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Will the new 'lucid' Income Tax bill reduce disputes and litigation?

The Income Tax Bill, 2025, has been proposed to make India's direct tax law 'concise, lucid, easy to read and understand'; tax experts believe that just the changes in language and better comprehension would simplify interpretation and raise compliance and efficiency of tax administration

EXPLAINER

Saptaparno Ghosh
NEW DELHI

Finance Minister Nirmala Sitharaman introduced the Income Tax Bill, 2025, in Lok Sabha on February 13 to make India's direct tax law "concise, lucid, easy to read and understand". During her Budget presentation in July last year Ms. Sitharaman announced the government's decision to overhaul the more than six decades old law. "This will reduce disputes and litigation, thereby providing tax certainty to the taxpayers. It will also bring down the demand embroiled in litigation," she reasoned, for the new law. The bill has been referred to a 31-member Select Committee of the Lok Sabha, to be chaired by the Bharatiya Janata Party MP Baijayant Panda. The committee is expected to table its report on the first day of the next Parliament session.

World class: The Centre hopes to standardise the tax system in line with international standards. GETTY IMAGES/ISTOCK

What is the purpose of the entire exercise?

The existing Income Tax Act of 1961 has been amended numerous times, "overburdening" the law and making its language complex, argues the new IT Bill. This, it says, has increased compliance costs for taxpayers and impeded direct tax administration. The latest bill aspires to address such inefficiencies.

Three broad measures have been adopted to pursue this objective. The first entails simplifying the language of the Act to make it more readable. It also attempts to remove redundant and repetitive provisions and re-organises sections for better navigation with logical links. The proposed IT Act also uses tables and formulae where needed. For instance, the existing Act has 43 sections for various incomes liable for tax deducted at source (TDS) depending on the status of the payer or payee and applicable monetary limits have been mentioned. The proposed bill consolidates them all into one section. To make this more understandable, the bill mentions tables for three broad categories of payees–residents, non-residents and all others. It does not distinguish between Indian and foreign nationals. Significantly, the Bill does not entail any policy changes in direct taxes.

> The existing Income Tax Act of 1961 has been amended numerous times over the years, 'overburdening' the law and making its language complex

How does this help then?

According to Anshul Khemuka, Partner at law firm Khaitan & Co, just the changes in language and better comprehension would simplify interpretation and raise compliance and efficiency of tax administration. Anil Talreja, Partner at consulting firm Deloitte India, wagered this would raise scope for minimum interpretations. "A good part of the litigation pending in courts comes on the back of interpretation of the section. A lot of tax money is locked up as a result," Mr. Talreja told *The Hindu*, adding clarity would reduce confusion.

What is a 'tax year'?

The new Bill seeks to replace the use of "financial year" and "assessment year" with a standard "tax year". The latter would refer to the (taxable) twelve-month period in a financial year. According to the IT department, use of the terms "financial year" and "assessment year" confuses taxpayers, giving them the impression that they are two separate tax payments. For context, an existing business would pay taxes for its income in the concluded financial year, and so the following financial year is labelled as the "assessment year", while, a business incorporated say last September, would have its "assessment year" beginning at the time of inception, that is, when it reports its first income. The government hopes that the term "tax year" would avoid this confusion and make clear that entities and individuals would be taxed for the time they have an income.

The government also says this would standardise the domestic tax system to those in comparable jurisdictions, such as the U.K., Australia, and so on.

What changes have been proposed in the virtual space?

The new Bill has introduced the concept of a "virtual digital space" and expanded the powers of search and seizure in that realm. Simply put, the powers of search and seizure have been expanded from physical or local assets to digital and virtual ones. The text defines virtual spaces as an "environment, area or realm" through which the digital world is experienced such as email servers, social media accounts, websites used to store details of ownership of any asset, cloud servers, and so on.

The Bill considers 'cryptocurrency' among virtual digital assets (VDAs). This means crypto assets cannot be transferred to evade tax liabilities, enhancing scrutiny of such assets by tax authorities. Mr. Khemuka pointed out authorities can block transfer of VDAs if they suspect tax evasion. "Increased scrutiny for crypto traders and investors, with tougher enforcement on undeclared holdings reinforces the government's intent to regulate and tax digital assets more strictly," he observed.

Is this the first time the Income Tax Act has been proposed to be revised?

No, similar attempts to revise the income tax law were made in 2009 and as recently as in 2019.

In 2009, then Finance Minister Pranab Mukherjee unsuccessfully attempted to introduce the Direct Tax Code. It aspired to give "a competitive edge to the country while dealing with international taxation issues". Among the issues it sought to address were concerns relating to the residential status of foreign companies–their control and management, taxation of charitable organisations; shift from EEE (exempt-exempt-exempt) to EET (exempt-exempt-tax) method of taxation of savings and capital gains. Drafts of the bill underwent revisions in 2012 and 2014. But it could not be passed as Parliament was dissolved in 2014 following the General Elections that year. In Sept. 2017, Prime Minister Narendra Modi observed the need to redraft the Income Tax Act. This led to the constitution of a task force which submitted its report in August 2019.

