The androgen receptor (AR) is critical for the progression of prostate cancer to a castration-resistant (CRPC) state. AR antagonists are ineffective due to their inability to repress the expression of AR or its splice variant, AR-V7. We report that the tyrosine kinase ACK1 (TNK2) phosphorylates histone H4 at tyrosine 88 upstream of the AR transcription start site, promoting AR transcription. Reversal of the pY88-H4 epigenetic marks by the ACK1 inhibitor (R)-9bMS sensitized naive and enzalutamide-resistant prostate cancer cells and reduced AR and AR-V7 levels to mitigate CRPC tumor growth.