



SUMMARY

ENERGY AND STORAGE

WORLD SYSTEMIC FORUM 2023

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This SUMMARY is the result of the Roundtable ENERGY AND STORAGE, which took place in the context of the WORLD SYSTEMIC FORUM 2023 on January 14, 2023 in the Hagerbach Test Gallery, 8893 Flums, Switzerland.

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Preface

In line with the position of the VDE as a neutral, technical-scientific association, the SUMMARY WSF 2023 presents the joint findings of the speakers at the Roundtable ENERGY AND STORAGE.

The collective results were developed in a constructive dialogue from different perspectives. The contents of this document therefore do not necessarily reflect the opinion of the companies and institutions represented by their employees.

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World Systemic Forum

The World Systemic Forum is the annual event of The System Change Foundation. The forum gathers its Transformers community, Program Partners and some of the most respected and influential minds of our time, to collaborate on questioning current global systems. Through new perspectives, we can collaboratively ideate possibilities for the future of humanity.

Hosted within the mountain at Versuchsstollen Hagerbach in Flums, Switzerland, the World Systemic Forum builds bridges to foster collaboration through roundtables and experiences that sets the tone for a year of System Change. This year the main topics are education and energy & storage.

Founded by non-traditional entrepreneur, Rudolf Hilti, the World Systemic Forum was created to bring big topics to the table into an environment which celebrates holistic thinking and integrity.



THE WHO: We are a symbiotic community of pioneers - we come together and pose new questions for which we do not necessarily have the answers to, just yet.

THE WHY: We believe that current global systems need to be re-imagined all together. The act of questioning creates the possibility to explore and brings us further towards our goal.

THE HOW: Constant shifts lead to stability. create discussions and experiences that equip people to answer and respond to the question of „How can we continue to shift, learn, innovate and adapt to creating a stable present future for ourselves?“

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Executive Summary

This Summary was generated at the 2023 World Systemic Forum (WSF), which is the annual event of The System Change Foundation. The content of this document was created from the discussions within the Energy and Storage Roundtable with the participation of leading experts that discussed important challenges facing the renewable energy sector.

In addition to climate protection, the dramatically-revealed geopolitical dependencies in the supply of fossil fuels have become an important driver for investments in green technologies. The transformation process towards a green renewable economy should be based on sustainable and fair use of our resources and demands a non-destructive lifecycle in order to create a truly circular economy. At the same time, it is necessary to avoid policy fragmentation between countries and to work on building bridges at the international level. This requires remaining open to new technologies and not succumbing to silo thinking.

The current regulatory requirements are preventing the progress of this transformation in many places. This has been compounded further by outdated technical specifications. As a result, investors cannot obtain an objective assessment of the technical specifications of new technologies in the short term. Regulations should enable and support the adoption of new solutions, rather than restricting them.

The frequency and impact of cyberattacks on critical infrastructure in the energy sector are growing rapidly. It is essential to conduct risk assessments of the systems continuously to identify vulnerabilities and determine the potential impacts of an attack.

The rapidly growing global market in the cleantech sector requires a continuous expansion of human capital in all areas. Considering the ongoing transformation of the traditional energy sector and to close the gap of skilled workers in the cleantech sector, we also need suitable capacity-building programs. This requires long-term planning and a focus on training initiatives which is based on market needs.

Technical progress and successful sustainable business development must be based on scientific facts but allow room to learn from mistakes in developing breakthrough technologies. This includes both professional work, especially in the field of development of new products and systems, as well as the creation of quality criteria and standards.

We are currently at a historic tipping point in energy policy and the development of the energy sector. The important message is that we already have technology available, we need to get started now to implement what we have, and then improve.

1. Objectives

This Summary was generated at the 2023 World Systemic Forum (WSF), which is the annual event of The System Change Foundation. The forum gathers the community of transformers, decision makers and some of the most respected and influential minds of our time, to collaborate on questioning current global challenges. This year the forum was hosted within the mountain at Versuchsstollen Hagerbach in Flums, Switzerland, where founder Rudolf Hilti welcomed over 200 attendees to discuss the central theme “There is no collaboration without communication”. The main afternoon event was the roundtable discussion with the theme “Energy and Storage”. This roundtable invited leading experts to discuss the current market situation, the state of technological progress and existing challenges and barriers faced in the energy and storage environment.

