SUSTENANCE e-Newsletter 5/7
April 2024

Sustainable energy system for achieving novel carbon neutral energy communities

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101022587, and the Department of Science and Technology (DST), Government of India under the SUSTENANCE project. Any results of this project reflect only this consortium's view and the funding agencies and the European Commission are not responsible for any use that may be made of the information it contains.

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Energy Transition in India

Author: Soudipan Maity, Zakir Rather

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India's road towards the energy transition reflects its robust economic growth and rapid urbanization. The country is ranked third in the primary energy consumption globally in 2022 behind only China and USA. The total primary energy requirement for the country has more than doubled from 2000 to 2020, surging from 441 million tons of oil equivalent (Mtoe) to 870 Mtoe. However, India's energy consumption per capita is still less than 1/10th of the US currently. Consequently, the country's ability to meet its growing energy demand and alter its primary energy mix over the coming decades will substantially influence global energy markets and help determine how global emissions targets are reached.

Fig. 1 Group photo in Kashitoli plant area.

The theme of India's G20 recently concluded presidency, "One Earth, One Family, One Future," resonated during a time of multiple global crises, highlighting India's proactive role in steering towards a better tomorrow. The recent focus has been on balancing energy transition while enhancing access, security, and affordability globally. Climate change's pervasive effects, coupled with soaring energy costs, are amplifying the socioeconomic gap between the Global North and South, underscoring the significance of emerging economies like India in absorbing economic shocks and managing climate-related challenges, which will have far-reaching impacts worldwide.

Currently, the energy landscape in India is in the middle of a profound transformation, navigating a paradigm shift towards sustainability and efficiency known as the energy transition. With a growing population and rapid economic growth, the country faces the challenge of meeting rising energy demands while addressing environmental concerns and reducing dependency on fossil fuels. This ongoing transition encompasses various facets, from renewable energy adoption to policy reforms and technological innovations.

Renewable energy (RE) sources have emerged as a cornerstone of India's energy transition (Fig. 1). The country has set ambitious targets to increase the share of renewables in its energy mix, aiming for 500 gigawatts (GW) of installed capacity from non-fossil fuel resources by 2030. Solar and wind power, in particular, have witnessed remarkable growth, with India becoming one of the world's largest

RE markets. Solar photovoltaics account for 72 GW of installations compared to 44 GW for wind as of February 2024. Initiatives like the International Solar Alliance and various state-level policies promoting the adoption and mandatory inclusion of RE in the energy mix have accelerated investments and propelled India towards a cleaner and greener energy future.

CHANGES IN LEGISLATION SUPPORT GREEN TRANSFORMATION

Simultaneously, the government has been proactive in driving policy changes to support this transition. The introduction of initiatives such as the National Electricity Policy, the National Solar Mission, and the Ujwal DISCOM Assurance Yojana (UDAY) have laid the groundwork for RE integration, incentivized clean energy production, and aimed to reform the power distribution sector. Additionally, programs like the Green Energy Corridors project to facilitate the transmission of power generated from RE-rich states to the crucial load centres and the implementation of energy efficiency schemes have contributed to the overall momentum.

In today's era, where global focus leans heavily on sustainability and environmental awareness, the electric vehicle (EV) industry stands out as a key player in shaping the future of transportation. With the world moving away from traditional internal combustion engines, EVs have taken a prominent role by offering a cleaner, more eco-friendly, and efficient mode of travel (Fig. 2). This shift signifies more as a transformative change, a revolution poised to curtail carbon emissions, address climate change, and redefine our approach to transportation. India stands on the brink of transforming its transportation landscape. In this context, the India has already introduced and devised several programs such as the Faster Adoption and Manufacturing of Electric Vehicles (FAME) Scheme, state-wise EV policies and subsidies to prospective owners and active exploration to develop

Fig. 2 The V2G car being tested at the Shunya building at IITB.

a widespread vehicle charging network is continuing to benefit Indian industry and citizens and will play a pivotal role in the energy transition. The EV sector in India is fast expanding and according to forecasts, the EV industry is predicted to reach 17 million units by 2030, with EVs encompassing 80 percent of new vehicle sales by 2040.

India's pledge to achieve net zero emissions by 2070 and procure 50 percent of its electricity from RE sources by 2030 marks a monumental milestone in the fight against climate change. This commitment signifies the nation's pioneering role in shaping an alternative economic development model that steers clear of carbon-intensive approaches that have been the norm in the past. It stands as a potential blueprint for other developing economies to follow, showcasing a path towards sustainable growth and climate action.

CHALLENGES ON INDIA'S PATH TOWARDS SUSTAINABILITY

Despite the substantial progress in the RE sector, the dominance of coal in India's energy mix still poses a substantial challenge to its clean energy initiatives. Coal-fired power plants continue to be a primary source of electricity generation due to their reliability and affordability, posing a challenge in balancing energy needs

with environmental commitments. Transitioning away from the conventional fuels while ensuring energy security and affordability remains an uphill challenge, one that will require scaling several technological and economic barriers in the immediate future.