ISTOCKPHOTO

Constitutional morality: the origins and nuances of the concept

Constitutional morality is a civic culture of respect for constitutional forms and offices, along with the vigilant application of public reason, self-restraint and critique. It requires citizens to understand that the constitution's rules are sacred

Saai Sudharsan Sathiyamoorthy

In the recent past, our constitutional courts have embraced the polysemous concept of "constitutional morality" as a tool to interpret and as a test to adjudicate upon the constitutional validity of statutes. Today, it is seen by some as a bulwark to keep a check on the volatility that is attached to public morality, and to others, as a "dangerous weapon". In its judgments in *Navtej Singh Johar versus Union of India* (2018) and *Joseph Shine versus UOI* (2018), the Supreme Court reinvigorated the ancient concept to frame it as an ideal of justice and a "guide (to) the law."

As such, it is not a surprise that constitutional morality and its meaning(s) have become the cynosure of debates on some of the most pressing issues of our time – the rights of sexual minorities, women's entry into temples, the limits of free speech, and the balance between national security and civil liberties. However, amidst these swirling debates of ownership, it is worth revisiting the origins of this evocative but elusive phrase. British classist George Grote's original conceptualisation of the phrase offers a nuanced and constructive path forward for popular political engagement.

Back to the roots

For Grote, whose *A History of Greece* was as much a reflection of the Victorian passion for –and self-identification with – ancient Greece as it was an attempt to champion Athenian democracy from the condescension of its critics such as the Scotsman John Gillies and William Mitford, the democracy at Athens was "one of the most important and prolific events in all Grecian history" and the result of a "rare and difficult sentiment which we may term a constitutional morality." This rare and difficult sentiment was "a paramount reverence for the forms of the constitution". This involves adherence to both the form and procedure of the constitution to resolve disputes that arise, with the actions of citizens being only subject to the rule of law, unrestrained by the "censure of those very authorities as to all their public acts." Grote claimed that eloquently drafted rules and procedures were insufficient to ensure the longevity of a constitution. It required the instillation of "constitutional morality" – a civic culture of respect for constitutional forms and offices, along with the vigilant application of public reason, self-restraint and critique. Pertinently, it requires the creation of confidence in citizens that the constitution's rules are sacred even to those with different political views, even during heated political debates.

It is this civic culture that Dr. Ambedkar spoke of during his famous invocation of the concept in his speech 'The Draft Constitution', delivered on November 4, 1948. Dr. Ambedkar believed that democracy in India would have to learn the ideal of constitutional morality, as it was not a "natural sentiment" to a polity and had to be "established and diffused" so as to ensure a free and peaceable democracy.

However, Dr. Ambedkar, who had mainly invoked Grote to stress on the necessity of providing for even minor administrative details in the Constitution, knew that the birth of such constitutional morality was a rarity in history. He knew that it was "perfectly possible to pervert the Constitution, without changing its form by merely changing the form of the administration and to make it inconsistent and opposed to the spirit of the Constitution."

For him, self-restraint was a prerequisite for preserving freedom under a properly constituted government.

Commitment with critique

This interpretation of constitutional morality emphasises on the fact that adherence to the Constitution must be non-transactional and that it cannot be based on an expectation that it would result in outcomes that reflect the value judgments or beliefs of a particular group of citizens. In other words, it demands the acceptance of a result that is vastly different from what these citizens had envisioned. The framework's genius lies in how it navigates between competing imperatives. It demands respect for constitutional forms while enabling critique of their operation. It requires following established processes while allowing those processes to be questioned and reformed.

Most crucially, it sees the Constitution not as demanding blind devotion but as a framework for managing differences through agreed-upon procedures. This is in stark contrast to the ideal of Jürgen Habermas' constitutional patriotism, which designates political allegiance as solidarity born of the norms and values of the constitution. While the former stresses on the liberalising effect of moderate cultural nationalism, the latter often pushes forward a form of singular-identity democracy purportedly constructed on the principles espoused in the constitution.

Constitutional morality's emphasis on process is especially important given the present rhetoric. It shows how we can maintain constitutional commitment without descending into fundamentalism. It points toward a more mature constitutionalism that balances reverence and reform, stability and change. One should not forget the fact that the founding fathers also saw the promulgation of the constitution as allegiance to constitutional form.

Saai Sudharsan Sathiyamoorthy is advocate, Madras High Court.

How did a DDoS attack cripple Kaveri 2.0?

What happened to Kaveri 2.0, the web-based portal which streamlines property registrations in Karnataka? How does a Distributed Denial of Service attack operate? How can a company or firm protect themselves against such kind of cyberattacks? Was the social media platform X also victim to a DDoS attack?

EXPLAINER

John Xavier

The story so far:

In January, web-based portal Kaveri 2.0, which streamlines property registrations in Karnataka, faced sporadic, crippling server outages. On investigating the outage, the Revenue Department and E-Governance Department concluded that it was not due to "technical glitches" but a "motivated Distributed Denial of Service (DDoS) attack" on Kaveri 2.0, which was launched in 2023 to reform land registration.

