THE RISE OF SUSTAINABILITY:
Charting a Course Towards a Greener Tomorrow

Professor Satishchandra B. Ogale, Director, RISE

With the planet heating up, sea levels rising, and extreme weather events becoming the new normal, sustainability and going green are increasingly coming under the spotlight. Organisations, think-tanks, communities, and research institutes across the globe are racing against the clock to understand, identify, and devise solutions in the fields of clean energy, sustainability, and environment.

The Research Institute for Sustainable Energy (RISE), one of the six Centres of Excellence under The Chatterjee Group Centres for Research and Education in Science and Technology (TCG CREST), is a newly established institute in Kolkata with a focus on developing novel materials and device technologies around sustainable energy storage and green hydrogen. In this article, we speak with Prof. Satishchandra B. Ogale, Director of RISE, under whose capable leadership the institute is poised to become one of India's leading research and learning environments in current and next-gen battery chemistries and systems, clean energy, green fuels, and more.

What motivated you to take on the role of Director at RISE?

I was motivated to take this position because of Dr. Purnendu Chatterjee's [Founder and Chairman of TCG CREST] vision. He is an alumnus of the University of California Berkeley, and TCG Crest is his brainchild. He envisioned that India needs more institutes of eminence: places where excellence is nurtured, R&D flourishes, and intellectual property (IP) is generated. He described it as the two wheels of a bicycle—the first wheel representing outstanding fundamental research and excellence, and the second representing the consciousness about social needs and societal benefits; synergy and harmony between the two is critical for progress.

The fact that TCG CREST was planning research not just for the sake of research alone but translation as well, was very important to me. When I was approached for the role, I was already working in my established laboratory at the Indian Institute of Science Education and Research (IISER) in Pune. Dr. Chatterjee very kindly allowed me to assume the role of Director at RISE in Kolkata alongside my responsibilities in Pune. Interestingly, I joined as Director on 2nd March 2020—just before the lockdown started!

Could you discuss the importance of establishing such an institute within India, given the current strong emphasis on sustainability and clean energy not just within the country, but worldwide?

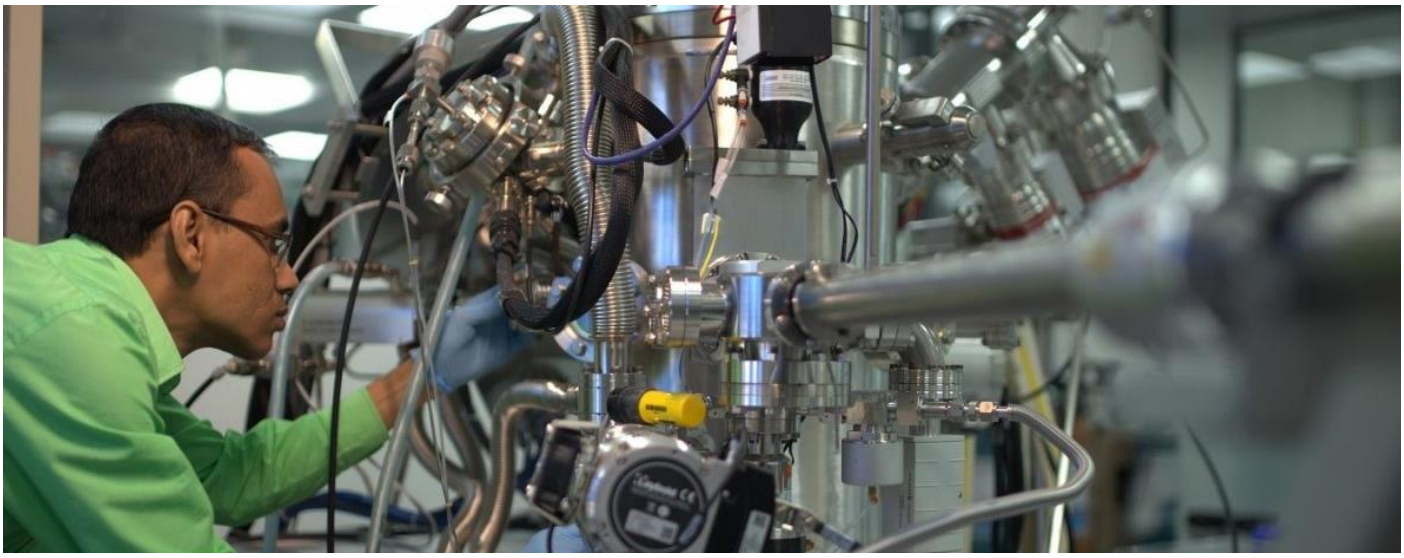
Sustainable energy is one field which has implications for every individual on this planet. I think everyone worldwide is aware of what is happening in terms of environmental pollution and its huge negative consequences for humans and life on Earth. We are also in a rapid zone of development for which significant energy and fuels are essential. This development cannot be stopped because its fruits cannot be denied to the more underprivileged sections of society. But we can be more conscious and responsible about how that development is engineered. We cannot be unscrupulously using bad fuels, causing pollution, and so on.

