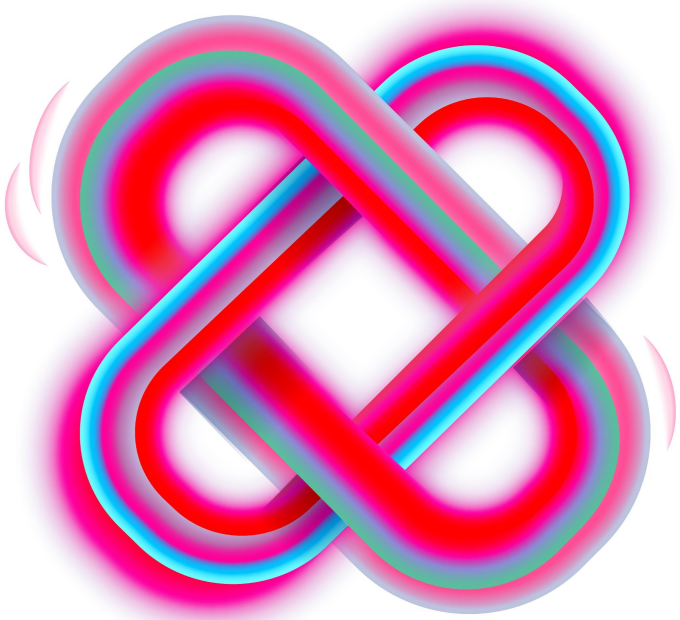


Powering the Future
Fusion & Plasmas

A long-range plan to deliver fusion energy and to advance plasma science

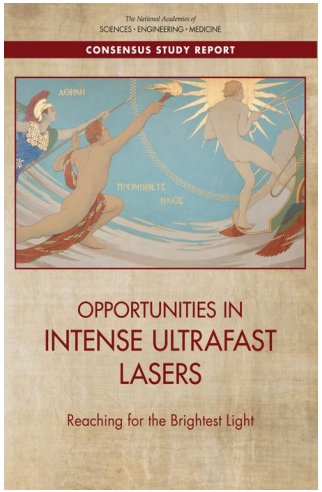
A report of the DOE Fusion Energy Sciences Advisory Committee

FPA Meeting, December 15, 2021

2018 Fusion Energy Sciences Advisory Committee Charge

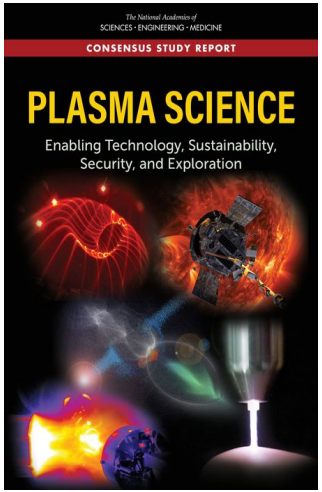
- Charge covers entire DOE Fusion Energy Sciences portfolio: "…should identify and prioritize the research required to advance both the scientific foundation needed to develop a fusion energy source, as well as the broader FES mission to steward plasma science."
- Two part process, community driven phase (APS DPP Community Planning Process) and FESAC-led phase
- "Optimized FES program over the next ten years" (FY22-FY31). Consider three budget scenarios: constant level of effort, modest growth (2% above inflation), and unconstrained but prioritized
- "...assume that the US Contributions to ITER project will continue throughout this entire period": focus on the non-ITER-project portion of the budget.

Context: Four important NASEM reports

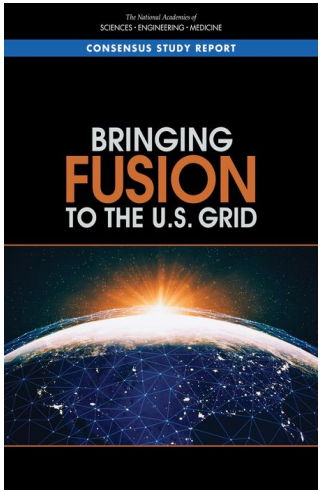


2018

2019



2020

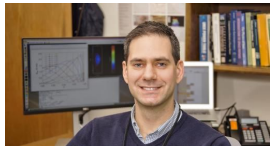


2021

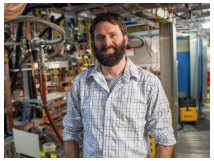
- Convey exciting opportunities in plasma science and technology and urgent need to accelerate the development of fusion energy, with the goal of a fusion pilot plant on a timescale to mitigate climate change

