

Equivalent Generation Injection Factor (EGIF)

A Methodological White Paper for Evidence-Based DSPV and DER Impact
Assessment

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1 Intellectual-property and confidentiality notice

The Equivalent Generation Injection Factor methodology described in this paper is a proprietary analytical framework developed by **Chief Consultant** for the electrical representation of distributed solar photovoltaic generation in distribution-system studies. The methodology, evidence hierarchy, calculation logic, seasonal treatment, profile construction, quality controls and engineering translation presented here form part of Chief Consultant’s intellectual property.

This paper intentionally contains no customer names, meter identifiers, feeder names, transformer tags, geographic coordinates or private network records. Its empirical basis is described only in anonymized and methodological terms. The paper may be used for authorized technical discussion, project delivery and regulatory or utility engagement, subject to the applicable confidentiality and data-use arrangements.

2 Executive summary

Distributed solar photovoltaic capacity is normally available to utilities as an administrative quantity: the sanctioned or registered capacity in kilowatts. That quantity is essential, but it is not the power that a distribution network experiences at every instant. Actual grid impact depends on solar availability, inverter operation, customer demand behind the meter, outages, curtailment, season, time of day and the coincidence of many individual installations.

Chief Consultant developed the **Equivalent Generation Injection Factor (EGIF)** to bridge this gap. EGIF converts sanctioned DSPV capacity into an equivalent grid-injection quantity appropriate to a defined operating instant or time step:

$$P_{\text{equivalent injection}}(t) = S_{\text{sanctioned PV}} \times EGIF(t)$$

For the empirical net-metering route, the connection-level injection attributed to the grid is deliberately bounded at zero:

$$P_{\text{net injection},i}(t) = \max(P_{\text{export},i}(t) - P_{\text{import},i}(t), 0)$$

This rule recognizes that a net-importing customer is not injecting active power into the grid at that instant, even though the customer’s PV system may be generating behind the meter. Consequently, EGIF is an **equivalent grid-injection factor**, not a measurement of gross PV production or conversion efficiency.

Two complementary EGIF products are maintained:

1. **Seasonal snapshot factors**, representing high but credible seasonal operating-point priors for snapshot studies; and
2. **Typical seasonal 24-hour profiles**, representing the empirical variation of equivalent grid injection by clock hour.

The adopted snapshot factors are **0.36 for winter, 0.64 for the shoulder season, and 0.50 for summer/monsoon**. These are seasonal P95 operating-point priors. The 24-hour curves are separately calculated clock-hour means and are not rescaled to force their peaks to equal the snapshot factors.

EGIF allows hosting-capacity and DER-impact studies to distinguish clearly between sanctioned capacity and coincident network injection. This distinction improves the interpretation of voltage rise, reverse power flow, line and transformer loading, losses, voltage-control interaction and the incremental capacity that may be accommodated under a declared operating condition.

3 1. The problem addressed by EGIF

3.1 1.1 Sanctioned capacity is not instantaneous injection

A sanctioned PV capacity of 100 kW means that 100 kW has been approved or registered. It does not establish that 100 kW is being exported to the network at a selected timestamp. The instantaneous grid exchange may be smaller because:

- solar irradiance is below rated conditions;
- module temperature reduces output;
- an inverter is unavailable, curtailed or operating below its rating;
- part or all of the PV output is consumed behind the meter;
- customer demand changes independently of solar production;
- systems with different orientations and operating conditions are not fully coincident; or
- the sanctioned record and the field installation are not perfectly aligned.

Using sanctioned capacity directly as instantaneous injection can therefore overstate network stress in some cases. Using meter export alone without a consistent denominator can understate or misrepresent the contribution of the installed DSPV stock. EGIF provides the missing analytical bridge.

3.2 1.2 The meter observes exchange, not gross generation

At a net-metered connection, the import and export channels describe exchange with the grid. Behind-the-meter consumption is absorbed before that exchange is recorded. In simplified active-power terms:

$$P_{\text{grid},i}(t) = P_{\text{BTM load},i}(t) - P_{\text{PV gross},i}(t)$$

The empirical EGIF method does not claim to separate both hidden quantities. It asks the narrower question needed for grid-impact modelling:

What positive net injection reached the distribution network, relative to the sanctioned PV capacity represented by valid observations at that time?