Energy, environment, and health are intertwined with each other in very complex ways. There are multiple contexts of science, industry, governments, economics, international relations, resource management, etc. involved in this scenario. RISE embodies this multidisciplinary aspect of sustainable development for a better tomorrow. Dr. Chatterjee had the foresight to anticipate that the approach of combining fundamental and translational research alone would positively benefit the nation, and the society at large.

So, among the various research projects which are being undertaken at RISE, are there any you are particularly passionate about and why?

The field of clean and renewable energy has three angles. One is energy harvesting, where we are talking about harvesting energy in different ways from sustainable sources such as wind, solar etc. Then, we look at energy storage, whereby the harvested renewable energy is sustainably and safely stored. And finally, there is a need for conservation of energy, along with social awareness.

At RISE, we are working on two types of battery systems in particular. One is the sodium-ion battery, a part of it being the anode-free metal battery. Another one is the all-solid-state battery. My team and I are also passionate about green hydrogen and clean fuels. We are currently involved in a lot of research around converting nitrogen to ammonia for use as fertilisers and catalyst development, and also mitigating the CO_2 menace by converting it into methane, propane, and other value chemicals. About 65% to 70% of our work is on batteries, and about 30% to 35% is in the area of green hydrogen and clean fuels.



RISE has state-of-the-art laboratories for its faculty and research scholars

As Director, how do you plan to foster a culture of collaboration both within the institute and with external partners? Are there any specific collaborations you're looking forward to?

Collaboration is the key to the success of scientists and institutes in the arena of modern science. We collaborate to exchange ideas and expertise and understand the world around us. This culture benefits everybody as intellect is the one commodity that grows through collaboration instead of being spent. Within the institute, we foster collaboration through our group meetings which take

place every Saturday with all science faculty, postdocs, and students in attendance. When people working in different, maybe even unrelated research areas converse with each other, new ideas emerge. The external viewpoint is essential for the development of new research and solutions.

Collaborations with other institutions allow our students to access facilities and laboratories that we may not have at RISE and vice versa. For example, one student may travel to the Bhabha Atomic Research Centre to do neutron diffraction studies, while another might go to IISER to use a high-resolution transmission electron microscope. On the other hand, someone from IISER might send us a sample for X-ray photoelectron spectroscopy and so on. We have also collaborated with top international institutions such as UC Berkeley, University of Chicago, RICE University, University of Edinburgh, etc., and are exploring collaborations with other universities across the world.

Our collaboration efforts also extend to industry and other social sectors as well. In fact, RISE recently collaborated with KPIT Technologies in Pune in the area of Na-ion batteries. We are also exploring collaborations with international industries for various projects.

One of RISE's priorities is the development of IP. Are there any mechanisms in place for the commercialisation of IP that may be developed within the Institute?

We are a Section 8 not-for-profit R&D institution. If through an external industry collaboration project something is jointly developed, then the IP is shared between us and the company. There are different agreements, one of which might be that the company has the first right to secure the IP for putting it into practice, by giving us the royalty. This happens with international collaborations as well.

When we develop an IP independently through our own resources and research without outside industry participation, then our target is to generate a portfolio of patents. We apply for patents—we've already applied for 2–3 last year—and after the portfolio is developed, we can sell the same to earn revenue for the sustainability and maintenance of our not-for-profit outfit.

We would also encourage start-up formation by our faculty. These start-ups will eventually grow out of the institute and get established, and whatever royalties RISE gets from them would also go towards enhancing the institute's infrastructure and facilities.