Furthermore, the intermittency and variability of RE sources in India that is greatly influenced by the seasonal changes presents its own challenges in grid integration. Establishing adequate energy storage systems and smarter grid infrastructure becomes imperative to fully leverage the capabilities of solar and wind resources in the country. Technological progress in energy storage, fast-paced advancements in battery technology and grid management systems, play a pivotal role in stabilizing the grid and optimizing the utilization of renewable energy sources.

The energy transition in India is also heavily intertwined with social and economic considerations. Access to clean and affordable energy remains a priority, especially in rural areas. Initiatives like the Pradhan Mantri Sahaj Bijli Har Ghar Yojana (Saubhagya) aims to electrify all households, ensuring energy access for socio-economic development while incorporating RE solutions and microgrids.

In conclusion, India's ongoing energy transition represents a multi-dimensional shift encompassing policy reforms, technological advancements, and socio-economic considerations. The country has made significant strides in adopting RE, implementing policy frameworks, and promoting research and innovation. However, addressing challenges related to fossil fuel dependency, grid stability, and ensuring universal access to clean energy will play a crucial role. Effective collaboration between the government, private sector, and global partnerships will be crucial in navigating this transition towards a sustainable and resilient energy future for India ■

Seeking roads towards CO_2-neutral heating in the Municipality of Skanderborg

Author: Susanne Skårup,
the Municipality of Skanderborg

The roadmap for reaching the goal of 'energy islands', based on smart renewable energy sources in the Municipality of Skanderborg, must be created as part of SUSTENANCE. But how can the municipality help the 30-40 % of consumers without district heating to switch to CO_2-neutral heating? And how can it be done without additional burdens to the electric system? These are some of the questions that the SUSTENANCE project has raised in Denmark. But one thing is clear, all of this has to be done voluntarily by the citizens.

ECONOMY HELPS

The realization of the goals of SUSTENANCE was positively influenced by the difficult geopolitical situation which resulted in explosive increase to the energy prices in 2021 and 2022 – especially natural gas. Suddenly everybody was interested in alternatives. District heating was expanded to 3 more areas in the municipality, and many single houses changed to heat pumps. Three more areas were in the pipeline to district heating, but due to the falling gas prices, support for district heating has now fallen and these areas are now on hold. You need about 70% of the consumers in an area to be connected to district heating to make it economically sustainable. The region provided some local funds for joint energy solutions. Skanderborg Municipality cooperated with five interested villages to successfully receive funding.

COOPERATION IS THE KEY TO SUCCESS

In March 2023 the municipality held a big meeting about the alternatives to district heating. The participants were grouped according to their villages to encourage networking and cooperation. Before the meeting, the 7 biggest villages without district heating

Fig. 1 Meeting in the village of Sjelle in February 2023 (Susanne Skårup).

were screened for the prices of alternative heating compared to individual heating. It turned out, that most of them could benefit from common heating, especially through the concept called "termonet". A 'termonet' grid can be considered as a 'collective geothermal heating system' (https://termonet.dk/). This is where a joint company both owns the water pipes outside and the heat pumps inside the individual households. In this way villagers gain the possibility to get lower electricity prices because they would get it through a company. However, the villages have to establish the company(ies) themselves as the municipality does not own energy companies. Nevertheless, the municipality helps the villages with all the needed permissions, some money and meetings to stimulate and ease communication and collaboration.

The next meeting will be a common one for the active villages (at least 5 villages) to exchange knowledge and cooperate on common heating.

ENERGY ISLAND

Most district heating in Skanderborg Municipality is actually realised from the beginning back in 1970'ies (and earlier) as kind of an 'energy island' concept, because they are owned by the consumers themselves and they must not make a surplus. This is due to the fact that any surplus must stay in the company according to national rules on district heating in Denmark. This resembles the EU-idea on 'energy islands'.

Consumption of power is a different story. Consumption of power in Denmark is heavily taxed nationally, which make local common solutions with shared power difficult. But luckily the cost of power changes according to the amount of power in the grid. So smart steering of power consumption – as in the SUSTENANCE project - is both good for the consumers economy and for the grid.

As the energy system goes more and more to electricity for heating and transportation, the need for power is expected to double within the next 10 years.

LARGE EXPANSION IN POWER PRODUCTION TOGETHER WITH THE CITIZENS

The politicians in Skanderborg Municipality have a goal for 100% power production compared to consumption in 2030 within the municipality's borders. A part of the realisation of this will hopefully be with 'energy islands' in cooperation with the local citizens. As a pioneer project two villages are now investigated further on how to create local energy

islands. One of the villages is Voerladegård, where Danish demonstrator of SUSTENANCE is located. Neogrid has installed heat pumps, salt-heat-storages and smart steering of power consumption depending on the local power production and the weather in 20 of the several hundred houses. The aim is to show how much these systems can help the power grid concerning fluctuations in production and consumption of power, especially if all the houses in Voerladegård do the same. This will also lower CO_2-emissions and price for the consumers.

SKANDERBORG MUNICIPALITY:

- 65.000 inhabitants,
- 417 km^2,
- 4 larger cities and about 40 villages,
- 63 % on district heating from 4 different heating plants. (Three of the plants are owned by the consumers, while the 4th is owned by Aarhus Municipality).