This narrower definition is observable, auditable and directly relevant to power-flow impact.

3.3 1.3 Why a single annual factor is insufficient

The balance between PV generation and behind-the-meter consumption changes through the year. A season with strong irradiance can exhibit high grid injection when local daytime demand is moderate. Another season can exhibit lower grid injection even with substantial PV production because cooling, commercial or agricultural demand absorbs more energy locally.

An annual average conceals these operating differences. It can overstate one season, understate another and produce a misleading operating point for voltage, reverse-flow or loss assessment. EGIF is therefore defined by season and, for time-series work, by clock hour.

4 2. Definition and interpretation

4.1 2.1 General definition

For an assessed group of valid connections $\mathcal{A}(t)$ at time t :

$$EGIF(t) = \frac{\sum_{i \in \mathcal{A}(t)} P_{\text{net injection},i}(t)}{\sum_{i \in \mathcal{A}(t)} S_{\text{sanctioned PV},i}}$$

where:

- $P_{\text{net injection},i}(t)$ is the positive net export of connection i at time t ;
- $S_{\text{sanctioned PV},i}$ is its authoritative sanctioned PV capacity;
- $\mathcal{A}(t)$ contains only authoritative connections with valid data at that timestamp; and
- EGIF is dimensionless.

The ratio is a capacity-weighted aggregation because the numerator and denominator are summed before division. A large installation therefore contributes in proportion to its sanctioned capacity rather than receiving the same weight as a small installation.

4.2 2.2 Positive-injection boundary

For every connection and timestamp:

$$P_{\text{net injection},i}(t) = \max(P_{\text{export},i}(t) - P_{\text{import},i}(t), 0)$$

Accordingly:

- export greater than import produces positive grid injection;
- export equal to import produces zero grid injection; and
- import greater than export also produces zero grid injection.

Negative values are not carried into EGIF as negative solar production. They represent net customer import and are outside the defined positive-injection quantity.

4.3 2.3 Physical meaning

An EGIF of 0.50 means that the assessed sanctioned PV stock is represented as an equivalent positive grid injection equal to 50% of that sanctioned capacity under the defined operating condition. It does **not** mean that every installation generated at 50%, that inverter efficiency was 50%, or that 50% of annual PV energy was exported.

4.4 2.4 What EGIF is not

EGIF is not:

- an inverter efficiency;
- a photovoltaic capacity factor;
- an irradiance-to-power conversion coefficient;
- an annual energy-yield factor;
- a diversity factor for customer demand;
- a probability of reverse power flow;
- a hosting-capacity limit;
- a protection threshold;
- or proof that all connections operate identically.

It is an operating-condition-specific translation from sanctioned DSPV capacity to equivalent positive grid injection.

5 3. Empirical evidence architecture

Chief Consultant’s EGIF derivation uses three logically separate evidence layers.

The framework was developed by studying timestamped import and export behaviour from multiple individual net-metering connections distributed across multiple anonymized feeders and seasonal observation windows. No individual connection or feeder is treated as universally representative; the methodology preserves connection-level evidence before forming feeder and portfolio composites.

Evidence layer	Authoritative role	Key control
Connection register	Identifies eligible net-metered connections and sanctioned PV capacity	Only authoritative connection keys are admitted
Spatial mapping	Associates connections with network locations or transformer aggregation points	Multiple connections at one location are combined without losing their sanctioned capacity
Interval AMI records	Supplies timestamped import and export measurements	Irrelevant meter rows are excluded; valid underlying data are read even where workbook metadata is misleading

This separation prevents an AMI file from defining which customers are authoritative and prevents missing AMI records from being interpreted as zero generation.

5.1 3.1 Connection matching

The eligible population is established from the authoritative connection register. Meter reference numbers present in an AMI export but absent from that register are excluded. Identifiers are normalized carefully so that leading zeros, text formatting and spreadsheet conversions do not create false matches.