What happened after the attack?

Following the incident, K. A. Dayananda, Inspector General of Registrations and Commissioner of Stamps (IGR & CS) lodged a complaint with the cyber-crime police. The Cybercrime, Economic offences, Narcotics (CEN) police registered a case under the Information Technology Act, 2000, against the unidentified miscreants. "The Kaveri 2.0 faced some performance issues during December 2024. Upon analysis and inputs from the Centre for Smart Governance [CSG], it was found that these issues were caused by a malicious DDoS attack using automated tools or bots," the FIR said.

What is a DDoS attack?

A DDoS attack is a malicious attempt to disrupt the normal functioning of a targeted server, service, or network by overwhelming it with a flood of internet traffic. Unlike a Denial of Service (DoS) attack, which typically involves a single source, a DDoS attack leverages multiple compromised systems, often infected with malware, to generate the traffic. These compromised systems are collectively known as a botnet. Such attacks may be aimed at saturating the bandwidth of a particular site, exploiting weaknesses in the network protocol stack, or targeting specific weaknesses in applications or services. DDoS attacks can lead to service downtime, which render services unavailable, leading to a disruption or potential loss of revenue. While DDoS attacks do not directly steal data, they can be used as a distraction while other forms of cyberattack, such as data breaches, are executed. Organisations that fall victim to DDoS attacks may suffer reputational damage, as customers and partners question their ability to protect against cyber threats.

GETTY IMAGES

What happened to Kaveri 2.0?

The Kaveri 2.0 portal experienced performance issues in December 2024 and January 2025. Fake accounts were created, and entries were made into the database using these accounts, overwhelming the system. The attack involved 62 email accounts originating from 14 IP addresses, highlighting the distributed nature of the assault. In January 2025, a similar attack occurred, with extremely high traffic observed from citizen-side users for Encumbrance Certificate (EC) searches, which was eight times more than usual. At one point, the portal received 6.2 lakh requests in just two hours from malicious users using random keywords to perform searches. This surge in traffic crippled the portal, reducing the number of registrations.

How can such attacks be mitigated?

To protect against DDoS attacks, organisations implement advanced traffic filtering mechanisms to distinguish between legitimate and malicious traffic. Monitoring tools can help identify unusual traffic patterns and take pre-emptive actions. Enforcing rate limiting can control the number of requests a user can make in a given time frame, preventing the system from being overwhelmed. Bot detection technologies, such as CAPTCHA challenges and behavioural analysis, can identify and block automated tools or bots. Additionally, robust authentication mechanisms and regular security audits can strengthen the security of online services and prevent unauthorised access. Organisations can also work closely with cybersecurity agencies to help investigate attacks and identify perpetrators. They can share information and collaborate on mitigation strategies to prevent future attacks. This will include having a dedicated team to monitor and respond to security incidents. For the user, knowing about the risks of phishing and other social engineering attacks can help prevent account compromises.

What next for Kaveri 2.0?

The cyberattack crippled the Kaveri 2.0 portal, and registrations fell significantly on February 1 and 4. While the portal was restored on February 5, the DDoS attack should serve as a wake-up call for organisations, particularly government agencies, to prioritise cybersecurity and implement robust mitigation strategies.

What are other major DDoS attacks?

There are several such attacks, but most recently Elon Musk-owned X was targeted in August 2024. Mr. Musk reported that the platform experienced a massive DDoS attack, which caused delays and disruptions. This attack occurred just before his scheduled conversation with U.S. President Donald Trump, highlighting the vulnerability of even high-profile platforms to cyber threats.

In another occasion, in 2015, Microsoft-owned code repository GitHub was targeted by a China-based botnet. The attack specifically aimed two GitHub projects that provided tools to circumvent Chinese censorship. The attack involved injecting malicious JavaScript code into the browsers of visitors to Baidu, China's most popular search engine, and other sites using Baidu's analytics services.

THE GIST

- A DDoS attack is a malicious attempt to disrupt the normal functioning of a targeted server, service, or network by overwhelming it with a flood of internet traffic.
- Following the incident, K. A. Dayananda, Inspector General of Registrations and Commissioner of Stamps (IGR & CS) lodged a complaint with the cyber-crime police.
- The cyberattack crippled the Kaveri 2.0 portal, and registrations fell significantly on February 1 and 4. While the portal was restored on February 5, the DDoS attack should serve as a wake-up call for organisations, particularly government agencies, to prioritise cybersecurity.

Lighten the pollution burden of thermal power States

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In its first updated Nationally Determined Contribution under the Paris Agreement to United Nations Framework Convention on Climate Change (UNFCCC) in August 2022, India has committed to first, adopting a climate-friendly and cleaner path to economic development; second, reducing the emissions intensity of its GDP by 45% by 2030 from the 2005 level, and third, achieving about 50% cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030 along with other six commitments. Currently, thermal power has the dominant share in India's electricity basket. Under the new regime, thermal power will also have a 50% share.