The future energy supply will rely heavily on “electrical competences” – from renewable energy generation to electromobility in all its forms. With massive demand and high energy use globally, storing energy goes hand in hand with production. As one scales up, so does the demand for the other. Thus, skilled workers with training in electric and electronic engineering are crucial to more sustainable, secure, and reliable energy sources.

Unlike incremental innovations that serve an existing ecosystem, disruptive innovations require a large amount of money over longer periods of time. Therefore, having specific shared ‘lessons learned’ help guide the industry into a more sustainable and realistically achievable state.

The purpose of this summary is to explain the current drivers, the lessons learned, and present what experts contribute as solutions. The summary will be presented to members of the Government and attending organizations within the framework of the World Economic Forum 2023.

2. Policy and Barriers

The transformation of society to a future renewable green economy should be based on sustainable and fair use of our resources, which demands a non-destructive lifecycle in a truly circular economy. Recycling is difficult from the entropy point of view, but nearly inexhaustible renewable energy can be the driver for sustainability for the foreseeable future. Key to this will be the development of truly green technologies in a circular economy and to improve existing renewable technologies. We need to get started immediately to progress from where we are now, and be open to innovation.

For this to happen, other challenges also need to be addressed. There needs to be an alignment between environmental, economic, and political priorities to ensure that the policies that arise to support the sector are consistent both in goals and results.

In addition to climate protection, the dramatically-revealed geopolitical dependencies in the supply of fossil fuels have become an important driver for investments in green technologies .

It is crucial to adapt the current regulatory framework to new technologies and products and to reduce the barriers to their market introduction.

First, tariff reductions on products that provide clean energy must occur. This could potentially reduce CO₂ emissions by 10 million tons by 2030 and increase global trade in the sector to US\$25 billion. Access to clean energy and storage technology should also be a central part of all countries' international development cooperation strategies.

Secondly, the selection of technologies for future energy systems has to be based on environmental and climate neutrality aspects as well as on performance criteria defined by a holistic life cycle assessment. This enables more dynamic metrics for measuring sustainability. There are specialized organizations that can supply this kind of service by providing transparent metrics. The energy sector needs to apply the best technology for each situation, instead of applying a 'blanket' solution to all.

Then, policies must remain consistent, even if disadvantages threaten existing dependencies. As said before, change will not happen for free. We should also avoid policy fragmentation between countries and work on building bridges at the international level. We should be open to learn from one another and share competences, to avoid repeating mistakes. In order to create and maintain partnerships, we must nurture trust between politicians, businesspeople, and consumers by using fair procedures to increase transparency without creating unnecessary bureaucracy. We should remain open to new technologies and not succumb to silo thinking.

We should see how to motivate sustainability in other sectors such as manufacturing through policy incentives. A good example to observe is Germany's recent adoption of climate protection contracts, which will give companies in energy-intensive industries 15-year subsidies in return for reducing carbon emissions in production. These policies should also complement the global carbon emissions trading system.

The climate crisis has no boundaries. Therefore, it should be in the interest of all countries to ensure that everyone has access to technology for clean energy production and storage and to prevent monopolies in the production of clean energy components. The global democratization of clean energy and storage technology is vital to meeting the world's climate goals.

3. Technology & Security

We are currently at a historic tipping point in energy policy and the development of the energy sector. While the main driver for the expansion of renewable energies so far has been combating the climate crisis, the current situation also makes clear that local and decentralized renewable energy sources and storage facilities with innovative technologies contribute to the security of the energy supply.

However, since the supply from renewable sources does not match the current energy demand, solutions must be found to achieve the necessary balance, and therefore the power grid must be ramped up to host increasing volumes fluctuating renewables. On the one hand, this requires supply-side management: the expansion of regional grids, plannable generation units, as well as energy storage - both as short-term storage for balancing on an hourly basis and long-term storage for bridging so-called dark periods and for seasonal balancing. On the other hand, demand-side management is also critical. In particular, the additional demand for electricity through sector coupling should be oriented towards the use of renewable energy.