Where multiple net-metered connections belong to the same mapped network location, their sanctioned capacities may be aggregated for network modelling. Connection-level identity remains available for the evidence audit.

5.2 3.2 Import and export channels

The preferred calculation uses simultaneous active-power import and export channels. If direct power values are unavailable and cumulative energy registers are used, interval power is reconstructed from valid consecutive differences:

$$P_{\text{interval}} = \frac{\Delta E}{\Delta t}$$

Meter multipliers are applied exactly once. Resets, non-positive time intervals, missing values, duplicated timestamps and implausible discontinuities are flagged or excluded according to the declared quality rules.

5.3 3.3 Availability-aware denominator

A connection that is absent at a timestamp is not assumed to have zero output. It is removed from both the numerator and the denominator for that timestamp. The applicable set is therefore $\mathcal{A}(t)$, not the entire registered population regardless of data availability.

This rule is essential. Treating missing observations as zero would systematically depress EGIF and confuse data unavailability with physical behind-the-meter absorption.

5.4 3.4 Coverage evidence

Every result should retain, at minimum:

- number of authoritative connections;
 - number of matched connections;
 - valid interval count;
 - excluded irrelevant row count;
 - excluded invalid interval count;
 - available sanctioned capacity at each aggregation level;
 - sanctioned-capacity coverage;
 - eligible days or windows; and
 - reasons for material exclusions.
-

6 4. Derivation of seasonal snapshot EGIF

6.1 4.1 Purpose of a snapshot factor

A snapshot hosting-capacity or DER-impact assessment requires one declared operating point. The snapshot EGIF translates sanctioned capacity into a high, credible equivalent injection for the selected season without claiming an absolute theoretical maximum.

6.2 4.2 Connection-level calculation

For each valid connection i and interval t :

$$J_i(t) = \max(P_{export,i}(t) - P_{import,i}(t), 0)$$

The connection-level EGIF, where required for diagnostics, is:

$$g_i(t) = \frac{J_i(t)}{S_i}$$

The authoritative aggregated interval value is calculated as a ratio of sums:

$$G_f(t) = \frac{\sum_{i \in \mathcal{A}_f(t)} J_i(t)}{\sum_{i \in \mathcal{A}_f(t)} S_i}$$

This is not the unweighted arithmetic mean of customer ratios.

6.3 4.3 Daily high-operating-point statistic

For each eligible day, the 95th percentile of valid solar-period interval EGIF values is calculated:

$$G_{f,d}^{P95} = P95 (G_f(t) : t \in d, t \text{ eligible})$$

The P95 statistic captures a high but repeatable injection condition while reducing dependence on a single extreme or erroneous record.

6.4 4.4 Seasonal feeder statistic

For season s , the feeder-level snapshot statistic is the median of eligible daily P95 values:

$$G_{f,s}^{snapshot} = \text{median}_{d \in s} (G_{f,d}^{P95})$$

The median provides robustness against an isolated day while retaining the upper-operating-point character of the P95 calculation.

6.5 4.5 Portfolio composite

The seasonal composite is sanctioned-capacity weighted:

$$G_s^{composite} = \frac{\sum_f S_f G_{f,s}^{snapshot}}{\sum_f S_f}$$

This prevents a small feeder or connection group from receiving the same influence as a much larger sanctioned PV population.

6.6 4.6 Adopted seasonal snapshot factors

The empirical calculation supports the following controlled project values:

Operational season	Month grouping	Adopted snapshot EGIF	Interpretation
Winter	December–February	0.36	Lower equivalent grid injection and/or stronger relative behind-the-meter absorption
Shoulder	March–April and October–November	0.64	Strong solar availability with comparatively lower coincident daytime absorption

Operational season	Month grouping	Adopted snapshot EGIF	Interpretation
Summer/Monsoon	May–September	0.50	Material solar production combined with greater local daytime consumption and seasonal diversity

These values are maintained as **seasonal P95 operating-point priors**. They are project reference values, not universal constants for every feeder, customer class, region or timestamp.

