

**Speech at Plenary Session, “Summaries from Concurrent Sessions”  
- Summarizing Track A Concurrent Sessions -  
Third Annual Meeting of the STS forum  
September 12, 2006, Kyoto, Japan**

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Energy and water are the fundamental ingredients for life on Earth. We learned this already in primary school. In modern society this simple relationship is at stake. The technologies we've built on these two fundamental needs have allowed the standard of living to increase, and the population to grow to 6 billion and in about 15 years to 8 billion individuals.

The developed and developing countries face different challenges. Just an example: In Uganda there were plenty of TV's to watch the World Cup, but power could only be supplied for 24 of every 48 hours. All the while energy use per capita in Africa is 10 times less than the rest of the world. On average in the world each person is consuming about 2000 W of power. The developed world is of course at the top of this average with Europe and Japan consuming around 3-4 times the average and the US 6 times.

The answer to the stress on the resources energy and water is not in setting quotas and regulating individual's energy use. The answer is in making changes to the way energy is obtained and supplied that eliminate negative impacts. The Kyoto Protocol was one step in the right direction. However, the protocol's content is difficult to explain to everybody and the goals set are not sufficient to face the challenges awaiting us. To increase awareness, we need metaphors like the 2000 Watt Society. This metaphor represents a feasible scheme. It asks the developed world to bring down its energy consumption and allows for the developing countries a controlled increase of their energy consumption. Of these 2000 Watts, half can be obtained from fossil sources, the other half from nuclear and renewables. Detailed studies have shown for Europe that a 2000 Watt society can be achieved by 2050. 75% of the cuts can be obtained by technological energy efficiency measures already known now, the rest by future innovation and often difficult but important behavioral changes.

Energy security is only one side of the coin. The pollution, with global change in tow, which goes with energy conversion and consumption, is the other side. De-carbonization of energy supply is the key word. This means the reduction of fossil carbon – as CO<sub>2</sub> or methane - released to the atmosphere. There is no quick fix for this problem, or silver bullet as many said. A whole series of possibilities are available, and the mix may vary from country to country, and region to region. Besides renewables like hydro, wind, solar, and biofuels, nuclear power is also an option. Up to now fission is the only way, and whether fusion will become the long awaited panacea is literally still in the stars. For the time being, and on a global scale, oil, gas and coal are the main source options. Coal reserves are the largest and actually are found conveniently where most energy is needed in the future: China, India, Russia, USA. Since in this century coal will be the main fossil energy source, and coal exploitation is among the most polluting, much emphasis is needed in pollution prevention

and carbon sequestration. A significant need for process optimization and technology development can be identified.

Why are we not already now moving towards a 2000 Watt society with de-carbonized energy supply? It was agreed in this conference that we are lacking the leadership on all levels from universities through institutions to businesses and politics to instigate significant action. This leadership will require collaboration, and this must be done carefully with consideration for impacts, both good and bad, to economic development. Bottom-up efforts must also be instigated while the best top-down strategies are agreed upon on international and national levels. Only the economically most sustainable solutions will make it. However, the question remains open of how the long-term external cost will be internalized, and which capital market instruments are most useful for best leverage. Perhaps, the Dow Jones Sustainability Index may become an even stronger instrument, than it is already now.

One thing in common between the sessions on energy and the session on water was that in both cases we have a limited ability to use something that seems to be infinitely available. We have vast oceans of water and enough solar energy from the sun to power society thousands of times over. The problem arises from our desire to find the quickest, easiest and cheapest way to cover society's needs in water and energy. Water is fundamental not only for drinking, but also in ecosystem services and food production to maintain healthy people and a livable environment. Yet 1.2 billion people still lack adequate water supply and about the double is without satisfying sanitation. Food exports and imports can help offset water-poor regions, and it is important to recognize ways in which adequate water can be provided without having a net impact on the supply in the future. In many cases aquifers are over-pumped and/or contaminated. More effective utilization can help, but there are still extreme cases of water shortages in places like the Middle East and North Africa. Not only must adequate fresh water be supplied to sustain society, but effective treatment of wastewater is also essential. This must be incorporated into strategies to improve water infrastructure to prevent the spread of water-born diseases. We, in the industrialized world, often forget that only a healthy person can liberate him or herself from the chains of poverty.

Although water and energy sustain life, they alone do not sustain a society. They are essential parts of the complex systems we've created that make the modern technological wonders possible. Nevertheless, the energy system still creates pollution that alters the climate and local and regional environments, and it is depleting a limited supply of non-renewable resources. At the same time, both quality energy and water still need to be provided to humanity. Increasing supply is made more challenging by the concurrent need to minimize the negative impacts inherent in most systems used today. Thus, the need for change is apparent, and it is up to us to try and move in the right direction to create a better, more sustainable tomorrow. By being here today we are taking a step in the right direction, and although our life here may seem to be sustained by sushi, coffee and cocktails, our collaborations will hopefully lead to effective global solutions to the seemingly so simple need for energy and water.