Press Conference

SUMMARY

Contact:
Laban Coblentz
Laban.Coblentz@iter.org
+33 6 14 16 40 85

Summary of Presentation by Pietro Barabaschi, ITER Director-General

St. Paul-lez-Durance, France (3 July 2024) – The ITER Organization convened a press conference on 3 July to provide more details of the project baseline proposal submitted to the ITER Council on 19-20 June. The updated baseline schedule will serve as a working reference while the Council continues its review.

What is a baseline? A project baseline is a reference project plan that includes agreed scope, schedule, and cost, against which progress and performance are to be measured. In a complex mega-project such as ITER, a baseline plan is essential to provide clear guidance, manage resources effectively, identify and mitigate risks, ensure coordination and collaboration, measure performance, control costs, maintain quality, manage changes, and ensure compliance.

The construction of ITER requires us to account realistically for the challenges of a First-of-a-Kind machine. The volume and weight of the ITER tokamak is nearly 10 times larger than the largest existing tokamaks. For example: ITER will feature the largest magnet in the world, by far. The current Guinness world record for the largest magnet is the barrel toroid magnet in the Atlas experiment at CERN: it has a cold mass of 370 tonnes, operates at 4 Tesla, and stores 1.08 Gigajoule of energy. By comparison, ITER's largest magnet, made up of the combined toroidal field coils and now all completed, has a cold mass of more than 6000 tonnes, operates at 12 Tesla (a 3x stronger magnetic field), and stores 41 Gigajoules of energy (almost 40x more energy).

What are the project goals (mission elements) of the ITER project?

1. To demonstrate the integration of systems needed for industrial-scale fusion operations.
2. To achieve Q≥10: 500 MW of thermal fusion power output for 50 MW of heating power input to the plasma, in 400-second pulses, reaching thermal equilibria in plasma and in structures.
3. Over time: to achieve a Q≥5 at steady state operation.

Why does ITER need to update its project baseline? The previous plan—the Baseline designed in 2016—has not been feasible for a few years. Since October 2020, it has been made clear, publicly and to our stakeholders, that First Plasma in 2025 was no longer achievable.

Several factors contributed to this realization. The Covid-19 pandemic shut down some factories supplying ITER components, reduced the associated workforce, and triggered other impacts such as backlogs in maritime shipping, challenges in conducting quality control inspections, etc. Some of ITER's First-of-a-Kind components proved more challenging than envisioned. Quality issues were experienced in design, manufacturing, and project culture—leading to some key components requiring repairs, as previously reported. In addition, the planning for some aspects of manufacturing and assembly proved to be too optimistic.

How does the new baseline compare with the previous 2016 Baseline? The goal of the previous baseline was to reach "First Plasma" as rapidly as possible. However, the scope of that First Plasma was constrained by the fact that some key components would not be available. This produced a sub-optimal result: the First Plasma scheduled for 2025 was designed as a brief, low-energy machine test

(100 kiloAmperes), using only hydrogen, to be followed immediately by assembly and operation in four successive stages, reaching full plasma current (15 MegaAmperes, 150x higher current than in the First Plasma of the 2016 Baseline) later, in 2033. These constraints were unavoidable because key components were not available for assembly before 2025: for example, the divertor that functions to absorb high heat loads, the shield blocks that protect the vacuum vessel, and more.

This understanding led to a number of considerations for how to optimize the New Baseline. We could have retained the Baseline 2016 roadmap, but this would have been illogical—based on the availability of additional key components to construct a more complete machine.

Therefore, the new baseline has been redesigned to prioritize the Start of Research Operations. It was important to make up for past delays, as much as possible, but above all to ensure that the causes of these delays were understood and corrected. As noted, the incorporation of risk-reducing components will enable starting operation with a more complete machine. The project has also been reorganized internally to meet the challenges and enhance project quality culture. In summary, the new baseline is a more robust way to achieve ITER's performance goals.

How does the new baseline prioritize these project goals? For the Start of Research Operations (SRO), we will have already installed the divertor, shield blocks, and other key components. The SRO phase will feature hydrogen and deuterium-deuterium plasmas, and will culminate in operating the tokamak in long pulses at full magnetic energy and plasma current. This phase will largely demonstrate the integration of systems needed for industrial-scale fusion operation—a key project goal.

The new baseline is thus designed to mitigate operational risks, substantially preparing for deuterium-tritium (DT) operations. We will also reduce project technical risks by additional testing of some toroidal field and poloidal field coils, fully to 4 Kelvin, before installation. More time will be dedicated to commissioning. An initial sacrificial "First Wall" will be installed, to be used up to full plasma current, to protect the shield blocks and vacuum vessel during SRO testing. We will also add more external heating capacity, to allow testing during SRO that can simulate the full heat loads to be experienced in DT operations. All systems, including the disruption mitigation system, will be fully tested during the SRO phase.

How do the schedules compare in the previous baseline and the new baseline? The 2016 Baseline envisioned achieving First Plasma in 2025, as a brief, low-energy machine test, with relatively minimal scientific value, to be followed by four stages of assembly and construction, achieving full plasma current in 2033. The new baseline envisions the Start of Research Operation (SRO) in 2034, featuring a more complete machine, to be followed by 27 months of substantive research. The achievement of full magnetic energy will be about 3 years delayed from the previous baseline, from 2033, now targeted in 2036. Deuterium-deuterium fusion operation is targeted for 2035, about the same time as in the previous baseline. The Start of Deuterium-Tritium Operation Phase will be about 4 years delayed from the previous baseline, from 2035 to 2039.

One further key feature of the new baseline is that we will use tungsten instead of beryllium for the First Wall (plasma-facing material), because it is clear that tungsten is more relevant for future "DEMO" machines and eventual commercial fusion devices.

ITER—designed to demonstrate the scientific and technological feasibility of fusion power—will be the world's largest experimental fusion facility. Fusion is the process that powers the Sun and the stars: when light atomic nuclei fuse *together to form heavier ones, a large amount of energy is released. Fusion research is aimed at developing a safe, abundant and environmentally responsible energy source.*

ITER is also a first-of-a-kind global collaboration that serves as the scientific backbone behind the growth of a fusion industry. As the host, Europe contributes almost half of the costs of its construction, while the other six Members to this joint international venture (China, India, Japan, the Republic of Korea, the Russian Federation and the United States), contribute equally for the remaining expenses. The ITER Project is under construction in Saint-Paul-lez-Durance, in the south of France.

For more information on the ITER Project, visit: http://www.iter.org/