THE TERMONET CONCEPT CONSIST OF:

- A common ground heating system within a village.
- Each house has a heat pump connected to the common ground heating system.
- The heat pump can be owned by the house owner, or by the same company who owns the common ground heating system.
- An energy source: often it is a horizontal brine in a field. This can also be other sources like vertical tubes, surplus of energy from a company, or houses/companies that give heat and gain cooling. ■

Preparing for the perfect storm

Author: Gerwin Hoogsteen,
University of Twente

Autumn has kicked in and storms are raging over the low countries. Likewise, dark clouds move over the Dutch distribution grids as over 6600 companies are currently waiting for additional capacity. Furthermore, newly built houses cannot be connected, and distribution service operator Enexis reports more than double the number of service interruptions due to the ongoing electrification. Now that winter is coming, we prepare ourselves for a flexible and smart energy system that deals with uncertainty.

Demo from the Netherlands

Unforeseen circumstances happen all the time, yet researched systems are mainly only studied in “nice weather” conditions. An ideal world situation in which researchers receive immunity against all havoc the universe throws at society. Nevertheless, our researched systems need to be robust in all possible situations before deployment. Therefore, we have opened our office windows and embraced a new fresh wind full of opportunities.

Over the last period the researchers of the University of Twente and Saxion have been focusing on preparing our algorithms for the real world by researching the use of ad-hoc communication networks and how a fully distributed system can operate an energy grid in a fully democratic way. And we succeeded, resulting in a system in which no individual weakest link exists, but all computing nodes are equal. This allows the system to be able to include new devices that pop up, or to continue to operate steadily when a device goes missing. In other words, we made our energy management system resilient to sudden changes that are bound to happen.

Next to this, we see more and more issues related to grid congestion. Also, for this we are now prepared by using energy modii. We take into account that the future energy grid may not always provide the energy or capacity that we want. Instead, we call for an adaptive system that braces for impact and ensures for a soft landing. The developed energy modes for this range from a fully connected electricity grid (business-as-usual), via congested and scarcity modes, to a fully islanded operation. If problems are foreseen, e.g., by forecasts, then the system can prepare the energy system for this. Just like having an emergency kit at home, our energy management system charges batteries upfront and utilizes energy in a rational way during the “perfect storm”. This way we ensure a higher quality of service during severe conditions and thereby critical devices can keep on operating.

Parallel to this, the IT systems backbone, our Internet of Things (IoT) Edge Computing for carbon neutral communities (IECON) framework, has been hardened as well and new designs are able to respond and communicate about

such situations. New embedded devices have been developed to monitor PV production and control the heat pumps at Vriendenerf. The latter consists of an IoT device that has to be placed between the thermostat and the heat pump. It allows the control system to slightly adjust thermostat setpoints if it is desirable in our efforts to decarbonize our energy system. Note that this solution does not require the existing thermostats to be replaced, meaning that nothing will change for the end user, whilst the heating system will be operating more efficiently.

Finally, we have been developing an open-source tool to track the carbon emissions of the Dutch electricity grid. With the first fully open-sourced and validated tool, people can freely access the information they need to join forces in utilizing more sustainable energy (see Figure 1). This allows people to make conscious choices on the electricity use and how it affects the emissions of greenhouse gases. The storms keep on raging in the North Sea, but this allows offshore wind farms to generate clean energy. So, let that perfect storm roll in and make it work to our advantage! ■

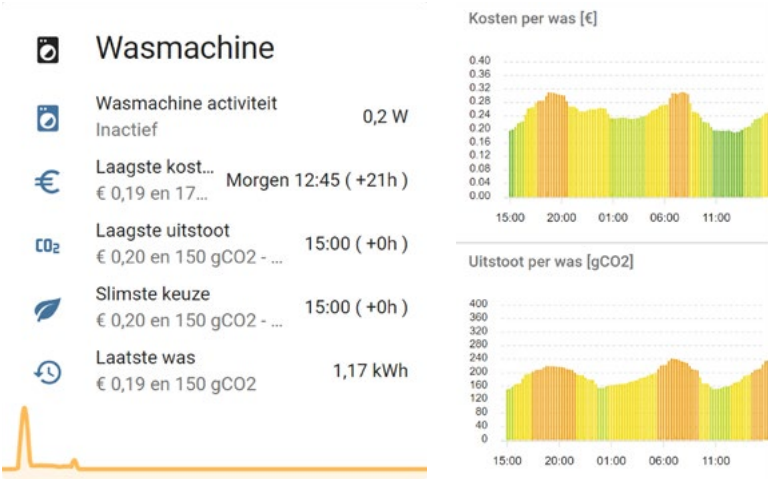


Figure 1: Home Energy Management system with integrated CO_2 emissions to make informed choices.

Intelligent energy management system in a housing estate in Sopot

Author: Pawel Grabowski,
CEO, STAY-ON Energy Management

Energy systems supplied with increasing amounts of renewable energy are becoming increasingly unreliable. Due to this situation, energy storage systems are more frequently mentioned as a panacea for the emerging problems with stability and quality of energy. However, unsatisfactory economic results stemming from investments in energy storage systems and the complicated legislative and technological process of such a project are still a significant challenge for investors. Therefore, STAY-ON Energy Management has addressed the above concerns of investors and ultimately the power grid by developing and implementing an intelligent energy management system (iEMS), which is being launched and demonstrated in the Mickiewicza Housing Association in SOPOT as a part of the SUSTENANCE project.

