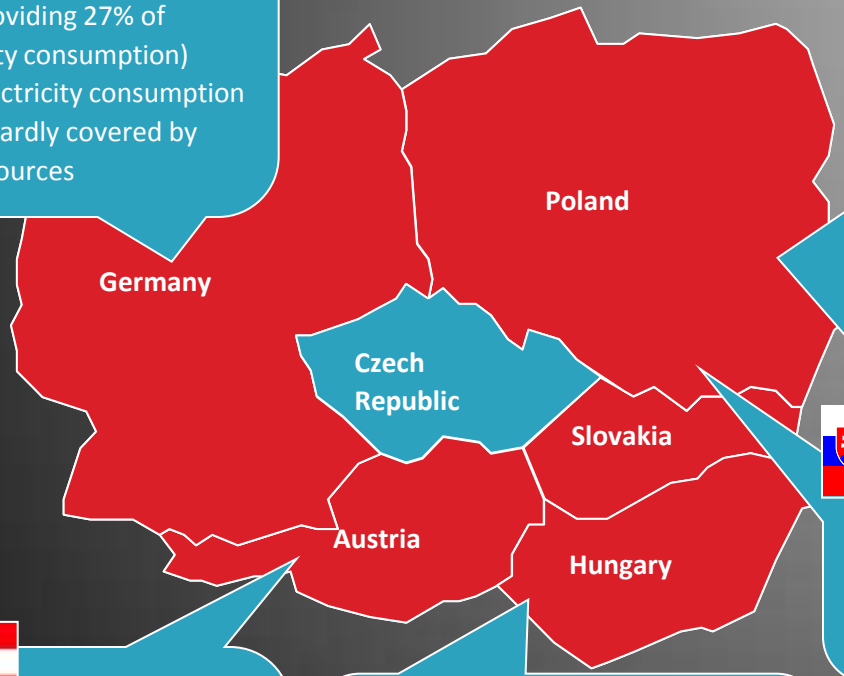
Referendum on Zwentendorf NPP, November 1978

Registered 5 083 779 voters,
Participated only 3 183 486 (62,63 %)
For opening Zwentendorf NPP 49,5%
Against 50.5%.
Decision made by a tiny majority of 30 068 out of 5 083 779 voters i.e. 0.59 %

Nuclear Energy Sweden 1980 – 2008

Nuclear Energy Germany 2012 – ????

② CZECH REPUBLIC CAN‘ T RELY ON ELECTRICITY IMPORTS



- Political decision to close all NPP (providing 27% of electricity consumption)
- own electricity consumption will be hardly covered by own resources

- Poland will close 3500 MW of coal power plants due to environmental reasons to the year 2015. Possible closure up to 7000 MW of coal PP.
- Already closing of 3500 MW will make Poland dependent of electricity imports.
- Presently no PP constructed, perspective plans for PP construction exist

- 2008 two NPP units closed (1600 MW(e).
- From a pure exporter of electricity country is becoming a pure importer

- In peaks depends on imports
- Total electricity import 2005 16.3 TWh (Production of both Temelin units)

- Largestelectricity importer in Central Europe (18%)
- No plans for construction of PP
- Limited fuel reserves

- Impossible to rely on import of electricity from neighboring countries
- In central Europe will be to 2030 closed about 30 GW of power plants
- It is expected a shortage of about 15 GW of electricity producing capacities

* Nováky, Vojany, Jaslovské Bohunice

A „Green“ Natural Gas?

Several years ago I met at one of the Brussels conferences Alexey Miller, boss of the powerful Russian Gazprom. As one should expect, he advertised in his talk how large are the Russian resources of, how much of it is Russia exporting to Europe and how environmentally friendly is this fuel. During a break we drank coffee and I asked him how big are the losses of natural gas during the drilling, mining and especially during its transportation over tens of thousands of kilometers from Siberia or Far North to Europe. My curious question obviously embarrassed him – he has to admit that he can't answer my question. I was even more surprised by the fact that is unable to answer my simple and important question.

