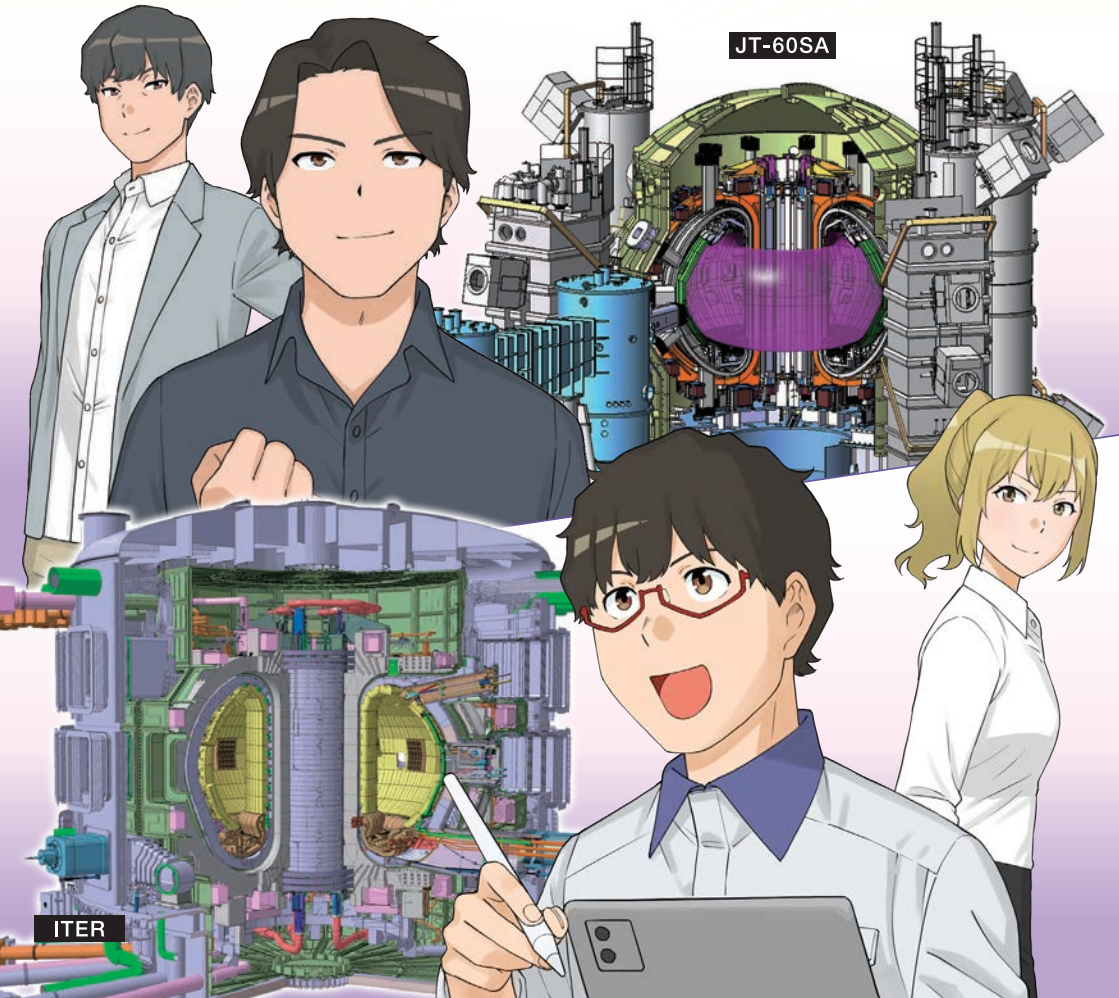
National Institutes for
Quantum Science and Technology
Naka Institute for Fusion Science and Technology

ITER Japan Domestic Agency

A small Sun on Earth

ITER (イーター)

Vol.8 The New ITER Baseline and JT-60SA's Contributions



CHARACTERS

TAIYO TENNO

Interested in fusion since his days as a student, he's now a staff member at QST (National Institutes for Quantum Science and Technology), the Japanese Domestic Agency of the ITER project.

HYUGA MIYAZAKI

Junior researcher studying plasma physics at JT-60SA and a work friend of Taiyo's.
Despite his reserved demeanor, he is a deeply compassionate person who dreams of conducting research at ITER.

SUSUMU YAMATO

An expert in the field of procurement, he oversaw the JT-60SA components from their design to assembly.
He is also involved in procuring components for ITER.

SOLÉANE

A French researcher at ITER in Saint-Paul-lez-Durance, currently living in Aix-en-Provence.
She introduced Taiyo to the ITER project.

MIRAI MITSUHASHI

Administrative staff at QST,
the Japanese Domestic Agency of the ITER project.

