Lithium Research Priorities (LRTSG PAC talk Feb 2010):

Over-arching goal:

Develop and understand novel Li-based PMI solutions for NSTX, NSTX-upgrade, and a low aspect ratio high-heat-flux / component testing facility. (RENEW Theme IV.)

FY10 priorities:

- Develop and understand high-performance operating scenarios utilizing a liquid lithium divertor (LLD) for pumping and particle control.
- Understand and minimize the sources and accumulation of plasma impurities arising from lithium conditioning of the PFCs.
- Investigate lithium surface chemistry

FY11 priority: Milestone R11-3:

- Assess the relationship between lithiated surface conditions and edge and core plasma conditions. (RENEW Theme III.)
- Steady state high heat flux handling is important longer term goal.

Experimental Proposals:

Four areas of research:

1. LLD commissioning (XMP)/ characterization (XP) (today)
2. Particle Control 3 days Priority 1
3. Impurity control 2.5 days Priority I
4. Other 2.5 days Priority II

Note: Submissions and presentations from December 2009 Research Forum are at:
http://nstx-forum-2010.pppl.gov/index.html

- Piggyback experiments with new diagnostics: supertile, PMI probe, IR camera ….
- CC XP: LLD Physics Survey 2d (Gerhardt) aimed at developing variety of discharges for use by all TSGs.
- ASC XPs on by ELM pacing (Canik), ICRF heating (Bell)…
- General remarks.

Particle Control:

Group XP 1002 on particle control, Priority I, 3 days:

1. 'Recycling and Pumping characterization of the LLD module' (Soukhanovskii)
2. 'Effective SOL particle lifetime and generation of SOLC and effects on edge' (Jarowski)
3. 'High resolution measurements of modifications to edge parameters by lithium PFC coatings' (Kallman)
4. 'D retention with LLD' (Skinner)

- Modelling (Maingi, Soukhanovskii…)

- Please send input to Vlad.
- Group review scheduled next Friday 26th B252 10:00 AM

- Note: "Qualification of LLD…" XP (Gerhardt) is now separate CC XP

Impurity Control:

Priority I, 2.5 days:

1. 'Can impurities be purged from the core … with aerosol' (Mansfield)
2. 'Understanding and eliminating High-Z accumulation during ELM-Free H-modes' (Mansfield) (both 1. and 2. allocated 0.75 d)

   review tentatively scheduled Wednesday 10:00 AM May 3 B252
3. 'Impurity reduction by diffusive Li injection' 0.75 d (Skinner) (+0.5 CC d if warranted).

   review tentatively scheduled Wednesday 10:00 AM May 3 B252
4. 'Core impurity density and radiated power reduction using variations in LLD divertor conditions' 1 d (Soukhanovskii)

   review tentatively scheduled Wednesday 10:00 AM May 10 B252

- Modelling (Brooks, Pigarov, Stotler, Maingi, Soukhanovskii…)

- Note: Related ASC XPs on ELM pacing (Canik), RF core heating (Bell)…

Other:

Priority II, 2.5 days:

1. ‘Evaporating Li into the SOL to reduce heat fluxes’ 0.5 d (Gray)
2. ‘Characterization of LLD with two-color camera’ (McLean) (0.5 d)
3. ‘Creation of disruption database during LLD operation’ 0.5 d (McLean).
4. ‘Mapping of Te along Divertor Surfaces…’ 0.5 d (Takahashi)
5. ‘LLD decommissioning’ 0.5 d (Kugel).

- Priority II XPs subject to available run time.
- Reviews will be ~ May - before mid-run assessment

Remarks:

- *"3. BP or Li TSG experiments to better characterize the sources of impurities should be revisited/reconsidered w.r.t. run-time for the FY10 run if these are not of sufficiently high priority or interest right now.*
  Is most of the core C coming from the divertor, or CS/first-wall? what are the relative contributions? If we don't know this well, let's find out more in FY10."
  [Jan 8 email from Jon: Re: Mo tiles on the NSTX horizontal IBD for FY11 run - what do you think? (inspired by Re: LRTSG PAC presentations)]
- *"those activities that strengthen edge/boundary/ divertor themes should be strengthened even if this means some delay in core-specific research themes."*
  [PAC preliminary feedback]

Is this an invitation to ask for more run time ?

Potential additional XPs:

- 'Li Dropper and LLD in combination' ? 0.5 d (Mansfield).
- 'Density pumpout with increased Li and SGI at rampup' ? 1 d (Skinner).
- 'CH4 puffing and transport to core plasma' ? 1 d (McLean / Soukhanovskii)
- *Your favourite new idea here !*