Efficient and secure sector coupling and decentralized optimization are only possible if the opportunities offered by advancing digitization and automation are exploited. System management, especially in cellular supply structures, will flexibly manage the balancing of generation.

The aforementioned new technologies will pave the way towards attaining a secure energy supply. Demand for solutions in these areas favors the entry of new and innovative companies into the market, and thus promotes Central Europe as a technological ecosystem nexus.

The current regulatory requirements are preventing the progress of this transformation in many places. This has been compounded further by outdated technical specifications. As a result, investors cannot obtain an objective assessment of the technical specifications of new technologies in the short term.

To this end, it is of great importance that barriers to entry be lowered to encourage industry start-ups and young companies, and that an adapted methodology with regards to regulatory requirements be introduced. Regulations should enable and support the adoption of new solutions, rather than restricting them.

One possibility here is to accelerate the process of standardization for the industry. Standardization is a key instrument for enabling the scaling up of business models for new technologies. This in turn reduces barriers to the deployment of innovations. It improves product quality and reliability and allows users the freedom of choice to consider products from different vendors in a particular application. This also makes part replacement easier.

For this to happen, the existing and internationally recognized regime for technical standards in this industry needs to be supplemented by a credible, early-stage pre-standards, thus establishing investor confidence in these new technologies and accelerating faster development of solutions. These standards can be introduced in stages to cushion the technical and business risks associated with new products (such as safety, service life, reliability, efficiency) in a targeted manner. Materials design and recycling, together with device design, also need to be guided by sustainability metrics.

However, we must be careful not to create unnecessary bureaucracy in the standardization process. Already, we see a proliferation of local and international standards and guidelines. They are increasingly becoming barriers to market entry for smaller companies that can no longer afford this expenditure.

It is also very important to guarantee the scaling-up and implementation of new products and solutions, as this is the only way that these can develop into larger business models. Existing standards must also be promoted and implemented in parallel with the new pre-standards in order to ensure a holistic level of insurability and bankability.

Due to the connection of the energy sector to the digital grid, cloud computing and smart solutions/loE, new threats are arising. Therefore, the potential for cyberattacks on critical infrastructure and the energy sector is growing rapidly. Past attacks have demonstrated how vulnerable our infrastructure can be. Key stakeholders have to be prepared and to find out how to protect themselves against cyberattacks. It is essential to conduct risk assessments of the systems continuously to identify vulnerabilities and determine potential impacts of an attack. Preparing a response plan that is clearly communicated across an organization is fundamental to risk mitigation.

4. Education

The rapidly growing global market in the cleantech sector requires a continuous expansion of human capital in all areas. Besides existing educational and training programs, this requires new courses that take into account the need for new skills and applies not only to engineers, but also to technical workers, trainees and apprentices. It is of utmost importance to ensure that appropriate competence levels are attained so we do not jeopardize the production, the installation, and maintenance of systems.

Considering the ongoing transformation of the traditional energy sector and to close the gap of skilled workers in the cleantech sector, we also need suitable capacity-building programs. This requires long-term planning and a focus on training initiatives which is based on market needs. This shortage of skilled workers acts as a brake on the much-needed energy transition.

The development of adequate human capital with the necessary level of competence required cannot be addressed only in the short term. It requires long-term planning and a focus on training initiatives based on market needs. This also required complementary initiatives by politicians, chambers of industry and other stakeholder so that talented young will be motivated to work in the cleantech sector and can be supported by a framework of mentoring programs.

5. Best Practices and Lessons Learned

Technical progress and successful sustainable business development must allow room to learn from mistakes. This applies to both professional work, especially in the field of development of new products and systems, as well as the creation of quality criteria and standards. It is important that core criteria such as safety requirements and state-of-the-art are met.

In this context, we must take care to not allow less important requirements and minutiae to get in the way of attaining rapid technological progress, which will thus shorten time-to-market processes. Pre-standards help ensure accelerated product development and commercialization. They can be converted into international standards if the verification is successful. For manufacturers and assemblers, pre-standards support the achievement of bankability and insurability and contribute to technical and economic risk minimization.

