

INSIGHT

Grid Capacity Recovery and Deferred Infrastructure Replacement

Using MPTS Technology to Release Existing Transformer Capacity

Prepared for: Cooperative Utilities

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Purpose: Evaluation of opportunities to recover usable kVA capacity from existing electrical infrastructure before adding or replacing transformers, feeders, substations, or generation resources.

Executive Summary

Electric cooperatives are facing increasing demand from electrification, industrial expansion, EV charging, data centers, commercial growth, and other new electrical loads. At the same time, utilities are dealing with the high cost and long lead times associated with new transformers, substations, feeders, and generation infrastructure.

Before investing in additional infrastructure, an important question should be evaluated:

How much usable kVA capacity can be recovered from the electrical infrastructure already installed?

Transformers and electrical distribution equipment are rated and limited in **kVA**. Reactive power, harmonic current, phase imbalance, and other electrical conditions can increase RMS current and consume a portion of the available capacity of transformers, feeders, conductors, and switchgear.

MPTS Power Management Controls Technology is designed to measure these electrical conditions, reduce the unnecessary electrical burden close to the load, and verify the resulting improvement through operating data.

The objective is straightforward:

Reduce the electrical burden reaching the transformer so that released kVA capacity can potentially be used to support additional load within the existing infrastructure.

This creates an opportunity for utilities to pursue:

- **Grid Capacity Recovery**
- **Deferred Infrastructure Replacement**

before committing capital to additional transformers, feeder upgrades, substations, or generation capacity.

1. Actual Facility Evaluation

The following July 2026 operating data illustrates the opportunity to evaluate existing electrical systems for recoverable capacity.

Facility	Location	Electrical Group	Number of Transformers	Power Factor	Reactive %	Estimated Excess kVA %
Livingston HQ	Livingston, California	Rendering Group	3	76.4%	45.8%	30.9%
Livingston HQ	Livingston, California	Plant 2 Group	3	86.2%	37.0%	16.0%
Livingston HQ	Livingston, California	NCDC Group	3	87.7%	35.4%	14.0%
Livingston HQ	Livingston, California	Deli Group	2	86.1%	37.1%	16.1%
Livingston HQ	Livingston, California	Plant 1 Group	3	82.5%	40.7%	21.2%
Livingston HQ	Livingston, California	BNR Group	2	93.0%	28.3%	7.5%
Livingston HQ	Livingston, California	FSO Group	3	89.7%	33.1%	11.5%
Cherry Avenue	Fresno, California	Cherry Main Group	4	85.1%	38.2%	17.5%

Facility-Level Summary

Facility	Average Power Factor	Estimated Excess kVA
Livingston HQ	85.5%	17.0%
Cherry Avenue	85.1%	17.5%
Belgravia	Unmonitored	—

The data indicates that several electrical groups are operating with a significant reactive component and below-optimum power factor.

The Rendering Group is the most pronounced example, operating at approximately **76.4% power factor**, with an estimated **30.9% excess kVA requirement** compared with operation at unity power factor for the same real-power requirement.

These values identify areas where detailed measurement should be performed to determine how much transformer and feeder capacity can actually be released through electrical correction.

2. Why Transformer kVA Capacity Matters

Utility transformers are rated in **kVA**, not simply in kW.

The transformer must carry the total electrical burden imposed by the connected system.

This includes the current associated with:

- Real load
- Reactive power
- Harmonic distortion
- Phase imbalance
- Voltage conditions
- Nonlinear electronic loads
- Other electrical inefficiencies

When unnecessary current is allowed to flow through a transformer, part of the transformer's available thermal and electrical capacity is being utilized without providing proportional productive output to the customer.

Reducing this unnecessary burden can create additional operating margin within the existing transformer.

3. Reactive Power and Available Capacity

Reactive power, expressed in **kVAR**, is required by many inductive electrical loads, including motors, transformers, and other magnetic equipment.

However, excessive reactive power increases current throughout the electrical distribution system.

That current may travel through:

Generation → Transmission → Substation → Feeder → Utility Transformer → Customer Load

The upstream equipment must therefore be sized to carry both the productive and reactive portions of the load.

