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Towards a Lithium Radiative / Vapor-Box Divertor[1] ROBERT GOLDSTON, Princeton Plasma Physics Laboratory, MARIUS CONSTANTIN, Yale University, MICHAEL JAWORSKI, Princeton Plasma Physics Laboratory, RACHEL MYERS, Princeton University, MASAYUKI ONO, JACOB SCHWARTZ, Princeton Plasma Physics Laboratory, FILIPPO SCOTTI, Lawrence Livermore National Laboratory, ZHAONAN QU, Princeton University — Recent research has indicated that the peak perpendicular heat flux on reactor divertor targets will be hundreds of MW/m^2 in the absence of dissipation and/or spatial spreading. Thus we are attracted to both enhanced radiative cooling and continuous vapor shielding. Lithium particle lifetimes $\leq$ 100 micro-sec enhance radiation efficiency at T <10 eV, while lithium charge-exchange with neutral hydrogen may enhance radiative efficiency for T >10 eV and n_0/n_i >0.1. We are examining if the latter mechanism plays a role in the narrowing of the heat-flux footprint in lithiated NSTX discharges. In parallel we are investigating the possibility of immersing a reactor divertor leg in a channel of lithium vapor. If we approximate the vapor channel as in local equilibrium with lithium-wetted walls ranging from 300°C at the entrance point to 950°C 10m downstream in the parallel direction, we find that the vapor can both balance reactor levels of upstream plasma pressure and stop energetic ions and electrons with energies up to at least 25 keV, as might be produced in ELMs. Each 10 l/sec of lithium evaporated deep in the channel and recondensed in cooler regions spreads 100 MW over a much wider area than the original strike point.

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