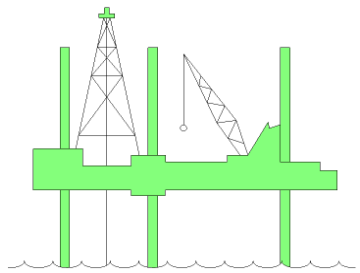
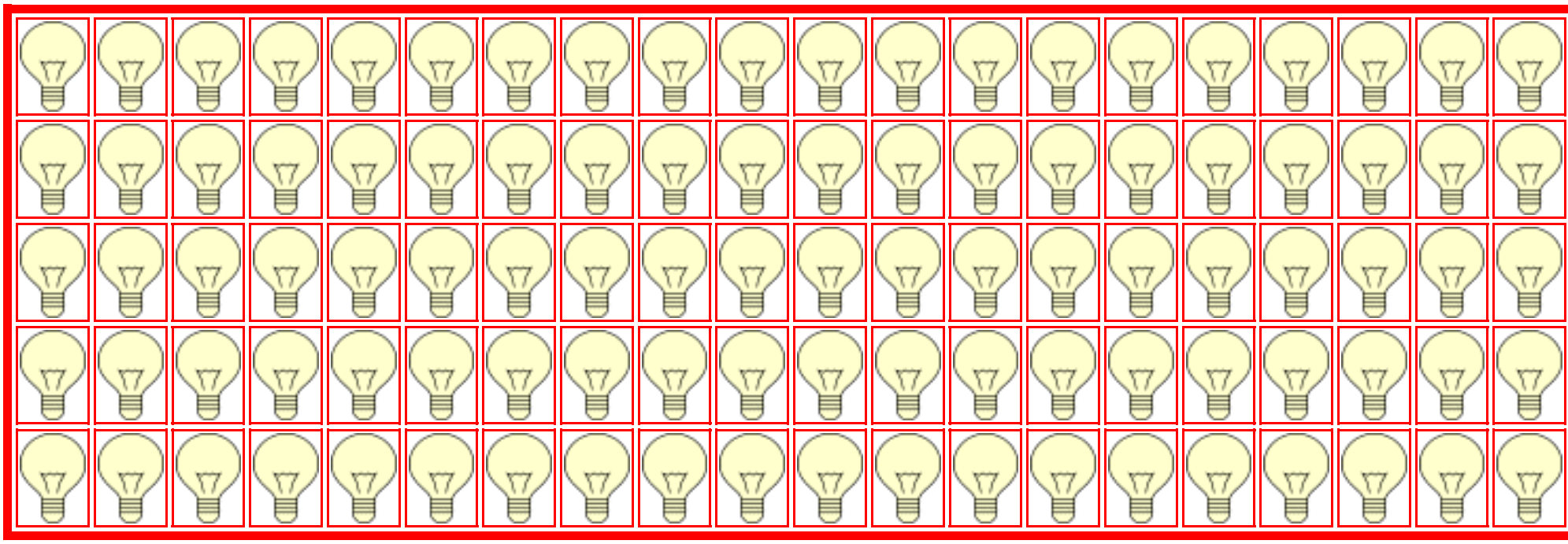
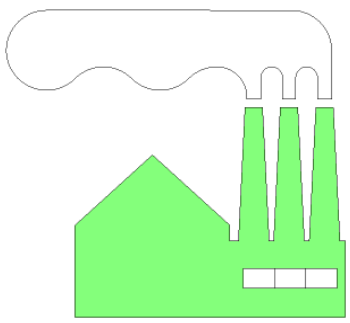


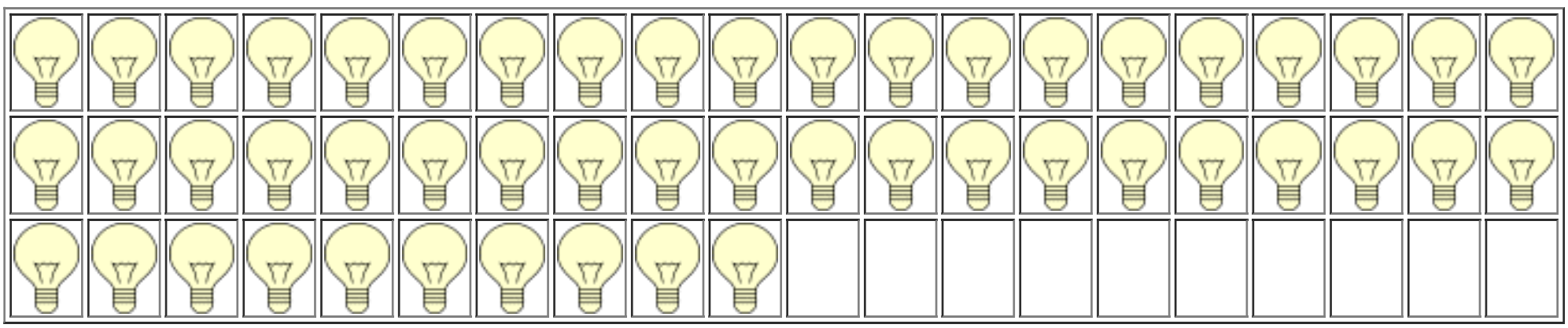
The Energy Chain

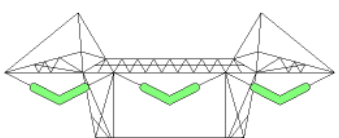
Imagine you were to convert a source of energy into electricity for useful street-lighting. Let's say you begin with the equivalent of 100 "units" of energy (in red box). How much of that energy ends up lighting the roadway for you?

