$P_{cap} = PV_{cap} \cdot solar(t)$ - installed capacity × normalized gen at time t (max @ 1pm)

$S_{cap} = P_{cap} \cdot 1.1$

$P_{real} = P_{cap} - P_{unt}$

$S_{real} = P_{real} \cdot 1.1 \; (S_{cap} - P_{unt})$

PV hosting capacity chart with Volt/VAR

P_c, Q_c - calculated vars

Q_{min} = $\tan(\cos^{-1} PF) \cdot P_{cap}$ → negative, based on PF, ignores oversized Q capability during results.

$PF = \cos\left(\tan^{-1}\left(\frac{Q_c}{P_{cap} - P_{unt}}\right)\right)$

$\cos^{-1}(PF) = \tan^{-1}\left(\frac{Q_c}{P_{cap} - P_{unt}}\right)$

$\tan(\cos^{-1}(PF)) = \frac{Q_c}{P_{cap} - P_{unt}}$

$Q_c = \tan(\cos^{-1}(PF)) \cdot (P_{cap} - P_{unt})$

Areas (PowerTechRes.m, FIGURE 4)

$P_{inj} = \min(P_{real}, P_{inj})$

$Q_c = S_{real} - P_{inj}$

$\square = S_{real} - (P_{inj} + Q_c)$

$P_c = P_{unt}$

Constraints

$Q_c^2 \le S_{cap}^2 - (P_{cap} - P_{unt})^2$ - including oversized Q capability

$|Q_c| \le \tan(\cos^{-1}(PF)) \cdot (P_{cap} - P_{unt})$ - PF calculated excluding oversized capacity

$P_{inj} = S_{real}^2 - Q_c^2$