STAY-ON Energy Management (STAY), as part of the SUSTENANCE project, proposed and developed a dedicated energy storage system to work with iEMS. In this case, an energy storage system based on lithium-ion technology was proposed. However, it should be remembered that the full potential of iEMS can be used in the case of long-term energy storage, such as e.g. flow battery. STAY has designed an all-in-one system for outdoor applications, including batteries, hybrid inverter, the aforementioned energy management system and electrical switchgear. A dedicated cabinet with IP54 protection class was designed and manufactured. In collaboration with IMP PAN, the thermal management equipment was dimensioned using TRNSYS modeling. The cabinet is equipped with a cooling unit and heaters and can safely operate batteries in Polish climatic conditions.

Fig. 1 Universal Energy Storage System (ESS).

The Energy Storage System (ESS) is designed to be paired with an electric vehicle charging station and will be installed in a parking lot near the building of the Mickiewicza Housing Association in Sopot (hereinafter referred to as WSM). Locally, it aims to perform peak shaving, while at the community level, it will offset photovoltaic power generation and provide strategies to reduce energy consumption during energy price peaks.

Modelling and simulation work was carried out to investigate the business models of energy storage in residential applications under different price and regulatory scenarios. Simulations were carried out using EnergyPRO

PARAMETER	UNIT	PV	PV + BESS
Energy Exports	MWh	9,5	7,7
Imported energy	MWh	3,4	2,3
Battery discharge	MWh	-	2,6
Battery cycles	-	-	291
Localized Impact	PLN/kWh	0,148	0,148
LCOS (LCOS Certified)	PLN/kWh	-	0,846
Payback period	years	5,8	7,6
BESS payback period	years	-	17,3

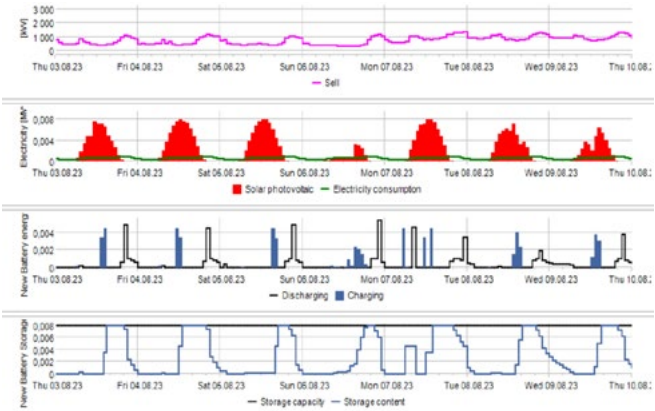


Fig. 2 Example of PV+ESS simulation in residential buildings.

Fig. 3 Krzysztof Rafał presenting the SUSTENANCE project at the PES conference in summer 2023.

software and hourly load and generation profiles. It has been shown that the use of ESS in combination with photovoltaics can result in a significant reduction in energy costs (Fig.2)

The results were presented at the international scientific and technical conference "Advances in Applied Electrical Engineering (PES)" in Kościelisko in 2023 (Fig. 3)

At the same time as the foundation of the energy storage facility, development of the intelligent Energy Management System (iEMS) is continued. The cloud software runs the necessary infrastructure such as user accounts, installations, databases, communication protocols, etc. Front-end solutions are deployed to provide a graphical interface for the user, including dashboards, charts, and forecasts (Fig. 4). Cloud software combines all resources in a single logical system. Predictive functions have been implemented to forecast photovoltaic generation and energy consumption at selected points. The system is prepared for dynamic pricing by connecting to an energy market with hourly price volatility. Current work focuses on the development of algorithms for managing ESS schedules in the neighbourhood in order to maximise the use of RES and minimise energy bills.

Edge controllers (local iEMS) were selected and dedicated software was deployed to monitor the installation, provide basic local control, and perform optimized schedules sent from the cloud. The local iEMS device is integrated with an all-in-one energy storage system and will then be integrated into a building with a heat pump and photovoltaics.

At the same time as the foundation of the energy storage facility, development of the intelligent Energy Management System (iEMS) is continued. The cloud software runs the necessary infrastructure such as user accounts, installations, databases, communication protocols, etc. Front-end solutions are deployed to provide a graphical interface for the user, including dashboards, charts, and forecasts (Fig. 4). Cloud software combines all resources in a single logical system. Ultimately, the iEMS system together with the energy storage system will be a complete, fully maintenance-free solution that will meet the expectations of the most demanding investors, as the function of the system is to optimize the price of electricity while balancing the demand for energy in such a way that the electricity supplier "sees" a stable load. The work carried out by STAY-ON Energy Management in the Polish demonstrator of the SUSTENANCE project, located on the premises of the Proprietary Housing Cooperative in Sopot, certainly contributes to achieving this goal. ■