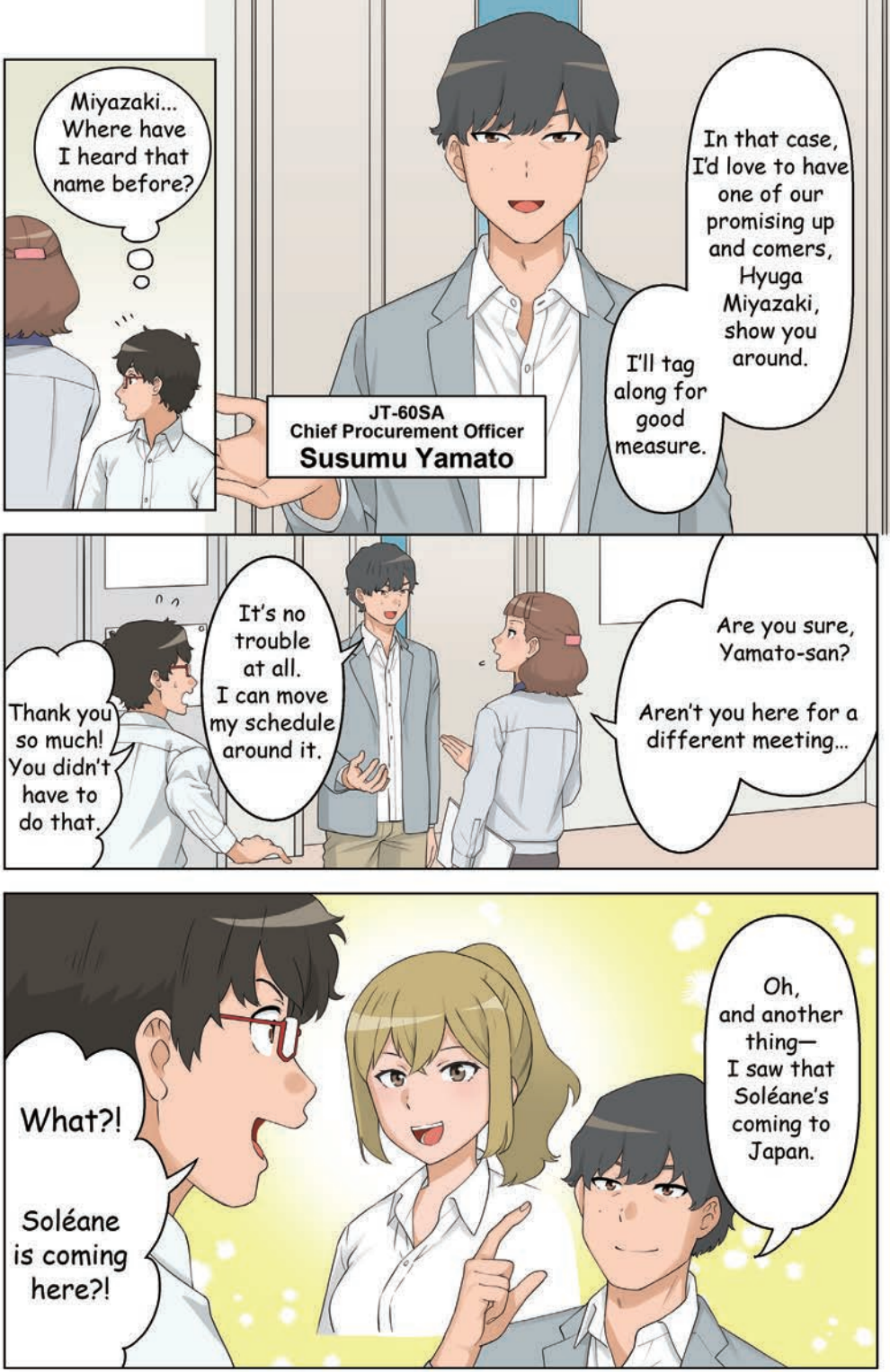
Our story so far…

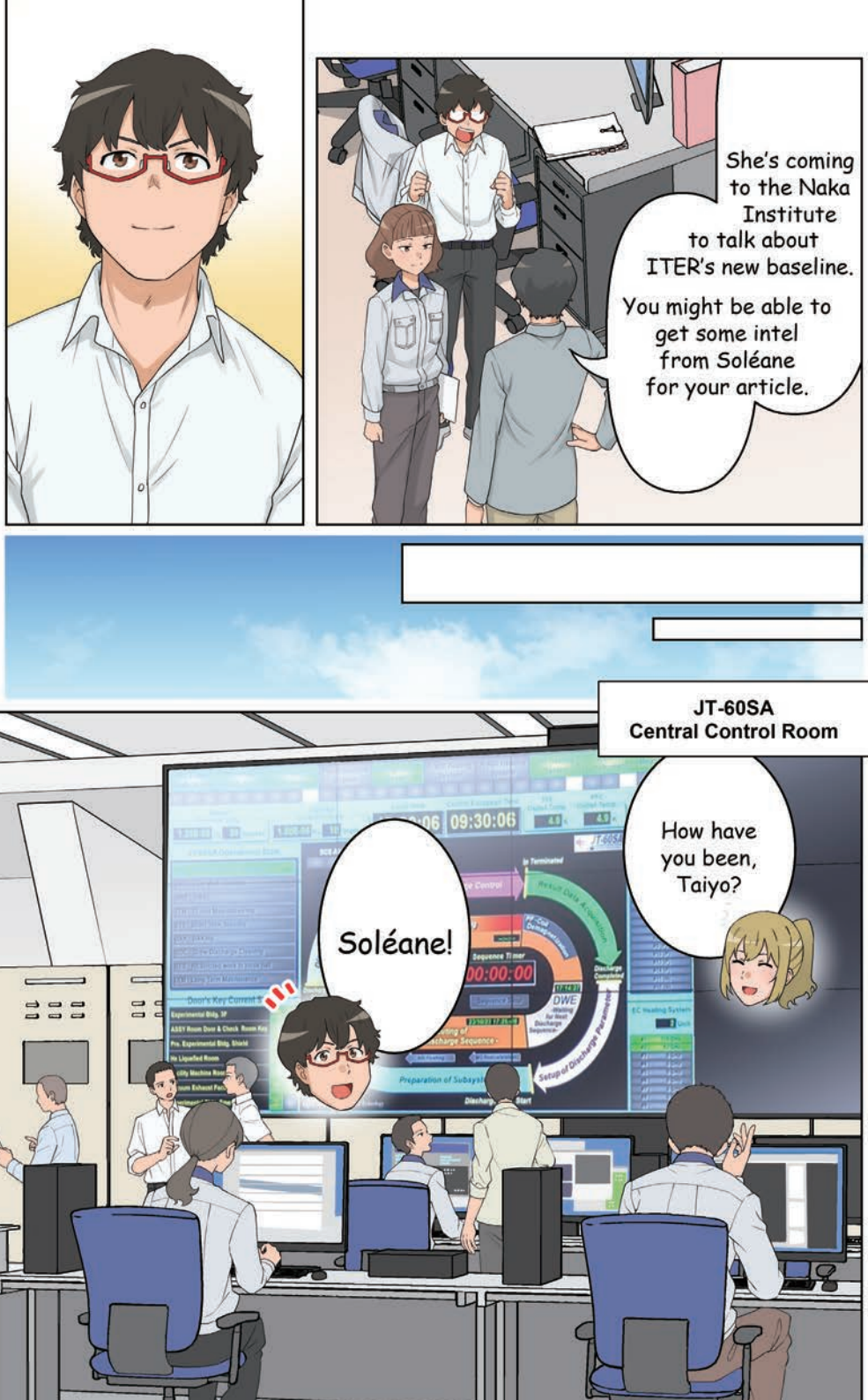
Now an administrative staff member at QST's Naka Institute for Fusion Science and Technology (Naka Institute), Taiyo has been getting up to speed on the various components Japan supplies for the ITER project through on-site tours led by his senior colleague Mirai. So far he has learned about the TF coils, gyrotrons, and divertor.

