

Questions & Answers About the Operate within IROLs Standard

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Introduction to Standard

This standard requires adherence to the subset of system operating limits¹ identified to prevent instability, uncontrolled separation or cascading outages that adversely impact the reliability of the bulk transmission system. These limits are called interconnection reliability operating limits and are under the authority of the entity performing the reliability authority function. (Note that there are many other system operating limits that are used by system operators working for entities performing the Reliability Authority function and for entities performing the Transmission Operator function. This standard only addresses Interconnection Reliability Operating Limits.)

This standard is subdivided into eight requirements. Each of the requirements addresses some aspect of monitoring or controlling the transmission system to operate within IROLs. Some of these requirements address underlying responsibilities that must be accomplished as a prerequisite to monitoring and controlling the transmission system relative to IROLs.

201 Interconnection Reliability Operating Limit Identification — requires identification of the facilities that are subject to IROLs and requires identification of IROLs. Each IROL must have a T_v . The lists must be updated to reflect changes in topology and system conditions. (The entity performing the Reliability Authority Function is responsible for this requirement.)

202 Monitoring — requires monitoring real time data and comparing the data to IROLs to determine if the RA Area is operating within its IROLs (The entity performing the Reliability Authority Function is responsible for this requirement.)

203 Analyses and Assessments — requires that an operational planning analyses be conducted at least once each day to look at the ‘day ahead’ and requires that real-time assessments be conducted at least once every 30 minutes. These analyses and assessments are done to see if the transmission system is expected to be operated within its IROLs and to see if the transmission system is operating within its IROLs. (The entity performing the Reliability Authority Function is responsible for this requirement.)

204 Actions — requires that actions be taken or directives issued to prevent or mitigate instances of exceeding IROLs. These actions and directives must be documented when an IROL is exceeded, and when an IROL is exceeded for a time greater than the IROL’s T_v this event must be reported to the Compliance Monitor. (The entity performing the Reliability Authority Function is responsible for this requirement.)

205 Data Specification and Collection — requires that a data specification be developed that identifies the data needed for monitoring real-time parameters against IROLs, and for conducting operational planning analyses and real-time assessments relative to operating within its reliability area’s IROLs. The Data Specification must be distributed to entities that are expected to provide data and needs to address what data to provide, a mutually agreeable format for the data, a timeframe and periodicity for providing data, and must address the data provision process to use when automated real-time system operating data is unavailable. The Reliability Authority must notify its Compliance Monitor if data is not provided as specified. (The entity performing the Reliability Authority Function is responsible for this requirement.)

206 Data Provision — requires that entities provide the Reliability Authority with data needed to monitor real-time parameters against IROLs, and to conduct operational planning analyses and real-time

¹ System Operating Limits are established through the standard, “Determine Facility Ratings, Operating Limits and Transfer Capabilities”

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assessments relative to operating within its reliability area's IROLs. (The entities performing the following Functions are responsible for this requirement: Balancing Authorities, Generator Operators, Generator Owners, Load-serving Entities, Reliability Authorities, Transmission Operators, and Transmission Owners)

207 Action Plan — requires that there be a plan to address actions to take or directions to issue to prevent and mitigate instances of exceeding IROLs. The plan must identify and be coordinated with all entities that have to take actions as part of the plan, and with entities that would be impacted by the actions taken in the plan. (The entity performing the Reliability Authority Function is responsible for this requirement.)

208 Reliability Authority Directives — requires that entities follow the Reliability Authority's directives issued to prevent or mitigate instances of exceeding IROLs. The directives issued and the actions taken in response to those directives must be documented. (The entities performing the following functions are responsible for this requirement: Balancing Authority, Interchange Authority, and Transmission Operator.)

Expansion on Definitions

Balancing Authority: Integrates resource plans ahead of time, and maintains load-interchange-generation balance within its metered boundary and supports system frequency in real time.

Note: This term was defined in the NERC Functional Model approved by the NERC Board of Trustees, June 12, 2001.

Bulk Electric System: A term commonly applied to the portion of an electric utility system that encompasses the electrical generation resources and bulk transmission system.

Note: This term was included in the NERC Glossary of Terms approved by the Engineering Committee and the Operating Committee in August 1996. The Glossary of Terms was prepared by the NERC Glossary of Terms Task Force.