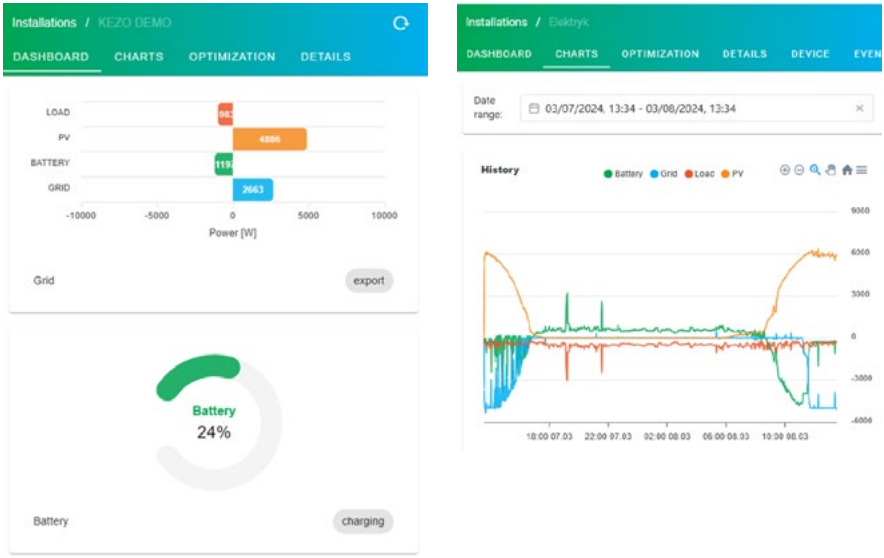


Fig 4. Screenshots of the EMS front-end

Energy transition happening locally in Indian demonstrators of SUSTENANCE

Author: Zakir Rather, Soudipan Maity
Indian Institute of Technology Bombay (IITB)

The goal of achieving global net-zero emissions will have to include India for its sheer volume of energy usage, the projected growth in demand and the corresponding contributions of greenhouse gas emissions. The development trajectory for India has been a benchmark for the economy of South Asia and is likely to continue to influence the region in trying to provide secure, reliable, and affordable energy while reducing carbon emissions.

Meanwhile, it is the local action that allows for the first steps to be taken on the wider path to the energy transition!

India showcases three distinct demonstration sites in SUSTENANCE situated in vastly different geographical regions and climatic zones. These encompass Barubeda village, adjacent to Ranchi city in Jharkhand state, Borakhai village near Silchar in Assam state, and the IIT Bombay campus, situated in the heart of Mumbai, in the state of Maharashtra.

In the **Barubeda demonstration site**, the distribution system including the erection of poles, laying of conductors and the service connection to households have been deployed. The construction of a control room for the generation plant has been initiated while installation and commissioning of generation system (solar PV and battery storage) is nearing completion.

A multi utility heat pump developed at IIT Bombay is being deployed at the site for multiple farming applications, such as chilling milk, drying vegetables, etc. MNNIT Allahabad has been coordinating the domestic water supply system at Barubeda which is expected to be completed by February 2024. Moreover, a tool to design the water pumping system has been developed which is also used to design the water pumping system at Barubeda. At IIT Kharagpur, the development of a motor controller and solar charger for e-rickshaws is in progress, with a lab scale prototype of the controller developed and tested on campus. Preliminary studies on the power electronic interface for integrating a second-life EV battery and solar PV system are being carried out, with a particular topology being selected for further study and hardware development.

Fig. 1, 2 The remote village of Barubeda, Ranchi in the state of Jharkhand and PV installation in the village.

Fig. 3 An E-rickshaw being used for research purposes at IIT Bombay.

At **Borakhai demonstration site**, two e-rickshaws (Fig. 3) have been delivered primarily to be used for local transportation for the inhabitants.

Further, more than ten visits and discussion sessions have been conducted with the village community. In addition, meetings with the Assam Power Distribution Company Limited (APDCL) have been carried out for the development of the grid-connected cluster at the demonstration site (Fig. 4).

Fig. 4 Meeting with Borakhai villagers.

The research and development activities associated with the testing of water samples at the selected project sites are in progress. However, to establish the proposed smart energy management system, the land (for the implementation and commissioning of ON-Grid & Off-Grid Energy Management Systems) has been identified and the land donation documents/ agreement from the Cluster 1 & 2 (Kolva Tilla & Khel Tilla) and Cluster 3 & 4 (Borakhai Market area) have been received. Based on the testing of water samples made at the different sites selected for the project, it is observed that the content of iron (1.2 to 1.4 ppm) and arsenic (26 to 41 ppm) in the water is above the permissible limits. NIT Silchar is in the process of designing the appropriate filtering system for the water supply system at Borakhai site.

For the **IIT Bombay demonstration site**, a carbon-neutral smart building has been developed in association with Team Shunya, a student technical team comprising of young passionate students, and is currently under operation with different data being logged, measured, and analysed from the building premises (Fig. 5)Moreover, preliminary analysis on EV integration in the IITB distribution system has been carried out. Simulation and design aspects for a multiport converter and solid-state transformer planned for the smart electrical building have been carried out. IISc Bangalore is in the process of developing the EV charger, which will be deployed at IIT Bombay for developing the smart EV charging infrastructure at IIT Bombay.

It can be concluded that with the advancements made possible in 21st century, the country's policymakers, industries, and other stakeholders can avail of many technological, policy, and financial tools to deliver the energy required locally and as a result to meet the nation's economic aspirations while mitigating the impacts of climate change. ■

Fig. 5 The carbon-neutral smart building developed and researched by Team Shunya at IITB.

