To answer the question of how driving a second parallel ground rod would affect the peak voltage developed, consider the following:

From the 2/9/21 PEG presentation, for a single ground rod the peak voltage across the ground rod is:

$$V_1 = \frac{A\rho I_{max}\left[arcsin\left(\frac{2s}{d}\right)+arcsin\left(1-\frac{d}{2s}\right)\right]}{180\pi s}\left[ln\left(\frac{4s}{a}\right)-1\right] \qquad (11)$$

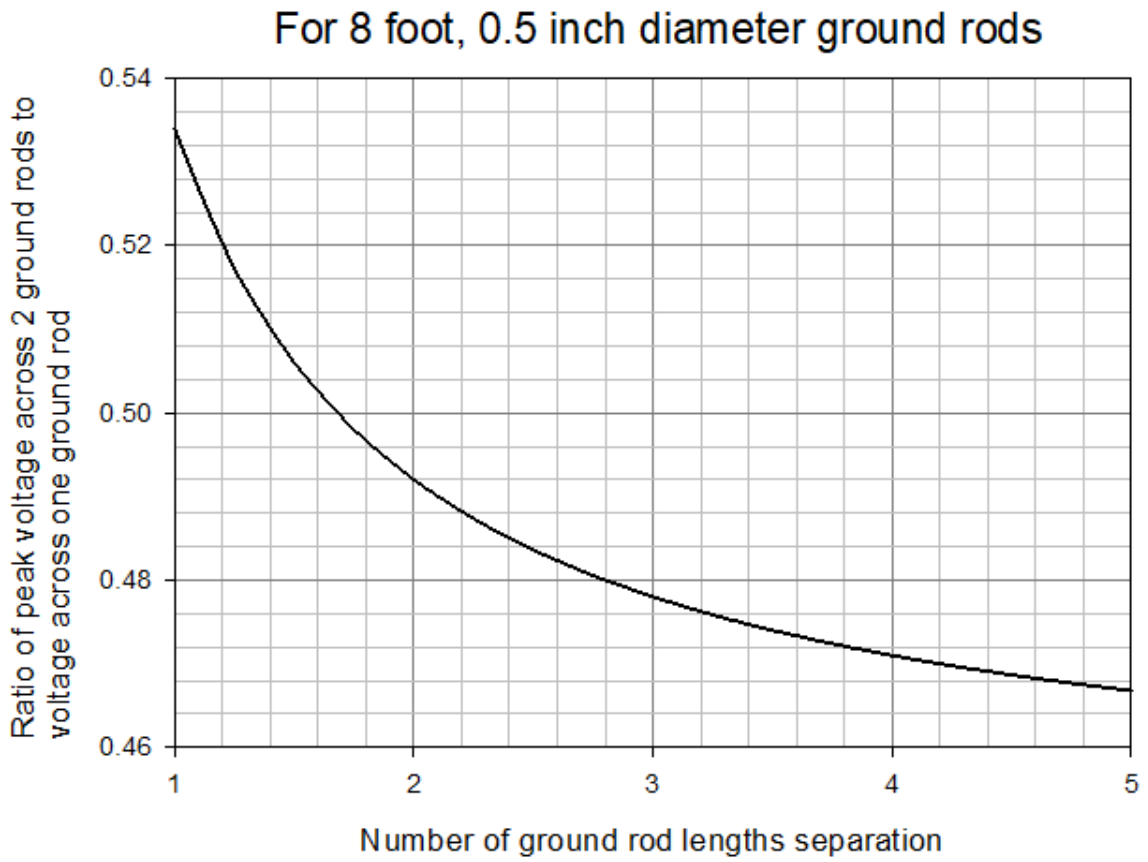
Using Grcev's [3] equation A1-2 (valid for D ≥ s), for two parallel ground rods separated by a distance D

$$V_2 = \left[\frac{1}{2}\right]^{0.9}\frac{0.9A\rho I_{max}\left[arcsin\left(\frac{2s}{d}\right)+arcsin\left(1-\frac{d}{2s}\right)\right]}{180\pi s}\left[ln\left(\frac{4s}{a}\right)-1+\frac{s}{D}\right] \qquad (A)$$

The ratio of the peak voltage V_2 developed across two parallel ground rods to the peak voltage V_1 developed across a single ground rod is:

$$\frac{V_2}{V_1} = \frac{0.9\left[ln\left(\frac{4s}{a}\right)-1+\frac{s}{D}\right]}{2\left[ln\left(\frac{4s}{a}\right)-1\right]} \qquad \text{(B)}$$

As an example of how much driving a second ground rod reduces the peak voltage, consider two 8 foot ground rods 0.5 inches in diameter separated by a distance D. The graph on the next slide shows how much the second ground rod reduces the peak voltage, as a function of the separation distance D. The value of the ratio at 5 ground rods separation is less than the near 0.5 value expected due to the 0.9 correction factor needed for A for 2 rods.


For 8 foot, 0.5 inch diameter ground rods
Ratio of peak voltage across 2 ground rods to voltage across one ground rod
0.54
0.52
0.50
0.48
0.46
1
2
3
4
5
Number of ground rod lengths separation