

## Earth, Sun, Sky and Sea: Sources

### **I'll Let These Sparks Fly Out: Electricity**

We have more potential to produce renewable electricity than any other form of renewable output (other of course than efficiency). As we will see in other sections, both wind and sun could provide enough renewable electricity to meet many times total world demand for all forms of power (not only electrical usage). Thus we will want to substitute electricity for other forms of energy whenever possible.

While efficiency and solar heat are the best ways to provide climate control and domestic hot water, these means may not always be practical. So long as we use it very thriftily, there is no reason renewable electricity rather than fossil fuels can't be used in these cases - via heat pumps, for example. Again, the preferred source for these purposes are solar energy, mid-temperature geothermal and ground-source heat pumps; but renewable electricity can provide backup, and last-ditch none-of-these-work alternatives. Because heat is cheaper to store than electricity, where this is necessary, PCM or other storage means could allow use of wind electricity without backup or standby energy.

In industry too, we can substitute electricity for much current fuel use. Often one for one substitution is impossible or at least highly inefficient. But almost always, when you look at the result you are aiming for, rather than merely focusing on the process, you can find an electrical means. For example, trying to design a resistance heater that would substitute for basic oxygen furnaces would be absurd. But electric arc furnaces process scrap metal far more effectively than coal fired furnaces - even when that electricity is produced by coal; if the electricity the savings are immense (which is why most scrap metal today is process in electric arc furnaces). Similarly, many of the efficiency means mentioned in the section on industry allow electrical substitution. Alternative cleaning processes such as super-critical carbon dioxide or ultrasonic chambers can substitute for high temperature cleaning processes. Mini-reactors can allow concentrated electrical processes to heat tiny areas substituting for huge fossil fuel driven furnaces. And, so forth.