Cascading Outages: The uncontrolled successive loss of system elements triggered by an incident at any location. Cascading results in widespread service interruption, which cannot be restrained from sequentially spreading beyond an area predetermined by appropriate studies.

Note: The word, 'cascading' was included in the NERC Glossary of Terms approved by the Engineering Committee and the Operating Committee in August 1996. The Glossary of Terms was prepared by the NERC Glossary of Terms Task Force.

Generator Operator: Operates generating unit(s) and performs the functions of supplying energy and Interconnected Operations Services.

Note: This is the definition proposed by the Functional Model Review Task Group for inclusion in the second version of the Functional Model.

Generator Owner: The entity that owns the generator.

Note: This is the definition proposed by the Functional Model Review Task Group for inclusion in the second version of the Functional Model.

Instability: The inability of the transmission system to maintain a state of equilibrium during normal and abnormal system conditions or disturbances.

Interconnection Reliability Operating Limit: A system operating limit which, if exceeded, could lead to instability, uncontrolled separation, or cascading outages that adversely impact the reliability of the bulk transmission system.

Note: This term was adapted from the term, Interconnection Reliability Limit, drafted by the Operating Limit Definition Task Force.

Interconnection Reliability Operating Limit Event: An instance of exceeding an interconnection reliability operating limit for any length of time.

Note: All IROL Events must be documented.

Interconnection Reliability Operating Limit Event Duration: The length of time an interconnection reliability operating limit is exceeded. The duration is measured from the point where the limit is first exceeded and ends when the value drops below the limit and remains below the limit for at least 30 seconds.

Note: Graphics in next section of this Technical Reference shows the application of this 30-second rule.

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Load-serving Entity: Secures energy and transmission (and related generation services) to serve the end user.

Note: This term was defined in the NERC Functional Model approved by the NERC Board of Trustees, June 12, 2001.

Occurrence period (Performance-reset Period): The time period in which performance is measured, evaluated, and then reset.

Note: This is a term used by the Compliance Monitors. When you look at the Sanctions Tables, note that the first table's column headings reference the number of infractions within the Performance-reset period. As the number of infractions within a performance reset period increases, so does the severity of the sanctions.

Operational Planning Analysis: An analysis of the expected system conditions, given the load forecast(s) and known system constraints, such as transmission facility outages, generator outages and equipment limitations.

Note: This standard requires that an operational planning analysis be conducted at least once each day, looking at the day ahead. This does not mean that operational planning analyses are limited to being conducted on a day-ahead basis. For example, an operational planning analysis should be conducted as part of approving a transmission line outage — and this operational planning analysis may be conducted several months ahead of the day being reviewed.

Real-time: Present time as opposed to future time.

Real-time Assessment: An examination of existing and expected system conditions, conducted by collecting and reviewing immediately available data.

Real-time Data: Real-time measured values, state estimator values derived from the measured values, or other calculated values derived from the measured values — may include directly monitored data, Inter-utility data exchange (e.g., Interconnection Control Area Communication Protocol or SCADA Data), and manually collected data.

Real-time Monitoring: The act of scanning data and drawing conclusions about what the data indicates.

Note: This definition supports the concept that monitoring is an 'active' task. The system operator assigned to monitor system conditions should be prepared to answer questions about what he/she has been monitoring without any preparation time. Simple questions can be used to determine whether or not monitoring has taken place. For example, a system operator who has been monitoring real time data to see if the area under the operator's direction is approaching or exceeding any IROLs should be able to answer the question, "Are there any IROLs on your system that have been exceeded? If any have been exceeded, are you approaching or exceeding the IROL's T_v ?"

Reliability Authority: Ensures the reliability of the bulk power transmission system within its Reliability Authority Area.

Note: This term was defined in the NERC Functional Model approved by the NERC Board of Trustees, June 12, 2001.

Reliability Authority Area: The collection of generation, transmission, and loads within the boundaries of the Reliability Authority. Its boundary coincides with one or more Balancing Areas.

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Note: This is the definition proposed by the Functional Model Review Task Group for inclusion in the second version of the Functional Model.

Self-certification: A process by which an entity does a self-evaluation to determine if it is compliant with the specific requirements for a reliability standard.

