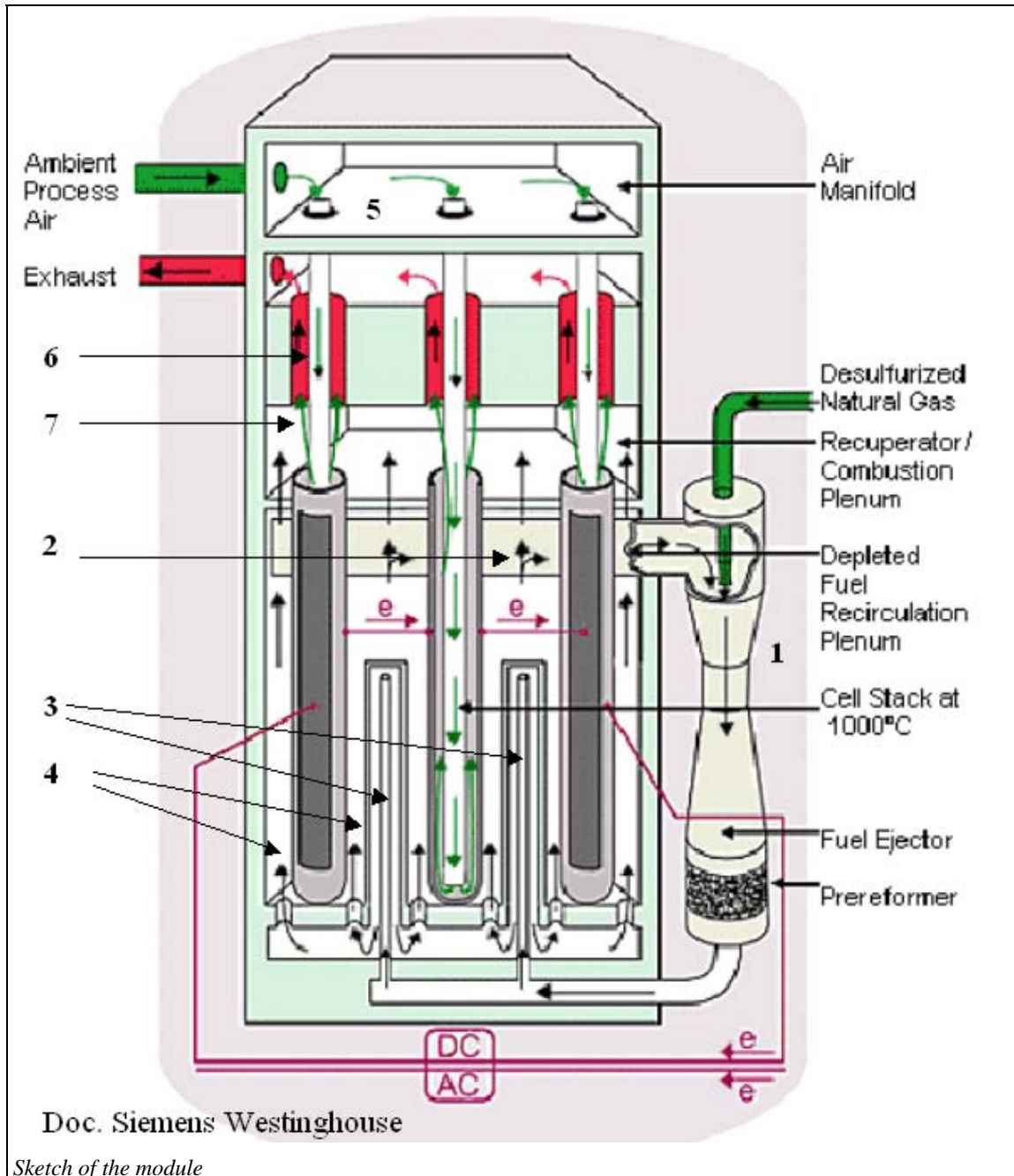


Modeling of the Siemens Westinghouse cell

In this exercise, whose solution is not provided, we suggest you start from the fifth model to model as closely as possible the system proposed by Siemens and Westinghouse (Figure below).