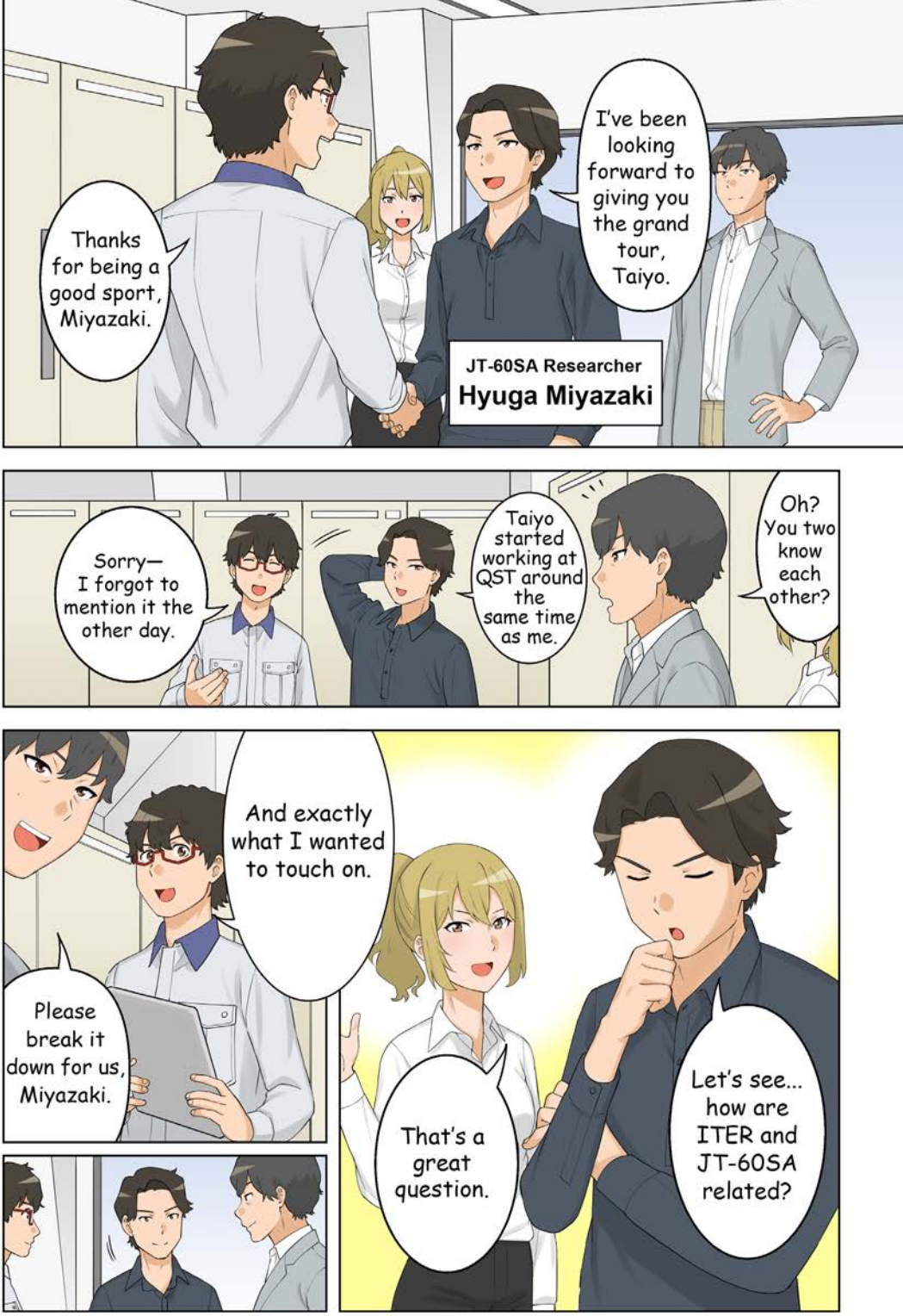
In this episode, Taiyo learns about the connection between ITER and JT-60SA, the advanced superconducting tokamak at the Naka Institute, as well as ITER's new baseline.


National Institutes for Quantum Science and Technology(QST)
Naka Institute for Fusion Science and Technology
What's that?! You want to see ITER at the Naka Institute?!
Our machine is the JT-60SA.
ITER is in France, so...
Beep!
Well, you see... it's just that—
Sigh...
People still get them mixed up...
ITER...
Naka...


Do you have any new ideas for how to get through to people about ITER, Mirai?
REPORT
The Relationship Between ITER and JT-60SA: A Comprehensive Analysis
Here you go—our next newsletter.
Have I got just the job for you, Taiyo.
The Relationship Between ITER and JT-60SA: A Comprehensive Analysis
Did someone say central control room?
If I were you, I'd go scope out the central control room to get some ideas for the article you're going to write.
Wow! Talk about perfect timing!


