

“Japan: A New Age” by Tasogarenin (黄昏人)

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Chapter 6: The start of development and unforeseen aftereffects

It was New Year’s Day 2020, and for the first time in quite a while Dr. Makimura got to spend time relaxing on the sofa at home with his wife Sanae and his daughter Mai.

Mai’s eyes were glued to the TV while Dr. Makimura had a conversation with his wife.

“Ever since that research paper appeared two months ago, you’ve been so busy,” said Sanae. “I’ve had little time myself to talk to you about how things are going. Has Ms. Hidaka from MEXT (*) been staying in Konan City this entire time?”

(MEXT = Ministry of Education, Culture, Sports, Science and Technology)*

“Yeah, since her parents live in Konan City, she’s been commuting from there to the college and her organization’s Konan office.

The development proposal for the FR Project was completed around a month ago, and with MEXT’s permission it has become official. Of course, people have already begun work on this project, and some of the equipment has been ordered. The setup of the manufacturing facilities is also proceeding as planned at the Yotsubishi Industries’s factory in Konan, with a portion of the equipment already shipped and in place there.

As for the design, we are at a point where the fundamental parts are already worked out and the overall structure is established. We’ve

realized that we can reuse more off-the-shelf parts than originally thought, and as a result time to completion may be shortened. The design team is lead by Professor Yamamura, comprised of three people from the college and five others from private companies.

The budget was initially estimated at \$20 million and current forecasts indicate that will probably be sufficient. For traditional 100 megawatt generators, gas generators are the most compact, but if you include ancillary equipment, an area of 30 by 30 meters with a height of 10 meters is needed, and costs roughly \$80-\$100 million. To generate the same amount of power with this new approach, we predict the device will fit inside of a 5 by 10 meter steel frame with a height under 5 meters, and if mass-produced it will cost around \$10 million.”

“But just as I thought, it looks like it won’t be able to fit inside of a truck,” said Sanae.

“Yeah, that’s true. But according to Professor Yamamura the current size is just for the prototype, and when we mass-produce it, the device will be significantly smaller. But the best part is it only requires regular water as fuel. That’s because we ended up designing it to use electrolysis on water internally to obtain hydrogen. It worked out so we can just use regular tap water after processing it to remove some minerals.”

“Oh by the way, how is the patent application process going?”

“The application has been submitted, and we expect it to become made publicly available early this month. The applicants turned out to be Junpei and I, in addition to Dr. Yamato and Dr. Yamamura representing the college side. There are plans for us four to sign a contract with

Konan College Technical Development, a public corporation which is currently in the process of being created.”

“That’s great! We’ll be receiving money for the license fees each month from that company, right?”

“Yeah, there will be a provision similar to a salary given to each engineer based on their contributions to the project and the revenue the company receives from patents and related technology. Beginning in the summer, money will start coming in based on patent license fees for manufacturing rights, and about this time next year the salary should triple.”

“Triple! That’s wonderful!”

“However, Junpei’s contributions on the fusion reactor development are nearly twice as much as my own. He’s absolutely amazing. Also, as an extension of this technology, he already has a good idea how to create a so-called ‘can of electrons.’ This is important since the energy from oil is not just used for generating electricity but also as fuel for cars and other vehicles. Batteries with improved efficiency could be leveraged to provide inexpensive power to both passenger and transport vehicles.

Furthermore, if things work out well, we would need to produce many motors instead of engines, because you see Junpei also said that conventional motors, filled with wires, are super inefficient. The theoretical principles for his new motor have already been worked out, and now a bunch of graduate students, along with mechanical engineering Professor Sano and electrical engineering professor Mizutani

have begun testing an early prototype. This is also expected to be realized by the end of the year.

Research shows there is a growing trend to avoid using copper as much as possible and instead rely on aluminum. As you know, aluminum is easily available but has been considered as high cost solution because of its heavy power consumption. However, this cost will be drastically reduced in the future as the cost of power goes down. The patent application is already complete for the new battery, and the one for the motor is nearly done as well. I'm listed as an applicant for the battery patent, so you can look forward to extra income from that. But Junpei is the primary contributor on all of these projects and he will get the largest share of the licensing fees."

"By the way, what happened with Junpei's father?"

"Yohei's company agreed to let him participate on our project early on, but it took a little time to finish off the things he was working on. Initially he was on the FR Project team, but now he's helping out on the motor project. It looks like he is having a great time working together with his son.

