Industry Corner
By Debdeep Paul

In this inaugural "Industry Corner" column, we interview Dr. Jayantika Soni, the co-founder and CTO of Resync, an early-stage startup based in Singapore. Resync is a company building intelligent machine learning and data analytics-driven energy cloud solutions to better manage distributed energy resources. Their mission is to create a sustainable and digitalised energy grid, and to constantly improve energy efficiency through adoption of sustainable energy. In this interview, you will hear about Dr. Soni's journey from undergraduate to graduate studies volunteering for IEEE, to crossing paths with Resync co-founder and their vision to build more sustainable power grids. She will describe the role that start-ups can have in this innovation landscape, the challenges and obstacles they face, as well as the opportunities it will enable towards a more sustainable and green world. She provides great advise for students interested in entering this domain.

You can find the audio for this interview at https://bit.ly/SMCS-IC-sept23 or by clicking on the QR code above. The transcription of the interview is available below. Happy listening/reading!

Dr. Jayantika Soni, Co-Founder and CTO of Resync

[Transcription of Interview with Dr. Jayantika Soni, Co-Founder and CTO of Resync Technologies]

Debdeep Paul (00:02)
Good afternoon. First of all, thanks a lot for joining this conversation. To give you a background, I am representing IEEE SMC community, and we are starting a E-newsletter for the community members as well as the broader IEEE audience. Over there, I am driving a column for industry, and specifically we are trying to focus on climate change and sustainability. Thanks again and let me congratulate you for the funding that you have managed to secure recently. Let's get started from the beginning. Let's start from your grad studies and your journey towards Resync. How do you say? Resync? Yeah. Resync. Okay, yeah.

Dr. Jayantika Soni (01:03)
Thanks, Debdeep. Thanks for having me. This is going to be an e-newsletter like you said, so it's going to have both video and audio format. Is that correct?

Debdeep Paul (01:11)
I can check with the community that whether we are... As well as we need to have the approval from you as well. That could take a while, but irrespective of that, either it would be... I hope that we can get the audio-visual format out as well.

Dr. Jayantika Soni (01:36)
Okay, sounds good. For me, I moved to Singapore around 10 years ago. Prior to that, I did my bachelor's from one of the IITs in India, and I was working in oil and gas industry for two years, nearly two years. Then I decided oil and gas is not something for me that I don't see a lot of future in it, and I was very oriented towards sustainability. I moved to Singapore to do my PhD in primarily focusing on control algorithms, on how to handle intermittent renewables, focusing on smart buildings, a juncture of those as well. That was almost in 2013, did my PhD for four years through that process. Again, very familiar with IEEE. Actually, I was a volunteer myself for IAS Society as well during that time and helped start the chapter locally as well. It was quite an interesting journey. Towards the end of the PhD, I was approached by a deep tech accelerator called Entrepreneur First, where they primarily focus on funding founders or pre-idea startups as well. Basically individuals who they believe are going to be monumental in building something substantial, et cetera. I had no idea about start-ups at that point in time.

Dr. Jayantika Soni (03:05)
Honestly, it was an experiment for me to see how start-ups are built, what are the things they require, and if I was able to find someone with a like-minded interest. Because I've dedicated almost all of my professional career towards electrical energy and more specifically power energy system, I wanted to continue doing that and focus, try to find a niche that aligns with my passion of sustainability, aligns with my passion of making the world better and move towards carbon neutrality as much as possible. I was lucky enough to find my co-founder, Emir, during that process, who had a very similar vision to me. He used to work in solar industry and was very motivated by creating products that can impact the world in a very substantial way. That's where Resync was born in October of 2017, where we initially started with renewable energy management, helping manage multiple energy sources such as solar, diesel-generated batteries, and how to optimize them and make sure they're running practically at the lowest cost and point, et cetera. That was our first initial practical problem. We have a bigger vision of developing virtual power plants, one of the first kinds in Asia, et cetera, that we want to develop.

Dr. Jayantika Soni (04:28)
That's where we started working at the demand response site. As you know, as an electrical engineer as well, supply is one part of it, but the other part is demand. How do you make sure that you strike the balance between the two? That's where we started with our smart-building product nearly two and a half years ago, two and a half, three years ago. Long-term plan for Resync is still developing virtual power plants, which help grid manage all these intermittencies. There are incentives on all front, and of course, like lowering carbon at each step of the process as well.

