7.1.1 Multiphase Flow in Normal Operation

The most obvious multiphase flow occurring during normal operation is the process of boiling in a BWR core. Sections 6.5.4, 6.5.5 and 6.5.6 described how boiling is initiated within a BWR reactor core (section 6.5.3), how the flow pattern within the coolant passages would change from bubbly flow to annular flow as the fluid rose (sections 6.2.3) and the circumstances under which the wall film might undergo burnout (section 6.5.4) leading to the critical heat flux condition (CHF) and a rapid rise in the temperature (section 6.5.2) of the interface between the fuel rod cladding and the coolant. Boiling water reactors are designed to operate at a comfortable margin short of CHF at any location within the reactor. This requires a coupled calculation of the multiphase flow and the neutronics (section 5.5) as well as a criterion that determines the CHF. For a review of the thermohydraulic data on CHF in nuclear reactors the reader is referred to Groeneveld and Gardiner (1977).