Miyazaki... Where have I heard that name before?
In that case, I'd love to have one of our promising up and comers, Hyuga Miyazaki, show you around.
I'll tag along for good measure.
JT-60SA
Chief Procurement Officer
Susumu Yamato
Thank you so much! You didn't have to do that.
It's no trouble at all. I can move my schedule around it.
Are you sure, Yamato-san?
Aren't you here for a different meeting...
What?!
Soléane is coming here?!
Oh, and another thing— I saw that Soléane's coming to Japan.


She's coming to the Naka Institute to talk about ITER's new baseline.
You might be able to get some intel from Soléane for your article.
JT-60SA
Central Control Room
Soléane!
How have you been, Taiyo?

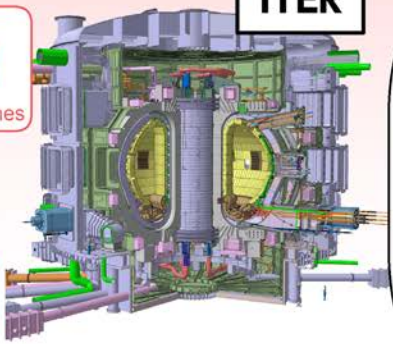

I've been looking forward to giving you the grand tour, Taiyo.
Thanks for being a good sport, Miyazaki.
JT-60SA Researcher
Hyuga Miyazaki
Oh? You two know each other?
Taiyo started working at QST around the same time as me.
Sorry— I forgot to mention it the other day.
Let's see... how are ITER and JT-60SA related?
That's a great question.
And exactly what I wanted to touch on.
Please break it down for us, Miyazaki.

ITER

Size
Height: approx. 30 m
Width: approx. 30 m
Weight: approx. 23,000 tonnes

Location
France

Members
Over 30 countries worldwide

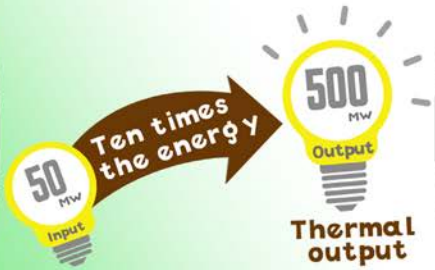


The JT-60SA at the Naka Institute plays a crucial role in the ITER project.

ITER will demonstrate that fusion is a viable and sustainable source of energy ※ (through experiments using deuterium-tritium fuel).

※ ITER will not actually produce electricity.

The goal is to create a "burning plasma" that can be sustained for 300 to 500 seconds.



It is designed to produce 10 times more energy from fusion than the energy required to heat the plasma.

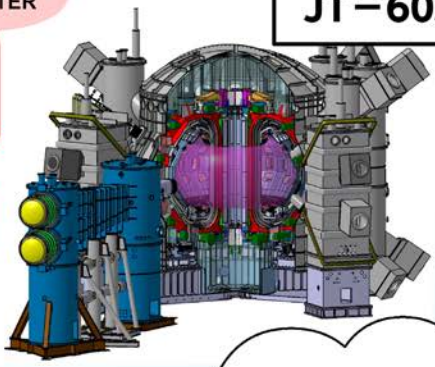
JT−60SA

About half the size of ITER

Size
Height: approx. 16 m
Width: approx. 13 m
Weight: approx. 2,600 tonnes

Location
Japan (Naka City, Ibaraki Prefecture)