Debdeep Paul (05:07)
Great. The next question I would have to you is that these days, everybody is talking about sustainability. So if you look at the annual report, it's always there. So how do you think, apart from the big players, everybody is doing that, but what is the unique opportunity for the start-ups to contribute towards that?

Dr. Jayantika Soni (05:31)
I think sustainability has definitely picked up in the last few years, and that has been ultimately a blessing. It's not just people driven by passion, but also profit. And also it makes economic sense to be sustainable in general. That's a very, very promising thing to see. Seeing other start-ups, seeing other companies is definitely a motivation that we're not doing it alone. All of us have to put our heads together, our effort together to make sure we solve this global problem as well. I think in terms of where start-ups can come in, there's a lot of time with innovative solution. If you see since the history of time, most companies have been born where traditional companies have failed to look into riskier ideas, which can be very innovative, or can look into specific problems where big companies may not have the time or the budget to look into. That's where start-ups help solve that niche gap, whether it be someone like us who are focusing on demand-side optimization. In the whole scale of

power systems, there are many ways it can be implemented, mostly at the substation level, mostly at the grid level. These are things that have been thought of, but nobody thinks about behind the meter, what goes on for individual building, what goes on at individual premises.

Dr. Jayantika Soni (06:58)
That's where we can help build up the technology and the awareness for the end-user and also create profit for them or create at least revenue for them while creating a much bigger problem and solving for a much bigger problem on a grid scale, essentially. There are, of course, niches. I think it's a very, in my opinion, a lot of the solutions for the climate problem are very technical in nature. People who do have expertise in different fields, whether it's battery technology, whether it's about like carbon capturing, or whether it's about other sustainability initiatives, that will require someone to think outside the box. That may not always be possible in bigger companies because they have their own set targets and goals.

Debdeep Paul (07:48)
Great. The next question I would have would possibly be, since you have been in this role for quite some time. What do you think are the challenges in terms of the policies that we have? Because that is something that could be very important and that also depends upon the geographical region. Because I was also working on this quite some time back, so at that time we knew that in California there are some policies, whereas in places like Norway and Spain that had different profile of renewable energy, they would possibly require some other policies to optimize the system. In Singapore, since we don't have a larger scale renewable generation system, so possibly the potential of the demand response for the... Or to say so. How do you see in terms of uniformity or the strategization of policies would come into play?

Dr. Jayantika Soni (09:08)
You're absolutely right, Debdeep. Because of regional demands being very different and regional footprint being very different in terms of whether it's about implementation on a big scale like CAISO. CAISO has a lot of implementation of their own policies, how much import to the grid, et cetera, and also the fluctuations in the power. That can happen because it's fairly predictable weather. Whereas in Singapore, we live in a tropical country where the weather is very, very intermittent and the solar production can drop. Also the rooftop space is not that much that we can install so much solar as well. I believe policies will still remain very regional in terms of their implementation, and it will definitely reflect the nature of the leaders, where they want to progress towards what kind of country they want to be. Recently, as you heard, Singapore gave an in-principle approval to import power from Indonesia. They are planning to have a lot of solar or some renewable energy in general that can be utilized and harvested and imported back into the Singapore grid, or can be sent off the ASEAN region. Singapore being very limited in land space and natural resources of itself, that it cannot go to net zero without relying on its neighbor very well.

Dr. Jayantika Soni (10:32)
All these collaborative efforts are needed if you want to meet our goals in general. I'm not a policy maker, but it takes years to form these relationships or these decisions, but if the thought process is not just for the next few years, but next 50 years, I think we will be able to achieve what we set out to do in Paris, basically.

Debdeep Paul (10:59)
That brings me to the question that in your opinion, what should be the role of different entities? That include entities like IEEE, that should include entities like government bodies. Let's say, for example, we need to work with NEA, we need to work with the MNCs, and we need to work with the government and everybody. How do you see that they are going to play to drive something, drive some vision?

