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Reduced ELM heat loads from increased magnetic field-line length in snowflake configurations[1] T.D. ROGNLIEN, LLNL, D.D. RYUTOV, M.V. UMANSKY — A major concern for fusion devices is the temperature rise of bounding material surfaces from plasma energy exhaust. For short bursts of energy deposition, as from edge-localized modes (ELMs), the temperature rise scales as the total energy deposited divided by the square root of the burst duration, T_b. The time T_b is known to depend on electron and ion convective and conductive transport along the field line, electron and ion collisional equilibration, and radiative losses. The conduction time scales as the field-line length, L, whereas the conduction time scales as L^2. The snowflake configuration naturally has a much larger L than the conventional X-point divertor, thus yielding larger T_b, and reduced surface temperature rise. The quantitative impact for the snowflake is presented through the comparison of 3 models: 2-point analytic scaling, 1D along a field line, and 2D including full snowflake tokamak geometry.

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