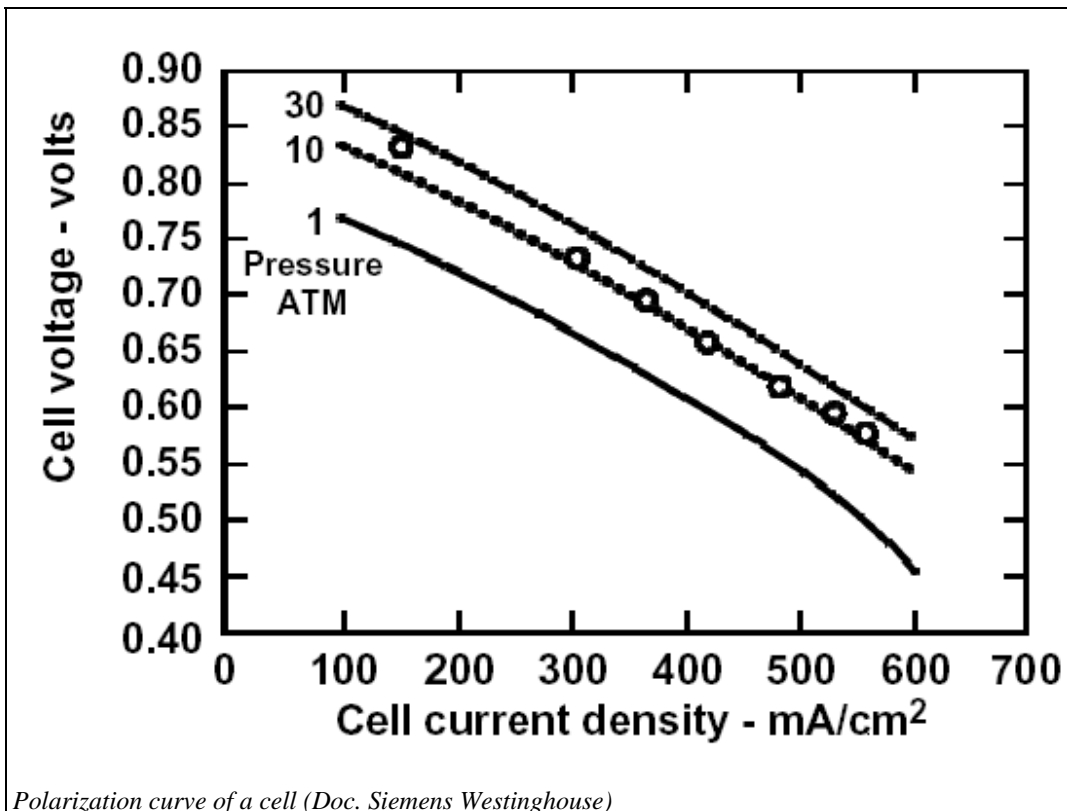


The fuel, natural desulfurized gas, enters at the right of the device in 1. It is directed to an ejector connected to a tube that sucks the gases leaving the anode, in 2, which are thus partly recycled.

The gases leaving the anode containing much water, this helps to humidify the fuel while preheating it. The mixture then enters the internal reformer, consisting of vertical tubes (3) heated by radiation from cell stack. The converted fuel then flows outside cells (4).

Air enters at the top left of the module, in 5, and warms up in 6 by exchange with the gases leaving the stack. It is then injected into the supply tubes at the bottom of the cells and then circulates in the annular space between the tubes and the cells. The depleted air is then mixed in 7 with the fraction of recirculated gas leaving the anode, further oxidation taking place due to high temperatures. The hot gases are then evacuated, after preheating the incoming air

You will start by determining a set of parameters for the [electrical model](#) representing as well as possible the performance of cells whose polarization curves were given in this session, taking into account the influence of pressure.



Then you will represent all of the heat exchange taking place in the Siemens Westinghouse SOFC module, by adjusting the flows of methane, air and recycled gas to get the best performance. The final oxidation will be represented by a combustion chamber producing complete combustion of the gases leaving the anode not recycled.

According to the explanations available, you will determine whether or not to take into account the [cooling of the stack](#), knowing that a setting in the inlet mixer screen allows you to do this.