$$\left\langle e^{-\beta W} \right
angle \ = e^{-\beta \Delta F}$$

$$\frac{P_F(W)}{P_R(-W)} = e^{\beta(W-\Delta F)}$$

$$\ln \left[\frac{P_F(W)}{P_R(-W)} \right] = \beta W - \beta \Delta F$$