



# Development of the U.S. Burning Plasma Organization

*U.S. BURNING PLASMA ORGANIZATION*

APS/DPP Town Meeting  
Denver, CO Oct 25, 2005

by  
Raymond Fonck, for the

## US Burning Plasma Organization Steering Committee

S. Allen	R. Fonck
E. Marmor	D. Meade
S. Milora	G. Navratil
R. Nazikian	E. Oktay
S. Prager	N. Sauthoff
T. Taylor	N. Uckan
J. VanDam	



# What is the USBPO?

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*U.S. BURNING PLASMA ORGANIZATION*

- A U.S. fusion research community-based organization with the mission:

*Advance the scientific understanding of burning plasmas and ensure the greatest benefit from a burning plasma experiment by coordinating relevant U.S. fusion research with broad community participation.*



# Expectations for USBPO: Bring a Coherence to Burning Plasma Activities

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- Organize/coordinate/facilitate burning plasma R&D activities in the U.S. program as needed
  - U.S Program is rich in activities related to BP and ITER
    - Major facilities, ITPA, IEA, and bilateral agreements
    - Theory and Modelling, Adv. Computing, Diagnostics, VLT, TTF, SciDac, etc.
  - Advocate for BP program activities, both near-term and long-term
  - Optimize our participation in BP experiments on ITER and address issues beyond ITER
  - Integrate BP research program with the broader domestic program
    - Develop entry points to BP research activities for interested parties
    - Foster community ownership of BP research and ITER participation



# Establishing a U.S. BP Organization will be an Evolutionary Community Activity

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- **May 05: OFES commissioned BPO to start process**
  - USBPO will work with community and OFES to develop process/structure for this activity
  - Summer-Fall 05: community discussions and organization development
- **USBPO will evolve as activities grow and we progress through ITER decisions in coming years**
- **Be flexible in adjusting to evolving program**
  - Now: 'Burning Plasma' support R&D in experiments, modeling, and technology
    - Including, but not limited to, specific ITER Physics and technology tasks
  - Eventually: Plan for and pursue experiments in ITER, integrate findings to broader program



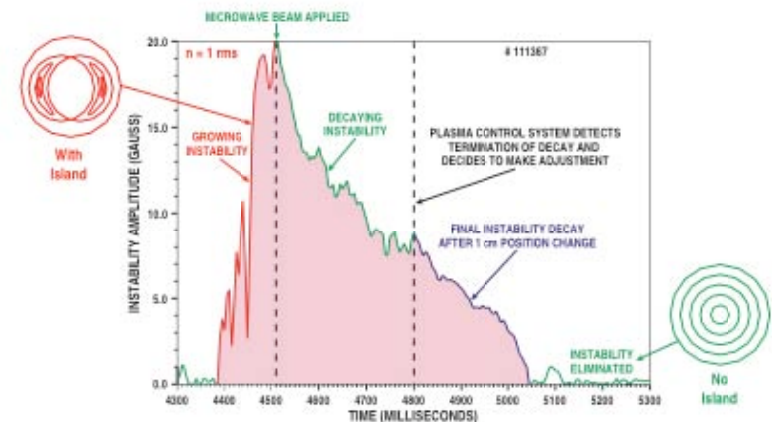
# Many Exciting BP R&D Opportunities Exist Now, Not 10 Years from Now