6.7 4.7 Evidence hierarchy for snapshot use

The appropriate order of precedence is:

1. synchronized timestamp-specific generation or high-quality AMI evidence;
2. accepted feeder- and timestamp-specific reconstruction;
3. the applicable seasonal snapshot EGIF; and
4. a documented sensitivity range where uncertainty remains material.

A stronger local observation may override the seasonal prior. The override must be traceable and must not be selected merely to force a desired hosting capacity result.

7 5. Derivation of typical 24-hour EGIF profiles

7.1 5.1 Purpose

The snapshot factors answer, “What equivalent injection should represent a high seasonal operating point?” The 24-hour profiles answer a different question: “How does equivalent positive grid injection typically vary by clock hour within that season?”

The two products are related but must not be substituted for one another.

7.2 5.2 Time alignment

AMI observations are standardized to a common timestamp convention and mapped to clock hour $h \in \{0, 1, \dots, 23\}$. Sub-hourly observations remain the calculation evidence; the hourly curve is their controlled aggregation.

For each interval, the same connection-level positive-injection rule applies:

$$J_i(t) = \max(P_{export,i}(t) - P_{import,i}(t), 0)$$

7.3 5.3 Availability-aware feeder interval EGIF

For each feeder group and timestamp:

$$G_f(t) = \frac{\sum_{i \in \mathcal{A}_f(t)} J_i(t)}{\sum_{i \in \mathcal{A}_f(t)} S_i}$$

Only valid, authoritative observations contribute. Missing connections are not inserted as zero.

7.4 5.4 Clock-hour mean

For season s and hour h , the typical feeder curve is the empirical mean of eligible timestamp values assigned to that clock hour:

$$G_{f,s}(h) = \text{mean} (G_f(t) : t \in s, \text{hour}(t) = h, t \text{ eligible})$$

Where the evidence design calls for a staged day-level aggregation, daily hourly means are first formed and then combined so that a day with more records does not receive unintended weight. The chosen aggregation rule must be stored with the frozen profile.

7.5 5.5 Capacity-weighted composite curve

The portfolio curve for each season is:

$$G_s^{\text{composite}}(h) = \frac{\sum_f S_f G_{f,s}(h)}{\sum_f S_f}$$

The output contains 24 values for each season. It may also retain the individual anonymized feeder curves so that diversity and outliers are not concealed by the composite.

7.6 5.6 Non-negative profile boundary

Because the underlying connection-level quantity is bounded at zero, all typical hourly EGIF values are non-negative. Night-time values should normally be zero or very close to zero after data-quality controls. A persistent positive night-time value requires investigation of timestamp alignment, channel meaning, meter multiplier, register differencing or data quality.

7.7 5.7 No forced rescaling

The typical hourly curves are **empirical clock-hour means**. They are not scaled so that their maximum equals 0.36, 0.64 or 0.50. Their peaks therefore do not need to equal the snapshot factors.

This is intentional:

- the snapshot factor is based on a seasonal high-operating-point statistic;

- the hourly curve represents typical clock-hour behaviour; and
- forcing equality would destroy the empirical relationship between hours.

7.8 5.8 Use in time-series studies

For transformer or node n , season s and hour h :

$$P_{PV,n}(s, h) = S_{PV,n} \times G_s(h)$$

The resulting generation series is combined with the applicable load series, network state and voltage-control assumptions. The model must preserve the distinction between:

- sanctioned/nameplate capacity $S_{PV,n}$;
 - equivalent realized grid injection $P_{PV,n}(s, h)$; and
 - net upstream exchange after loads and losses are solved.
-

8 6. Seasonal EGIF behaviour

The established seasonal pattern demonstrates that grid injection is not governed by irradiance alone.

8.1 6.1 Winter

Winter carries the lowest adopted snapshot factor. Shorter days, lower solar availability in some windows, system diversity and the relationship between PV production and customer demand reduce the equivalent positive injection represented at the grid boundary.

8.2 6.2 Shoulder season

The shoulder season carries the highest adopted snapshot factor. Solar availability can be strong while cooling and other daytime loads are below their summer levels. A larger share of available PV can therefore appear as net export through customer meters.