Successful Phase 1, thanks to CPP leadership and the community


Scott Baalrud


Nathan Ferraro


Lauren Garrison


Nathan Howard


Carolyn Kuranz


John Sarff

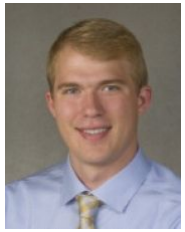

Wayne Solomon


Earl Scime

- APS DPP Community Planning Process (CPP): Year-long community-led process. Whitepapers, webinars, town halls and 5 major workshops; Open process, with community review/vetting of draft report
- Process not only enumerated the many scientific and technical opportunities, but did the hard work of establishing guidance for prioritization of these activities
- Consensus CPP report expresses community's excitement to move forward urgently to develop fusion power and advance plasma science and was the scientific and technical basis for the FESAC report

Thank you!

FESAC Long Range Planning Subcommittee


Scott Baalrud


Riccardo Betti


Troy Carter


Tyler Ellis


John Foster


Cameron Geddes


Arianna Gleason


Chris Holland


Paul Humrickhouse

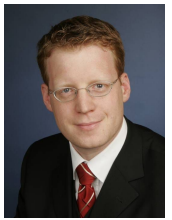

Chuck Kessel


Ane Lasa

Tammy Ma


Rajesh Maingi


David Schaffner


Oliver Schmitz


Uri Shumlak


Lance Snead


Wayne Solomon


Erik Trask


Francois Waelbroeck


Anne White

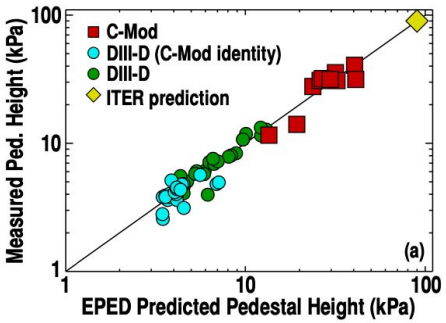

Don Rej (ex officio)

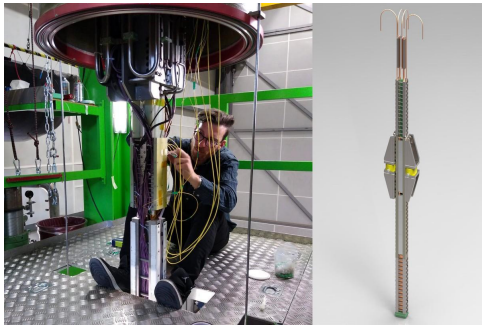
Final report published, web version available

- Subcommittee formed Feb 2020, worked completely virtually through 2020
- Draft report released publicly December 4, 2020
- Report approved by unanimous vote during FESAC meeting December 7-10, 2020
  - That approval required changes to draft to improve, clarify report
- FESAC changes implemented, report had professional editing and copy editing
- **Final report released Feb 15**
- **Web version of the report published in May**
- Report (web version + PDF) posted at http://usfusionandplasmas.org

Now is the time for fusion energy

— Now is the time to move aggressively toward the development of fusion energy. Scientific and technological innovations enable a unique US vision for economically attractive fusion energy, with the goal of a fusion pilot plant. Growth of a fusion energy industry is important for this vision and that industry is already seeded by $2B of investment.





