```matlab
function Unew = solvePoisonEq(dU, Vold, nold, eps, Ni, dx)
    e = 1.6e-19; eVtoJ = e; JtoEv = e^(-1);
    k_B = 1.38e-23; eps0 = 8.85e-12;

    T = 300;
    Vref = k_B*T*JtoEv;

    lenV = length(Vold);

    d1 = [ones(1, lenV-2), 0];

    d2 = -1-(eps(3:end)./eps(2:end-1))-(((dx^2)./eps(2:end-1).*(e*nold(2:end-1)/(eps0*Vref))));
    d2 = [1, d2, 1];

    d3 = eps(3:end)./eps(2:end-1);
    d3 = [0, d3];

    dfree = ((dx^2)./eps(2:end-1))*(e/eps0).*(nold(2:end-1).*(1-Vold(2:end-1)/Vref)-Ni(2:end-1));
    dfree = [0, dfree, dU]';

    Matrix = diag(d1, -1) + diag(d2) + diag(d3, 1);
    Unew = (Matrix\dfree)';
end
```