The derivation of optimal FIT and CAT gives rise to a number of predictions, which are summarized in this appendix. Equation (12) demonstrates that a two-part tariff is often feasible but not always feasible. The electric utility can use either a FIT or a CAT or both. The following theorems identify properties that follow from (12).

Theorem 1 (Existence). For a feasible combination of FIT and CAT to exist, it must hold that \( f_n \leq s_n \). Because \( f_n > 0 \), a feasible two-part tariff does not exist if \( s_n < 0 \).

This first theorem has an important implication. Because \( s_n \) must be non-negative, it must hold that \( p_0 T / s_0 > \gamma v_n / u_n - 1 \). This means that the two-part tariff is more likely to be feasible when the \( v_n \) is small or negative, or when the utilization rate \( u_n \) is large. There is an obvious corollary. When the ratio \( v_n \) is negative, a feasible two-part tariff always exists because the expression \( \gamma v_n / u_n - 1 \) is negative. The second corollary follows from the fact that \( p_0 \) and \( s_0 \) are positive, and thus \( p_0 T / s_0 > 0 \). Therefore, a feasible two-part tariff also exists always when \( v_n \) is positive but sufficiently small: \( v_n < u_n / \gamma \).

The next two theorems explore the constraints on offering single-part tariffs.

Theorem 2 (FIT without CAT). If the utility does not offer a CAT, then it must offer a differentiated FIT \( p_n \) such that \( f_n / u_n T \leq p_n \leq s_n / u_n T \).

Theorem 3 (CAT without FIT). If the utility does not offer a FIT, then it must offer a differentiated CAT such that \( f_n \leq s_n \leq z_n \).

If the utility offers a two-part tariff, there is an equivalency relationship between the two components, defined in the next theorem.

Theorem 4 (Equivalence). If the utility offers both FIT and CAT, any incentive pair \((p_n, s_n)\) and \((p_n', s_n')\) that satisfies \((s_n - s_n') / (p_n' - p_n) = u_n T\) is equivalent.

The next two theorems explore the possibility that the utility offers a two-part tariff that is uniform across IPPs in one element and differentiated in the other element.

Theorem 5 (Uniform FIT). If the utility pays a uniform FIT \( \forall n : p_n = \bar{p} \), it must offer a differentiated CAT \( s_n \) so that \( f_n - \bar{p} u_n T \leq s_n \leq z_n - \bar{p} u_n T \).

Theorem 6 (Uniform CAT). If the utility pays a uniform CAT \( \forall n : s_n = \bar{s} \), it must offer a differentiated FIT \( p_n \) such that \( f_n - \bar{s} u_n T \leq p_n \leq z_n - \bar{s} u_n T \).

A useful comparison concerns the conventional scenario of a uniform FIT without a second pricing instrument.

Theorem 7 (Conventional FIT). A uniform FIT \( \forall n : p_n = \bar{p} \) without CAT \( \forall n : s_n = 0 \) is welfare-reducing because it rejects projects \( n \) for which \( \bar{p} < f_n / (u_n T) < \bar{p} + s_n / (u_n T) \) when \( s_n \) would have been positive, and it accepts projects \( n \) for which \( \bar{p} + s_n / (u_n T) < z_n / (u_n T) < \bar{p} \) when \( s_n \) would have been negative.

In other words, a uniform FIT without CAT falsely rejects projects when \( \bar{p} \) is not crediting new projects for their reduction in back-up capacity, and it falsely accepts projects when \( \bar{p} \) is not charging new projects for an increase in back-up capacity. Essentially, a uniform FIT without CAT generates type-I and type-II errors.

The final theorem looks at a variation of theorem 5 where the utility offers a uniform FIT, but with a differentiated CAT. This option has some desirable characteristics because it attributes the heterogeneity across firms to one pricing element only. It fixes the problem encountered in theorem 7.

Theorem 8 (Optimal uniform FIT with differentiated CAT). Among the feasible two-part tariffs is one that offers a uniform FIT defined by \( \forall n : p_n = \bar{p} = p_0 \) and a heterogeneous CAT defined by \( s_n \leq s_0 (u_n - \gamma v_n) \). The CAT is positive when \( v_n > \gamma v_n \) and is negative when \( v_n < \gamma v_n \). When \( v_n \) is negative, the CAT is guaranteed to be positive.

Using (7) and (11), the sufficiency condition for the CAT to be positive is

\[
\frac{u_n K_n}{\gamma \sqrt{\sum_{(n-1)}}} > \sqrt{1 + \frac{\Delta(n)}{\sum_{(n-1)}}} - 1 \quad (18)
\]

When \( \Delta(n) < 0 \), the expression on the right-hand side of (18) is negative, and thus the inequality always holds. But even for small positive \( \Delta(n) \), the inequality will hold.