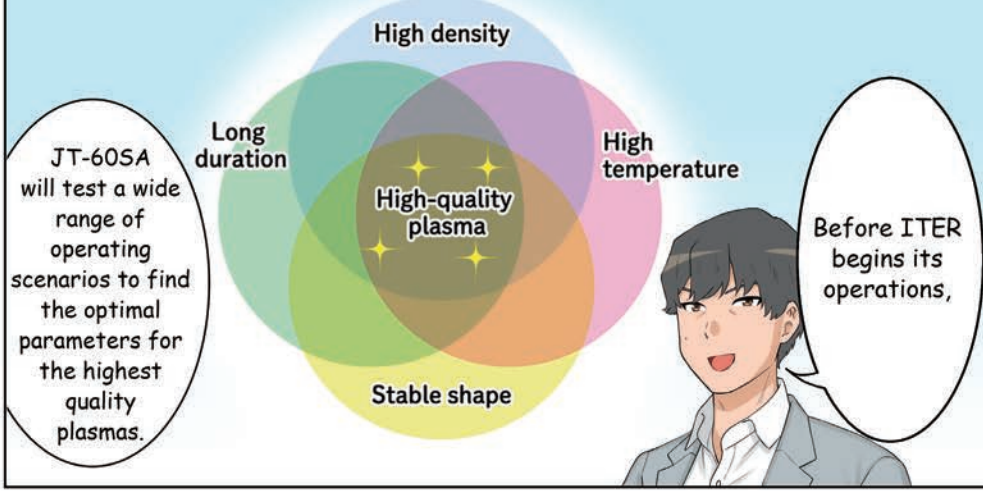
Members
Japan–EU joint project

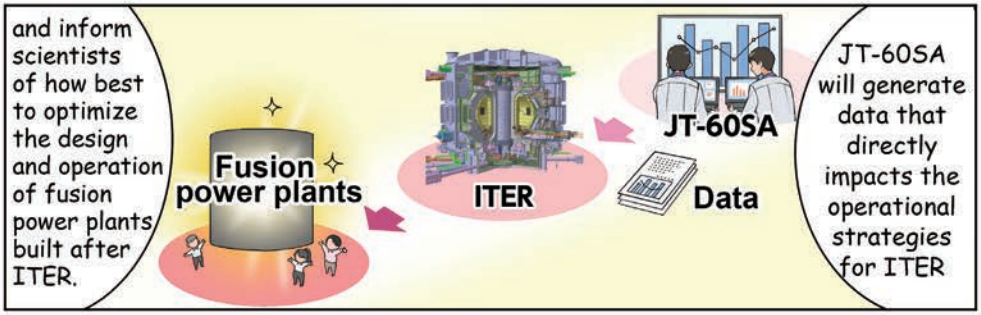


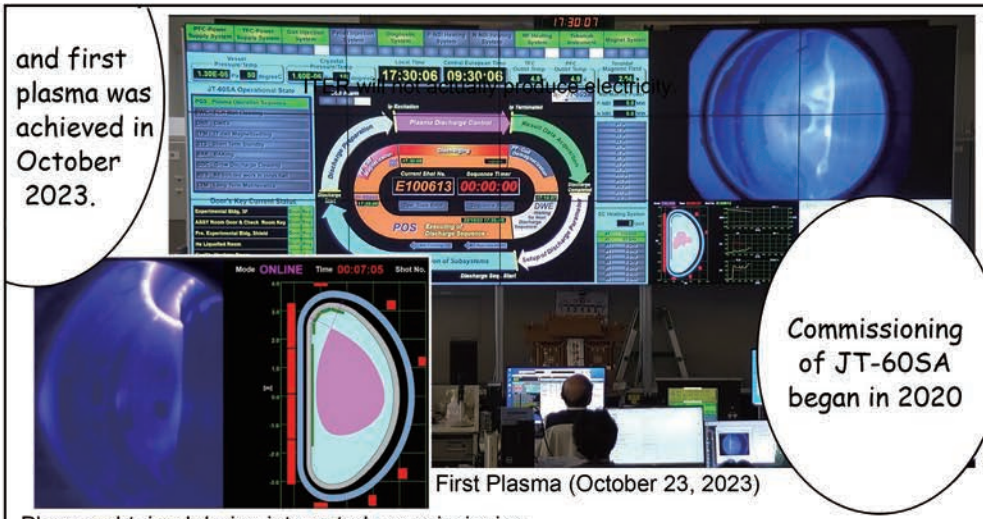
JT-60SA is dedicated to studying plasma behavior to develop techniques for long-duration, stable plasma confinement.

Allow me to expand on that.

It uses fuel that is easy to handle for more frequent experiments to help reduce operational expenses for future, larger reactors.

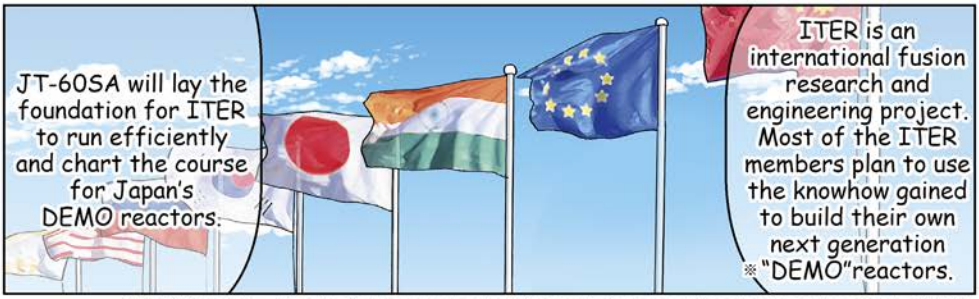






First Plasma (October 23, 2023)

Plasma obtained during integrated commissioning



※DEMO reactors will be the first to generate electricity from fusion energy based on the achievements of ITER.

Broader Approach (BA) activities in fusion energy research.

Naka Institute, Ibaraki, Japan

Superconducting tokamak

JT-60SA

Rokkasho Institute, Aomori, Japan

International Fusion Energy Research Center (IFERC)

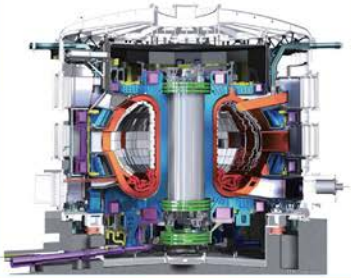
Rokkasho Institute, Aomori, Japan

International Fusion Materials Irradiation Facility (IFMIF)

Supporting ITER

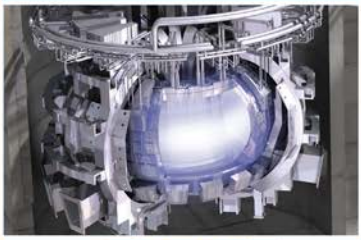
Complementing what cannot be done with ITER

