DÉBAT

John Andrews, conseiller de rédaction à *The Economist* et *Project Syndicate*

We are pushing for time but let me see if there are some questions from the audience.

Meir Sheetrit, ancien membre de la Knesset, ancien ministre des Renseignements et du Comité de l'Énergie atomique, ancien ministre de l'Intérieur d'Israël

I want to make a comment and ask a question. I want to tell Friedbert, that there is no need today to bury all this nuclear waste, there is technology that can really dilute it without burying it. It exists and it is working in the United States and other places, so we can get rid of this waste from nuclear power stations without burying it. Second, I would like to ask Mr. Piau about what he thinks the chances are of having cold fusion in the future. That would change everything if we had the possibility of cold fusion, then there would be as much energy as you want without any waste.

John Andrews

That would be the Holy Grail.

Mayankote Kelath Narayanan, président exécutif de CyQureX Systems Pvt. Ltd, ancien conseiller principal et conseiller en sécurité nationale du Premier ministre d'Inde (Manmohan Singh)

I must say this was a very interesting session. I used to be a member of the Indian Atomic Energy Commission and I also played a role in the India/US nuclear deal. I have a question for Mr. Servan Schreiber because I am engaged in a scheme to bring back the nuclear debate to India because energy is one of our problems. How reliable is what you have said because I would like to know, and I hope to discuss it more with you afterwards, is it really possible to use this in a commercial way or is it still pie in the sky at the moment? I understood what you said but is it realistic because I do not have to many years left but I would like to see if we can push it together. I still have a certain amount of traction in India at the moment so I would like to have a very honest and realistic assessment as to whether this is possible. You hear so much about HALEU and thorium, new reactors, etc., does all this underwrite what you are trying to say?

Suresh Kumar, professeur au département d'études africaines de la faculté des sciences sociales de l'université de Delhi

In addition to what Mr. Narayanan has said, my first question is whether thorium is really a viable solution, Franklin? Also, if there is viable solution, please share that with technology transfer.

Mohamed Laichoubi, Ambassadeur d'Algérie

C'est une question qui aurait pu être posée lors de l'atelier sur les minerais. Il y a évidemment plusieurs types de technologies mais certaines sont utilisatrices de minerais rares et un certain nombre d'analystes relèvent que, si on devait convertir le parc de véhicules en Angleterre en véhicules électriques, il faudrait deux fois la production mondiale de cobalt, les trois-quarts de la production mondiale de lithium, la moitié de la production mondiale de cuivre. Je ne parle évidemment que du parc de l'Angleterre. C'est une équipe de chercheurs du Museum qui en parle. Ma première remarque est donc qu'il n'y aura jamais assez de mines pour que la Chine, les États-Unis, l'Union européenne, la Russie rendent leurs véhicules électriques et gèrent le big data, la constellation des satellites et l'industrie d'armement. Ma seconde remarque est qu'une mine de cuivre peut consommer jusqu'à 40 millions de m3 d'eau, or les six plus grandes entreprises mondiales exploitent leurs mines dans des zones qui se caractérisent par des manques d'eau. Quand on envisage les questions technologiques, ces politiques sont-elles prises en compte, ces financements sont-ils orientés, ce débat est-il organisé ?

John Andrews

We really are running out of time. We have questions on thorium nuclear and rare earths, and unless I have forgotten something that is it. Who wants to tackle it. Let us go to Franklin, is your thorium a pipe dream in the end?

Franklin Servan-Schreiber, co-fondateur et PDG de Transmutex

First of all, it is a great question because I was sceptical. This was not my idea, it is someone else's and I just stumbled on it. I looked at it for almost two years before jumping in and I had a lot of experts who told me it was viable. I can assure you it is viable, and we have a very solid basis that is way beyond the research stage, we are in the engineering stage, and it is just a different way to look at it. Therefore, we are credible and that is why we have those partners, otherwise they would not come. I just want to say one thing about fusion before Friedbert, who wants to talk about it too. Something I learned on my own that I never read anywhere, fusion does not happen on earth, in the stratosphere, the atmosphere, on the surface, on the ground, in the core. It happens in the sun and the sun is a million times bigger than the earth and it happens because you have heat and gravity pressure. To replace gravity from the sun with just extra heat is not obvious to me, and I know I am going against a lot of common wisdom, but I am not sure this will every produce positive energy, how much energy you put in to how much energy you put out. That is my only way to say we should focus on what we know works because it is an emergency.

John Andrews

It comes from someone living by CERN. Interesting, so it is really fusion that is the complete pipedream.

Nicolas Piau, cofondateur et directeur général de TiLT Capital Partners

I am just going to attempt to answer your comment on minerals, etc. I think you are right, there is no other way to say it, but we do not know how to organise a system without creating entropy. We are replacing N1, which was CO2 and GHG emissions, with another one which is how you are going to sustainability mine all those materials. It will be an issue and I think

again, we are going to have to work on efficiency; we cannot have the same amount per capita that we had in the past. Then there is recycling, and the circular economy is critical, and in that sense both what Franklin and Frank are doing is critical. This is why I said if we do not adapt our investment models to integrate externalities, we will never get it and I am very certain of that. Our models today are ill- designed for this because financial theory does not take externalities into account.

John Andrews

Any comment, Frank? You got a real compliment from Friedbert, who I think is basically one of nature's sceptics, a realist, but he had a lot of praise for your a-fuel. Perhaps you have a solution, given that transportation is really the biggest single contributor to climate change at the moment.

Frank Obrist, PDG de OBRIST Powertrain

I tried to show the global perspective with the presentation because we have the ability, and we can be proud of our technologies. Photovoltaic has a huge efficiency and in the end, such a plant is 50 times more efficient than a regular forest so we can really create a future for humankind. I also think it is wonderful to present this and motivate financial guys and companies to create the biggest business ever on this earth. I think it is a positive view.

John Andrews

Friedbert, I am going to give you the final 30 seconds. I have just described you as a natural sceptic, which you are probably not, maybe you are a dreamer. I think this panel has been fascinating, does it make you actually feel optimistic?

Friedbert Pflüger, directeur du European Cluster for Climate, Energy and Resource Security (EUCERS) à l'Université de Bonn, fondateur associé de Strategic Minds Company GmbH

Absolutely optimistic if we unleash the powers of technology. Let me tell you a brief story, in 1922 the German best-seller at the time was called The Tunnel, by a guy called Kellerman. It is about technology making it possible to dig a tunnel between Europe and the United States. We had no planes and at that time, so it was revolutionary, and they went for it, and they financed it and it took them 25 years. It was a very difficult process and at the end they had a big celebration in Europe with all the trains coming and then suddenly they saw a plane because technological revolutions had taken place that people could not have foreseen. Therefore, my main point is not whether it is viable, we cannot decide this. I think what has been said makes a lot of sense, but we should be open to these new technologies and not just say we have solar and wind and that is it, there is so much more going on and we should keep our eyes, hearts, and minds open.

John Andrews

Thank you very much, Friedbert. I must say at the very beginning I claimed to be a human being and I think the great thing about humans as a species is the ability to create and think. I think this has been a fascinating panel and you deserve a huge round of applause.