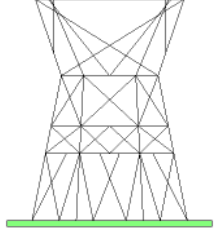




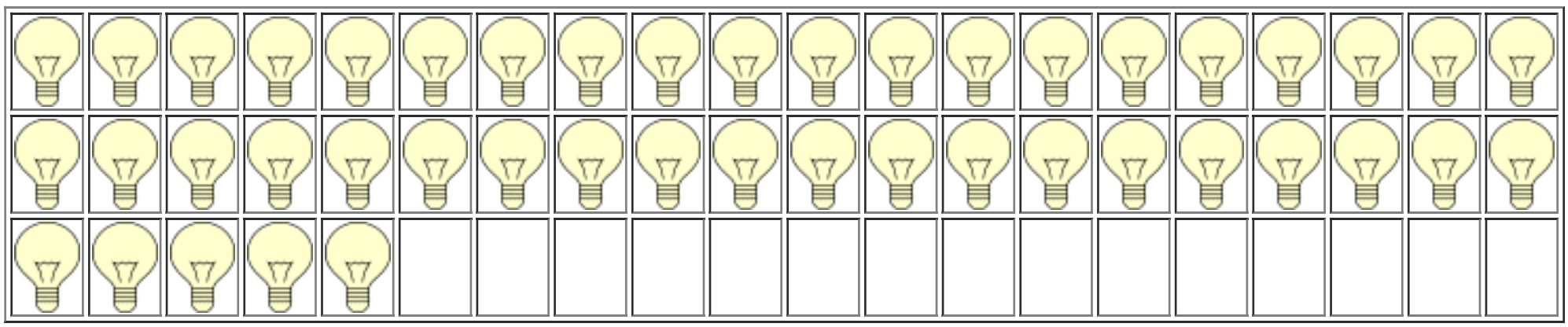
From that initial energy supply, power station losses quickly cut your available output by 50%:



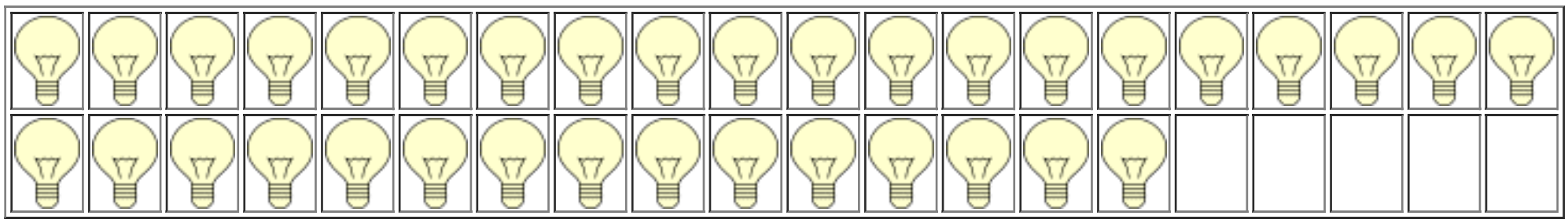




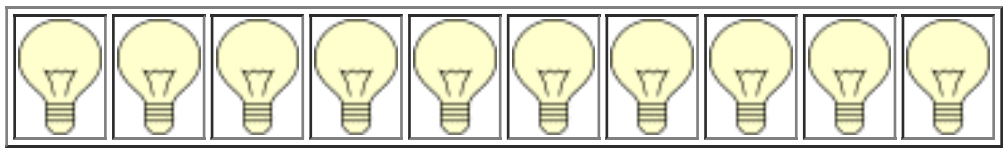
Transmitting from the power station through transformers, the energy is depleted by another 5%:



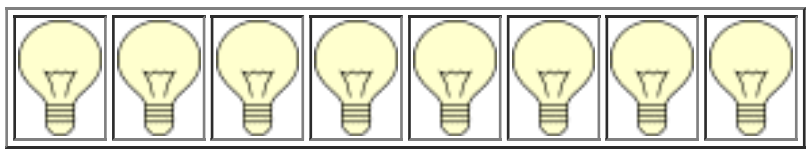
Lamp control gear losses eke out another 10% of the energy. Only 35 % of the initial energy reaches the light fixture:



One quarter (25%) of the energy emitted is non-visible, such as heat, so you now have only 10% of the initial energy that ends up as light, and even that light is not all useful:




About 2% is lost internally in the lantern and another fraction escapes upward to the night sky. Only 8% of the initial energy is emitted downward as light:




The losses continue. About 6.5% is converted to heat at the road surface (who knew?), and another smidgeon is scattered before reaching the road. Of the original 100 units of energy consumed, only about 1.2% is useful lighting that reflects off the road surface:

Was it worth it?

Source: *Light Pollution Handbook* by Narisada and Schreuder, p. 16; after Holmes, 1997, fig.1. Holmes notes: "The percentage figures are illustrative only and their precision is not important to the overall conclusions."