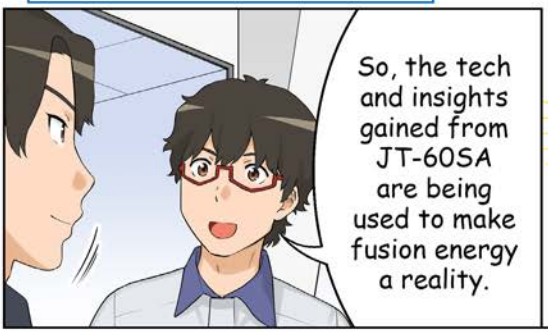
Experimental reactor ITER



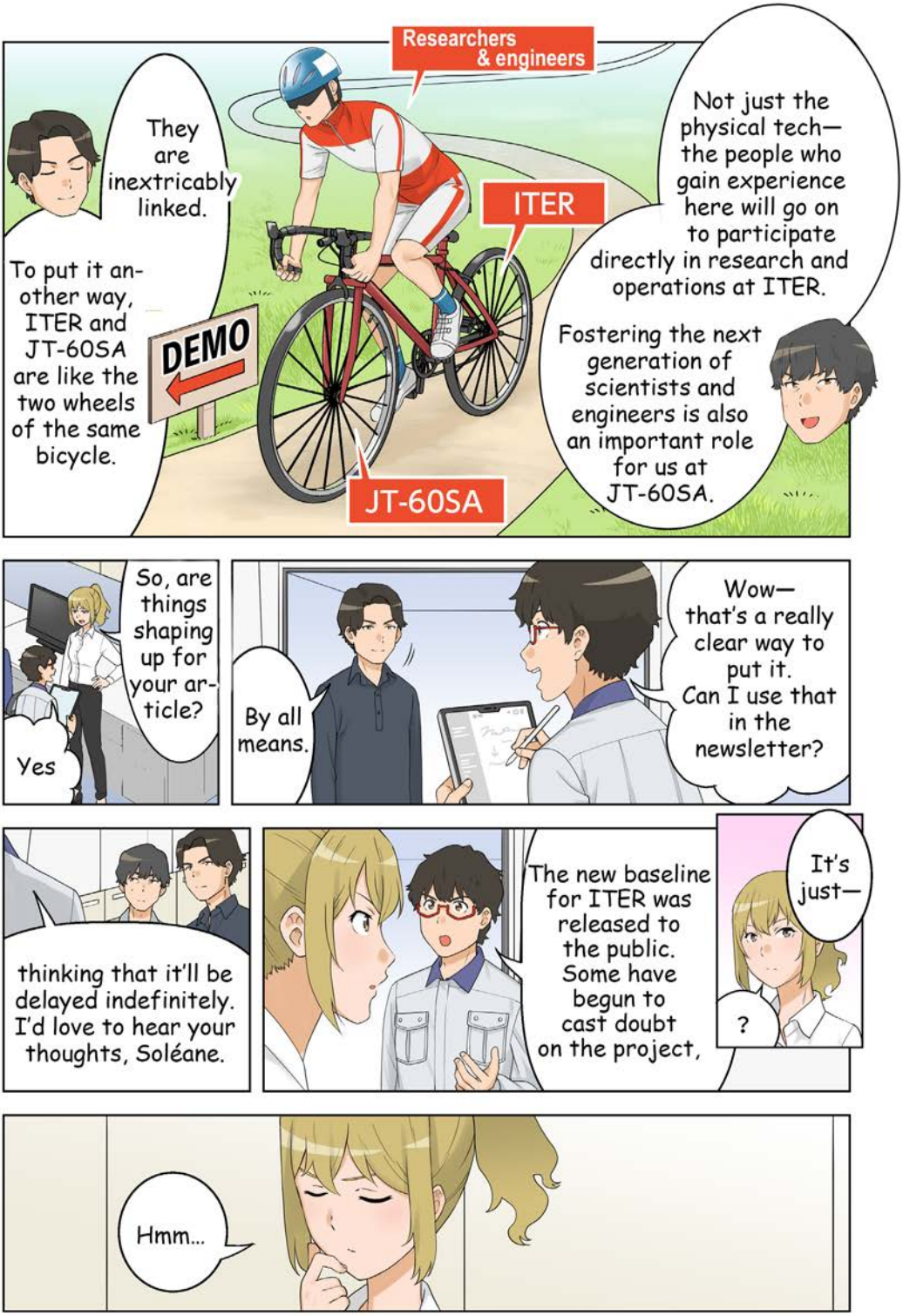
Serving as a training ground for scientists and engineers

DEMO reactors





Towards the realization of fusion energy


Researchers & engineers
ITER
JT-60SA
DEMO
They are inextricably linked.
To put it another way, ITER and JT-60SA are like the two wheels of the same bicycle.
Not just the physical tech—the people who gain experience here will go on to participate directly in research and operations at ITER.
Fostering the next generation of scientists and engineers is also an important role for us at JT-60SA.
So, are things shaping up for your article?
Yes
By all means.
Wow—that's a really clear way to put it. Can I use that in the newsletter?
thinking that it'll be delayed indefinitely. I'd love to hear your thoughts, Soléane.
The new baseline for ITER was released to the public. Some have begun to cast doubt on the project,
It's just—
?
Hmm...

Neutral Beam Test Facility (NBTF)

In fact, this revision prioritizes the start of significant research operations as rapidly as possible by having the major components installed from the get-go, such as the divertor, heating systems, and diagnostics.

The new baseline consolidates tokamak assembly stages and reorganizes work steps.

It hasn't simply postponed the old deadlines.

Divertor

Neutral Beam Injector

Electron Cyclotron Resonance Heating System (Gyrotrons)

We were also able to adapt to the latest research findings. The blanket first wall was originally planned to be beryllium—light and easy to process—

but based on our current state of knowledge, we switched to tungsten, which is more heat resistant and durable.

