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Political social and economic boundary conditions for the enactement of measures to improve energy efficiency

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Political Social and Economic Boundary Conditions for the Enactment of Measures to Improve Energy Efficiency: Under Which Circumstances can Switzerland Go at it Alone and When Is Coordination at EU Level Necessary?

International Energy Trends

The recent hike in oil and gas prices combined with the publication of a relatively alarming report by the IPCC about the increasing reality of climate change and the release by the British government of the Stern Review have once again put the question of energy production, conservation, and efficiency in its use at the center of the public debate. According to a statistical review of energy done by BP [1], energy consumption for the year 2005 amounted to 11'000 million tons of oil equivalent (TOE), which represents about 4.7 1020 joules (or 440 quads). Over 85% of this energy comes from fossil fuels, as is shown in the following figure:

Distribution of the worldwide primary energy use by source

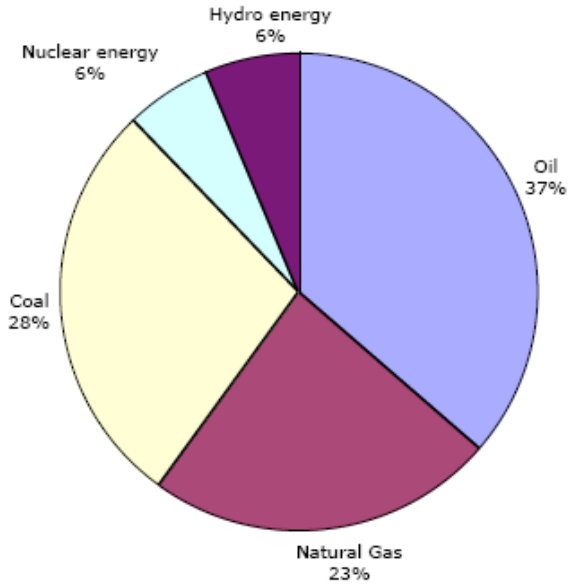

Fig 1: Worldwide primary energy use by source

Energy consumption has risen exponentially since the industrial revolution 250 years ago and it continues to rise today. World energy use grew by 2.7% during 2005. This increase is mainly due to a rise in oil consumption of 1.7%, a rise in natural gas of 2.4% and, especially, a rise in coal consumption of 5%. This latter figure is particularly alarming because it signals a shift from oil and gas to coal because of its lower relative price and great availability in particular in emerging countries such as India and China. This is preoccupying as coal produces more CO_2 than the other fossil fuels. Indeed this trend is consistent with a more rapid increase in greenhouse gas emissions in the current

decade than in the 1990's. In 2006 alone CO_2 concentrations in the atmosphere have risen by 2 ppms (from 388 to 390).

The growth in energy consumption is undoubtedly going to continue throughout the coming century, mainly because of the increasing industrialization of the developing countries. Indeed, the distribution of this energy per capita is highly uneven throughout the world. For example, the United States, France or Germany, which are all considered to be developed countries, represent respectively only about 5%, 0.9% and 1.4% of the total world population but account for 24%, 3% and 4% of the world's energy use [2]. Even if the United States is the most extreme example, it is clear that developed countries in general consume more energy per capita than the developing countries. Equalizing energy usage per capita throughout the world will greatly increase demand. Projections for the world marketed energy use by fuel until 2030 under assumptions of the continuation of current patterns are shown in the following figure:

