IMPACT LOAD STUDIES

Unified Data Collection Checklist

What is this form?

This checklist captures all data our engineers need to perform an Impact Load Study for your site, evaluating voltage dips, flicker, frequency excursions, and system response caused by sudden large load switching events such as large motor starts, arc furnaces, welding loads, crane hoists, and process step changes. Provide as much as you can; mark estimates as 'approx.'

- Attach existing SLDs, generator data sheets, or relay settings.
- Partial data is always useful our engineer will identify gaps and follow up.
- All information is treated as strictly confidential.

Your Contact Details

Company / Organization: _____

Site Name & Address: _____

Your Name & Role : _____

Email Address : _____

Phone Number: _____

Date Completed: _____

A. SYSTEM OVERVIEW & SUPPLY NETWORK

Supply Voltage at Point of Common Coupling (PCC) *e.g. 33 kV / 11 kV / 415 V*	**System Frequency (Hz)** *e.g. 50 Hz / 60 Hz*
Utility / Grid Fault Level at PCC (MVA / kA) *e.g. 500 MVA / 8.7 kA at 33 kV*	**Network Impedance at PCC (Z, R, X)** *e.g. Zk = 2.18 Ω from utility or prior study*
Supply Source Type *e.g. Infinite utility grid / Weak grid / Islanded generator bus*	**Applicable Standards** *e.g. IEEE 1453, IEC 61000-3-7, IEC 61000-4-15, utility flicker limit*
Voltage Flicker Limit (Pst / Plt) *e.g. Pst ≤ 1.0, Plt ≤ 0.65 per IEC 61000-3-7*	**Voltage Dip Limit (%)** *e.g. ≤ 3% at PCC per utility requirement*
SLD Available? *Yes attach / Partial / No*	**Previous Impact Load or Flicker Study?** *Yes attach / No*
No. of Other Customers / Feeders at PCC *e.g. 3 feeders shared at 11 kV bus*	**Has Utility Issued a Flicker or Voltage Complaint?** *Yes attach notice / No*

B. IMPACT LOAD DATA (complete one row per load attach datasheets if available)

Load Tag	Load Type / Application	kW / kVA Rating	Voltage (V/kV)	Starting Current (×FLC or kA)	Power Factor at Start	Switch-ON Duration (ms / s)	Switching Frequency	Notes
e.g. IL-01								
e.g. IL-02								

Impact Load Type Examples:

Large Motor Start | Arc / Induction Furnace | Welding Machine | Crane / Hoist | Compressor (DOL start) | Resistance Welder | Process Step Change | Battery Charger Bank | Large UPS Switch-over

C. LOAD SWITCHING PATTERNS & OPERATIONAL PROFILE

Load Tag	Switch Events per Hour	Switch Events per Day	Time of Day (Peak Events)	Random or Periodic?	Simultaneous with Another Load?	Notes
e.g. IL-01						

Operating Hours *e.g. 24/7 continuous / Mon–Fri 06:00–22:00 / Shift-based*	**Peak Production Period** *e.g. 07:00–15:00 weekdays / All day Saturday*
Are Multiple Impact Loads Switched Simultaneously? *Yes describe which loads and sequence / No*	**Load Shedding or Priority Tripping Scheme Present?** *Yes describe / No*

D. SUPPLY NETWORK & TRANSFORMER DATA

Tag	kVA/MVA	Pri. kV	Sec. V	Z% Imp.	X/R Ratio	Vector Group	Grounding	Notes
e.g. TR-01								

Cable / Feeder Ref	From	To	Length (m)	Size (mm²) / Type	R (Ω/km)	X (Ω/km)	Notes
e.g. F-01							

Other Background Loads on Same Bus *e.g. 500 kW process loads remain energised during event*	**Power Factor Correction / Capacitor Banks at PCC** *Yes kVAR rating, fixed/APFC / No*
Generators / DG Sets on Site *Yes capacity, parallel with grid or standby / No*	**STATCOM / SVC / Active Filter Present?** *Yes brand, rating / No*

E. SENSITIVE EQUIPMENT & AFFECTED LOADS

List all equipment known to be affected by voltage dips or flicker from the impact load events:

Equipment Tag	Equipment Type	Bus / Location	Voltage Sensitivity (% dip tolerated)	Dip Duration Tolerated (ms)	Criticality (High / Med / Low)	Notes / Observed Behaviour

e.g. PLC-01						
e.g. VFD-02						

Sensitive Equipment Examples:
PLC / DCS / SCADA | CNC Machine | Variable Speed Drive (VFD) | UPS | Medical Equipment | Lighting Controls | Communication Systems | Instrumentation / Analysers | Precision Process Equipment

