

## 8.02 ESG Independent Study

### Unit 4: Work and Energy

Unit three considered the potential and its relation to an electric field. Since the field acts on charges which are physical objects, we need to look at work and energy involved in assembling collections of charges. We will see that due to the nature of electric interactions (like charges *repel*), the field itself contains energy. This might suggest that the notion of an electric field is more than just a convenient way of expressing Coulomb's law.

**Objectives:** After completing this unit, you should be able to calculate the work done on assembling a system of electric charge and be able to express this energy in terms of the energy density associated with the electric field.

#### Suggested Procedure:

1. Read section 24.3 and review 23.1 in UP11. If you are unfamiliar with capacitors 24.1 should be helpful; you'll need it for Unit 6 anyway. Suggested problems include 3, 6, 50, 80 from chapter 23 and also problem 24.29.  
or,
2. Review chapter 1 of Purcell, especially section 14 & 15; these two sections contain a lot of important material. Suggested problems include pp. 35, #s 7, 10, 23, 27 (only if you're ambitious or bored), 30, 31 and 35. The calculations for 35 may be tricky (consider it a challenge), but make sure you at least understand the question and the result.
3. Take a unit test.