An agent of emissions

Thermal power production results in a huge amount of carbon emission. The power producing States bear the burden of all this pollution to provide electricity to the consuming States. So, who should pay for the pollution burdens of thermal power plants? This article looks at thermal power production under the central sector and recommended compensation mechanisms for thermal power producing States.

India has a total installed capacity of 4,56,757 MW in which the central sector has 22.9% share, the State sector has 23.7% and the private sector, a 53.4% share. Out of the total electricity generation capacity from thermal power plants (2,37,268.91 MW), private sector power plants have a capacity of 85,899.095 MW (36.20%), the State sector has 75,991.905 MW (32.03%), and the central sector has the capacity of 75377.91 MW (31.77%). Central sector power plants which are located in several States, have 31.77 % of the total electricity generation capacity. NITI Aayog data show that India accounts for 20,794.36 kg of carbon emission from electricity generation.

According to the Ministry of Coal, Government of India (April 1, 2023), the total reserves of coal in India are 378.21 billion tonnes, of which Odisha alone accounts for 94.52 billion tonnes. Around 59.12% of the total energy supply in India is from coal. In India, around 73.08% (11,80,427.19 million units) and 1.48% (23,885.04 million units) of electricity are generated from coal, oil and natural gas, respectively, in 2022-23. Thus, the thermal power sector remains a major contributor to carbon emissions in India.

According to the Central Electricity Authority (CEA), Maharashtra had the highest non-renewable electricity generation capacity (31,510.08 MegaWatt or MW), followed by Uttar Pradesh (26,729.374 MW) and Gujarat (26,073.41 MW) in 2022-23. Rajasthan had the highest renewable electricity generation capacity in India at 22.398.05 MW of installation capacity. Despite having the highest electricity generation capacity, some States consume more than their generation.

Thermal electricity generation by the National Thermal Power Corporation (NTPC) also shows that the States producing the maximum electricity do not consume most of it – Uttar Pradesh, Odisha, and Chhattisgarh only consume 40%, 38.43%, and 29.92%, respectively, of the electricity produced by NTPC in their respective State. Gujarat is the biggest consumer of NTPC produced electricity (4,612 MW) despite the State's meagre generation of 17.7 MW by the NTPC. Gujarat and Maharashtra purchase electricity from different States from what is produced by the central sector and in other sectors.

Thermal electricity-producing States bear a disproportionate pollution burden when compared to the consuming State. Data from the CEA show that Tripura has the highest (96.96%) share of thermal power in the total electricity generation capacity, followed by Bihar (95.57%), Chhattisgarh (94.35%), Jharkhand (92.69%), Delhi (87.96%), West Bengal (87.72%), and Uttar Pradesh (81.84%). Not all the electricity generated in the State is being utilised inside the State. Bihar sold 16,529.62 MW of electricity in 2022-23.

NITI Aayog data show that Chhattisgarh is the highest net seller of electricity among all Indian States with 535.29 MW in 2022-23, followed by Madhya Pradesh (379.19 MW), Himachal Pradesh (153.43 MW), Rajasthan (135.14 MW), Odisha (95.40 MW) and Meghalaya (55.22 MW). These are the States where the central sector produces more thermal electricity and sells to others. Gujarat is the highest importer of electricity (528.17 MW), followed by Haryana (212.63 MW), Maharashtra (187.50 MW), Delhi (162.97 MW), Punjab (160.82 MW), and Tamil Nadu (128.37 MW) in the year 2022-23.

No compensation

India's electricity and environmental regulatory structures do not compensate States that generate electricity from central sector thermal power plants. Therefore, net exporting States of central sector power producers bear the burden of all pollution, and net importing States enjoy clean electricity. Central sector thermal power is mainly produced in coal-rich States such as Jharkhand, Chhattisgarh, and Odisha. Even though coal-rich States produce the maximum thermal electricity, per capita electricity consumption remains substantially lower than other economically better-off States. Thus the coal-rich States face a new form of resource curse.

Under the Corporate Social Responsibility (CSR) scheme, although thermal power-producing companies spend a small amount of funds to develop the periphery, this is far from compensating for environmental damage. The National Clean Energy and Environment Fund was created to promote renewable energy, and to assist States with cleaner technology.

Thermal power producing States need to be well compensated for bearing the burden of pollution while supplying electricity to power consuming States

Electricity is a Concurrent subject (Entry 38 of List III of the Seventh Schedule of the Constitution), which allows both the central and State governments to legislate on electricity matters. States are constitutionally permitted to levy taxes on electricity consumption and sale, but not on its generation. Similarly, the central government does not impose any specific tax on electricity production.

In October 2023, the Ministry of Power issued a directive that prohibits State governments from levying additional taxes or duties on electricity generation, clarifying the constitutional boundaries. As a commodity, electricity is exempt from Goods and Services Tax (GST). Services related to electricity transmission or distribution by utilities are also GST-exempt. Therefore, the consuming States receive the electricity duty levied on electricity sales. The electricity-producing States do not get any tax revenue but only the burden of pollution.

