This study investigates the effect of water pressure on hydrocarbon generation and maturation of coals. Using a 25 ml Hastalloy pressure vessel, two high-volatile coals (Longannet, UK 0.75% Ro, and perhydrous Svalbard (Spitsbergen), Norway 0.68% Ro) were pyrolysed under non-hydrous, hydrous at 175 bar pressure, and high water pressure hydrous (500 bar and 900 bar) conditions at 350 °C for 24 h. The bitumen yield obtained during pyrolysis, together with the Rock–Eval S2, hydrogen index (HI) and vitrinite reflectance (VR) results from the pyrolysed coal residues indicated that water under relatively low pressure (175 bar) hydrous conditions promoted hydrocarbon generation and coal maturation in relation to non-hydrous conditions, consistent with previous work. However, under high water pressure (500 and 900 bar) conditions, a combination of the hydrocarbon gas (C1–C4) and bitumen yields, Rock–Eval S2, HI, VR and solid state 13C NMR results demonstrated that the changes in reaction pathways occurring with increasing pressure resulted in both hydrocarbon generation and maturation being retarded. The observed effect of pressure implies that for Type III source rocks, hydrocarbon generation will be retarded in high pressure geological basins, with gas yields being proportionally reduced more than bitumen yields. Source rock maturation (or coalification) is also retarded, with the decreases in vitrinite reflectance and carbon aromaticity being relatively small but significant in terms of explaining retardation in geological basins.