Natural gas is namely environmentally a very advantageous fuel. By using it to produce an unit of heat or electricity the Earth atmosphere will be polluted by much smaller amount of greenhouse gases that by using not only brown coal or lignite's, but even oil. By burning all fossil fuels, including natural gas,

the Earth atmospheres is „polluted“ by carbon dioxide which has a very large cross-section for absorbing the reflected solar radiation is being produced in such a way increasing the amount of solar radiation remaining in the Earth atmosphere.
Alexey Miller got interested by my question. But before I succeeded to explain him why I am so interested in losses of natural gas he tried to explain me why he is unable to answer my question: “ You know, natural gas is so cheap and so abundant than any attempts to reduce the losses during the boring and during its transportation to the place of its consumption would be much more expensive than the value of the natural gas lost into the atmosphere.
The amount of the natural gas released into the atmosphere is apparently considerable. Specialists I was asking this question were assessing the losses to be at least between 10-15%. I have in memory a terrible accident from the end of eighties. Somewhere in Siberia the Trans-Siberian railway was passing through a valley next to the natural gas pipe line and the compressor stations. The pipe-line was obviously leaking and the natural gas was

concentrating near the surface until a spark from the electric trolley or spark from breaking wheels did not change the whole valley with two trains into a fire hell with over five hundreds victims.

Apparently large amounts of natural gases are being released into the Earth atmosphere. The meeting of the European commission we both with Alexey Miller participated was devoted to the problem of energy supply and the reduction of the greenhouse gases.

The reason of the possible overheating of our atmosphere consist namely in the fact, that the Earth is being exposed to a permanent flux of solar radiation. Fortunately, around 2/3 of it is being reflected back into the atmosphere. By burning the fossils carbon dioxide (CO_2) is being released into the atmosphere. The molecules of CO_2 have a large cross section of absorbing the reflected solar radiation thus keeping it in the atmosphere. The problem is that methane, which is the main constituency of natural gas, has about a 3o times large cross

section for absorbing reflected solar radiation, than the CO2. This mean, that at a certain percentage of losses of natural gas during its transportation over large distances the natural gas may contribute more to the green-house effect than the CO2 from burning coal and oil represents at the present time. I explained to Alexey Miller the reason of my, a physicists alarm. The natural gas consists mainly of methane. Physicists know exactly since they have measured it, that methane is as gas which is about 40 times more effective greenhouse gas than CO2, the main reason of our alarm that our planet Earth may be over warmed. This means that a unit – a molecule, gram or cubic cm of methan will absorb in the Earth atmosphere about 40 times more of reflected solar radiation, than the C02 which is today a reason for of mankind alarm. Specialists claim, that the total losses of natural gas during its mining, liquefaction, compression and transport to the place of its consumption are reaching up to 10-15 %. Alexey Miller spontaneous answer seems to confirm it.

Alexey Miller, however, demonstrated immediately, that he is an able and professional manager and businessman. „This seems not to be a bad idea after all" he said me at another cup of coffee. "we might well use our measure to reduce the losses of natural gas during the mining and transportation in the frame of Kyoto protocol and have a financial profit out of it".

I

have to admit that Gazprom's president idea was not quite clear and understandable for me, a simple and an innocent theoretical physicist. Fortunately it was the end of a coffee-pause and we had to return to our further discussions and disputes.

I recollect recently this conversation when I read in internet that EU finally gave in to the pressure of the powerful Gas lobby and rebranded natural gas as green energy

http://www.guardian.co.uk/environment/2012/may/29/gas-rebranded-green-energy-eu.

It is no doubt a significant victory for the Gas lobby and a considerable defeat for the mankind. Would a good fairy provide me with a magical power, I would force a couple of dozens of Brussels officials to repeat a basic gymnasium course of physics. Moreover I would let perform a deep audit of the money fluxes between Gazprom and Brussels.