When reactive power is corrected close to the load, the upstream transformer and distribution system may carry less current and lower kVA.

The result can be released transformer capacity.

The objective is not to eliminate the reactive power required by equipment.

The objective is to prevent unnecessary reactive current from being supplied through the entire upstream electrical system when it can be managed closer to the load.

4. Harmonic Current and Transformer Loading

Power factor alone does not provide a complete picture of electrical-system utilization.

Modern electrical systems contain increasing numbers of nonlinear loads, including:

- Variable-frequency drives
- UPS systems
- Data-center equipment
- Electronic power supplies
- Battery chargers
- LED lighting systems
- Industrial controls
- Power electronics

These loads can produce harmonic current.

Harmonic current contributes to total RMS current and can create additional heating in transformers, conductors, neutral conductors, switchgear, and other electrical equipment.

In systems with significant harmonic distortion, reducing THDi can therefore be an important component of recovering available electrical capacity.

A complete capacity-recovery evaluation should consider:

kVA + kVAR + Current + THDi + THDv + Phase Balance + Transformer Loading

rather than power factor alone.

5. MPTS Grid Capacity Recovery Approach

MPTS Power Management Controls Technology provides a method to measure electrical performance, apply corrective control, and verify the resulting improvement.

The process can be summarized as:

Measure → Identify → Correct → Verify → Quantify Released kVA

Step 1 — Measure Existing Conditions

Establish the electrical baseline at the transformer or major distribution point.

Recommended measurements include:

- Transformer nameplate kVA
- Actual operating kVA
- kVAR
- Power factor
- Current by phase
- THDi
- THDv
- Voltage by phase
- Phase imbalance
- Transformer loading percentage
- Peak loading
- Operating temperature, where available

Step 2 — Identify Recoverable Capacity

Determine what portion of transformer loading may be associated with:

- Excessive reactive power
- Harmonic current
- Phase imbalance
- Excess current
- Poor power factor
- Other correctable power-quality conditions

Step 3 — Apply MPTS Technology

MPTS is installed downstream of the utility transformer and close to the electrical load.

The system measures and manages electrical parameters including:

Voltage • Current • kVA • kVAR • Power Factor • THDi • THDv

The objective is to reduce unnecessary electrical burden before it propagates upstream to the transformer and utility distribution system.

Step 4 — Verify Performance

The system should be evaluated under comparable operating conditions using:

MPTS OFF

versus

MPTS ON

The following should be compared:

- Transformer kVA
- Transformer current
- kVAR
- Power factor
- THDi
- THDv
- Phase balance
- Peak transformer loading

Step 5 — Quantify Released Capacity

The primary utility metric should be:

Released kVA- A practical calculation is:

Measured Transformer kVA Before Correction– Measured Transformer kVA After Correction = Released kVA

This provides the cooperative with a direct indication of how much operating capacity may have been recovered.

6. Example of Capacity Recovery

Assume an existing transformer has the following operating condition:

Parameter	Before MPTS	After MPTS
Transformer Rating	2,500 kVA	2,500 kVA
Measured Peak Load	2,200 kVA	1,900 kVA
Available Nameplate Margin	300 kVA	600 kVA
Released Capacity	—	300 kVA

In this example, MPTS-related correction reduces the measured burden on the transformer by **300 kVA**.

Subject to confirmation of conductor ratings, protective-device settings, thermal conditions, voltage limits, harmonics, utility planning criteria, and other engineering requirements, this released capacity could potentially be used to support additional load.

- The transformer has not been replaced.
- Its nameplate rating has not changed.
- The existing transformer is simply being utilized more effectively.

7. Recommended Utility Capacity-Recovery Dashboard

For utility evaluation, each transformer should be tracked individually.

Transformer	Nameplate kVA	Existing Peak kVA	kVAR	PF	THDi	Corrected kVA	Released kVA	Available Capacity After Correction
T-1	—	—	—	—	—	—	—	—
T-2	—	—	—	—	—	—	—	—
T-3	—	—	—	—	—	—	—	—

This allows the cooperative to answer a practical planning question:

How much additional load can the existing transformer and distribution system potentially support after the unnecessary electrical burden has been reduced?