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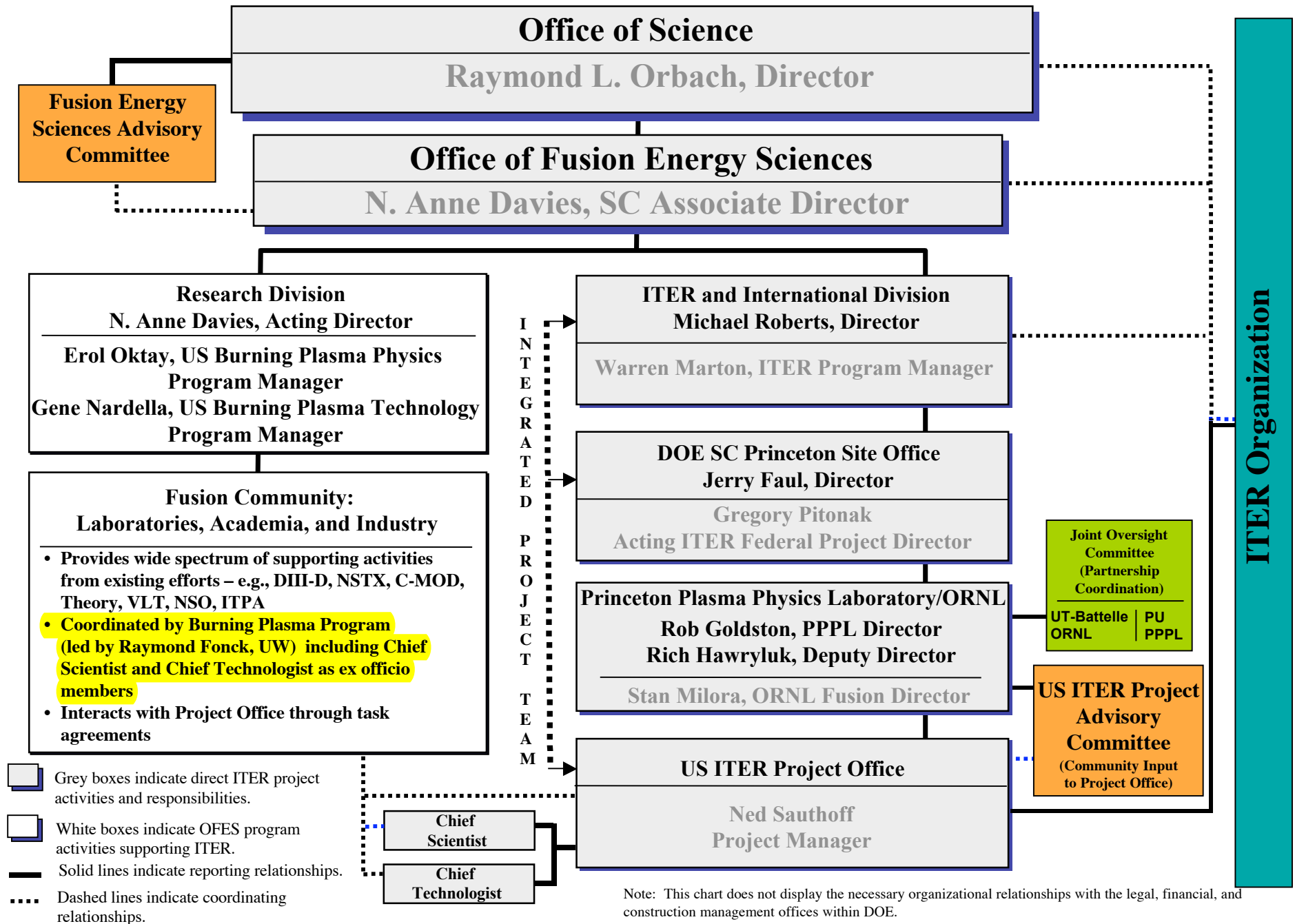
- National Academies NRC Burning Plasma Report

## *BP Research Opportunities in Next Decade:*

- Understand dynamics of edge Pedestal region
  - Physics and control of Edge-Localized Modes
  - Stabilization of neoclassical tearing modes
  - Physics and control of Edge-Localized Modes
  - Stabilization of neoclassical tearing modes
  - Develop ss & advanced tokamak regimes
  - The density limit and high density operation
  - Turbulence and transport
  - Plasma facing components and tritium interactions
  - Disruption avoidance and mitigation
  - Divertor Science & Technology development
  - Diagnostics of burning plasmas
  - Tritium breeding blankets
- **Note: these were clear to people outside the field!**
  - **USBPO should/will help identify and advocate for these activities**