Membership

FUSION INDUSTRY ASSOCIATION

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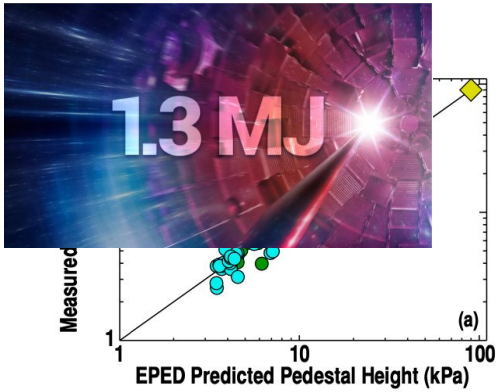

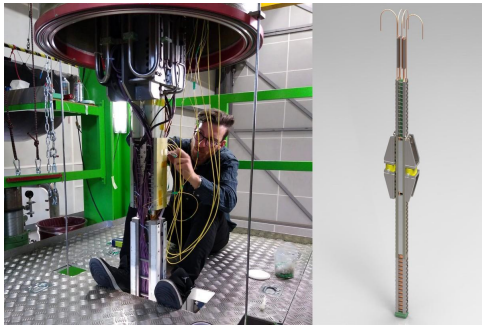

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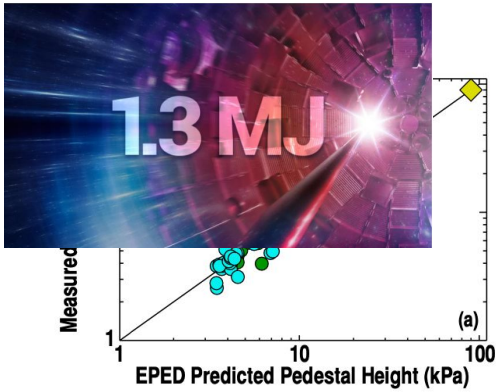

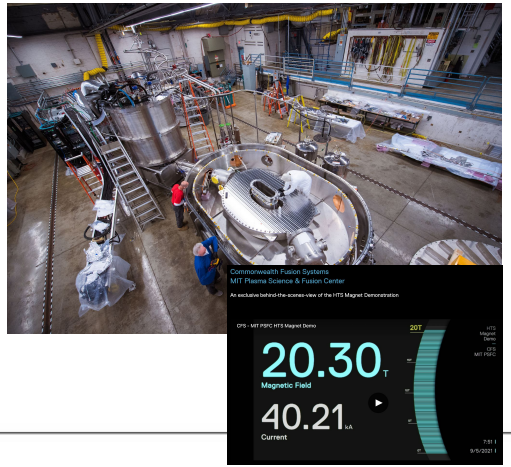

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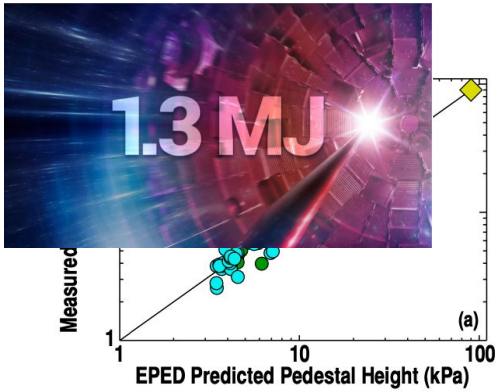
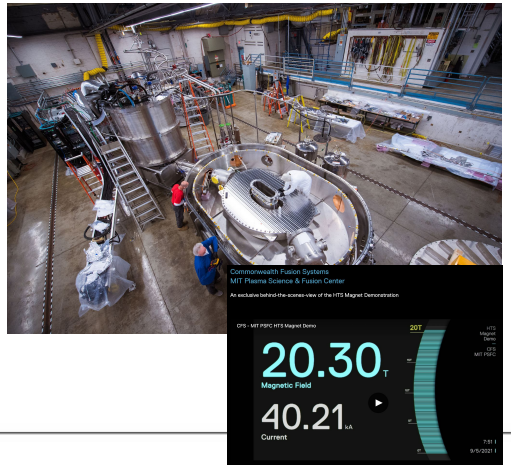




WSJ Wall Street Journal

Nuclear-Fusion Startup Lands $1.8 Billion as Investors Chase Star Power

Commonwealth Fusion Systems has raised more than $1.8 billion from the likes of Bill Gates and George Soros as startups join the quest to...