A formulation to pursue

Electricity produced and consumed within the State internalises all the benefits and costs. However, when the electricity is produced in one State and consumed in another, it creates a pure negative externality for the producing State. In such a situation, the States producing thermal power under the central sector should be compensated for all the electricity consumed by other States.

This can be done in two ways. States where central sector power plants are located can tax thermal power generation. Otherwise, the Union government can collect and transfer the generation tax to the producing State. The other mechanism would be a compensation mechanism through the Finance Commission of India. The last three Finance Commissions have recommended a formula to transfer funds to States under environmental and climate change concerns. This has been done through grants and horizontal devolution criteria. The Sixteenth Finance Commission should seriously consider India's international climate commitments and develop a fiscal road map to achieve those goals. Whatever the mechanism, thermal power-producing States under the central sector should be compensated adequately for carrying the burden of other States' electricity consumption.

China's EAST reactor keeps the fire of magnetic fusion burning

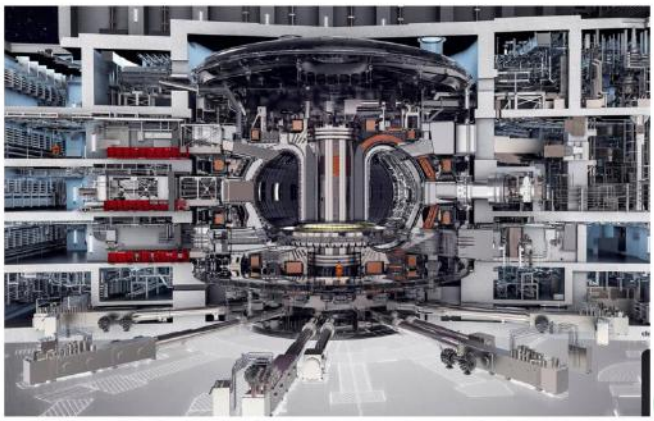
EAST is a testbed reactor for ITER, an international megaproject in which six countries are working together to build a tokamak to sustain nuclear fusion. EAST's successes are important for ITER's future because the latter has come under criticism for its delayed timelines and cost overruns

Shamim Haque Mondal

On January 20, Chinese scientists reported that they were able to maintain a plasma at a temperature of 100 million degrees C for about 1,066 seconds in a nuclear fusion reactor called the Experimental Advanced Superconducting Tokamak (EAST).

In 1938, physicists Otto Hahn and Fritz Strassmann found that energy is produced when the nucleus of an atom breaks apart, a process that Lise Meitner and Otto Frisch explained a year later as a process called "fission." Only four years later, physicists used this principle to build and operate the world's first reactor with a sustainable nuclear fission reaction.

By this time physicists also knew that energy is also produced when two atomic nuclei fuse together, a process called fusion. Nuclear fission produces harmful radioactive waste whereas nuclear fusion doesn't. This is why developing a nuclear fusion reactor has become an important technological goal for a world keenly interested in new sources of clean energy.



An exploded view of the ITER nuclear fusion facility. A human figure in orange is shown just below the image's centre for scale. The tokamak is visible at the centre, with the D-shaped cross-section. OAK RIDGE NATIONAL LABORATORY

The tritium problem

The problem is the amount of energy required to start and sustain a fusion reaction. A nuclear fission reaction can be kicked off by shooting neutrons of suitable energy at the atoms of unstable nuclei like uranium. For fusion to occur, however, the nuclei need to be exposed to a temperature of at least 100 million degrees C.

The lightest nucleus in nature is of hydrogen, consisting of a single proton. An isotope of hydrogen called deuterium has one proton and one neutron in its nucleus. The nucleus of another isotope called tritium has one proton and two neutrons. Deuterium-deuterium fusion requires a higher temperature to begin than deuterium-tritium fusion. This is because the extra neutron in the tritium nucleus helps overcome the repulsion of like-charges between the protons.

The fusion of a deuterium and a tritium nucleus creates a non-radioactive helium-4 nucleus, a neutron, and 17.6 MeV of energy, which is significant. The neutron can be directed to a blanket of materials surrounding the reactor that capture it and release more heat.

While deuterium is abundant in seawater, there are no natural deposits of tritium and it is very hard to produce. At present it is mostly created as a by-product in heavy-water fission reactors in Canada, India, and South Korea.

The temperature problem

Yet another challenge for nuclear fusion is the temperature. For two nuclei to fuse, two things need to happen: the like-charges in the nuclei (due to the protons) need to be overcome, then the particles need to come within around 1 femtometre (fm) of each other so they can bond with each other using the strong nuclear force.

This force is the strongest fundamental force in nature and is responsible for keeping protons and neutrons together in the nuclei of atoms. But on the flip side, it only acts across very short distances: 1 fm is roughly one-fourth the width of a carbon nucleus. This is why the nuclei need to be heated to such high temperatures: to give them enough energy to overcome their repulsion and get so close to each other.