# Management Structure for the US ITER Project and Program

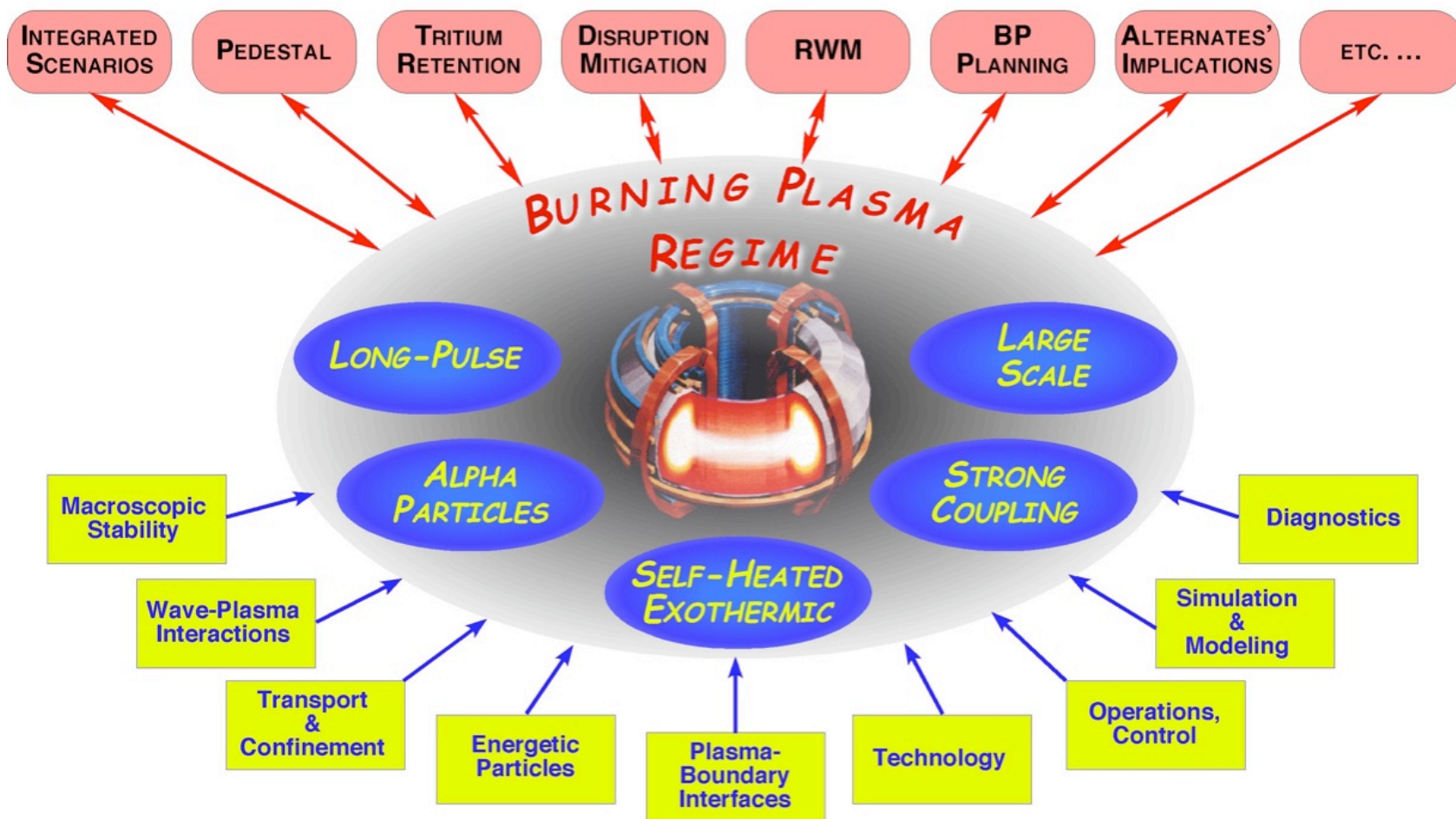




# USBPO: Help Apply Community Activities & Expertise to BP-Relevant Issues

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*USBPO CAMPAIGNS, TASKS (E.G.)*