SUSTENANCE REVIEW MEETING, January 2024

Since two thirds of SUSTENANCE has already come to an end, the Partners have in the online Review Meeting with a Representative of the EC's executive agency CINEA. The meeting was held on 11-12.01.2024 (Fig. 1)

Partners presented their work and achievements as well as took the opportunity to discuss any challenges or risks. After some fruitfull discussion we are pleased to confirm that the project is on track, and is reaching its expected objectives and delivering the impacts and milestones as foreseen in the Grant Agreement.

There is still, however, a lot of work to be done in the 6 demonstrators (3 in EU and 3 in India), especially now when we have entered the "the last straight streatch of the race"!

Thank you all for the constructive meeting and let's keep up the good work!

Fig. 1 Group photo at the Review Meeting.

SUSTENANCE at the TechConnect event in India, December 2023

We are pleased to inform the readers that one of the several exhibition booths at TechConnect, the premier R&D outreach event of Indian Institute of Technology Bombay (IIT Bombay), held between 27th and 29th of December 2023, on the institute campus, was devoted to the communication and dissemination of the SUSTENANCE project-related activities to the visitors (Fig. 1)

Fig. 1 SUSTENANCE booth with promotional poster and promo video at the TechConnect event at IITB in the end of 2023 (IITB, 2023).

TechConnect is IIT Bombay's largest research outreach activity inspiring, influencing, and kindling the scientific curiosity of children, students, researchers, and adults of all ages alike. Conducted as a part of Techfest, the annual science and technology festival of IIT Bombay, this exhibition showcases the institute's R&D achievements in reaching out to critical societal needs and industry requirements, as well as contributions to fundamental research, in the form of technology showcases, scientific models, interactive games and laboratory prototypes. Overall, an astounding amount of footfall during the three-day event, and excitement around the wonders of science was evident among all the visitors.

At this event, attendees had the chance to acquaint themselves with all six project demonstrations featured in the SUSTENANCE project, including three from India. They were able to refer to the promotional materials like posters and leaflets to learn about project specifics, showcased through videos highlighting the demonstrators from Denmark, the Netherlands, and Poland. Additionally, it provided a valuable opportunity for key stakeholders involved in the Indian sector of the project to engage in on-site discussions directly contributing to the realization of SUSTENANCE.

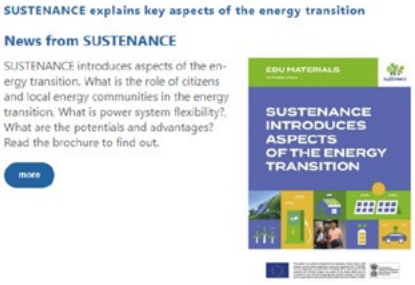
Last but not least, we also had the privilege of hosting Mr. S. Somanath, Chairman of the Indian Space Research Organization (ISRO), at our exhibition booth on the first day of the exhibition (Fig. 2). He expressed appreciation for the project researchers' efforts in advancing energy transition through the project activities. ■

Fig. 2 Mr. S. Somanath, Chairman of the Indian Space Research Organization (ISRO) visiting SUSTENANCE booth at the Tech Connect event (IITB, 2023).

SUSTENANCE in Bridge Newsletter

We are pleased to inform that "News from SUSTENANCE" was published in the BRIDGE Newsletter|#EUbridge|#CINEA_EU| in 13th December 2023.

Read the online version here



SUSTENANCE enters ENLIT World

We are excited to announce that SUSTENANCE entered the ENLIT WORLD in autumn 2023. You can visit our profile in the project directory section of Enlit World's platform here: SUSTENANCE

Further, we invite you to watch the introduction video to the SUSTENANCE project, including the objectves of its 6 demonstrators (3 from EU and 3 from India):

https://www.enlit.world/projects-zone/video-introducing-sustenance-project/

Last but not least, we are excited to inform you that prof. Birgitte Bak-Jensen, SUSTENANCE project coordinator together with prof. Richard van Leeuwen (see Fig. 1 below) participated onsite in the Enlit Europe Conference held in Paris on 28-30 November 2023. ENLIT was an outstanding opportunity for networking, including attending the EU projects zone sessions as well as the Bridge sessions. ■

Fig. 1 Prof. Birgitte Bak-Jensen from Aalborg University and prof. Richard van Leeuwen from SAXION at the EU Project Zone area of ENLIT Europe Conference

SUSTENANCE at the European Hydrogen Week in Brussels

Fig. 1 Sebastian Bykuć, IMP PAN|KEZO Research Centre, at the #EUH2week' EXPO area (Ewa Domke, IMP PAN).

We are pleased to inform you that SUSTENANCE was represented by Sebastian Bykuć from the Institute of Fluid-Flow Machinery, Polish Academy of Sciences (IMP PAN) and its KEZO Research Centre PAS, during the fourth edition of the European Hydrogen Week, which took place on 20-24 November 2023 in Brussels.