There are different reactor designs to achieve nuclear fusion by meeting these conditions. One set of designs involves the use of a tokamak – a donut-shaped vessel where the nuclei are confined, like in a cage, and made to fuse.

A magnetic cage

Inside the vessel, a deuterium gas is exposed to about 20 million degrees C, when matter exists in the plasma state. The charged particles are stripped from their respective atoms and float around freely. Next, the particles are exposed to a very strong magnetic field that acts like an invisible net, trapping the particles along the field lines. This method is called magnetic confinement.

Engineers prefer to use electromagnets – special materials that generate a magnetic field when a current is passed through wires coiled around them – to create these fields because the field strength only depends on the amount of current in the wires. These wires are also superconducting: they can carry electric current with zero resistance if they are cooled to a very low temperature, which is achieved by blanketing them with liquid nitrogen or helium.

Inside EAST, both toroidal and poloidal magnetic fields are generated by superconducting electromagnets. It is currently the world's only tokamak with this feature. Toroidal magnetic fields flow around the donut-shaped reactor while poloidal fields flow through its centre. Together, they keep the particles within from drifting into the vessel's walls and collapsing the plasma. Instead they move in a spiral pattern through the vessel, with opportunities to collide with each other and fuse.

The poloidal field also induces an electric current in the plasma. When parts of the plasma resist the flow of this current, heat is produced, adding to the energy required to achieve fusion.

Series of records

Through the years, EAST has been setting a series of records and validating the technologies used to achieve them. It was the first tokamak to sustain a plasma in high-confinement mode at around 50 million degrees C for more than 60 seconds in 2016 and for more than 100 seconds in 2017. In 2023, EAST achieved the world's first steady-state high-confinement plasma for 403 seconds – a world record that it broke on January 20, 2025, by sustaining a plasma for 1,066 seconds. For this achievement, operators provided twice the thermal power to EAST as they did for the 2023 feat, allowing the plasma to remain stable for longer.

At present, EAST isn't producing electricity. In fact, it is yet to reach a milestone called ignition: meaning it doesn't produce enough heat for more fusion reactions to occur, a.k.a. become self-sustaining. To produce usable electricity, a tokamak needs to maintain millions of degrees C for at least a few hours.

A nuclear fission reaction can be kicked off by shooting neutrons of suitable energy at the atoms of unstable nuclei like uranium. For fusion to occur, however, the nuclei need to be exposed to a temperature of at least 100 million degrees C

EAST is a testbed reactor for ITER, an international megaproject in which six countries around the world, including India, and the European Union are working together to build a tokamak that will sustain nuclear fusion that releases more energy than that required to sustain the plasma.

A need for alternatives

Crucially, EAST's successes are important for ITER's future because the latter has come under criticism for its delayed timelines and cost overruns. With a bill already upwards of euro 18 billion, ITER has been called the most expensive science experiment in history – at a time in which the high cost of doing cutting-edge science has put off many governments from pursuing it.

Some research groups have also been trying to achieve nuclear fusion using methods that require fewer (but still considerable) resources. For example, one alternative to achieving magnetic confinement is a device called a stellarator. Whereas a tokamak has a simple donut shape, a stellarator has a more twisting design that is harder to build and operate. But its advantage is that it does away with the need for a poloidal magnetic field to achieve a twisting magnetic field inside the vessel. Instead it achieves the desired field configuration using a more complicated architecture of external magnets.

Other designs do away with magnetic confinement altogether. In one technique, for example, a pellet of deuterium and tritium is hit with laser beams of extreme power.

Whereas a deuterium nucleus has one proton and one neutron, a tritium nucleus has one proton and two neutrons. When the beams strike the pellet, the energy causes the nuclei to compress and fuse, releasing more energy. The heat from the reactions could then be diverted to a pool of water, generating steam that moves a turbine and produces electricity.

In the light of lasers

In 2008, scientists at the Lawrence Livermore National Laboratory in the US began a project called 'Laser Inertial Fusion Energy' (LIFE) to test this idea. While they were able to develop lasers with the requisite power, the fusion output was found to be much lower than they had predicted. The project was cancelled in 2013 after it became clear it couldn't achieve ignition.

But another project at the same institute, called the National Ignition Facility (NIF), achieved the milestone in 2022. At the NIF, a system of 192 high-power lasers delivers 2.05 megajoules (MJ) of energy towards a small cylindrical capsule at the centre of the room. This capsule, called a hohlraum, is made of uranium-238 and plated with gold. It's about 2 mm wide. It contains a thin shell made of a polymer inside which deuterium and tritium atoms are placed in a frozen or gaseous state.

When electromagnetic radiation from the lasers enters the hohlraum, it strikes the inner wall and produces X-rays. Over a short span of time, the nuclei are bombarded by X-rays from all directions inside the hohlraum. Eventually they compress the fuel sample in a symmetric way and heat it up rapidly to around 100 million degrees C. In 2022, the NIF said it had used this technique to produce 3.15 MJ of energy, crossing the breakeven point.