Apparently Junpei's father is in charge of the new battery production at his company. In particular, he is working with 30-200 kilowatt devices which are used by the automobile industry.

Because of security concerns, Junpei's mother quit her job at the hospital and is at home now. I heard that MEXT, Yotsubishi Industries, and Dr. Yamato spoke to his father's company, and he got a significant raise. That's probably another reason his mother quit. For now, they are living at the same house, but in the near future, once word gets out

about Junpei, I imagine there will be a need for them to move to another location which is easier to protect.”

“I was also curious about how Junpei ended up participating in the college.”

“You see, as opposed to attending classes, Junpei is able to absorb all kinds of information if he simply knows where to find academic papers and is given access to read them. That’s why we are keeping his regular classes to a bare minimum and instead have him participating in discussion sessions with instructors and doctorate students on a variety of topics.

There Junpei is able to communicate the information he learned from the papers he has read, and these seminars are extremely popular on campus now. In the middle of talking about some topic he’ll suddenly propose these creative ideas. It’s really...an eye opening experience, as those attending are presented with totally new ways of thinking about things.

That’s why on campus now there is a long waiting list for these these ‘Junpei Seminars’ as they are being affectionately called by the students. Our college is science-focused to begin with, but this year we have had a sudden rush of groundbreaking scientific papers being written by the students and teachers. The content of some of these papers is such that it would be dangerous to publish them immediately, so we have an expert from MEXT working full time here to categorize them. For such papers, there is a a chance of spawning new industries and making a great deal of money, so those who are asked to hold off on publishing for now aren’t particularly upset.

Also, for the same reason we have two more patent lawyers, in addition to our local Dr. Yamamoto, who are working full time at the college.”

“Wow, things are getting really crazy...but it’s nothing but good things, so I’m so happy for everyone.”

The TV show his daughter Mai was watching just finished, and she said, “Daddy, let’s go out somewhere!”

“Good idea. Since Ain Mall is open today, maybe we can stop by there. Alright, let’s get ready to go.”

They took the car and went out as a family, something the Makimura family hasn’t done in quite some time.

On August 10th, MEXT Minister Mr. Nakane began a discussion in the cabinet meeting. The topic was something he had had a long talk with Prime Minister Ayama about yesterday for nearly 2 hours.

“There is an important matter I must discuss with all of you today.

A certain project has been under development with the assistance of our Ministry. It is called the *Fusion Reactor Project*, abbreviated as *FR Project*, and began last year in November. As the name implies, this project is about the development of a nuclear fusion power generator. They are targeting a 100 megawatt device, apparently because anything smaller than that would be difficult in principle. This device will take hydrogen as fuel and directly output electricity.

Hydrogen will be generated from tap water via electrolysis, so connecting the device to a tap will be all that is needed. There isn’t any radiation emitted, and the reaction temperature, or shall I say operating

temperature, is below 500 degrees Celsius, with dimensions approximately 5 x 10 x 5 meters. Their development budget was set at \$20 million, but current estimates suggest requiring only \$18 million. These funds currently fit the requirements for the available new technology subsidies.

The project is going smoothly, and they are predicting that within a month they may be able to do a test run of the reactor.”

“Oh, a fusion reactor plant! And it’s almost complete!” mocked MEXT Minister Shirota, who had a strong technical background. “Of course, it doesn’t use an isotope like deuterium or tritium, but rather simple hydrogen! And it will directly output electricity! What the hell is this?!”

“Yes, when I first heard about this project, I too thought it was too good to be true. But after talking to many people, it seems this is the real thing. And yet, when I had some people investigate this, some problems started to appear as well.

Just think about it.

Without a doubt, this 100 kilowatt generator can be mass-produced for under \$10 million, although it will be sold for a bit higher than that. Normally, oil- and gas-based power generators of that scale cost around \$100 million. And for this fusion generator, the fuel cost is practically nothing. Even a gigawatt generator would cost under \$100 million. Our nuclear reactors, for which there is so much opposition to bringing them back online, cost around \$3.5 billion for a little over a gigawatt of power, so there is no comparison.

With this new inexpensive way to generate power, conventional generators will become scrap metal. Accordingly, all existing power

companies' facilities will also be completely worthless. As a result, the power companies will all have to write off their facilities as a complete loss, and will incur enormous financial losses. Taking into account all the power companies in the country, this will amount to over \$50 billion in losses. Unfortunately, none of these companies will be able to endure this, and the government must provide some form of relief if any companies are to stay in business.

