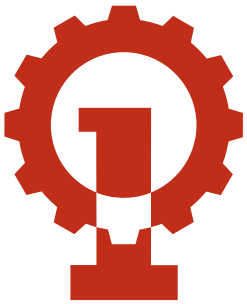


DATA FOUNDRY®

White Paper

THE TRUTH ABOUT DUAL POWER FEEDS

The term "dual feed" is used by many data center operators today when communicating the power configuration of their respective facilities. However, "dual feed" does not always mean that the facility is receiving two independent power feeds from the utility company to the data center as it might imply. In actuality there are several different configurations of services promoted as dual feed, each offering a drastically different level of robustness and failure risk.

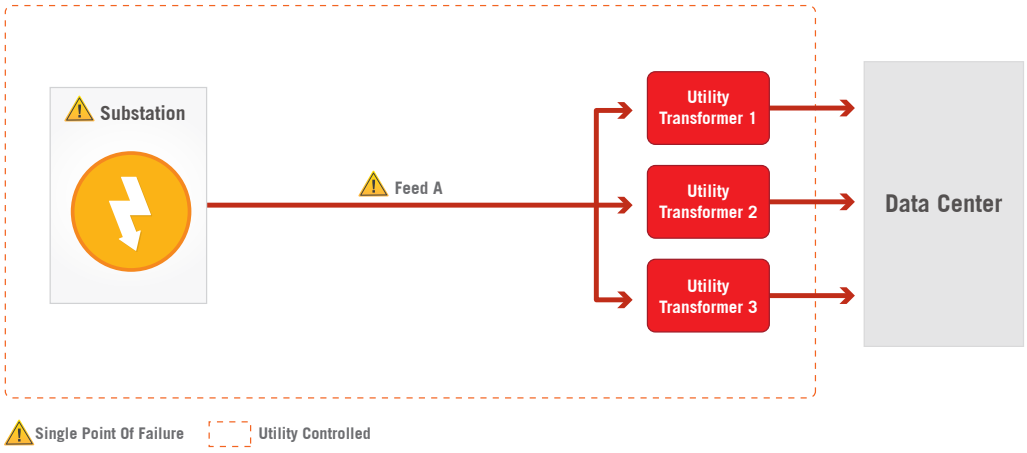
It is important to understand these differences and the true level of risk/reward provided within each. Substations, switches, transformers, and UPS systems are all key components in moving power from the utility company to the data center. Differences in quantity, placement, and redundancy of each determine the breadth and depth of its true dual feed power. To help explain these methods, and provide a good understanding of the pros/cons of various configurations, consider the following classification system that defines the variances in each methodology.

Data Center Power Feed Classifications:

- Class 1 – Single Feed
- Class 2 – Single Substation
- Class 3 – Dual Substations
- Class 4 – True Dual Feed

Class 1: Single Feed - Single Substation

Most of today's data centers fall into Class 1 single feed operators. Though many of these organizations will claim their facilities are dually fed, there is only one single feed from a single substation in this configuration. Multiple local transformers are fed by this single source, giving an appearance of more than a single feed.



A single feed is passed from the substation to the transformers

Class 1: Key Identifiers	Class 1: Components
1. One single power line above ground or below	1. Single Substation
2. Absence of an MTO or ATO (manual throw-over or automatic throw-over) switch	2. Single Feed
3. One substation	
4. Single input feed into the local transformer(s)	
5. Utility control of most components	

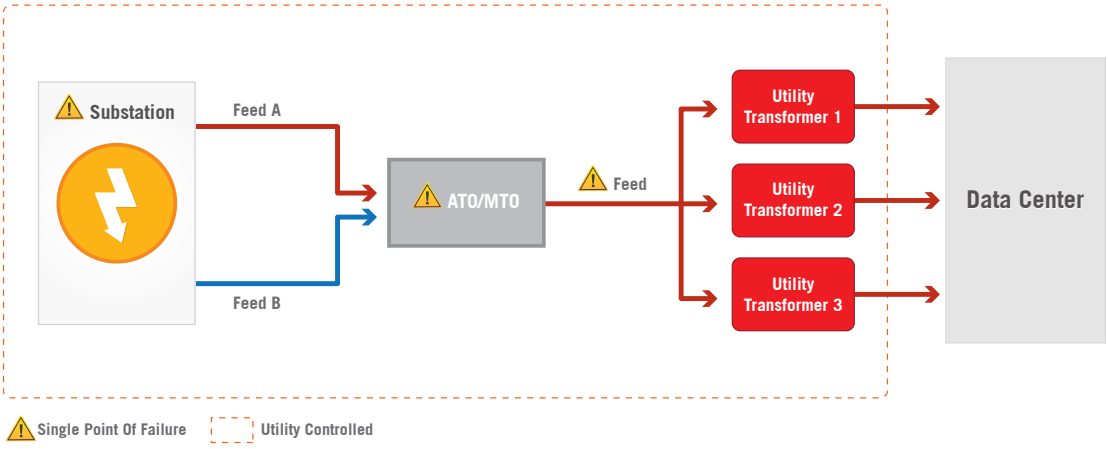
Class 1 data centers have multiple points of failure and are not redundant at any stage of the power supply chain. They may have multiple utility transformers, which appear to confer redundancy, but all transformers are fed off of the same utility feeder and are subject to single-cause interruption. These types of facilities run an extremely high risk of prolonged power outage and rely heavily on the utility company for maintenance and emergency repairs.