It is important that non-confidential technical business information, market development experiences, regulatory frameworks, and arising risks, are frequently discussed and exchanged through existing platforms. Testing facilities and laboratories must support product development through feasibility studies and field trials to ensure that these concepts work. We also need to make these services more widely available. These lessons lead to better collaboration and earlier identification of technical and business risks for all stakeholders.

6. Resumes



Prof. Dr. Andreas W. Bett

Director Fraunhofer Institute for Solar Energy Systems ISE

Prof. Dr. Andreas W. Bett is director of the Fraunhofer Institute for Solar Energy Systems ISE in Freiburg, Germany and Professor of “Solar Energy Materials and Technologies” in the Faculty of Mathematics and Physics, University of Freiburg.

He joined the Fraunhofer Institute for Solar Energy Systems, ISE already in 1986. The main areas of research of Prof. Dr. Andreas Bett include solar silicon material, epitaxial growth of Si and III-V semiconductors, development of characterization techniques for advanced solar cell devices and the fabrication of solar cells.

For his scientific achievements he was honored with several prestigious prizes like the Becquerel Prize, the Fraunhofer Prize and the Deutsche Umweltpreis. He has organized several international conferences and served in many scientific committees. He was also co-founder of the company Concentrix Solar in 2006 and in 2015 of the company NexWafe.



Dr. Britta Buchholz

BVES Vice President

Dr. Britta Buchholz works with Hitachi Energy as VP Active Distribution Grids. In this role, she drives innovations for energy transformation in industrial and public distribution systems. From 2001 to 2011 she held various positions at the regional energy supplier MVV Energie in Germany.

She holds a PhD in Electrical Engineering from Kassel University, and a master's in industrial engineering from Karlsruhe Institute of Technology. Since 2023, she chairs the power engineering society (ETG) in VDE and is member of the VDE supervisory board. She is CIGRE Fellow and Distinguished Member, member of the board of trustees of Fraunhofer IEE and Vice President of the German Energy Storage Systems Association BVES.



Dr. Sweta Chakraborty

Chief Executive Officer „We Don't Have Time“

Dr. Sweta Chakraborty is a climate behavioral scientist who is regularly interviewed on major, international news media outlets like CNN, the BBC, MSNBC, etc.

Sweta is the US CEO for We Don't Have Time, the world's largest social media and communications company for accelerating climate solutions. She is a partner at Pioneer Public Affairs and is on the steering committee of the Global Commons Alliance.

She is an Independent Director at Lightbridge Corp. where she chairs their ESG committee and is on several advisory boards like the New York Academy of Sciences and Climate Power.

She is a book author from her time as a postdoc at Oxford University. She is a TEDx, SXSW, and globally recognized keynote speaker and consultant for several Fortune 100 companies economically viable.



Dr. Markus Forstmeier

Sales & Business Development Officer EIT InnoEnergy

Dr. Markus Forstmeier supports start-ups in the sustainable energy space winning first contracts in the DACH region.

Before this was the Head of Business Development & Sales at H-TEC SYSTEMS, a German provider of PEM Electrolyzers where was responsible for growing and leading a global business.

Previously he had the role of a Vice President Business Development at Electrochaea GmbH, a leading player in biological methanation.

Prior to this he served as the Head of New Business Development at SGL Carbon for carbon-based products for energy application.

Previously he worked as Director Corporate Strategy Energy at Siemens AG

and served as Lead Engineer on Renewable Energy Systems and Water Treatment at General Electric. Markus holds a PhD in Environmental Engineering from TU Berlin, and an Executive MBA from Augsburg University and University of Pittsburgh.



Rudolf Hilti

President & Founder The System Change Foundation

Rudolf "Rudi" Hilti is a non-traditional entrepreneur and visionary. He is the Founding Chair of «The System Change Foundation», which together with the «World Systemic Forum» and «THE HUS.institute» form a platform for imagination and change. The non-profit from Vaduz sees itself as a value-based global village, enabling global topics to be discussed to rethink global challenges, free of higher interests. Everything that Rudi does is based on inspiration, collaboration, and holistic thinking. Rudi is also the Founder of «RHEINEST» and «THE COMBINATOR», an investment company for impactful ventures to scale systemic change.