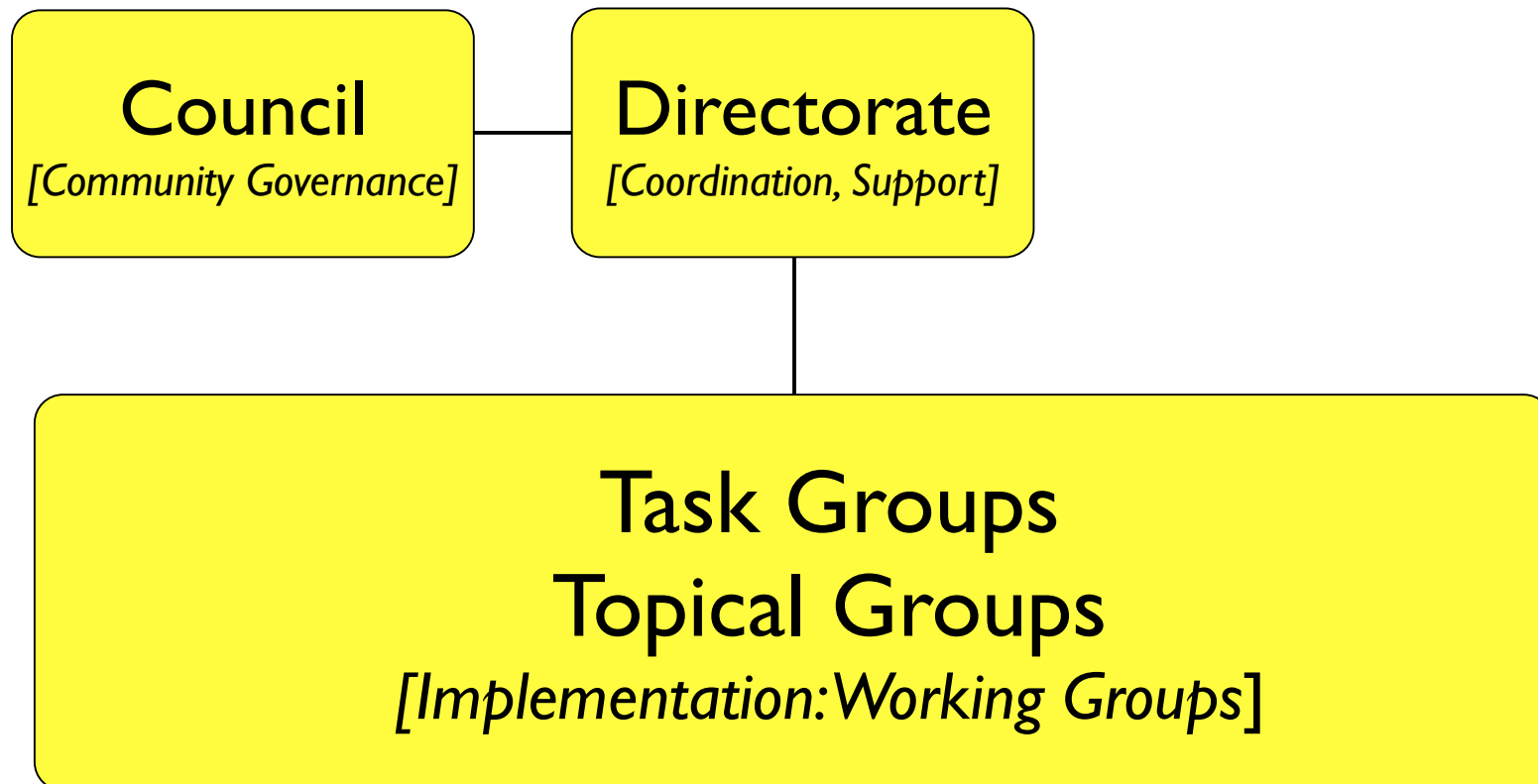


*PLASMA AND ENGINEERING SCIENCE TOPICAL EXPERTISE*



# First-cut Structure: USBPO Comprised of 3 Elements

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*Entry: Join Topical Groups of Interest via  
BPO web site*





# Execute Tasks using Cross-Cutting Expertise in Community

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	<b><i>Tasks (examples only!)</i></b>						
<b><i>Topical Expertise</i></b>	<b>Integrated Scenarios</b>	<b>Pedestal</b>	<b>Tritium Retention</b>	<b>Disruption Mitigation</b>	<b>RWM</b>	<b>Radiative Divertor</b>	<b>etc. ...</b>
<b><i>Macroscopic Stability</i></b>	X	X		X	X	X	?
<b><i>Wave-Plasma Interactions</i></b>	X			X			?
<b><i>Transport Confinement</i></b>	X	X	X			X	?
<b><i>Energetic Particles</i></b>	X		X	X			?
<b><i>Plasma-Edge-Wall</i></b>	X	X	X	X		X	?
<b><i>Technology</i></b>	X		X	X	X	X	?
<b><i>Operation Scen. Control</i></b>	X			X			?
<b><i>Simulation Modelling</i></b>	X	X		X	X		?
<b><i>Diagnostics</i></b>	X	X	X			X	?