F. EXISTING POWER QUALITY & FLICKER MEASUREMENTS

Measurement Parameter	Value (if known)	Location / Bus	Date Measured
Voltage Dip Magnitude (%)			
Voltage Dip Duration (ms)			
Flicker Pst (short-term)			
Flicker Plt (long-term)			
Voltage THD (%)			
Voltage Unbalance (%)			

PQ Monitoring Instrument Used *e.g. Fluke 435, Hioki PQ3100, Dranetz / Not available*	**Monitoring Duration** *e.g. 7-day continuous / Single event capture / Not measured*
Oscillography / Waveform Data Available? *Yes attach / No*	**SCADA / BMS Event Logs Available?** *Yes attach / No*

G. DISTURBANCE SCENARIOS TO MODEL

Tick all scenarios to be included in the impact load study:

☐ Single impact load switch-ON event (worst case)	☐ Repetitive switching flicker assessment (Pst/Plt)
☐ Simultaneous switching of multiple impact loads	☐ Sequential switching with defined time delays
☐ Maximum grid fault level scenario (stiff supply)	☐ Minimum grid fault level (weak grid / DG only)
☐ Impact load connected to dedicated transformer	☐ Impact load sharing bus with other sensitive loads
☐ Capacitor bank in service during switching event	☐ Capacitor bank out of service during switching event
☐ Load switch-OFF transient (over-voltage assessment)	☐ Generator / DG as sole source impact load start
☐ N-1 scenario one source transformer out of service	☐ Arc furnace operation continuous flicker assessment
☐ Load step-down event (sudden load rejection)	☐ Other describe below

Additional scenario details / constraints *Bus topology during event, simultaneous events, process interlocks, load sequence...*	**Simulation Time Step Required** *e.g. 1 ms EMT / 10 ms RMS / 20 ms per cycle*	**Flicker Assessment Period** *e.g. Pst = 10 min / Plt = 2 h / Both*

H. PROBLEMS & SYMPTOMS OBSERVED

Tick all that apply even infrequent events are important for flicker and dip assessment:

☐ Visible light flicker from arc furnace / welder / crane	☐ Voltage dips causing equipment dropouts or trips
☐ PLC / DCS / instruments resetting during load events	☐ VFD tripping on under-voltage during switching
☐ Contactor drop-out when large load switches on	☐ UPS switching to battery unexpectedly
☐ Utility has issued a flicker complaint or notice	☐ Neighbouring facility complaining of flicker
☐ Motor tripping or failing to run during furnace cycle	☐ Breaker or fuse tripping on load energisation
☐ Failed flicker compliance test (utility measurement)	☐ Production stoppages or quality issues from dips
☐ Overheating of capacitor banks near impact loads	☐ Other describe below

Describe the problem in your own words *Which load, what is affected, how often, any complaints received, equipment damage...*	**When did problems start?** *e.g. After furnace upgrade 2023 / Always an issue*	**Estimated Financial Impact** *e.g. USD 50k penalty / production loss / Hard to estimate*

I. EXISTING DATA & DOCUMENTS (tick what you can share)

☐ Single Line Diagram (SLD) any revision	☐ Load list or equipment schedule
☐ Impact load technical datasheet (furnace, welder, hoist)	☐ Transformer nameplate / test certificate
☐ Cable schedule or impedance data	☐ Utility fault level data or network impedance
☐ Power quality measurement report (flicker / dip data)	☐ Oscillography or SCADA event log from dip events
☐ Previous impact load or flicker study	☐ Utility complaint or written notice
☐ Capacitor bank / APFC datasheet	☐ Active filter / SVC / STATCOM datasheet
☐ Electricity bills (last 6–12 months)	☐ Generator / DG set datasheet (if applicable)
☐ Photographs of main switchboard / load equipment	☐ Other describe below

J. STUDY OBJECTIVES & SCOPE

Tick your top priorities for this engagement:

☐ Calculate voltage dip magnitude and duration at key buses	☐ Assess flicker severity Pst and Plt at PCC
☐ Comply with utility flicker / voltage dip limits	☐ Identify equipment at risk from impact load events
☐ Evaluate effect on sensitive equipment (PLC, VFDs, etc.)	☐ Assess impact of simultaneous load switching events
☐ Investigate and resolve utility complaints / notices	☐ Design or evaluate flicker mitigation (SVC, STATCOM, APFC)
☐ Evaluate effect of arc furnace / welder on the network	☐ Recommend mitigation measures and design specification
☐ Prepare documentation for utility submission / compliance	☐ Assess N-1 contingency impact on load switching events

☐ Support design of new high-impact load connection	☐ Other describe below

Most important goal / successful outcome *What does a successful result look like for your operation?* _____ _____	**Deadline / Timeline?** *e.g. Utility compliance in 4 weeks / Planned furnace start-up date* _____

COMPANY NAME

Full Name: _____
Signature: _____
Date: _____

What Happens Next

Our engineer will review your form shortly and contact you.