Furthermore, this does not apply just to power companies. Most facilities, such as car manufacturers and other types of factories, are based on an energy cost of \$0.10 to \$0.20 per kilowatt hour. On top of all that, any companies involved with production or maintenance of existing power generators, or companies related to conventional fuel, will be forced out of business, and all those employees will become jobless.

Once this technology is publicly announced, the stock prices of power companies or any of companies from the other aforementioned industries will immediately crash.

And that's not all.

Actually, while the ideas supporting all this were established at Konan College, the device they are developing is being constructed at Yotsubishi Industries' factory in Konan City. The same college is leading 'super battery' and 'super motor' projects, and they say those are both nearing completion. The battery will be revolutionary, able to store a very high capacity with an extremely compact size. They are saying it will weight around 10 kilograms for a one gigawatt-hour device, at a price of approximately \$1000.

This means that if this battery is used in an automobile it can run at maximum output for 10 hours on a single charge. As you know, the

problem areas of a traditional electric car are typically its batteries and motors. The motor they are developing isn't nearly as revolutionary, however it leverages a large amount of aluminum instead of copper to achieve a size of roughly half that of conventional batteries, at a third of the weight. At present, aluminum is somewhat expensive, but once the price of electricity drops dramatically, aluminum's price will become equal to that of iron. After all, aluminum is abundantly available.

Anyway, to get to the point—I think we need to focus our efforts on making electric cars.

Some of the car parts like the body will remain unchanged, but companies manufacturing the engine will suffer the same fate as those that make power generators. The cost to manufacture an electric car will become the same, if not less, as the cost of a gasoline car, and most importantly the fuel costs will be reduced to a tenth of the cost of gasoline. From what I've heard, recharging these batteries will require returning them to the factory, so maybe we can lease them out and have people exchange the batteries for fresh ones at places similar to conventional gas stations.

All of these projects are predicted to finish within the year. We cannot simply sit back and say, 'Congratulations on a job well done!'

However, as you all know, this is an unprecedented chance for our country.

All current power facilities, at least in the case of our country, will be decommissioned within in five years and power generation will be converted to use the new system. This includes without exception the five active nuclear plants and those which are currently shut down. Just like the generators, all cars on the road will be replaced with those using

this new technology, probably within around three years. I think the same thing can be said about all the factories as well.

Most likely within five years, companies in these industries will need to convert, or shall I say be economically compelled to convert, but in any case we believe the cost of converting all the infrastructure to the new system will exceed \$500 billion in Japan alone. In other words, within a short span of only five years a demand of \$500 billion will emerge. Of course, this is only the direct demand. Taking into account various ripple effects throughout the industries, the total demand is predicted to be at least double that. On the other hand, the amount of fossil fuels our country is importing each year now is a little over \$150 billion.

Around \$80 billion of this figure comes from electricity generation, but as discussed once our society converts to using electricity, oil will no longer be needed for transportation, reducing dependence on fossil fuels from \$150 billion to \$20-\$30 billion.

This means that in addition to the new one trillion demand emerging within five years, the money we are spending overseas for fuel costs will be reduced by \$120-\$130 billion. For better or for worse, our country has a great deal of money. That's why banks are willing to loan money to the populace, whether it's one trillion or two trillion, whenever there is a need and clear advantage of doing so. Currently, our economy is in a strange state such that nobody wants to borrow, hence banks tend to buy up government bonds with their money. But without a doubt, within five years things will drastically change.

Furthermore, even looking at our country from an international point of view, it is clear that we would be wrong to not take advantage of such a great opportunity.

It is necessary for us to think long and hard about how we should take action in the coming days.”

At this point, Prime Minister Ayama said, “Everyone, there you have it. When things are publicly announced, it is our duty as the government to show the populace that we are taking the proper measures for the sake of the country. And so, once this new generator’s operation has been confirmed, I will be addressing the people.

Mr. Nakane, based on the current schedule, do you expect to be able to verify the device’s operation by the end of August?”

“Yes,” said Mr. Nakane. “That is what I have been told.”

“Understood. On September 10th, a month from now, I will make an announcement about this invention and its development, along with the measures we will be taking with respect to its massive impact on society and what action we expect from the populace.

I request that the heads of each Ministry—finance, general affairs, MEXT, economic planning, etc—organize their respective action plans. Of course, MEXT, who is managing the development effort, has already made much progress on this, so for the time being please proceed after consulting with Vice-Minister Yamamoto.”