Diagnostics

Remote Handling System

Age25

The New ITER Baseline

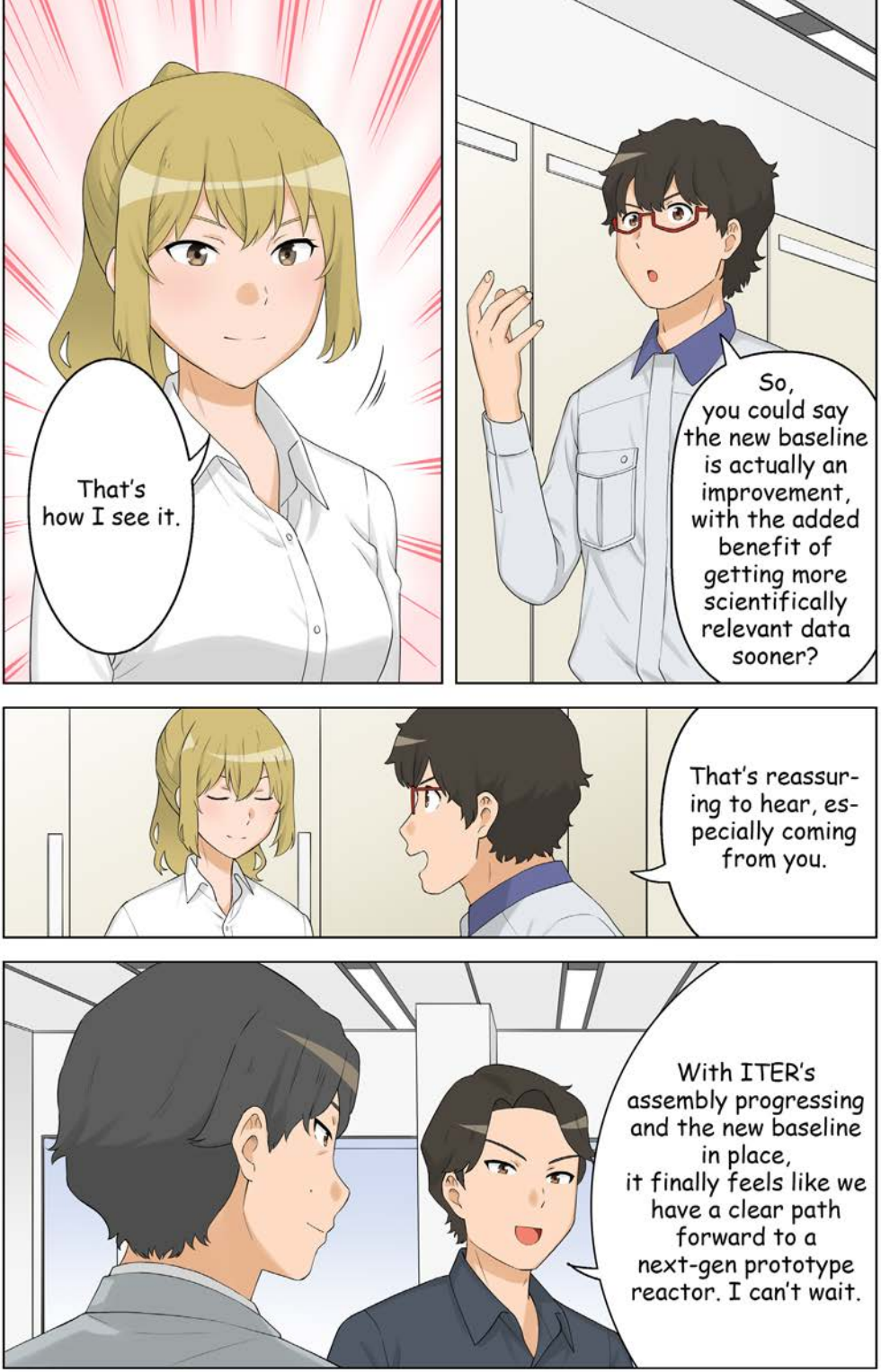
	2025	
1 Year Later	2026	
2 Years Later	2027	
3 Years Later	2028	
4 Years Later	2029	ITER machine assembly
5 Years Later	2030	
6 Years Later	2031	
7 Years Later	2032	
8 Years Later	2033	
9 Years Later	2034	Integrated commissioning I
10 Years Later	2035	Start of research operations
11 Years Later	2036	
12 Years Later	2037	
13 Years Later	2038	ITER machine assembly
14 Years Later	2039	Integrated commissioning II
15 Years Later	2040	Research operations
16 Years Later	2041	Maintenance
17 Years Later	2042	Research operations
18 Years Later	2043	Maintenance
19 Years Later	2044	Research operations
20 Years Later	2045	Maintenance
21 Years Later	2046	Research operations
22 Years Later	2047	Maintenance
23 Years Later	2048	Research operations
	⋮	

Start of deuterium–deuterium plasma experiments and operation at full magnetic energy

Start of operation with fusion fuel (deuterium–tritium)

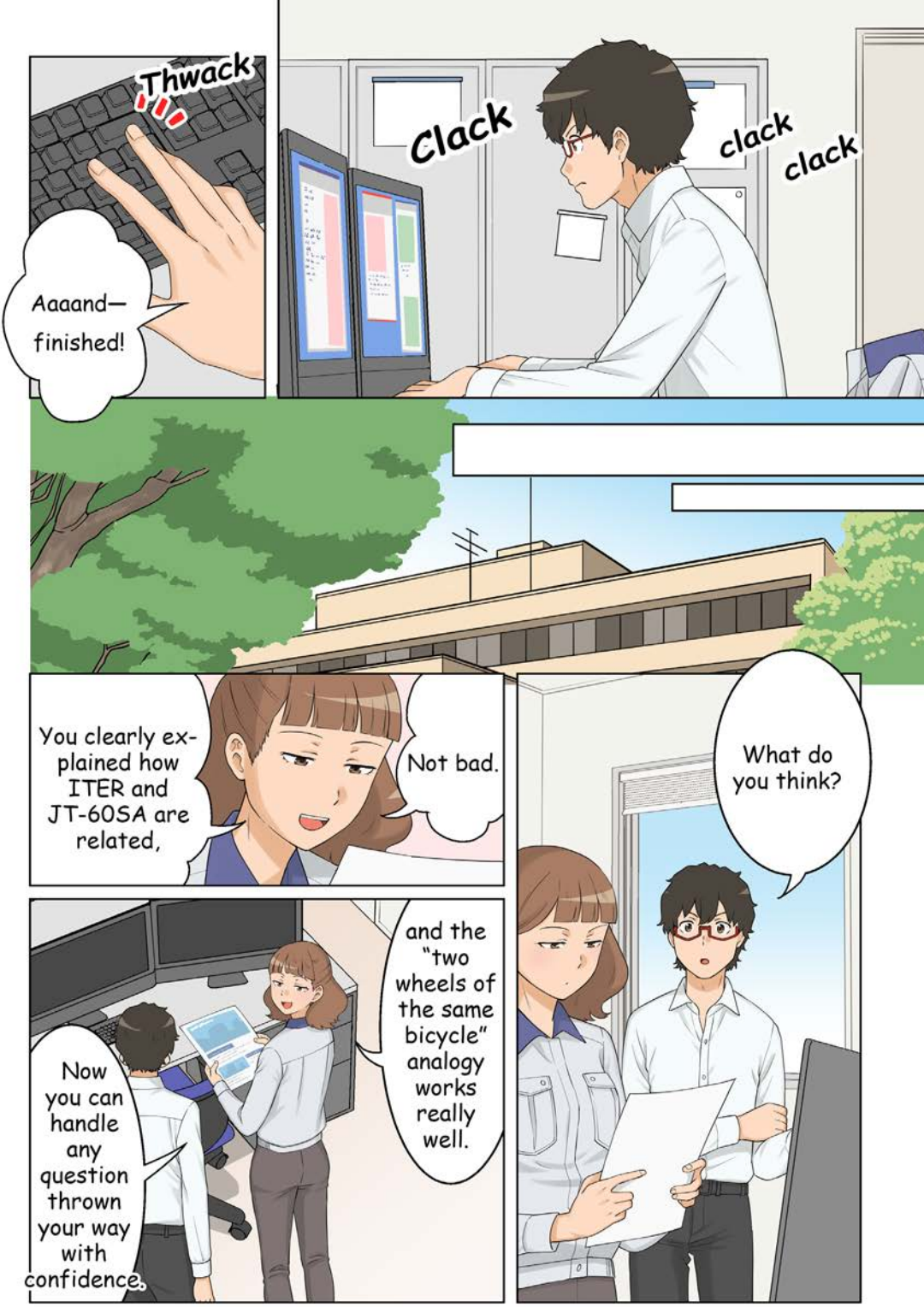
For more details, check out the new baseline explainer video