Note: This is a term used by the Compliance Monitors.

T_v: The maximum time that an interconnection reliability operating limit can be exceeded without compliance sanctions being applied.

Note: Operating Policy 2 — Standard A.2. included the following requirement:

Following a contingency or other event that results in an OPERATING SECURITY LIMIT violation, the CONTROL AREA shall return its transmission system to within OPERATING SECURITY LIMITS AS soon as possible, but no longer than 30 minutes.

This new standard does not require a response within 30 minutes — rather each limit has its own 'T_v'. Some IROLs are so critical that exceeding them for 30 minutes may be too long — and for other IROLs, a T_v greater than 30 minutes may represent an acceptable risk. While a default of 30 minutes may be easier to remember, this default may have the undesirable result of limiting the application of Market Solutions that could be used to resolve instances of exceeding IROLs.

See the charts in the next section for examples of how T_v is used to determine whether an instance of exceeding an IROL must be reported to the Compliance Monitor.

Transmission Operator: The entity that operates the transmission facilities and executes switching orders.

Note: This term was defined in the NERC Functional Model approved by the NERC Board of Trustees, June 12, 2001.

Transmission Owner: Owns transmission facilities.

Note: This term was defined in the NERC Functional Model approved by the NERC Board of Trustees, June 12, 2001.

Uncontrolled Separation: The unplanned break-up of an interconnection, or portion of an interconnection, that is not the result of automatic action by a special protection system or remedial action scheme operating correctly.

Wide Area Impact: The impact of an event that, if left untended, could lead to voltage instability, cascading outages or uncontrolled separation that jeopardizes the reliability of an interconnection. The geographic size of the area affected by such an event is always larger than the local area monitored by a single transmission operator and may be larger than the portion of the transmission system under the authority of a single reliability authority.

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Questions and Answers

Who needs to comply with this standard?

Each of the requirements in the standard assigns responsibility for that requirement to one or more ‘functions.’ The entities performing the listed functions are the entities that must comply with that requirement. Most of the requirements are applicable to entities that perform the Reliability Authority Function — but several functions are assigned responsibility for the Data Provision and RA Directives requirements.

Requirement	Entities that Perform these Functions Must Comply With the Requirements							
	Reliability Authority	Balancing Authority	Interchange Authority	Trans. Operator	Trans. Owner	Gen. Owner	Gen. Operator	Load-Serving Entity
201 IROL Identification	X							
202 Monitoring	X							
203 Analyses & Assessments	X							
204 Actions	X							
205 Data Specification & Collection	X							
206 Data Provision	X	X		X	X	X	X	X
207 Action Plan	X							
208 RA Directives		X	X	X				

When does compliance with this standard start?

Several things must be in place before entities are expected to come into full compliance with all of the requirements in this standard. Most importantly, the Operate Within IROLs Standard can't be implemented until after the Determine Facility Ratings, System Operating Limits and Transfer Capabilities standard has been implemented. The methodology for developing system operating limits must be in place and the RA must identify system operating limits before the RA can be held accountable for identifying which of its system operating limits are IROLs. There are other parts of the standard that will take some time to put into place if they aren't already in place. Some entities performing the RA function may have a detailed data specification that could be used to meet the Data Specification requirement in this standard — but other entities may have handled this requirement on a more casual basis and may need some time to formalize their data specifications.

For a System Operator — how does this new standard differ from Operating Policy 2 — Transmission?

There are three significant differences between what is expected of system operators under Policy 2, and what is expected of system operators under Standard 200.

Major Difference #1 — Term, 'OSLs' replaced with term, 'IROLs'

The first difference is a terminology change. The NERC Director-Compliance reports on compliance violations at each NERC Board of Trustees Meeting. He noted an increase in the number of OSL violations and was directed by the BOT to investigate the cause. The investigation results showed a widespread misunderstanding on what was/was not an OSL. The task force that worked on this problem, called the Operating Limits Definitions Task Force (OLDTF) recommended that the term, "Operating Security Limit" not be used in the future because of the widespread misunderstanding associated with this term. The new standard uses the term, 'Interconnection Reliability Operating Limit — IROL'.