TechCrunch

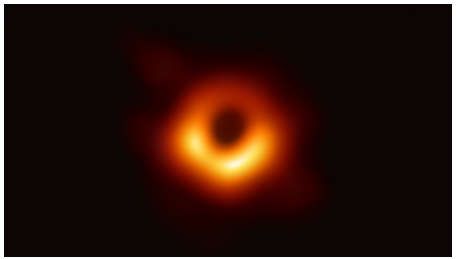
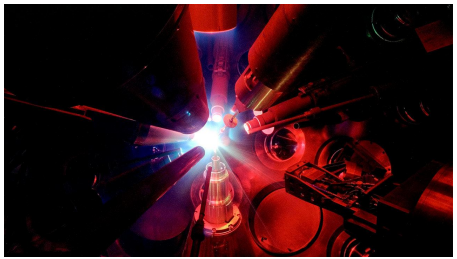
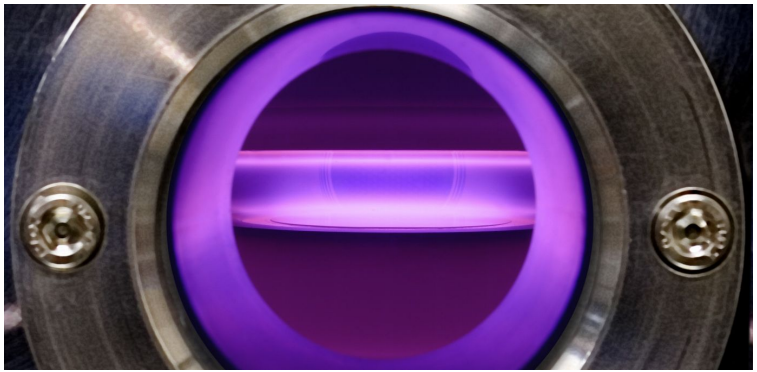
Helion Energy will use $500M Series E to power up its fusion energy efforts

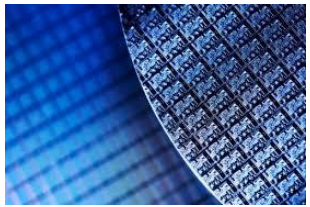
Helion Energy will use $500M Series E to power up its fusion energy efforts · The TechCrunch Top 3 · Startups/VC · The holiday shopping season is...

1 month ago

Plasma science and technology has far reaching impact

— Plasmas transform society. Far-reaching impact spans: advances key to enabling fusion energy; deeper understanding of our universe; creating exotic states of matter with the most intense lasers in the world; transformative applications that impact our everyday lives and have the potential to enable a more sustainable society



By partnering we can accelerate the timeline

- Partnerships accelerate progress.
  - International partnership, especially ITER, is critical.
  - Public–private partnerships have the potential to reduce time to commercially viable fusion and support the growth of a fusion energy industry.
  - Interagency partnerships can maximize progress in research and development.

World leadership is in our grasp, but we must act

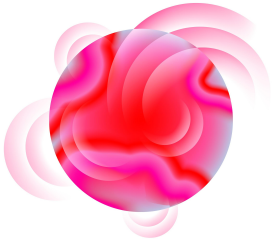
- Fusion and plasma research in the US have been world-leading; continued scientific leadership requires nurturing and agility.
  - The US is poised to create world-leading fusion industry, should be supported.
  - Leadership in key areas is threatened by the absence of investment in major new facilities to address critical R&D needs.

We speak with one voice in support of this strategic plan

- For the first time, scientists have created a long-range plan to accelerate the development of fusion energy AND advance plasma science. The fusion and plasma science research community not only identified important new opportunities, but did the hard work of prioritizing these through a consensus process.
- The plan conveys a vision for a vibrant research and development program that will bring significant benefit to society.