Burkhard Holder

Managing Director VDE Renewables

Burkhard Holder possesses more than 30 years of strategy and leadership experience in the solar industry through positions in the photovoltaic industry, applied research area, and energy policy initiatives.

He is currently the Managing Director of VDE Renewables, a globally active subsidiary of the VDE Association which provides quality assurance, risk mitigation and international certification for renewable energy products and systems.



Marten Jensen

Founder GreenTEC Campus

Marten Jensen (Dipl.-Ing. Electrical Power Engineering) has been active in the wind industry for 30 years: initially as a developer, construction manager and technical operations manager of many citizen wind farms, of which he is still the managing director today.

Since 2005 active in both educational areas of technology and occupational safety (BZEE, OffTEC, OSC) as well as SmartHome solutions with small wind (Easywind) and e-mobility in all facets. He is owner of the green business park and test site "GreenTEC Campus" (former BW site with 130ha size, 17km road network) for meanwhile about 25 StartUps and early adaptors of modern energy use in Power to X, mainly electric and automated mobility and Green

Data. Since 2010 volunteering as delegate in the BWE, in the eE4mobile e.G. as well as area board of the LEE SH to fight socially for "Electricity from the dike instead of oil from the sheikh!".



Walter Kreisel

CEO & Founder neoom

Climatefighter. Passionate Mountainbiker and proud father of twins. Walter feels confident that we can "electrify" the world with renewable energies. He demonstrates this every day anew as a successful entrepreneur leading a highly talented and motivated team. As a visionary and passionate advocate of the energy transition, Walter illuminates the past, questions the status quo and – in his very unique and fascinating way – points out to solutions that seem immediately achievable and in an ecological as well economically viable.



Prof. Dr. Anke Weidenkaff

Director Fraunhofer IWKS and Head of Department TU Darmstadt

Anke Weidenkaff is professor at the Technical University of Darmstadt and director of Fraunhofer IWKS. Her principal areas of research and expertise are materials science and resource strategies, including the development, synthesis, and characterization of sustainable materials for energy conversion and storage. Her current work focuses on regenerative circular materials and the development of next-generation green process technologies for fast and efficiently closed material cycles. Anke Weidenkaff completed her PhD degree in Chemistry at ETH Zürich in 1999, received the Venia Legendi from the University of Augsburg in 2006 and became section head at Empa as well as associated professor at the University of Bern. She was chair holder of

Materials Chemistry and director of the Institute for Materials Science at the University of Stuttgart from 2013-2018 Ms Weidenkaff was awarded with the Kavli Foundation Lectureship prize in 2011, the Karl Böer Award and the GDCh/GCCCD Award for Excellent Supervisors of Chinese PhD Students in 2022. Since 2020 she is member of the German Advisory Council on Global Change (WBGU).



Torge Wendt

Founder & CEO Nordgröön Energie GmbH

Torge graduated from the Flensburg University of Applied Sciences in 2004 with a focus on logistics, system analysis, graph theory, and digitization. From 2004-2008 he worked in project management in IT in the financial sector before moving on in 2008, to a position in area responsibility for energy logistics at a North German municipal utility for all market roles in the energy market, which he held till 2013.

Between 2009-2012 he was a member of many specialist groups at BDEW and in 2010-2013 he was involved in the development of a company in the field of industrial flexibility control. In 2012 he founded Nordgröön, where he serves as CEO today. From 2013 he has been an active board member of a

renewables association in the north (Germany).

Further Information



VDE ETG Future Energy Picture:
<https://www.vde.com/de/etg/arbeitsgebiete/v2/zukunftsbild-energie>



VDE Whitepaper on the hydrogen economy
<https://www.vde.com/whitepaper-hydrogen-22>



VDE Study Labor market 2022 - Electrical engineers:
<https://shop.vde.com/de/arbeitsmarkt-studie-2022>



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