# Some Example Topical Experts Groups (& some related existing activities)

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- MHD, Macroscopic Plasma Physics (ITPA, MHD group)
- Confinement and Transport (ITPA, TTF)
- Plasma-Boundary Interfaces (ITPA, ECC, TTF, VLT/PFC)
- Plasma-wave Interactions (H&CD, ITPA)
- Energetic Particles (TTF, ITPA)
- Fusion Engineering Science (VLT)
- Modeling and Simulation (FSP, TCC, SciDac, etc.)
- Operational Scenarios and Control (ITPA)
- Diagnostics (ITPA, HTPD)
- Integrated Scenarios (ITPA)

future: Join Topical Groups at <http://www.burningplasma.org/>



# Some Example First Task Groups

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- Finite-term, discrete task, defined deliverables; cross-cutting
- Workshop breakout groups: Summarize progress; ID issues; Develop plan
  - Integrated scenarios
    - Energetic Particles
    - Macroscopic Stability
  - Boundary
  - Diagnostics and Control
    - Transport & Confinement
    - Technology
- IPO Physics Tasks (e.g., 2005)
  - RWM Control
  - VDEs, Disruptions & their Mitigation
  - Fast particle Confinement
  - ICRF heating and current drive
  - Effects of radiation transfer on divertor plasma
- Possible long-term?
  - Pedestal
  - Integrated Scenarios



# Burning Plasma Workshop

## Planned for Dec '05

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- Dec 7-9 at ORNL
- Driven by ITER decision and need to start organizing
- Topics:
  - Engaging the US fusion research community in development of USBPO
  - Advances in BP issues since Snowmass 2002
  - Status and plans for ITER (domestic and international)
  - Planning US Burning Plasma research activities in general, and for ITER specifically
- More info at [http://www.burningplasma.org/WWS\\_05.html](http://www.burningplasma.org/WWS_05.html)



# Workshop Questions: Begin to Address or Suggest a Plan for Addressing BP Issues

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- **Recent Developments**
  - What major BP-related developments (theory, modeling, experiment, technology) have occurred in this area since Snowmass 2002?
- **Implications and Outstanding Issues**
  - What issues remain to be resolved for a successful BP experiment in ITER?
  - What are the consequences of resolving these issues, or not, in the next ~10 years?
  - What issues should be resolved by a successful BP experiment?
- **What the U.S. fusion community should do**
  - What contributions can/should the U.S. fusion program make to resolving these issues?
  - How should the BPO be structured to best help the community make these contributions?



# Workshop Plenary Speakers & Discussion Leaders Identified

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- Introduction
  - Engaging the US fusion community in development of the USBPO (R. Fonck)
  - Status and Plans for ITER – Domestic (C. Strawbridge)
  - International Perspective and ITPA (R. Stambaugh)
  
- Topical Plenary Presentations
  - Technology (S. Milora)
  - Macroscopic Stability (J. Menard)
  - Transport/Confinement (W. Houlberg)
  - Pedestal Physics (A. Leonard)
  - Boundary (B. Lipschultz)
  - Energetic Particles (W. Heidbrink)
  - Integrated Scenarios (T. Luce)
  - Diagnostics and Control (R. Boivin)
  
- Topical Break-out sessions (co-leaders)
  - Integrated Scenarios (A. Hubbard, C. Kessel)
  - Macroscopic Stability (C. Hegna, G. Navratil)
  - Boundary (S. Krasheninnikov, R. Maingi)
  - Transport/Confinement (C. Petty, P. Terry)
  - Diagnostics and Control (S. Allen, D. Johnson)
  - Energetic Particles (B. Breizman, J. Snipes)



# What to do NOW?

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- Sign up for Workshop Access
  - ORNL Security Information Required for Workshop Participation:
    - **NOTE: This applies to everyone (including US citizens) who is considering attending. Submitting Advance Security Info does not obligate workshop attendance, but not submitting it guarantees no attendance!**
    - **Must apply by Nov. 7, 2005 !**
    - see <http://www.burningplasma.org> > Workshop > Security Form
- Sign up for BPO participation
  - Identify Resource Group interests
  - Offer suggestions for Tasks
  - will be available soon at <http://www.burningplasma.org/>



# Summary

*U.S. BURNING PLASMA ORGANIZATION*

- USBPO = Fusion research community-based effort to advance Burning Plasma Science and optimize benefits from participation in BP experiments
- Facilitate fusion community coordination of, participation in, and ownership of BP program activities
  - Both now and in the future
- Develop areas of focus and excellence to prepare us to participate and compete in the ITER era, and look beyond...
- Need active participation from community to succeed
  - Join USBPO at <http://www.burningplasma.org/>
- Planning a community BP Workshop in near-future
  - **Security Form: Deadline is Nov. 7, 2005!!**





# We Need Your Input and Help!

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- How to evolve USBPO?
- What is an effective structure?
  - Management of USBPO
  - Topical Groups / Task Groups?
- How to add value to program activities, and not increase demands on programs?
  - How to interact with existing structures?
- What should scope of USBPO activities be?
- (Add your questions here ...)