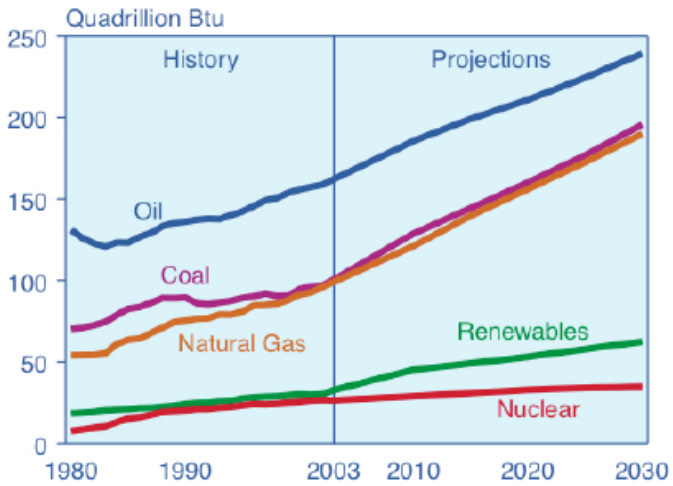

Fig. 2: World marketed energy use by fuel 1980-2030 (a quadrillion BTU represent 1015 BTUs and about 1 1018 joules) [3]

What do these trends tell us in terms of the consequences of energy use and efficiency questions and their impact on such troubling questions such as the increase in global warming? Clearly, energy consumption worldwide is more than likely to increase and drastically so in the future. This is an inescapable reality.

Theoretical Considerations

The present paper will address the dual question stated in the title (i.e. a "home grown" Swiss energy policy versus coordination with the EU position) and also ask fundamental questions about energy and its relations to climate change and other sources of pollution. Indeed, I emphasize here that energy use in and of itself is not necessarily a problem. What matter are the negative externalities that energy production and use generate. In this context, climate change stands out as an example of a particularly worrying negative externality of energy use: Stern in his review calls it a "gigantic market failure". However, this does not mean that the energy and the climate change issues are identical: Fighting global warming can be achieved in part without drastic

increases in energy efficiency and achieving greater energy efficiency does not necessarily help in reducing greenhouse gases. What has to be achieved is mostly a substitution of energy use that generates considerable quantities of greenhouse gases by an energy use that produces little or no greenhouse gases. Or, to put it more generally: substitute more polluting energy sources by less polluting ones. Striving for energy efficiency for its own sake makes little sense and may prove to be a costly and low rewarding enterprise. What is the economic rational behind this statement? A market economy should in principle achieve optimal efficiency in terms of input use into its productive processes. This means that firms, but also to some extent households, have no incentive to waste resources or to manage them inefficiently. Efficient energy use should therefore be a "natural" consequence of an efficient market. If it is not, then two closely interrelated factors must pertain: 1) Access to a crucial resource is essentially open and free and thus its scarcity value representing its correct cost of usage is not taken into account in economic processes. This is the case with the atmosphere, whose use is so far mostly free and open, thus the market failure evoked by Stern. 2) The negative externalities generated by the use of the resource are not incorporated in its price which means that its true cost is not included in its market value. Corrective policies should therefore not be centered upon energy per se but on these two aspect.

International Considerations

The international community has elaborated a relatively intricate network of institutions to deal with energy and climate change issues. Whereas the International Energy Agency (IEA) is largely a coordinating and information exchange type institution focused on energy, the issue of climate change has resulted in some binding obligations for countries combined with a series of mechanisms and procedures to realize them. Policy measures to deal with climate impacts are addressed within the United Nations Framework Convention on Climate Change (UNFCCC), first presented at the United Nations Conference on Environment and Development in Rio de Janeiro in 1992 and then turned into binding commitments through the drafting of the Kyoto Protocol to the UNFCCC in 1997. The enactment of the Kyoto Protocol was (according to its own rules) assured in 2004 with ratification by Russia. The Protocol went into force on February 16, 2005 even though some important industrial nations such as the United States and Australia have refused to ratify it. The UNFCCC goes no further than to oblige countries to report on their greenhouse gas emissions and to recommend that parties develop climate change policies that, for industrialized countries, would lead to a stabilization of emissions to their 1990 levels by 2012. Moreover, parties are encouraged to favor the dissemination of greenhouse gas emission reducing technologies to developing countries. The Kyoto Protocol (KP) rests upon a dual foundation for climate change mitigation policies: 1) Legally binding reduction targets of greenhouse gases (six gases are enumerated in the KP) for each industrial country or country grouping (such as the EU) with respect to their 1990 levels by the end of the first time period 2008-2012. The Kyoto targets amount globally to a lowering of 5.2 % of industrial country emissions. 2) The use of "flexible mechanisms" to achieve this goal. These can take the form of emission reduction, trading, and joint implementation of these between industrialized countries. More important, reductions can be achieved through the Clean Development Mechanism (CDM). This arrangement allows firms from industrialized countries as well as the

