34. The voltage difference across R is $V_R = \mathcal{E}R'/(R' + 2.00\,\Omega)$, where $R' = (5.00\,\Omega R)/(5.00\,\Omega + R)$. Thus,

$$
\begin{aligned}
P_R &= \frac{V_R^2}{R} = \frac{1}{R}\left(\frac{\mathcal{E}R'}{R' + 2.00\,\Omega}\right)^2 = \frac{1}{R}\left(\frac{\mathcal{E}}{1 + 2.00\,\Omega/R'}\right)^2 \\
&= \frac{\mathcal{E}^2}{R}\left[1 + \frac{(2.00\,\Omega)(5.00\,\Omega + R)}{(5.00\,\Omega)R}\right]^{-2} \equiv \frac{\mathcal{E}^2}{f(R)}
\end{aligned}
$$

where we use the equivalence symbol $\equiv$ to define the expression $f(R)$. To maximize P_R we need to minimize the expression $f(R)$. We set

$$\frac{df(R)}{dR} = -\frac{4.00\,\Omega^2}{R^2} + \frac{49}{25} = 0$$

to obtain $R = \sqrt{(4.00\,\Omega^2)(25)/49} = 1.43\,\Omega$.