8.3 6.3 Summer and monsoon

Summer/monsoon carries an intermediate adopted factor. Strong sunlight does not automatically produce the highest grid injection because cooling and other daytime demand may absorb a greater part of PV output behind the meter. Cloud, humidity, temperature and monsoon variability also broaden the operating range.

8.4 6.4 Engineering meaning

The seasonal ordering is evidence that **gross generation potential and net grid injection are different quantities**. A network study concerned with grid impact must represent the second quantity consistently, even when the first is high.

9 7. Implementation in distribution-system studies

9.1 7.1 Snapshot reconstruction

For a selected observed operating point:

1. retain the authoritative sanctioned PV by transformer or node;
2. select the applicable EGIF through the evidence hierarchy;
3. calculate equivalent realized injection at every mapped PV location;
4. calibrate or reconstruct downstream gross load consistently with the observed feeder-head current, power factor and import/export direction;
5. solve the network model;
6. verify power balance and convergence; and
7. report sanctioned PV, EGIF and equivalent realized injection separately.

9.2 7.2 Hosting-capacity assessment

If ΔS_{PV} is an incremental sanctioned PV allocation, its equivalent incremental injection is:

$$\Delta P_{PV} = EGIF \times \Delta S_{PV}$$

The assessment then increases sanctioned capacity under a declared EGIF until the applicable stopping rule is reached. Results should report both:

- accepted additional sanctioned PV; and
- the corresponding equivalent realized injection.

This prevents a hosting-capacity result from silently mixing administrative capacity with instantaneous electrical power.

9.3 7.3 Time-series assessment

For chronological or representative-day studies, the seasonal hourly profile replaces the single snapshot factor. Each time step is solved with the corresponding load, EGIF-realized PV and network-control state.

9.4 7.4 Sensitivity assessment

Where evidence uncertainty is material, the study should test:

- the adopted seasonal factor;
- a defensible lower EGIF;
- a defensible higher EGIF; and
- feeder- or timestamp-specific evidence where available.

The sensitivity range must be labelled. It must not be presented as additional measured evidence.

10 8. Relevance to hosting-capacity and DER-impact studies

10.1 8.1 Voltage rise

Voltage rise is driven by the realized spatial injection and network impedance, not sanctioned capacity in isolation. EGIF determines how much of the mapped capacity is active in the assessed state and therefore directly influences LV and MV voltage response.

10.2 8.2 Reverse power flow

Reverse flow occurs when realized downstream generation exceeds coincident load and losses across the relevant boundary. EGIF provides a consistent basis for testing reversal at customer aggregation points, distribution transformers and the feeder head.

10.3 8.3 Thermal loading

DER can relieve forward loading, create reverse loading or shift the location of maximum current. EGIF allows thermal results to be related to plausible coincident injection rather than full registered capacity at every location.

10.4 8.4 Network losses

Losses often decrease as local PV offsets upstream power transfer, reach a minimum near a feeder-specific operating point, and rise again as reverse transfer grows. EGIF is required to locate these operating points on a common sanctioned-capacity basis.

10.5 8.5 Voltage-control interaction

Capacitor banks, OLTC settings, fixed taps and other controls respond to net network conditions. An unrealistic PV realization assumption can produce a false voltage-control response. EGIF improves the consistency of the injected power used in these studies.

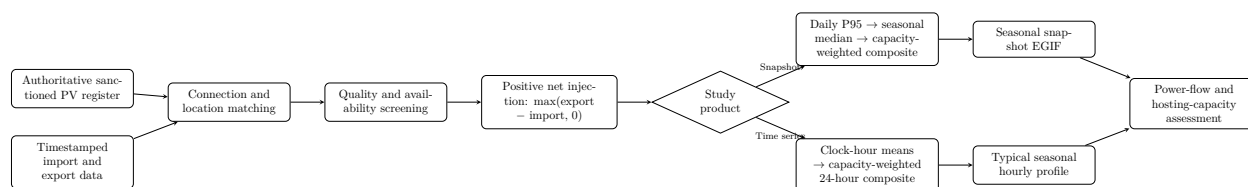
10.6 8.6 Protection and operational screening

Although EGIF does not replace a fault or protection study, it improves the normal-operating power-flow state from which protection-direction, anti-islanding and reverse-power concerns may be screened.