Sebastian gave his presentation (see below) as a part of the session on R&I projects at the Polish booth (Hall 11-B43) of the Polish National Contact Point for EU Research Programmes at the #EUH2week' EXPO area, where he presented several research projects in the field of smart energy systems, in which IMP and its KEZO Research Centre are currently involved. ■

SUSTENANCE at the #EURegionsWeek in Brussels, 2023

It gives us pleasure to report that prof. Birgitte Bak-Jensen, the project coordinator of SUSTENANCE and SERENE, was among the speakers at the workshop held on 11th of October 2023, organised as a part of the 21st European Week of Regions and Cities in Brussels.

The workshop event entitled "Energy transition – making local and regional solutions replicable for Europe" gathered many participants and turned out to be an excellent platform for discussions about the actions needed to achieve the energy transition locally, and the challenges involved (Fig. 1,2).

How can we best stimulate user engagement? How can we successfully replicate the findings? What should be the means to also involve rental citizens? These were some of the major social issues addressed during the workshop, and it was a great advantage

Fig.1 Prof. Birgitte Bak-Jensen presenting SUSTENANCE and SERENE (Urszula Sokołowska, Pomorskie Region in EU,2023)

Fig.2 Prof. Birgitte Bak-Jensen answering questions from the participants (European Committee of the Regions, 2023)

to listen to three presentations, which treated social, technical and economical challenges from different angles.

Prof. Birgitte Bak-Jensen from AAU Energy gave her presentation about local paths towards the energy transition based on experiences from two international projects covering altogether 9 demos located in EU and India, whereas other speakers were Mr Iñigo Ansola Kareaga, Director General from Basque Energy Agency and Mrs Janina Wilkos-Gad, a representative from the Municipality of Pruszcz Gdański from Poland. Ewa Domke, from the Institute of Fluid-Flow Machinery, Polish Academy of Sciences (IMP PAN), also a partner of both SUSTENANCE and SERENE, was the moderator at the workshop (Fig. 3). ■

Fig. 3 Ewa Domke from Institute of Fluid-Flow Machinery, Polish Academy of Sciences (IMP PAN) moderating the workshop (European Committee of the Regions,2023)

SUSTENANCE at IEEE PES PowerTech Conference 2023 in Belgrade, Serbia

Fig. 1 Rakesh Sinha introducing SUSTENANCE during the special session on "International collaborative projects for the energy transition and rural electrification in India" at PowerTech Conference 2023.

"(...) PowerTech is the anchor conference of the IEEE Power and Energy Society (PES) in Europe. It provides a forum for researchers and engineering professionals active in numerous segments of the electrical power engineering industry and academia to network, exchange ideas and share results of their scientific work. The IEEE PowerTech 2023 conference theme was "Leading innovations for resilient and carbon-neutral power systems" and both industry and academia were warmly welcomed to strengthen their collaboration and lead the innovation in the energy world. The conference is organized and co-sponsored by IEEE, PES and School of Electrical Engineering Belgrade – University of Belgrade, and was held in Belgrade, Serbia, on June 25-29, 2023" [1]. ■

[1] https://powertech2023.com/

STAY·ON
ENERGY MANAGEMENT

STAY-ON Energy Management is a company offering products and solutions in the field of energy storage Energy Management Systems (EMS) for distributed resources and microgrids. The companies services include proprietary EMS with smart algorithms to manage energy storage systems and other energy assets such as EV chargers and heat pumps. STAY-ON provides expert services related to ESS investment analyses. The solutions offered include thermal modules to extract energy from waste heat generated by Vanadium Redox Flow Batteries. ■

www.stay-on.pl/

Z miłości do nauki
FUNDACJA KEZO
przy Centrum Badawczym Polskiej Akademii Nauk

The organisation is a NGO acting in the form of a foundation. It was developed in cooperation with the Institute of the Fluid-Flow Machinery of the Polish Academy of Sciences and KEZO Research Centre of the Polish Academy of Sciences.

It's main role is to support and develop cooperation among Science – Industry – Public Administration towards the development of common projects, but also more intensive market introduction of new technologies and scientific ideas. ■

www.kezo.pl

WŁASNOŚCIOWA SPÓŁDZIELNIA MIESZKANIOWA
IM. A. MICKIEWICZA W SOPOCIE

The Adama Mickiewicza Housing Association in Sopot was established in 1957. The first multi-family eleven-storey buildings were built between 1969-72. The residential area is fully equipped with technical infrastructure inlcuding a boiler house, roads, power, water-sewage and gas grids as well as a commercial building.

Interestingly, the Adama Mickiewicza Housing Association has been ahead of its time since its inception. It took a pioneering approach to the construction of the apartments, which saw members contributing 50% of the value and then paying the rest in instalments over the next 25 years. Whilst this is a common practice today, it was unheard of in communist Poland!

This pioneering approach remains unchanged among its inhabitants, and thus also today the engagement and activeness of the residents plays a crucial role in the decision-making process in terms of the new investments and refurbishments inside and outside the houses. ■

www.wsmsopot.jimdofree.com/

Indian Institute of Technology (IIT) Bombay
Established in 1958, the second of its category of academic institutions in India, IIT Bombay was the first to be set up with financial support from United Nations Educational, Scientific and Cultural Organization (UNESCO). In 1961, the Indian Parliament decreed the IITs as 'Institutes of National Importance'. Since then, the institute has grown from strength to strength to emerge as one of the top technical universities in the world.