countries themselves to implement greenhouse gas reducing technologies in developing countries in order to share (with the given country) the credit for such reductions. In this way, developing countries can be incorporated into the Kyoto reduction process even before they are part of a reduction agreement. The flexible mechanisms also define the only explicit exclusionary principle contained in the Protocol, namely the prohibition of non-members or firms from non-member countries from participating. This exclusion may become important in the future by giving incentives to non members to join.
All in all, and despite some obvious limitations, the Kyoto Protocol appears as a relatively reasonable compromise. Properly applied, it should both diminish industrialized countries' emissions and, through the Clean Development Mechanism, ultimately draw in developing countries as well. For the moment, it is difficult to say if it will completely succeed. A first and important step occurred with the Russian ratification and the Protocol's enactment in February 2005. Another important and crucial aspect of the development of Kyoto will be determined by the success or failure of the emission reduction trading market set up by the EU Commission, and yet another when the organization of the CDM market will be complete and linked to the EU market with transfers of clean technology working correctly under them. Last and foremost, the Kyoto Protocol constitutes both a framework for the present but also a step into the future with more reduction commitments perhaps involving more countries for a coming negotiation period. From an efficiency of climate policies point of view, a large degree of participation by most countries in the World is highly desirable. Any action resulting in more (rather than fewer) inclusions is thus greatly beneficial. In particular, it is important to involve the emerging economies of China, India and Brazil into a climate mitigation process since most of the future increases in greenhouse gases will come from them. In some sense, it is better, as demonstrated in the works of the Yale economist William Nordhaus, to have a shallower accord that everybody follows rather than a very narrow one observed scrupulously by a few. The argument that I make here is that one of the only hopes to enlarge the Kyoto Protocol and to have emerging countries fully involved in a reduction strategy, is precisely to engage in trading in a systematic way and not to try to achieve the targets on the basis of purely domestic measures. An important international role for Switzerland would be to contribute massively to this inclusionary process as it quite clearly represents the most efficient way to fight climate change. In the context of this argument, it is therefore important to understand how the Protocol, which Switzerland ratified, impinges upon Swiss energy and climate policy.

Switzerland, the EU, Kyoto and Energy Policy

Switzerland, like the EU as a whole, was assigned a – 8% reduction target. It is important to understand that the EU 15 constitute from the point of view of Kyoto a "bubble" where the reduction target is distributed in terms of differentiated sub-targets to the member countries. So, for instance, France has a 0% reduction target and Sweden is allowed to increase its greenhouse gas emissions by 4%. This relatively drastic reduction goal of -8% is imposed upon Switzerland despite the fact that the country is one of the lowest per capita greenhouse gas emitters is the industrial world as illustrated by the following graph:

