INITIAL EQUILIBRIUM

Demand: The elasticity is $\frac{P}{Q} \frac{dQ}{dP} = -0.05$, and $P = 50$, $Q = 80$. Therefore $\frac{dQ}{dP} = -0.08$.

Then the equation of the demand curve is $Q = 80 - 0.08 (P-50)$.

Supply: The elasticity is $\frac{P}{Q} \frac{dQ}{dP} = 0.10$, and $P = 50$, $Q = 10 + 45 = 55$ (non-OPEC).

Therefore $\frac{dQ}{dP} = 0.11$, and the equation of the supply curve is $Q = 25 + 55 + 0.11 (P-50)$.

SHORT RUN

After the hurricanes hit, the quantity at $P = 50$ is $Q = 8 + 45 = 53$. Then $\frac{dQ}{dP} = 0.106$, and the equation of the supply curve is $Q = 25 + 53 + 0.106 (P-50)$.

In the new short-run equilibrium, $80 - 0.08 (P-50) = 78 + 0.106 (P-50)$, so $0.186 (P-50) = 2$, or $P = 50 + \frac{2}{0.186} = 60.75$

To maintain the price at $50, the government would obviously have to release an amount equal to the supply shortfall at this price, namely 2 million barrels per day. If the damage to the capacity persists, the strategic reserve will be depleted in 350 days.

LONG RUN

Demand: The elasticity is $\frac{P}{Q} \frac{dQ}{dP} = -0.40$, and $P = 50$, $Q = 80$. Therefore $\frac{dQ}{dP} = -0.64$.

Then the equation of the demand curve is $Q = 80 - 0.64 (P-50)$.

Supply: The elasticity is $\frac{P}{Q} \frac{dQ}{dP} = 0.40$, and $P = 50$, $Q = 10 + 45 = 55$ (non-OPEC).

Therefore $\frac{dQ}{dP} = 0.44$, and the equation of the supply curve is $Q = 25 + 55 + 0.44 (P-50)$.

After the hurricanes hit, the quantity at $P = 50$ is $Q = 8 + 45 = 53$. If the damage persists in the long run, $\frac{dQ}{dP} = 0.424$, and the equation of the supply curve is $Q = 25 + 53 + 0.424 (P-50)$. Then, in the new long-run equilibrium, $80 - 0.64 (P-50) = 78 + 0.424 (P-50)$, so $1.064 (P-50) = 2$, or $P = 50 + \frac{2}{1.064} = 51.88$