Globally, the institute is recognised as a leader in the field of engineering education and research. Reputed for the outstanding calibre of students graduating from its undergraduate and postgraduate programmes, the institute attracts the best minds from all over the country. Research and academic programmes at IIT Bombay are driven by an outstanding faculty, many of whom are reputed for their research contributions internationally.

IIT Bombay has also been successful in developing collaboration with peer universities and institutes, both at the national and the international levels, to enhance research and enrich its educational programmes. The alumni have distinguished themselves through their achievements in and contributions to industry, academics, research, business, government, and social domains. The institute continues to work closely with the alumni who have excelled in industry, academics, research, business, government, and social domains to further its activities through interactions in academic and research programmes as well as to mobilise financial support. ■

www.iitb.ac.in/

Indian Institute of Science Bangalore

The Indian Institute of Science (IISc) was established in 1909 by a visionary partnership between the industrialist Jamsetji Nusserwanji Tata, the Mysore royal family and the Government of India.

Over the last century, IISc has become one of India's premier institutes for advanced scientific and technological research and education. Its mandate is "to provide for advanced instruction and to conduct original investigations in all branches of knowledge as are likely to promote the material and industrial welfare of India." In keeping with this guiding principle, the Institute has strived to foster a balance between the pursuit of basic knowledge and applying its research for industrial and social benefit.

IISc's research output is diverse, interdisciplinary and cuts across traditional boundaries. The Institute has over 42 academic departments and centres that come under six divisions. It also places equal emphasis on student learning, with about 4000 students pursuing several postgraduate and PhD programmes, as well as newly initiated undergraduate programs.

IISc has a vibrant and diverse campus spread over 440 acres of greenery in the city of Bengaluru (formerly Bangalore), India's hub of high-tech companies (in multiple domains such as aerospace, electronics, and information technology), educational and research institutions, and numerous start-ups. In recent times, IISc has also entered collaborations with several technology giants to work on varied solutions to problems in strategic areas. Over the years, numerous alumni and faculty members have established their own start-ups to take their research directly to society.

www.iisc.ac.in/

Indian Institute of Technology (IIT) Kharagpur

The IIT Kharagpur exists as an autonomous engineering and technology-oriented institute of higher education established by the Government of India in 1950. Regarded as one of the best engineering institutions in India, it was one of the first of the seven IITs established to train scientists and engineers after India attained independence in 1947 and officially recognized it as an Institute of National Importance. Indian government established IIT Kharagpur. Over the years, the institute's academic capabilities diversified with offerings in management, law, architecture, humanities, etc. IIT Kharagpur is widely acclaimed for the quality and breadth of its research enterprise, and particularly for its openness to multidisciplinary research. Several highly rated initiatives represent a long IIT Kharagpur tradition of cross-disciplinary research and collaboration.

In the quest for excellence in our research endeavours, recognizing the importance of modernization in infrastructure and experimental facilities and ensuring cutting edge innovation in research, the Institute has set up several state-of-the-art facilities over the years. Research and development at IIT Kharagpur cover a wide spectrum and is inspired by both real-world challenges and issues of fundamental importance. Being interdisciplinary is a core principle and our work usually involves researchers from various disciplines and integrating seamlessly to work jointly and progress beyond disciplinary ambit.

Indian Institute of Technology (IIT) Delhi

The Indian Institute of Technology (IIT) Delhi is an autonomous research university based in India. Indian Institute of Technology Delhi is one of the Twenty-Three IITs created to be Centres of Excellence for training, research and development in science, engineering, and technology in India.

Spread over 325 acres in the heart of Delhi, it is counted among the top universities in the world for technical education. It was established in 1961 by an act of the Indian parliament and designated an "Institute of National Importance" in 1963. With a long trail of accomplishments behind it, it added another feather to its cap in 2018 when it was awarded the newly created designation "Institution of Eminence" (IoE) by the Government of India.

It is the mission of IIT Delhi to generate new knowledge by engaging in cutting-edge research and to promote academic growth by offering state-of-the-art undergraduate, postgraduate, and doctoral programs. IIT Delhi strives to serve as a valuable resource for industry and society. Its values are focused on excellence in scientific and technical education and research, while maintaining academic integrity and accountability, respect for diversity, and an unfettered spirit of exploration, rationality, and enterprise.

IIT Delhi works to make knowledge a means for serving society. The institute looks to mobilize resources from the industry and academia through a network of alumni to give shape to its vision. Today, these alumni are leading scientists, technologists, business managers and entrepreneurs in various domains, carrying forward the repute of the institute globally and contributing significantly to building of the nation, and industrialization around the world. ■

www.home.iitd.ac.in/

Project Factsheet

More info:
www.h2020Sustenance.eu
SUSTENANCE H2020 project

Total budget:
€3.8m of EU funds
Duration: 07.2021-12.2024

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With support of project Dissemination & Exploitation Board Members

Project Partners

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101022587, and the Department of Science and Technology (DST), Government of India under the SUSTENANCE project. Any results of this project reflect only this consortium's view and the funding agencies and the European Commission are not responsible for any use that may be made of the information it contains.