New directions for the FES program

The Fusion Science and Technology (FST) area should focus on establishing the scientific and technical basis for a fusion pilot plant by the 2040s



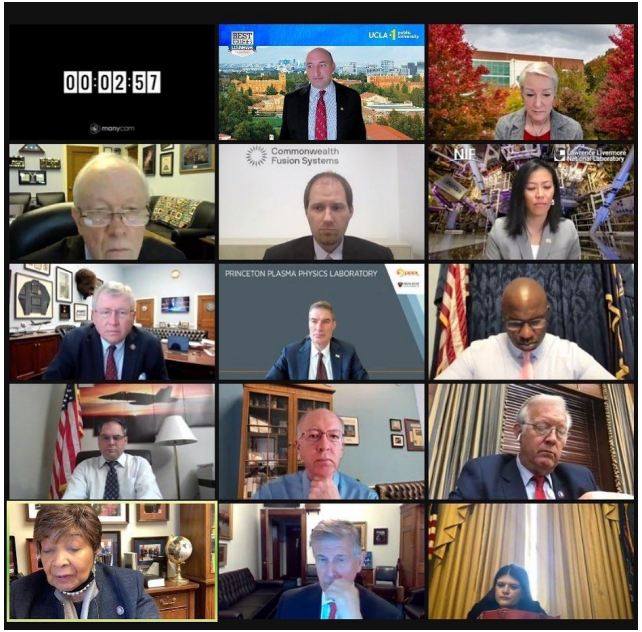
The Plasma Science and Technology (PST) area should focus on new opportunities to advance fundamental understanding, and in turn translate these advances into technologies that benefit society

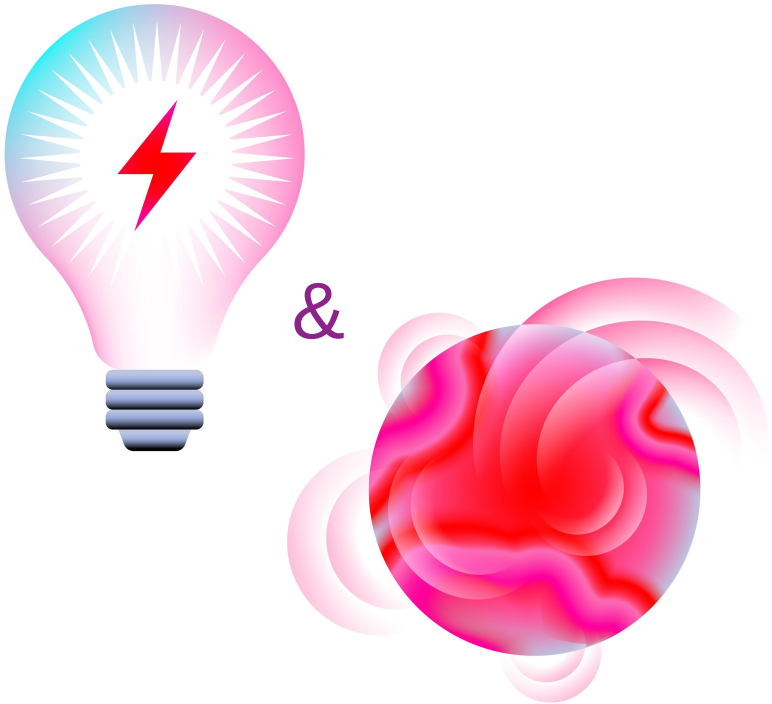
Report rollout presentations/briefings

- **Presentations to plasma/fusion institutions and community groups:** FPA, HEDSA, ANS FED, PPPL, ORNL, DIII-D/GA, Wisconsin, Michigan, VLT, US BPO, LLNL, MIT, UT Austin, U Wash, LANL, NERSC
- **Presentations to foreign plasma/fusion institutions:** I-DTT, Japan MEXT, DIFFER
- **Chevron:** presentation to energy transition team
- **Energy Sciences Coalition**
- **Congressional Staffers**
  - Fusion Day Congressional Briefing
  - Authorization committees staffers: House Science, Space & Technology Committee; Senate Energy & Natural Resources
  - Appropriation committees staffers: House Energy and Water; Senate Energy and Water Development

Report rollout presentations/briefings, cont.

- **Office of Management & Budget**
- **Congressional Hearing Nov 17**: “Fostering a New Era of Fusion Energy Research and Technology Development”
- **Undersecretary for Science & Energy Geri Richmond**





Thank You!

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