František Janouch

Právo, 25.06.1012

THESE AND MANY OTHERS FACTS ARE TAKEN FROM THE FOLLOWING BOOK:

The Czech and Austrian governments have agreed in the Melk Protocol to promote, support and finance joint projects in the field of energy efficiency, renewable energy promotion and emission reduction. The joint Czech-Austrian Energy Expert Group (CZ-AT EEG) consists of a number of energy experts from different Czech and Austrian universities and institutes. The CZ-AT EEG is convening regular meetings both in Austria and the Czech Republic and is jointly working on energy projects of mutual interest. This volume presents the first joint research papers.

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FRANTIŠEK JANOUCH AND STEFAN SCHLEICHER (EDITORS)

CZ-AT EEG 2005

ENERGY FOR SUSTAINABLE DEVELOPMENT

RESEARCH PAPERS OF CZECH-AUSTRIAN ENERGY EXPERT GROUP

CZ-AT EEG

2005

FRANTIŠEK JANOUCH AND STEFAN SCHLEICHER

(EDITORS)

ENERGY PRIMER

A HANDBOOK FOR POLITICIANS,
MY GREEN FRIENDS
AND
US, CITIZENS OF THE PLANET EARTH

TEN
ENERGY COMMANDMENTS

TEN ENERGY COMMANDMENTS

1. Physics knows only one type of energy: Nuclear Energy. Energy is produced in nature only in fusion of light nuclei or in fission of heavy nuclei.
2. Most of the raw materials used by mankind can be replaced or substituted by some other material(s). This is not valid for energy. Energy cannot be substituted or replaced. Energy can only be conserved, transformed, one can save energy or waste it.
3. The energy conservation and transformation laws belong to the most fundamental laws of nature discovered and confirmed already in the XIXth century or earlier.
4. Humankind uses energy extremely unevenly: 20% of mankind uses 80% of energy, 80% of mankind the remaining 20% of energy.

TEN ENERGY COMMANDMENTS (cont.)

5. GNP and several other important "civilization" parameters, as, e.g., life expectation or infant mortality, are related to the amount of energy disposed by the society. Mankind, therefore, have to expect a considerable increase in energy consumption.
6. Energy is even related to such abstract terms as "freedom" or "independence".
7. Until now we have not succeeded to stop the population explosion: the population of our planet increases daily almost by 250 000 people.
8. At the present time more than 85% of all consumed energy is obtained by burning fossil fuels.

TEN ENERGY COMMANDMENTS (cont.)

9. Fossil fuels were produced during hundreds of millions years by absorption of carbon dioxide from the atmosphere; by means of the photosynthesis reaction oxygen was released to the atmosphere, carbon stored in the green biomass.
If fossil fuels are consumed at the present rate their supply will be exhausted during a couple hundred years (EU Green Book on Energy 2000: oil in 40, natural gas in 66, coal in 160 years).

10. Already today is carbon dioxide released to atmosphere by burning fossil fuels a million time faster than it was, some hundred million years ago, absorbed from the atmosphere.

	1970	1980	1990	2000	2010
Vattenkraft och vindkraft	40,9	58,0	71,4	77,8	67,1
Vindkraft	0,0	0,0	0,0	0,5	3,5
Kärnkraft	0,0	25,3	65,2	54,8	55,6
Kraftvärme i industrin	3,1	4,0	2,6	4,2	6,4
Kraftvärme	2,4	5,6	2,4	4,7	12,5
Kondenskraft	12,0	0,9	0,0	0,0	0,3
Gasturbiner	0,7	0,2	0,0	0,0	0,0
Total nettoproduktion	59,1	94,0	141,7	142,0	145,5
Import minus export	4,3	0,5	-1,8	4,7	2,1

THANK YOU FOR YOUR ATTENTION!