On the other hand, ITER was launched in 2007 and is expected to produce its first plasma only in 2033, and over time also devour the world's meagre tritium reserves. The desperate need for sources of clean energy means achieving nuclear fusion may just be a matter of time, especially if governments continue to trust the scientists working on the required technologies. But which technology gets it over the line – magnetic, inertial or something else – remains to be seen. Some private sector enterprises are also beginning to enter the mix.

While the NIF has demonstrated a proof-of-concept ignition, EAST is keeping tokamaks in the hunt with its large scale and steady progress.

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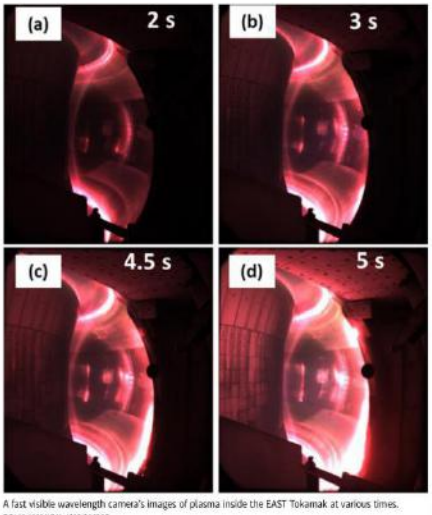

A fast visible wavelength camera's images of plasma inside the EAST Tokamak at various times.

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‘India-Bangladesh ties should not be regime-specific’

Bangladesh Foreign Affairs Adviser says India should place restrictions on former Prime Minister Sheikh Hasina to stop her from making public statements that may destabilise situation in his country; Hindus and other minorities are equal citizens and the government is doing its job of protecting them, he adds; interim government may hold talks with Adani group on power projects, he says

INTERVIEW

Touhid Hossain

Suhasini Haidar
MUSCAT

India-Bangladesh ties should not be “regime-specific”, Bangladesh Foreign Affairs Adviser Touhid Hossain said on Monday. After holding talks with External Affairs Minister S. Jaishankar at the eighth Indian Ocean Conference here, he said Prime Minister Narendra Modi and Bangladesh Chief Adviser Muhammad Yunus might finally meet on the sidelines of the BIMSTEC Business Summit in April in Thailand. Excerpts:

Tell us about your meeting with Mr. Jaishankar amid tensions in India-Bangladesh ties.

To be frank, ties were very tense [when the interim government took over]. Compared to six months ago, definitely, we can interact with each other much better now.

One of the concerns India has repeatedly made public is over the violence against minorities, particularly the Hindu community in Bangladesh. Do you think that your government has been able to control this? And does India agree?

The Hindus or other minority communities that live in Bangladesh are exactly equal citizens with the Muslim or the majority community. They are equal citizens with equal rights and equal rights to protection. And it is the Bangladesh government’s job, which it is doing, to protect them, like protecting any other citizen of the country. Unfortunately, just after 5th of August [in 2024, when Sheikh Hasina resigned], there has been an almost unexplainable frenzy in the Indian media about this issue, mostly based on falsehood. I would invite you to go through the findings in the UN report, which has been published two days ago and says that [the interim government was not involved in the violence].

On the subject of former PM Sheikh Hasina, what exactly are you hoping India will do?

There are cases against [Ms. Hasina], and we have asked for India to send [Ms. Hasina] back to us to face trial. As long as the Indian government doesn’t do that, we would expect they can at least put some restrictions on her so that she does not make incendiary and false statements which instigate reactions among the people because the issues are still very, very raw.

For 15 years, she was in power, and people feel very, very strongly angry about her actions.

So they would like to see that she does not try to destabilise the situation inside Bangladesh.


REUTERS

Even so, how do you justify that a mob was allowed to ransack Sheikh Mujibur Rahman’s house, allegedly over Ms. Hasina’s speech?

A mob may do something but that does not have government support.

Your government has thus far sent only a *note verbale*, a diplomatic note asking for Ms. Hasina’s return. Will there be a formal extradition request?

We have an extradition treaty, and we have given back many of the accused to India to face trial, and I think India can give her back to face trial in Bangladesh.

But for that extradition treaty, you would have to go through the trial process. You would have to have sufficient warrants for the MLAT (mutual legal assistance). When does Bangladesh hope to begin that process?

Well, the process is already on because the cases are now in court. We cannot compel them to do it [in a hurry]. And we are also aware that she might also have recourse to the Indian judicial system. It might take time but what we want is that she does not make incendiary statements while she is in India.

On the Adani Power agreement, recent reports suggest the Bangladesh government is negotiating for a restoration of power supply from the group. Could you confirm that the Bangladesh government intends to continue with the agreement with the Adani Group for power supply?

We have to go by the agreement but if we feel that it has not been done properly, we can always mutually agree to look at it again. And in my opinion, we will look at it with the Adani Group and try to make it more rational. I am not a technician, technical person, so I cannot go into exact details but then there has been comparison with other deals, and it was seen that the power tariffs have been unusually high.