8. Where Cooperatives Should Look First

A Grid Capacity Recovery Program should initially focus on transformers and feeders that have one or more of the following conditions:

- High transformer kVA utilization
- Low power factor
- High kVAR
- High THDi
- High RMS current
- Significant phase imbalance
- Transformer overheating

- Voltage instability
- Frequent peak-capacity constraints
- Planned transformer replacement
- Planned feeder upgrades
- Planned substation expansion
- New customer-load requests
- EV charging expansion
- Industrial expansion
- Data-center or other high-density electrical loads

These locations offer the greatest opportunity to determine whether capacity can be recovered before capital improvements are authorized.

9. Proposed Cooperative Utility Pilot

A limited pilot can provide the cooperative with actual measured results before considering broader deployment.

Phase 1 — Select

Identify several heavily loaded or capacity-constrained transformers.

Phase 2 — Baseline

Measure actual electrical conditions before corrective action.

Phase 3 — Install

Apply MPTS at selected downstream locations.

Phase 4 — Verify

Compare MPTS OFF and MPTS ON operation under comparable load conditions.

Phase 5 — Quantify

Determine:

- kVAR reduction
- Current reduction
- THDi improvement
- Power-factor improvement
- Transformer kVA reduction
- Percentage reduction in transformer loading
- **Released kVA**
- **Available kVA after correction**

Phase 6 — Evaluate Deferred Capital

Compare the verified capacity recovery against proposed expenditures for:

- Transformer replacement
- Transformer upsizing
- Feeder upgrades

- Switchgear expansion
- Substation upgrades
- Other distribution-system improvements

10. Utility Value Proposition

Traditional grid-capacity planning often begins with:

Existing capacity constraint → Add infrastructure

A Grid Capacity Recovery approach adds an important intermediate step:

Existing Capacity Constraint → Measure → Recover Existing Capacity → Verify → Determine Remaining Infrastructure Requirement

This may allow the cooperative to:

- Extend the useful capacity of existing transformers
- Increase operating margin
- Reduce feeder current
- Reduce reactive-power flow
- Reduce harmonic burden
- Reduce transformer heating
- Improve voltage performance
- Accommodate additional customer load
- Prioritize capital projects more effectively
- Defer selected transformer replacements
- Defer selected feeder upgrades
- Defer selected substation improvements

11. Recommended Performance Standard

Capacity-recovery claims should be based on measured results.

ACCENTZ, INC. recommends that the cooperative establish a documented baseline and verify improvements under comparable operating conditions.

The principal performance indicators should be:

Primary Metric

Released Transformer kVA

Supporting Metrics

- **kVAR Reduction**
- **Current Reduction**
- **THDi Reduction**
- **THDv Improvement**
- **Power Factor Improvement**
- **Phase-Balance Improvement**

- **Reduction in Transformer Loading %**

This approach provides engineering evidence rather than relying solely on calculated or projected performance.

12. Conclusion

Electrical cooperatives may have meaningful capacity already installed within their distribution systems that is not being utilized as effectively as possible.

Reactive power, harmonic current, phase imbalance, and other electrical conditions can increase current and kVA loading on transformers and upstream electrical infrastructure.

MPTS Power Management Controls Technology provides a means to:

- **Measure the electrical system**
- **Identify the unnecessary electrical burden**
- **Apply correction close to the load**
- **Verify the improvement using operating data**
- **Quantify the kVA capacity released from existing infrastructure.**

The goal is not to increase the nameplate capacity of a transformer.

The goal is to reduce unnecessary loading so that more of the transformer's existing kVA rating becomes available to serve productive electrical loads.

Recover Capacity Before Building Capacity

Before replacing transformers or expanding electrical infrastructure, determine how much usable kVA can first be recovered from the existing grid.

Grid Capacity Recovery + Deferred Infrastructure Replacement

Measure. Correct. Verify. Release Capacity.

Thank you.

Sincerely

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