10.7 8.7 Planning comparability

By preserving both sanctioned and realized quantities, EGIF allows planners to compare scenarios, feeders and seasons without confusing nameplate growth with coincident network stress. Cross-feeder comparison still requires normalization for load, connected transformer capacity, feeder length, impedance and spatial allocation.

11 9. End-to-end EGIF workflow



12 10. Quality assurance and audit controls

12.1 10.1 Input controls

- Preserve connection identifiers as text.
- Use the authoritative connection register as the eligibility gate.
- Validate sanctioned capacity as positive numeric data.
- Confirm import/export units and meter multipliers.
- Inspect worksheet contents even if file metadata incorrectly indicates an empty dataset.
- Retain the original time zone and document any daylight-saving or clock adjustment, where applicable.

12.2 10.2 Interval controls

- Reject invalid or duplicated timestamps according to the declared rule.
- Do not difference cumulative registers across resets or non-consecutive intervals.
- Do not apply meter multipliers twice.
- Do not combine import and export as if both were generation.

- Apply the zero lower boundary after calculating export minus import.
- Record exclusions without replacing them with invented measurements.

12.3 10.3 Aggregation controls

- Use a ratio of sums for capacity-weighted EGIF.
- Match numerator and denominator availability at every timestamp.
- Do not treat an unavailable connection as zero injection.
- Retain capacity coverage and eligible-day counts.
- Keep feeder-level and portfolio-level aggregation distinct.
- Do not substitute an equal-feeder arithmetic mean for a sanctioned-capacity-weighted composite.

12.4 10.4 Output controls

Every frozen EGIF release should identify:

- methodology version;
- season definition;
- timestamp and time-zone convention;
- input period and eligibility rules;
- percentile and aggregation rules;
- sanctioned-capacity weighting rule;
- positive-injection boundary;
- missing-data treatment;
- coverage statistics;
- snapshot factors;
- all 24 hourly profile values;
- whether profiles were rescaled;
- exclusions and limitations; and
- approval and issue date.

13 11. Limitations

13.1 11.1 EGIF measures net grid injection, not gross PV output

Because behind-the-meter consumption is not separately metered in the adopted empirical route, EGIF cannot identify total PV production. A customer may be generating substantially while remaining a net importer; its EGIF contribution is zero at that instant because no positive injection reaches the grid.

13.2 11.2 Data coverage is not uniform

Not every authoritative connection is present at every timestamp. The availability-aware denominator prevents false zeros, but sparse coverage can still increase uncertainty. Coverage must accompany the result.

13.3 11.3 Short measurement windows do not define long-term probability

Representative windows can establish credible operating patterns and seasonal priors. They do not, by themselves, establish annual exceedance probability, long-term energy yield or the frequency and duration of a constraint.

13.4 11.4 Weather is embedded rather than explicitly modelled

Irradiance, temperature and cloud effects are reflected indirectly in meter exchange. Without synchronized weather data, their separate influence cannot be isolated.

13.5 11.5 Administrative capacity may differ from field reality

Sanctioned capacity can be outdated, understated or otherwise inconsistent with the installed system. Such discrepancies appear as anomalous connection-level ratios and require investigation; they must not be silently corrected.

13.6 11.6 Customer and feeder transferability is limited

Tariff mix, load shape, PV orientation, weather, network geography and operating practice differ. The adopted seasonal factors are controlled project priors, not universal constants.

13.7 11.7 Hourly averaging removes sub-hourly extremes

A 24-point curve is appropriate for representative hourly studies but can smooth short-lived ramps and interval peaks. Studies of rapid voltage change, protection behaviour or inverter control may require finer resolution.

13.8 11.8 EGIF does not remove model uncertainty

Network topology, conductor parameters, transformer data, load allocation, voltage-control states and LV representation remain separate sources of uncertainty. EGIF strengthens the generation representation but does not validate every other model component.