The End

Aus der letzten Rede des Abgeordneten T.G. Masaryk im Wiener Parlament, 26.5.1913

Meine Herren! Wenn ich die Gabe der literarischen Beredsamkeit hätte, wie einer meiner Kollegen, der nach mir sprechen wird, so würde ich Ihnen eine — ich weiß nicht, wie das Genre zu nennen wäre — Allegorie, eine Symbolik vorführen. Es würde beiläufig in Kürze so lauten: Ein armer Mann, ein guter Österreicher, ein echter Wiener, hat am Naschmarkt eines Tages einen alten verrosteten Regenschirm geschluckt. Wie das physiologisch zustande gekommen ist, darüber mögen Sie mich nicht fragen; jedes Gleichnis hinkt. *(Heiterkeit.)* Also der Mann, ein hochgestellter Mann, hat seinen Regenschirm geschluckt und nun hat er Angst... *(Ruf: Es könnte regnen! — Heiterkeit.)* Nein, der Regenschirm könnte sich jeden Augenblick aufspannen *(Heiterkeit)*; infolgedessen traut er sich nicht, sich zu rühren. Er muß ganz kerzengerade stehen. Er hat ein ganz gutes Gehirn, er hat ganz gute Augen und Ohren, aber er kann nicht sehen, was alle anderen Menschen sehen, er kann nicht hören, was die anderen Menschen hören, er kann nicht beobachten und infolgedessen kann sein von Natur aus ganz gutes Gehirn auch nicht ordentlich funktionieren und er kann nicht so denken, wie alle anderen Österreicher der verschiedenen Zungen denken. Meine Herren! Dieser arme, dieser sehr arme Mann ist der Typus der österreichischen Staatsmänner. Sie haben ein Gehirn, sie haben Augen, sie haben Ohren, aber sie können sich

nicht rühren, der Mann kann nicht beobachten, er kann sich nicht frei bewegen, er kann nicht sehen, nicht hören, was überall zu sehen und zu hören ist; er kann auch nicht denken, wie alle anderen denken und infolgedessen kommt dieser merkwürdige Dualismus zwischen der Bevölkerung Österreichs und der Politik Österreichs, der Politik und nicht nur der Politik, sondern auch den Staatsmännern zustande. Ich will das Bild nicht weiter ausführen, wie gesagt, dazu fehlt mir die literarische Fähigkeit. Ob nun dieser Regenschirm den Bureaukratismus oder was immer darstellt, das will ich jetzt nicht untersuchen. *(Abgeordneter Kuranda: Die acht Nationalitäten sind die acht Speichen dieses Regenschirmes!)* Der Mann kann sich nicht rühren, der kann nicht beobachten, nicht denken, nicht sehen, er darf nicht hören, nur abends wird er immer von den treuen Genossen mitleidig in die horizontale Ruhelage gebracht und den andern Tag wieder senkrecht aufgestellt. Zwischen dieser senkrechten und vertikalen Bewegung verrinnt sein ganzes inhaltloses Leben. *(Heiterkeit und Zwischenrufe.)* Ich wünsche, meine Herren, daß endlich alle Parteien dieses Hauses einsehen, daß es ihr Interesse und das Interesse unserer Völker ist, dieser Unfähigkeit der inneren und der äußeren Politik ein Ende zu bereiten. *(Lebhafter Beifall und Händeklatschen.)*

Vizepräsident **Ždárský**: Ich erteile das Wort dem nächsten Proredner, dem Herrn Abgeordneten

My humble question to our dear Austrian guests:
Does this quote says something to you?

Österreich braucht (k)eine Energiewende

Stefan Schleicher

Wegener Center an der Universität Graz und
Österreichisches Institut für Wirtschaftsforschung
Jänner 2, 2013

Primer, Букварь, Abécédaire, Lesebuch oder Fibel, Slabikář, abc-bok

prim-er [1] (prim'uhr; esp. Brit. prie'muhr) n.

1. an elementary book for teaching children to read.
2. any book of elementary principles.

[1350-1400; ME < ML primarium, n. use of neut. of primarius PRIMARY]

prim•er1 (prim¿€r; *Brit* prïm¿€r)

n.

1 a simple book for teaching reading to beginners

2 a textbook giving the first principles of any subject

AUSTRIA – AN ENERGY-SWALLOWER (ENERGIE-SCHLUCKER)?

Some facts

Table 6: Electricity per GDP 1995–2002

Electricity	Percentage change from 1995 to 2002
Austria	1.1
Czech Republic	-5.3
Denmark	-10.9
France	-3.1
Germany	0.1
Slovak Republic	-19.5
Sweden	-12.6
Switzerland	-1.3