You have met our External Affairs Minister twice now but Prime Minister Modi and Chief Adviser Professor Yunus have not yet met. Do you expect a meet between them at the BIMSTEC Summit in April?

So far, the two leaders have not been at any venue on the same day, so there was no opportunity for them to meet. But I personally believe that there is willingness from both sides to meet and discuss things freely and frankly. That helps. In our culture in the region, when the ‘top bosses’ sit together, they can resolve an issue just in one word, rather than leaving it to people like us to negotiate for years. I think a meeting between the two would be a good thing to happen in that sense...and is likely if they both attend the BIMSTEC Summit.

As a veteran of foreign policy, and the India-Bangladesh relationship, particularly the good ties between them since 2009, do you think India and Bangladesh can return to that state in the relationship?

Well, why only look at the past 15 years? Even during the BNP’s time (1996-2001), the trade within the two countries increased exponentially. I don’t think the relationship has to be regime-specific. So I think whichever government, whichever party, is in power in our two capitals, that should not affect our relations, because elections are based on mutual interests and mutual respect. And I believe that both our sides realise what is in their interest, and we can have very good relations with India.

(For full interview, visit newsth.live/TouhidInt)

Gyanesh Kumar named CEC after panel meeting

The former IAS officer who was serving as an Election Commissioner is to assume office tomorrow; Haryana Chief Secretary Vivek Joshi appointed Election Commissioner; Congress had sought adjournment of the PM-led panel's meeting as the Supreme Court is set to hear a challenge to the new law under which the selection had been made

Sreeparna Chakrabarty
NEW DELHI

Election Commissioner Gyanesh Kumar has been appointed Chief Election Commissioner after a meeting of a three-member committee headed by Prime Minister Narendra Modi in New Delhi on Monday. He will assume office on Wednesday, when the Supreme Court will hear the challenge to a new law under which the selection has been made.

The Law Ministry notified the appointment late on Monday. Haryana Chief Secretary Vivek Joshi has been appointed an Election Commissioner.

Mr. Kumar's appointment came even as the Congress asked the government to "adjourn" the meeting of the panel till Wednesday as the case is before the court.

Mr. Gyanesh Kumar, a 1988-batch former Indian Administrative Service officer belonging to the Kerala cadre, retired as Union Cooperation Secretary on January 31, 2024. On March 14, 2024, he was appointed Election Commissioner.

While the Prime Minister heads the selection panel, Home Minister Amit Shah and Leader of the Opposition in the Lok Sabha Rahul Gandhi are its members.

New role: Gyanesh Kumar was the senior most Election Commissioner under his predecessor Rajiv Kumar. FILE PHOTO

'Partisan mechanism'

Congress sources said Mr. Gandhi left the meeting at the Prime Minister's official residence, after submitting his objections in writing.

Mr. Gandhi was not present when the names were discussed. At a press conference after the meeting, the Congress said the new law under which the committee had been constituted created a "partisan" and "non-neutral" mechanism for the selection of Election Commissioners. The party asked the government to seek an early hearing and early disposal of the application in the court.

"At the outset, we cannot ignore that this committee is in clear and direct violation of the Supreme Court's judgment of March 2, 2023 where a Constitution Bench of the Supreme Court in *Anoop Baranwal vs Union of India* declared that the CEC and the ECs should be appointed by a committee comprising the Prime Minister, the LoP [Leader of the Opposition] and the CJI [Chief Justice of India]," Congress leader Abhishek Manu Singhvi said.

While maintaining that the Leader of the Opposition participated in the meeting, Mr. Singhvi said: "What he said, what happened, what he discussed, etc., is not for me or you to speculate upon. We can't say anything. What happened you will come to know in the next 24-48 hours."

Congress treasurer Ajay Maken, who was present at the press conference, said, "We cannot say more. We have put our stand forward. What happened in a secret meeting, we cannot say as we respect secrecy."

This is the first time that a CEC is selected under provisions of the Chief Election Commissioner and other Election Commissioners (Appointment, Conditions of Service and Term of Office) Act, 2023. Before this, Mr. Kumar and Sukhbir Singh Sandhu had been selected as Election Commissioners under the new law.

Earlier, the CEC and Election Commissioners were appointed by the President after recommendations of the government. The new law came into effect after the Supreme Court, in its ruling in March 2023, mandated that a selection panel be formed with the Prime Minister, the Leader of the Opposition in the Lok Sabha, and the Chief Justice of India.

The court had said the order would hold good until a law was made by Parliament. The Centre though replaced the Chief Justice of India with a Union Minister on the panel when the law was passed, giving a dominant role to it in the appointment process.

'Consensus needed'

Mr. Kumar was the senior-most Election Commissioner after CEC Rajiv Kumar. In a farewell address, Mr. Rajiv Kumar said it was high time that NRIs were empowered to vote from their locations and a consensus was needed for remote voting mechanisms to facilitate crores of migrant voters.

He batted for biometric authentication at polling booths to tackle impersonation.