14 12. Future development

The EGIF framework is designed to improve as additional evidence becomes available. Priority extensions include:

1. synchronized full-year connection and feeder-head AMI;
2. direct inverter-generation or gross-load measurements for selected samples;
3. feeder-specific irradiance and temperature records;
4. explicit day-type separation for weekday, weekend and holiday behaviour;
5. customer-class and orientation stratification where privacy controls permit;
6. uncertainty bands for every seasonal hourly curve;
7. finer time resolution for ramp and protection studies;
8. automated anomaly detection for sanctioned-capacity inconsistencies;
9. validation against newly observed reverse-flow and voltage events; and
10. controlled versioning of regional, feeder-class and technology-specific EGIF libraries.

Future revisions should add evidence without breaking the central discipline: sanctioned capacity, gross PV production, behind-the-meter use, positive grid injection and upstream net power are separate quantities.

15 13. Value created by Chief Consultant

The principal innovation is not merely the use of a coefficient. Chief Consultant has created a complete, auditable bridge between fragmented administrative records, interval net-metering data and distribution-system simulation.

The framework adds value by:

- converting sanctioned DSPV stock into an operating-point quantity that a power-flow model can use;
- incorporating behind-the-meter absorption without falsely claiming direct measurement of gross PV production;
- preserving connection authority and spatial mapping;
- preventing missing data from being treated as zero generation;
- creating a robust seasonal snapshot statistic for planning studies;
- creating separate empirical 24-hour profiles for time-series assessment;
- maintaining sanctioned-capacity weighting from connection to portfolio;
- making assumptions, coverage, exclusions and uncertainty auditable;
- supporting reproducible comparison of losses, reverse flow, voltage and thermal response; and
- establishing a scalable foundation for feeder-specific and regional DER planning tools.

This methodology turns a common planning weakness—knowing registered PV but not its coincident network injection—into a controlled engineering input.

16 14. Recommended engineering reporting language

The following language is recommended:

The Equivalent Generation Injection Factor converts sanctioned DSPV capacity into equivalent positive grid injection for a defined season and operating condition. It is derived from authoritative, matched net-metering connections using the non-negative difference between export and import, aggregated on a sanctioned-capacity-weighted basis. Seasonal snapshot factors represent P95 operating-point priors, while the 24-hour curves represent unscaled empirical clock-hour means.

Avoid statements such as:

- “EGIF is PV efficiency.”
- “All sanctioned PV produces the EGIF percentage at all times.”
- “The peak of the hourly curve must equal the snapshot factor.”
- “A missing meter record means zero generation.”
- “The annual hosting capacity is established by one seasonal snapshot.”
- “A seasonal prior overrides better timestamp-specific evidence.”

17 15. Conclusion

EGIF provides a disciplined answer to a fundamental DER-planning problem: registered solar capacity is known, but coincident positive injection into the distribution network is not equal to that capacity. By using authoritative connection matching, simultaneous import/export evidence, a non-negative net-injection boundary, availability-aware denominators and sanctioned-capacity weighting, Chief Consultant has created a transparent method for converting administrative DSPV records into defensible electrical study inputs.

The adopted snapshot factors—0.36 for winter, 0.64 for shoulder conditions and 0.50 for summer/monsoon—provide controlled seasonal P95 operating-point priors. The separately derived 24-hour profiles preserve typical clock-hour variation and are intentionally not rescaled to those snapshot values. Together, the two products support both snapshot and time-series studies while keeping their statistical meanings intact.

Used correctly, EGIF strengthens hosting-capacity assessment, voltage and thermal studies, reverse-flow analysis, loss optimization and broader DER planning. It does not remove the need for sound network models, synchronized measurements or engineering judgment. Its value lies in making the relationship between sanctioned capacity and network-visible injection explicit, reproducible, auditable and suitable for systematic future development.

18 Document control

Field	Entry
Document title	Equivalent Generation Injection Factor (EGIF)
Document type	Proprietary methodology white paper
Owner	Chief Consultant
Methodology lead	Engr. Muzammil Adeeb
Primary application	DSPV/DER impact and hosting-capacity assessment
Confidentiality	Controlled technical reference; anonymized methodology
Revision	1.0
Issue date	September 2026

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