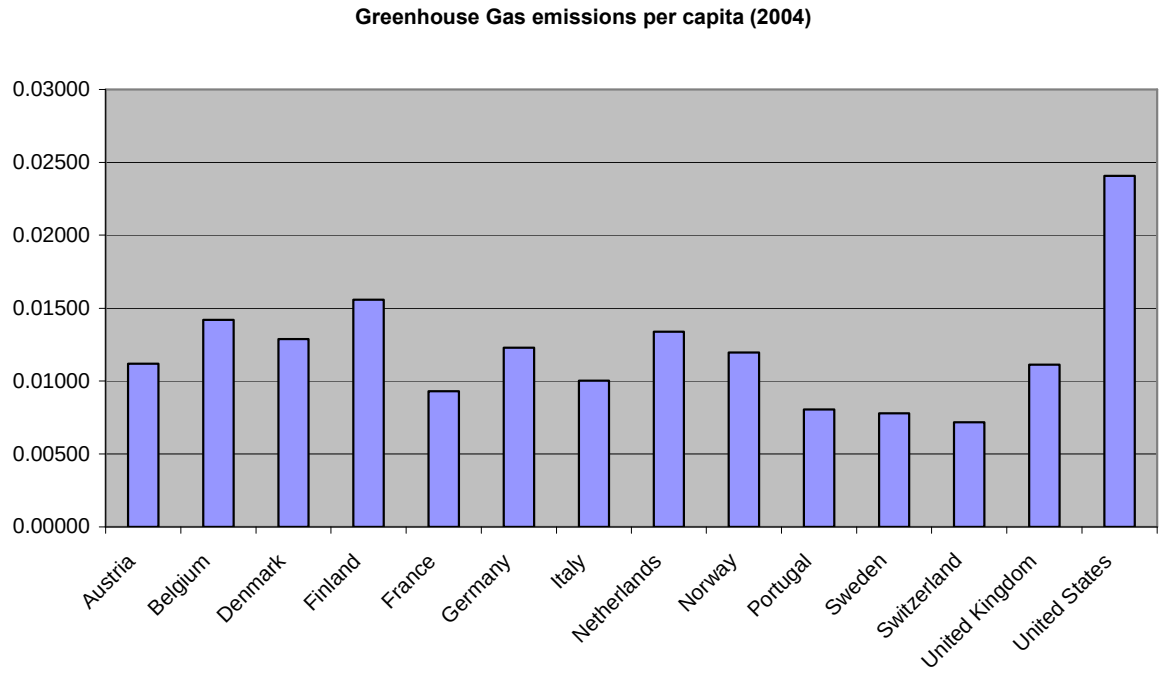

Fig. 3 Per Capita Greenhouse Gas Emissions in CO_2 equivalent Teragrams (TG) for selected industrialized countries

It is interesting to notice from the above graph that countries that have a "high reputation" for environmentalism such as Denmark, with its long term reliance on wind energy, or the Netherlands and Germany, remain among the highest per capita emitters in Europe. These observations point toward some obvious conclusions: 1)Given its low level of present per capita emissions, any further reductions in emissions for Switzerland will be extremely costly to achieve domestically. 2) This relatively low level is largely realized through the present Swiss energy mix and especially the current almost completely "decarbonized" nature of its electricity production based on nuclear and hydroelectric plants. Any plan to "recarbonize" Swiss electricity is bound to make a reduction strategy even more complicated. It appears in fact desirable to increase rather than decrease future decarbonized electricity production since an efficient climate change policy will result in part in the progressive substitution of energy from fossil fuels by energy from sources that produce little or no greenhouse gases as stated in the above theoretical considerations. Does this mean that energy and electricity saving measures are useless? Not necessarily, since it will be desirable in the future to preserve as much decarbonized electricity as possible for the substitution tasks outlined above. However, such measures will best be achieved if, on the one hand, the Swiss electricity market gets decartelized and that such liberalization is accompanied by government requirements of strong domestic reserve capabilities in order to avoid excessive price volatility. In other words, the present electricity production mix should not only be preserved but allowed to expand.