From the Terms Used in the Operating Policies, here is the definition of an Operating Security Limit (OSL):

- The value of a system operating parameter (e.g. total power transfer across an interface) that satisfies the most limiting of prescribed pre- and post-contingency operating criteria as determined by equipment loading capability and acceptable stability and voltage conditions.

From the Operate within IROLs Standard, here is the definition of an Interconnection Reliability Operating Limit (IROL):

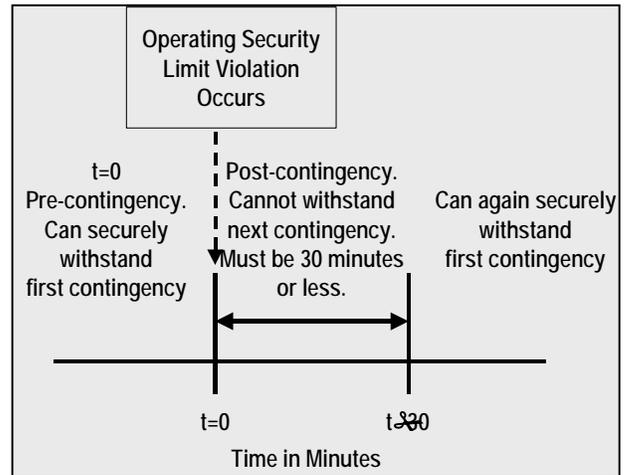
- A system operating limit which, if exceeded, could lead to instability, uncontrolled separation, or cascading outages that adversely impact the reliability of the bulk transmission system.

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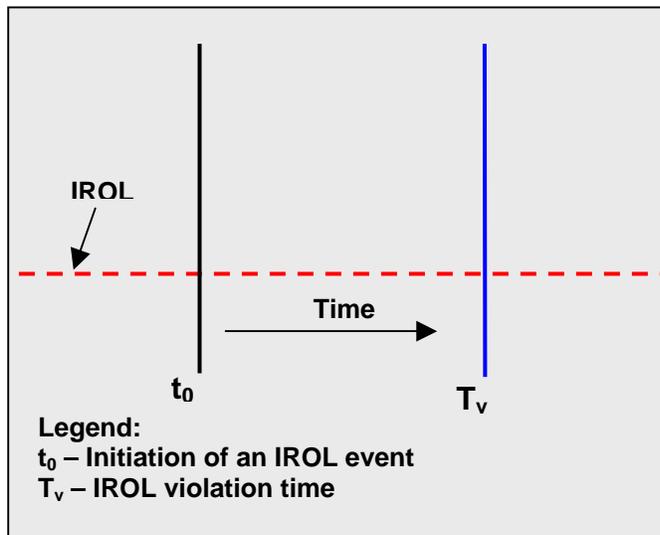
Major Difference #2 — Resolution time changed from a uniform ‘30-minutes’ for all OSLs to a ‘unique’ T_v for each IROL

Policy 2 has a standard ‘30 minute’ response time for resolving any instance of exceeding an operating security limit. The 30 minutes was established to give system operators enough time to recognize the problem and take corrective actions. The new Operate Within IROLs standard is designed from a perspective of system risk, and doesn’t have a standard ‘30 minute’ response time.

T_v is the maximum amount of time the system operator has to return to a state that is at or below the limit before being subjected to compliance sanctions. T_v is based on system risk — and recognizes that some IROLs shouldn’t be exceeded for longer than 10 minutes without causing an unacceptable risk to the interconnection. Each IROL may have its own T_v .



From Policy 2 — All OSLs addressed with the same 30-minute maximum resolution time



← *Operate within IROLs Standard — each IROL may have its own T_v .*

For IROLs that should never be exceeded, T_v may be zero minutes.

Major Difference #3 — New Report for IROL Violations

Policy 2 requires that a NERC Preliminary Disturbance Report be completed for OSL violations that exceed 30 minutes. The Preliminary Disturbance Report asks for a preliminary analysis to be conducted regarding the cause of the event — and is still needed. The new report is a compliance document and doesn’t require the same data that is required of the Preliminary Disturbance Report.

The data that is collected in the IROL Violations Report is data that should be readily available to the system operator shortly after an instance of exceeding an IROL. The report doesn’t ask for an analysis, just for a collection of the facts such as what limit was exceeded, how long was it exceeded, etc. The new report must be filed with the compliance monitor within five days of the event.