Note: The "New ITER Baseline" is a proposal by the ITER Organization and may be subject to change.


That's how I see it.
So, you could say the new baseline is actually an improvement, with the added benefit of getting more scientifically relevant data sooner?
That's reassuring to hear, especially coming from you.
With ITER's assembly progressing and the new baseline in place, it finally feels like we have a clear path forward to a next-gen prototype reactor. I can't wait.


Back when I was a student, I witnessed the moment JT-60SA achieved its first plasma.
So, Miyazaki —what made you want to become a researcher at Naka?
The atmosphere was electric and I guess you could say ignited a spark in me.
That's what set me on this path, spending my days researching at the Naka Institute. But someday soon, I want to follow in my seniors' footsteps and work at ITER.


Absolutely. I'll be waiting for you.
When that day comes, I'll be counting on you again, Soléane.
I can't let myself be outdone!
They're both such go-getters ...

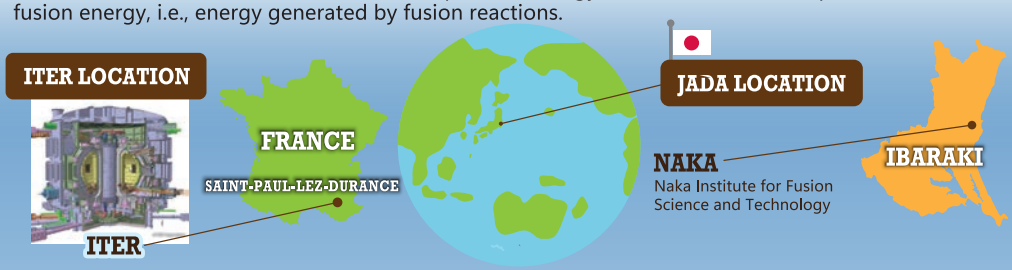

Thwack
Aaaand—
finished!
Clack
clack
clack
You clearly explained how ITER and JT-60SA are related,
Not bad.
What do you think?
Now you can handle any question thrown your way with confidence.
and the "two wheels of the same bicycle" analogy works really well.


Thank you Miyazaki, Yamato-san, Soléane...
I certainly hope so!
Oh... I know you just got done with the last one, but— here's your topic for the next issue.
I'm doing my part to contribute to the ITER project!
Alright, I'll post it on QST's website right away.
Whaaat?!?
Already !?

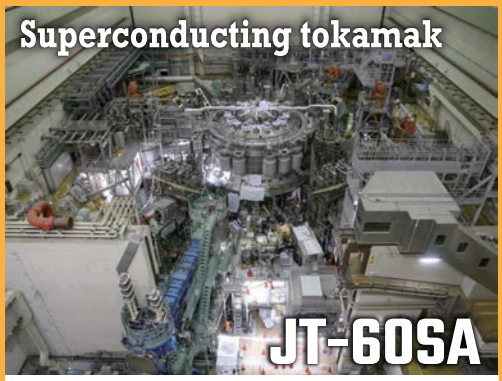
The Naka Institute is forging ahead towards the realization of fusion energy. At the heart of our R&D activities are the ITER Project and the JT-60SA Project.

Web

Officially the "Naka Institute for Fusion Science and Technology," it is one of several institutes of QST, the "National Institutes for Quantum Science and Technology." The Naka Institute is a leader in the field of quantum energy and conducts R&D to produce fusion energy, i.e., energy generated by fusion reactions.



Superconducting tokamak JT-60SA



JT-60SA is a joint Japan–EU project. Its development, procurement of components, and construction were carried out collaboratively by Japan and Europe. To acquire the technologies required for ITER and future prototype reactors, researchers from around the world gather here.

ITER Japan Domestic Agency

QST has been designated by the Japanese government as the ITER Japan Domestic Agency (JADA). In this role, QST procures key components for ITER, such as the superconducting coils, and delivers them to the ITER site in France. But it's not just equipment that is sent to France; QST actively recruits skilled Japanese personnel to work at the ITER Organization to contribute to the ITER project.

Naka Institute for Fusion Science and Technology

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