What kinds of conclusions can be drawn from these statements concerning climate change and the Kyoto process? It seems clear that given its status of low greenhouse gas emitter, Switzerland will always have trouble meeting its reduction targets domestically and will have to engage in reductions abroad by joining international reduction certificate markets. As I have pointed out above, such a strategy is not only convenient but also desirable from the point of view of an efficient worldwide climate mitigation strategy. To the extent that domestic reductions can be achieved, it is regrettable that the current Swiss climate change legislation makes not only connections with international certificate markets difficult to realize but fails to take full advantage of the possibilities of the Kyoto Protocol. Indeed, as stated above, the Protocol allows the targeting of a basket of six greenhouse gases and not just CO_2. Among these gases, methane and nitrous oxide have a heating potential of respectively 21 and 310 times CO_2. Clearly, strong CO_2 taxes especially target households, industry, and, in particular, transportation services, all of which are part of the more productive part of the Swiss economy. It is remarkable that agriculture, a relatively inefficient and heavily state subsidized sector with a share of 5% of the active population and 1.2 % of GDP and which produces 11 % of greenhouse gas emissions, mostly in the form of methane and nitrous oxide is not targeted at all. A further liberalization of this sector could not only achieve substantial gains in efficiency but also a significant reduction in greenhouse gases. Are Swiss energy policy scenarios for the future considering some of the questions that have been raised so far? A rapid look at policy issues is now warranted.

Swiss Energy Scenarios, Efficiency and International Coordination

The Swiss Federal Office of Energy released a series of energy scenarios for the future on January 12, 2007 (Energy Perspectives 2035). Two considerations appear to underlie these scenarios: 1) To keep a safe energy supply for the country and 2) To conform to climate protection greenhouse gas reducing targets that are likely to be implemented after the current phase of the Kyoto Protocol ends in 2012. These scenarios are relatively opaque in terms of their assumptions and objectives (there is no rationale given for the reduction targets for the country. Why, for example, should they be the same as for the EU as a whole?) and very conservative in terms of the policies analyzed (mostly taxation policies as they exist now). They contain an allusion to the inclusion of Switzerland in an international certificate market without a full scale study of how this policy would work out domestically. They also fail to explicitly present all the possible substitution effects between the various forms of energy. Finally, the ultimate goal of the reduction in energy consumption is not clearly specified: Is it a goal in itself or are mostly externalities targeted? They do, however, confirm some of the statements made above: 1) Purely domestic reductions of greenhouse gas emissions are extremely costly 2) Strong reduction scenarios require heavy forms of taxation, which, initially, can be close to 5% of GDP (the Stern Review with drastic assumptions estimates the costs of climate mitigation, if undertaken quickly, at 1% of GDP or less). 3) Isolationism is costly as the difference between international trading and purely domestic measures can multiply costs tenfold. Isolationism is sometimes justified in the Perspectives 2035 by claims that higher prices lead to greater technological innovations. Is this argument necessarily valid? A thorough investigation of this question has been carried out by the economists Dasgupta and Heal with the following conclusions: 1) The market for information (of which the

market for innovation is a part) is quite imperfect and does not necessarily respond to prices. 2) If it does respond, this is largely due to scale effects, the larger the firm or the larger the market, the more profitable research and development and innovations will be. In other words, innovations are only likely to be produced in response to price increases if either firms are large or markets big. It is therefore doubtful that such effects can appear at the level of a small economy like Switzerland, especially if it is increasingly isolated from the rest of the world.

Summary and Conclusions

The conclusions one can draw from these analyses are quite straightforward:

1) To fight climate change, the target for action must be negative externalities rather than energy.
2) Energy savings will be realized through market mechanisms once externalities are properly accounted for.
3) Climate change mitigation policies should entail a shift from large greenhouse gas emission technologies to low or zero greenhouse gas emission technologies.
4) Climate change mitigation policies are most effective when most countries participate.
5) Policies to enhance participation of most countries are more effective than domestic reduction policies.
6) The structure of the Swiss economy and its energy mix require a large international involvement in the form of participation in a European and world reduction certificate market. Participation in the EU trading system would be a first step in the right direction.
7) This would require the abandonment of current public and private taxation schemes (centime climatique).
8) A full use of all the possibilities provided by the Kyoto Protocol is desirable.
9) Energy and climate "Alleingang" policies are possible but prohibitively costly
10) A greater coordination with EU energy markets is desirable and ultimately profitable to the Swiss economy (e.g. full participation in a European electricity market with strong reserve capacity requirements).

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