The Prime Minister paused for a moment, then looked across the members of the cabinet.

“Information relating to this matter is extremely sensitive with respect to insider trading.

If anyone uses this information to make stock trades for personal profit, be prepared to be prosecuted. Furthermore, this information is considered extremely important for the interests of the country. I beseech that everyone protect this information with the utmost diligence. I have instructed the Public Safety Commission to monitor for any suspicious behavior in this area.”

After the cabinet meeting ended, Minister Nakane and Chief Secretary Fukuyama were summoned by the Prime Minister.

“By the way, from what I hear the central figure of all these development efforts in Konan College is the boy Junpei Yoshikawa.”

Mr. Nakane responded to the Prime Minister’s remark. “Yes sir, it seems that he has been participating in various seminars in the college. On campus, these are being called ‘Junpei Seminars’ by the students and teachers, and apparently his presence is having a major influence on those who attend.

In a blink of an eye, problems we have been struggling with for some time are solved, what are supposed to be everyday technical discussions lead to breakthrough improvements, and expected discoveries are made as side effects. It seems that these are not just ideas from Junpei but many actually come from those attending, as if somehow influenced by Junpei.

From early on, Dr. Yamato seems to have realized this catalytic effect of the boy.

The content of many of these is sensitive and we need to carefully consider when to make them public, so we have added two more people from the Ministry working on coordinating this effort in addition to the one we already had. At present we have three patent lawyers working at the college full time, with a total of 21 patent submissions currently in progress. Around half of these are estimated to be as important as the original light-emitting-diode.

By the way, the college has gotten the permission of MEXT and established a corporation under the name *Konan College Technical Development*, which is managing the related patents."

"That was smart thinking on their part," said the Chief Secretary. "However, how much do you think the licensing fees for these patents will amount to?"

"In particular, they are expecting to receive a lot from the nuclear fusion related patent," answered Mr. Nakane. "They are considering things in terms of facilities and electricity generated, planning on charging both fees on kilowatts.

Domestically, they are thinking of establishing rates of \$10 per kilowatt for facilities, and \$0.10 per kilowatt-hour of electricity, with overseas rates double that."

The Chief Secretary raised an objective to Mr. Nakane's response. "Wait a minute, isn't that a little too cheap?"

"Yes, in terms of unit price this can be seen as quite inexpensive. However, concerns about domestic vs overseas aside, I feel the entire world will be converting to use this new system. Our country currently is

able to supply 200 gigawatts, but I expect this to double very quickly. In that case, 400 gigawatts at \$10 per kilowatt becomes \$4 billion, and for electricity it is one petawatt which translates to one billion. Considering the entire world, the total demand is probably ten times that of Japan, so we end up with \$40 billion and \$10 billion, respectively.

So what do you think? Is it still too inexpensive?" argued Mr. Nakane.

"Yes!" both the Prime Minister and the Chief Secretary yelled out simultaneously.

"We can't let all this money go to the pocketbooks of a few individuals, right?" added the Chief Secretary.

"Hmm, it looks like Konan College really has thought things through. Let's have them pay for all of the national college expenses. Ha ha ha!" joked the Prime Minister.

After a moment, the Prime Minister regained his composure and said, "This Junpei boy is truly a national treasure. I'm very honored he was born in Japan.

I think his role in all of this will probably be discovered by the public within the year. We must quickly ramp up our national security in order to protect him. I'd like to have everything in place by the time of my public announcement. Mr. Fukuyama, can I have your help on this matter?"

"Of course, sir. We will increase security in order to protect not just his parents, but also any close relatives. For the short term, these security precautions will be done covertly without creating a big scene. We will

also probably have to reconsider Junpei's participation at Konan College," said the Chief Secretary.

"Regarding that matter, can the government construct an office building on campus and lease that out to the newly established *Konan College Technical Development* corporation?"

I have heard that they are having a very difficult time blocking overseas students from Junpei's seminars," said Minister Nakane.

"That may work, but a single building may take as long as a year to construct. The question is what we do in the meantime, assuming he will be continuing an active role in these important projects," said the Prime Minister.

"Understood," said the Chief Secretary. "I can reserve a building nearby to protect him in the meantime."

"Please do so," said the Prime Minister. "Above all, at the present time this is our country's most important project. In particular, if something were to happen to Junpei, it would be a terrible loss we could never recover from."

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