Appendix B P_iLMP_i Linearization Proof

Proposition 1. $P_iLMP_i = P_ib_i + P_i^{max}\phi_i$

Proof. Torkayesh (2020) presents the third reformulation of the bilevel model based on Active Set approach taken from Gümüş and Floudas (2005). In Reformulation 3, constraint (4.14c) is as follows: $-b_i + LMP_i - \phi_i + \alpha_i = 0$. Leaving LMP_i alone resulting in $LMP_i = b_i + \phi_i - \alpha_i$. As a consequence, we obtain the following by multiplying both sides with P_i

$$P_iLMP_i = P_ib_i + P_i\phi_i - P_i\alpha_i \tag{32}$$

Constraint (4.14i) is as follows:

$$\alpha_iP_i = 0 \tag{33}$$

We can turn constraint (4.14f) $\phi_i(P_i^{max} - P_i) = 0$ into the following form:

$$P_i\phi_i = P_i^{max}\phi_i \tag{34}$$

Substituting (33) and (34) for (32) yields

$$P_iLMP_i = P_ib_i + P_i^{max}\phi_i$$

□