Dr. Jayantika Soni (11:35)
Yeah. So I think societies like IEEE, because of their expertise in different areas, play the role, which all the government officials cannot play all the time. Say, for example, there are deep technical issues that can be

involved when you are trying to implement, like renewables at scale. I don't know if you know, but Singapore, when it came up with the carbon taxes, it also came up with an intermittency tax for solar as well. They're balancing it out. If there's too much solar in the system, how do you balance that out? One of the clear way is an economic indicator you attach a cost to it. A lot of time, decisions by economists or by government officials cannot be made without having the solid understanding. That's where professional bodies such as IEEE can help navigate those conversations. In terms of uniformification, I think especially EV chargers is something which is universally long-being debated and long-being asked for, is why we are investing in different type of charging standards. Every battery, every EV company comes up with their own charging standards, and that becomes a painful process. A very miniature version of it, you look at how our laptop charges and phone charges, even Apple has decided to move to USB-C to uniform it.

Dr. Jayantika Soni (13:00)
Something like these will be very essential that we reduce our resources and charges can be used interchangeably between EVs and standardization of those things are definitely needed because we don't want to generate more waste. Just in this name of sustainability, or we are driving cleaner fuel cars, but we are actually extracting more rare-earth metals, or their life cycle is very less, etc. Or there's no recycling process of EV batteries at the end, so you don't give them a second life, et cetera. These are the things that would definitely need a lot more standardization. These are the things that require a bit more deep thought rather than just the surface-level things. Oh, we should just have a single standard of how much renewable injection could be there, because that depends on the very regional demand and how it needs to be managed as well by locally-driven thing.

Debdeep Paul (13:53)
Correct. Thanks for this. Let's talk about the maturity of the industry, because I think also raising case also trying to build in some data-driven methods or deep technology. As per how much I know is that typically these are optimization-based, where people do traditional optimization, OPF and optimal power flow and all that. But if you do a data-driven technology, then possibly there would be a compromise in stability or the worst-case guarantee. Right now in terms of research, I feel that things are coming up at a pace that it should have been, but in the real practice, I'm not sure how much is being implemented. What's your thought in that?

Dr. Jayantika Soni (14:56)
Slight correction on the understanding of things. Optimal power flow is mostly on the grid level, as you understand, to balance out the generation and the power. What we are trying to do is more behind the meter. We have very small assets like you have the HVAC system, you have the local solar, you have battery storage. And then in the microgrid or nanogrid setup, how do you make sure that the system is running at the most cost-efficient and the lowest carbon within the constraint conditions? It's more like a stochastic optimization than a power-flow problem, because power-flow problem is quite big, because it involves generators, reactive power balance, and all these things as well. Whereas what we are trying to solve is like, we know the carbon impact, so we can attach a cost to it. Second thing, we know the energy cost if we have variable tariff from the grid, and then how do you plan to reduce it? Now, what we try to do is the unique part is machine learning optimization, where we try to forecast how much would you be your cooling load, how much solar you're going to generate, how much energy you're going to consume over the next 15 minutes to two days, essentially.

Dr. Jayantika Soni (16:11)
Using that forecasting along with real control systems helps us manage these assets much better. Again, these are newer technologies that are being tested on the ground, but making use of the cutting edge technology rather than the stability. Now comes the stability part from the grid perspective. You're doing all these things, but how do you make sure that the grid can plan ahead and grid can plan well? If we are doing it on a smaller scale, doing it on a bigger scale becomes much easier because the error rates go down. Then you can provide that forecasting or provide that commitment to the grid, and then grid can give you a signal of what needs to be dispatched at what given time. Usually, most of the time, grid has been giving these dispass signals to power generators or auxiliary power generators. How can you use literally the distributed generation systems in the

grid system to help manage these intermittencies, help manage these fluctuations well so they can plan ahead and go ahead with that and not rely on expensive auxiliary power. That is the use case that we are looking for a few years down the line where more distributed energy generation becomes ubiquitous, it becomes a problem for the grid in the long run.

Dr. Jayantika Soni (17:35)
That's where virtual power plants happen, where they don't actually own a power plant asset, but can use these distribution, generation, and consumption assets to help dispatch the power that is needed for the grid or help absorb the fluctuations in the consumption that is needed for the grid.

Debdeep Paul (17:55)
That was a bit of technicalities. Yeah. If I ask a question on behalf of students who are undergrads and early grad students, then what would be the typical methods or areas? I guess control is going to play a critical role in that. I guess there are some frequency stability area that is also there. And what else can you think of? If you talk about typical stochastic programming or dynamic programming, then it's a bit of control and applied math.