What is an IROL?

An IROL is a special type of system operating limit. While operating so that system operating limits aren't exceeded is always important, if an IROL is exceeded, there is an increased risk of voltage instability, cascading outages or uncontrolled separation that adversely impacts the interconnection.

System Operating Limits are monitored by system operators working for entities performing the Transmission Operator function and may also be monitored by system operators working for entities performing the Reliability Authority function.

The Reliability Authority monitors IROLs. The Reliability Authority may delegate this responsibility to system operators working for entities performing the Transmission Operator function, but it is the Reliability Authority that is held accountable for ensuring that IROLs aren't exceeded.

What is the IROL's T_v ?

T_v is the maximum amount of time the system operator has to return to a state that is at or below the limit before being subjected to compliance sanctions.

The T_v associated with each IROL is a time value used to assess how quickly the interconnection may deteriorate if an IROL isn't mitigated. IROLs should never be exceeded — but if one is exceeded, the T_v represents the maximum amount of time the limit can be exceeded before the risk to the interconnection becomes unacceptable. Under this standard, if a T_v is exceeded, there are financial penalties and additional reporting requirements.

Why don't all IROL's have the same T_v ?

The IROL's T_v is based on system risk — and recognizes that exceeding some IROLs is unacceptable for any length of time; while exceeding other IROLs can probably be tolerated for a longer period of time before there is an unacceptable risk to the interconnection. By establishing a T_v for each IROL, the RA has information needed to anticipate the negative results of exceeding an IROL. If an IROL can't be exceeded for any length of time, then the RA may choose to install a special protection scheme to control the risk of exceeding the limit in real time.

If an RA installs a special protection scheme to reduce the probability of exceeding an IROL for time greater than the limit's T_v , does this eliminate the IROL?

No. The facility being protected by the special protection scheme would still need to be included in the list of facilities subject to IROLs, and the IROL would need to be listed with its T_v . Since special protection schemes don't always work as planned, it is important that system operators know where they have IROLs, know which facilities are subject to IROLs and know what the T_v is for each IROL. The system operator needs access to this data to make appropriate system operating decisions when special protection schemes don't work as planned.

How do you develop a list of IROL's?

The Determine Facility Ratings, System Operating Limits and Transfer Capabilities standard includes a requirement that entities responsible for developing system operating limits document their methodology for developing these limits. The RA is responsible for developing the subset of system operating limits that are called IROLs. The RA must follow its methodology for developing system operating limits and then must identify whether or not exceeding that limit could cause voltage instability, cascading outages,

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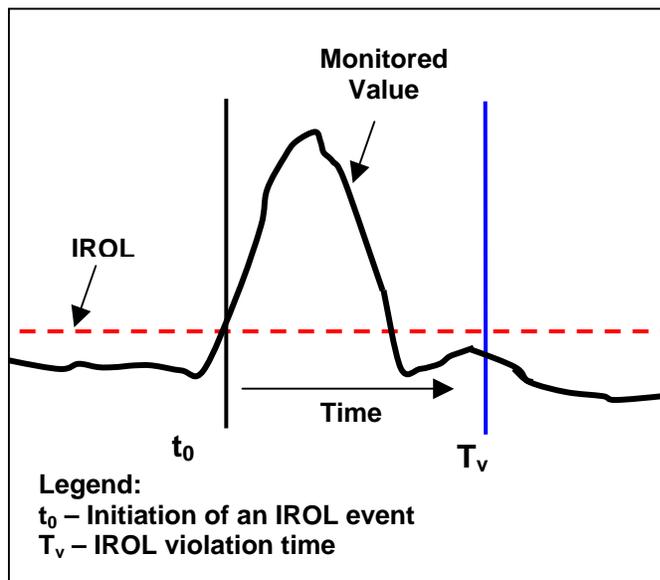
or uncontrolled separation from the interconnected transmission system. If the system operating limit could lead to one or more of these dire consequences, then the limit is an IROL.

How do you establish a T_v for an IROL?

