Changing C Dimensions

A parallel-plate capacitor has plates with equal and opposite charges, separated by a distance $d$. The capacitor is not connected to a battery.

Suppose the plates are pulled apart until separated by a distance $D > d$. Does the potential difference between the plates:

1. Increase
2. Decrease
3. Stay the same
Changing C Dimensions

(1) Potential Increases

The electric field doesn’t change when you change the distance between the plates, so:

\[ V = E \ d \]

As \( d \) increases, \( V \) increases.
Changing C Dimensions

A parallel-plate capacitor, disconnected from a battery, has plates with equal and opposite charges, separated by a distance \( d \). Suppose the plates are pulled apart until separated by a distance \( D > d \). How does the final electrostatic energy stored in the capacitor compare to the initial energy?

1. The final stored energy is smaller
2. The final stored energy is larger
3. Stored energy does not change.
Changing C Dimensions

(2) The stored energy increases

As you pull apart the capacitor plates you are increasing the amount of space in which the E field is non-zero and hence increase the stored energy. Where does the extra energy come from? From the work you do pulling the plates apart.