Dr. Jayantika Soni (18:35)
Yeah.

Debdeep Paul (18:36)
What could be or like if.

Debdeep Paul (18:39)
You had to think of.

Debdeep Paul (18:40)
The areas that are understandable by the students.

Dr. Jayantika Soni (18:44)
Yes. I think in general, I would say the fundamentals. When we talk about power, energy, systems are something you need to understand very clearly. This is something as a base knowledge, whether you understand how the dispatch works, how the power, the frequency, stability works, or how voltage stability, et cetera, work in a bigger system as a small system because they are basically inherently balanced equations that you're trying to achieve. You must also understand the mechanics of, okay, if you use a certain control system, what is the aim that you're trying to achieve? Now on top of that, this is the fundamental layer. This is something I would say is the basics of power systems. On top of that, you can learn a bit more about technology if you have certain skills like you want to learn data analytics. Because fortunately in our field, because data has been collected for decades and decades, there are a lot of analysis, et cetera, that can be done to improve the system to understand the correlation, et cetera, et cetera. Having those tools handy, so those are tools that can help build you something further on top of your base knowledge.

Dr. Jayantika Soni (20:03)
How do you use the tools on the top of base knowledge is how you make new products or how you make innovations happen. My general advice is be curious about the basic stuff and learn as many tools as the time progresses. Back then when I was doing my undergrad, we used to code in MATLAB and C++. Now the world has changed. In the last 15 years, it's now mostly based on Python and how you deploy libraries. You don't have to write a hefty MATLAB code or a C++ code that's going to consume so much RAM, but you can do that with a few lines of code in Python. Those are tools that you build on further, essentially. Then what is the end goal? If you have fundamentals clear, you will identify the gaps in the problem as well, and you will be able to see how can you contribute as well. Have the basic knowledge, develop tools, whatever is the latest, I am not sure,

but definitely having some Python tools handy as well as data analytics. If you can learn about machine learning, very simple models as well like analytics will be definitely useful and keep upgrading that knowledge.

Dr. Jayantika Soni (21:12)
Learning should never stop, even though you're no longer a student.

Debdeep Paul (21:16)
Correct. Another technical question I am a bit interested about, so that is you mentioned that you have some cost associated with different actions and different sources of energy. Is it coming from some industry standard or is it really in card or it's some virtual stuff that you are putting in for your optimization based on your user's preference?

Dr. Jayantika Soni (21:51)
There are different elements of cost to it. There are certain things are industry standard, such as the cost of solar, cost of battery, variable tariff from the grid. These are fairly, fairly standards. I don't have a say in it. People have done their own LCOE calculations for a very long time, and we directly use that. Now there are certain other things that we use which are secret source to these things, such as the cost of not taking an action, cost of comfort of the user, et cetera, which are developed in-house, which is essentially trying to understand basically penalizing behavior, which we have tweaked over time. Third thing comes in essentially like, see, using cost as the primary function makes it easy for everyone to understand, even though they are not an electrical engineer. They can understand a problem in a very simple manner. Okay, how expensive the solution is going to be literally in terms of occupant discomfort, in terms of the purchase that I have to do of the power versus if I use my local energy, so on and so forth. That becomes easier to explain to the client and easier to explain to even non-electrical engineers.

Dr. Jayantika Soni (23:08)
That's why cost is a very big factor. Most of the stochastic problems that we hear in power systems as well use a cost-based function. You can assign a cost-based function that helps you find the minima, and then your optimization is solved for, essentially.

Debdeep Paul (23:28)
Fortunately, there are a lot of research that is being carried out, especially a group in Caltech, I think Steve Floors group and Adam Weerman. All across the world, there has been very nice work on this so I hope some of this we will see in real life, in real deployment very soon. Thanks for taking this initiative. We are going to have a conference called CAI in Singapore next year, so it would be great to have some presentation from your Resync as well, so in terms of booth or whatever. Okay, so thanks for your time and have a nice week ahead.

Dr. Jayantika Soni (24:13)
Thanks, Dedbeep. You, too. And please tell me the details of the conference as well. I'll send you the recording link.

Debdeep Paul (24:19)
Sure. Thanks so much.

Dr. Jayantika Soni (24:21)
Cheers. Bye-bye.