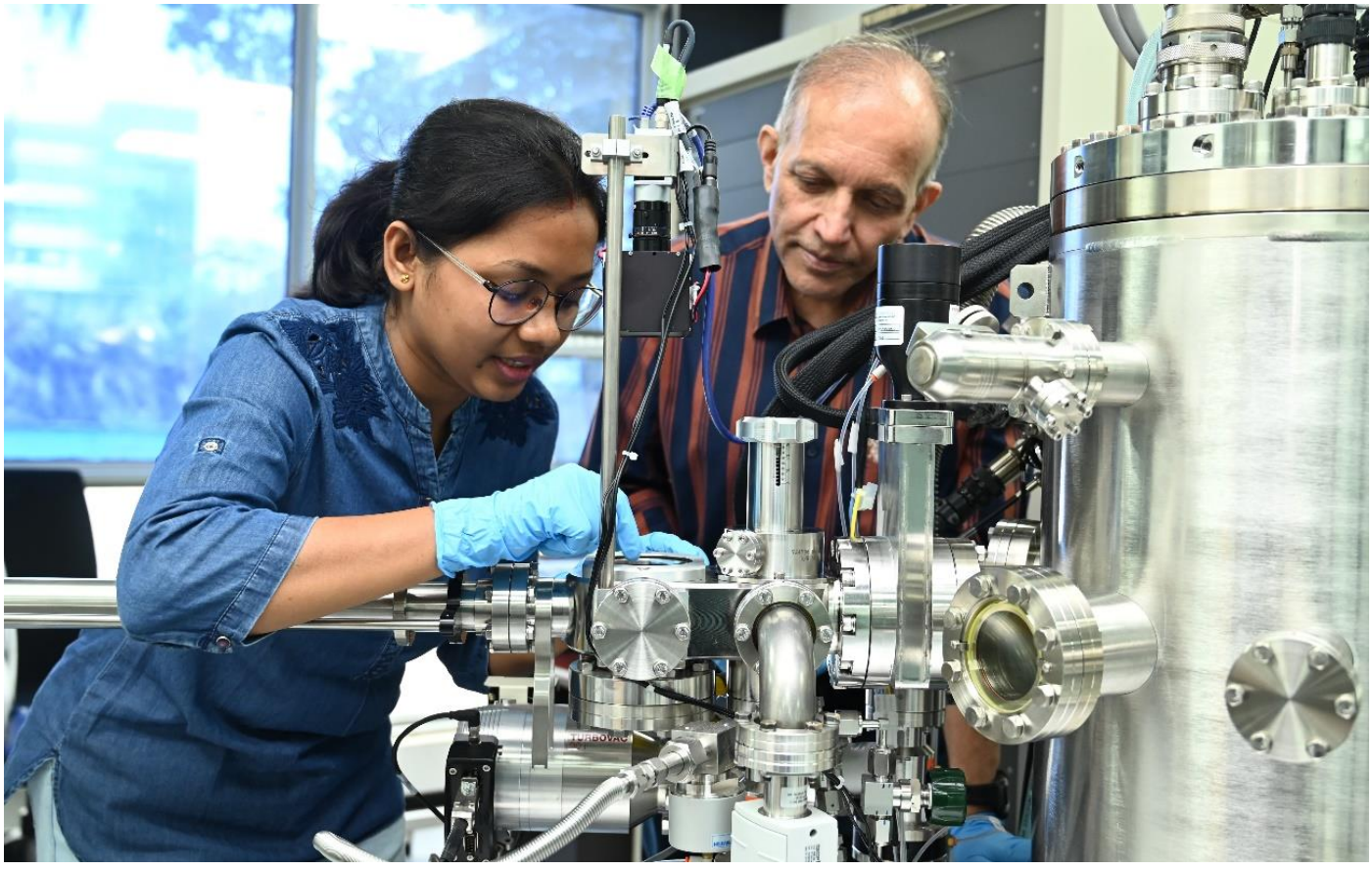
Besides the current Ph.D. programme, does RISE plan to offer any other academic courses or training programmes in the future?

Yes. Since many industries often prefer an M. Tech degree for their technical employees, we have developed courses in green hydrogen and clean fuels, as well as batteries, towards an M.Tech

degree. We plan on offering them sometime soon as our facilities and faculties grow, as a lot of teaching, infrastructure, and other resources are involved. Once our organisation becomes a university, we will have multidisciplinary master's and bachelor's courses. Times are changing, and we cannot follow the same old educational patterns. Our goal is to break away from stereotypes, and our focus remains on nurturing creativity and applying it for the benefit of society.

On that note, RISE emphasises excellence in higher education and human resource development. Could you elaborate on what this entails?

We hope to attract brilliant young minds with adventurous and entrepreneurial spirits, and have them trained and guided by senior, more experienced people such as myself; so that they can grow and learn in the best possible ways. We aim to get the best people through a comprehensive selection process, provide them with resources and mentorship, and nurture them so that they reach excellent heights, ready to give back to the institute as well as to the society. Our students and faculty are encouraged to freely ideate and plan their research, while RISE supports them with infrastructure, facilities, networking, national and international grant applications, and more.



Prof. Ogale with a student at the RISE laboratory.

Coming to the last question, how do you see the future of the sustainable energy sector panning out in India? What strategies do you envision implementing to ensure that RISE remains at the forefront of clean energy research and innovation, particularly in the face of rapid technological advancements and evolving global challenges?

Energy and sustainability are rapidly growing sectors in India, and for our youngsters and faculty, the institute gives the perfect setting to thrive and grow. We also have the advantage of not being as structured as a conventional institute. As a not-for-profit educational and R&D institute, we have the autonomy to explore completely different ideas, while also ensuring that the research which comes out of RISE can translate to the people's needs.

Our plan is to network heavily with other institutions, industry, and NGOs; and build a big network. Good people, good ideas, and good connections together matter for the success of an organisation such as ours, and we are absolutely enthusiastic about the opportunities and challenges that lie ahead. There is a big storm coming our way in terms of energy and sustainability needs, and if we can handle it in the best way, we can uplift everyone around us.

Interview conducted by:

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