Each RA may use whatever system it wants for establishing a T_v for its IROLs. This gives each RA the latitude to be as conservative as it desires. Some RAs may choose to use a default T_v of 30 minutes — currently some entities have a default of 20 minutes for all limits that would be categorized as IROLs. One of the benefits of this variable T_v is that it gives an RA that operates in a market environment greater flexibility before implementing remedial actions that have the effect of negatively impacting that market.

Which instances of exceeding an IROL need to be documented?

All. Every instance of exceeding an IROL for any length of time must be documented. Most entities are expected to document the instance on a system operating log, but the standard does not require that the documentation be on an operating log, just that it be documented somewhere.



When you exceed an IROL, what do you have to document?

When you exceed an IROL for any length of time, you need to document the following three things:

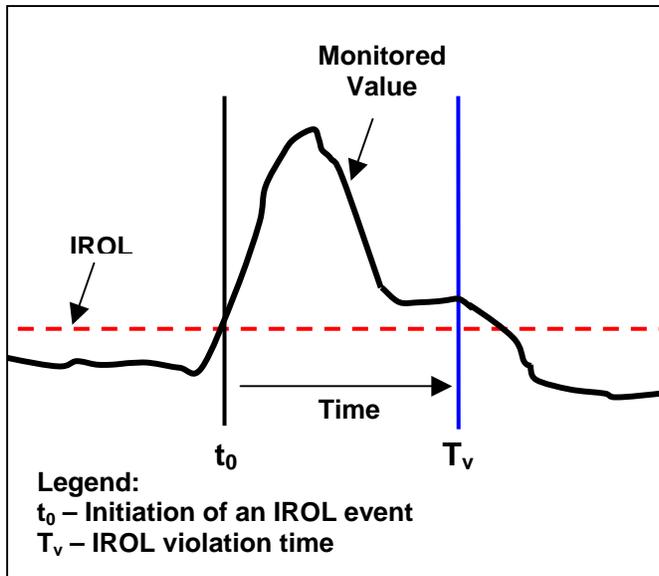
- Actions taken or directives issued
- Magnitude of the event
- Duration of the event

Does the standard require that exceeding an IROL be documented on the system operator's daily log?

No. Each entity can document IROL events using whatever documentation system works best for them. While each entity may use whatever system(s) it chooses to document instances of exceeding IROLs, the documentation must be retrievable so it can be shown to the compliance monitor. The data can be retrievable through computer screen displays, through paper or electronic logs, or other sources.

Which instances of exceeding an IROL need to be reported?

Every instance of exceeding an IROL for time greater than the IROL's T_v is reported to the compliance monitor within five business days.



The value being monitored exceeded its IROL for a time greater than the IROL's T_v and the event must be documented and reported.

When you exceed an IROL for a time greater than the IROL's T_v , what do you have to report?

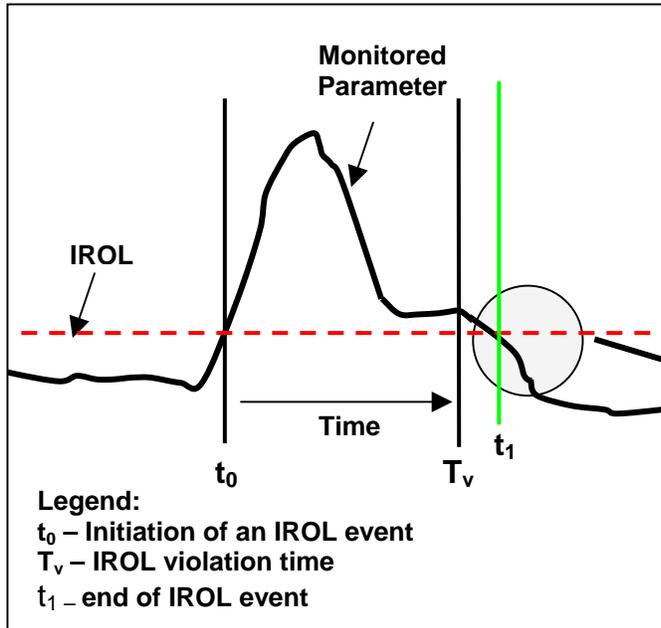
When you exceed an IROL for a time greater than the IROL's T_v , you have to report the following information to the compliance monitor:

- Date and time of the event
- Identification of which interconnection reliability operating limit was violated
- T_v for that limit
- Magnitude and duration of exceeding the interconnection reliability operating limit
- Actions taken or directives issued
- Time actions or directives were initiated or issued
- Explanation of results of actions or directives

There is a report called the IROL Violation Report that captures this information. This report is available from the NERC website and is provided at the end of this document.

How do you calculate the duration of an IROL event?

The duration of an IROL event is measured from the point in time when the IROL is first exceeded to the point in time where the parameter being monitored has returned to a value that is at or below the IROL. The event concludes when the actual value is below the IROL for 30 seconds.

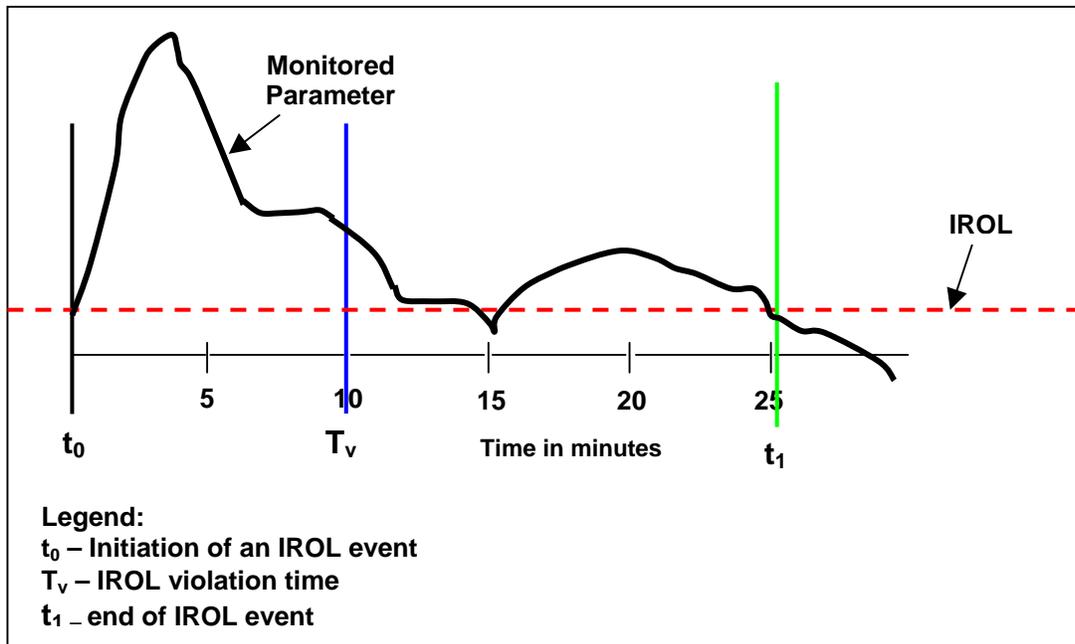


The monitored parameter must remain at or below the IROL for 30 seconds or more.

The line for t_1 shows the end of the IROL event, which is the point in time when the monitored value returns to a value that is at or below the IROL as long as the monitored value remains at or below the limit for at least 30 seconds. (From pt. A to pt. B is 30 seconds.)

The following example is shown in the chart below. The IROL that has been exceeded has a T_v of 10 minutes. The IROL is exceeded for 15 minutes, then the monitored value returns to a value that is below that IROL for just 20 seconds, then exceed the IROL for another 10 minutes — then returns to a value that is below the IROL for 2 hours, the duration of the event that must be reported is:

- 25 minutes, 20 seconds



IROL Violation Report

Interconnection Reliability Operating Limit Violation Report Compliance Template			
Entity Performing Reliability Authority Function:			
Report Date:			
Event Date:	Event Start Time:	Event End Time:	
Name of IROL that was exceeded:	Value of the IROL that was exceeded:	The exceeded IROL's T_v:	
Magnitude of Limit Exceeded after T_v:		Duration of Event:	
List of Actions Taken or Directives Issued and Results Achieved:			
Time Action Initiated or Directive Issued:	Action Taken or Directive Issued:	Time Action Completed:	Results Achieved:
Report completed by:			
Name:		Phone:	
Title: _____		E-mail:	