Pros: Lowest Cost, Less Maintenance Cost, Many Options

Cons: Higher Risk, Less Control, Many "Single Points of Failure"

Class 2: Dual Feed - Single Substation

Class 2 data center operators differ from Class 1 by adding one additional feed from the single substation. By having two separate feeds, a Class 2 dual feed data center reduces the risk of a single line failure causing prolonged outage. However, this configuration still holds a high risk of prolonged power outages with the use of only one substation as the power source.



Only one power feed at a time is passed from the ATO to the transformers.

Class 2: Key Identifiers	Class 2: Components
1. One single power line above ground or below	1. Dual Feeds
2. The use of an ATO switch	2. Single ATO switch
3. One substation	3. Single Feed
4. Single input feed into the transformer(s)	
5. Utility control of most components	

ATO = Automatic Throw-Over Switch

Once power has left the utility substation, the two feeds typically traverse the same intra-neighborhood route to the site, and are connected at a single throw over switch at the building (commonly referred to as the "MTO" or "ATO"). The throw-over device manually or automatically switches to the second feed if power is lost on the main feed. This device does not offer any power balancing and only switches to backup if power completely fails from on the primary feed. From the throw-over switch, power then runs through a single feed into multiple transformers located outside the data center facility.

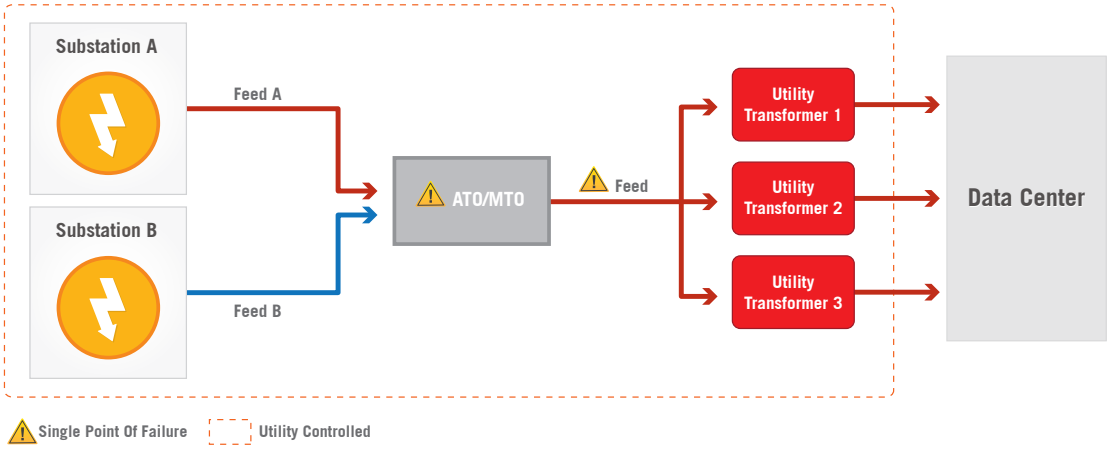
Keep in mind that in Class 1, 2 and 3 configurations, the substation, the ATO and the utility transformer(s) are all owned and maintained by the utility company. No maintenance is required by the data center operator, making these configurations less expensive than Class 4. However, this also presents a problem for the data center operators. The utility companies typically have a "run-to-failure" maintenance plan, meaning they do not perform preventative maintenance of any equipment. Instead, they wait for it to fail – taking all power to the facility down – and then replace the switch under emergency conditions. This is cheaper for the utility company, but substantially increases the risk of prolonged downtime.

Pros: Low Cost, Low Maintenance Cost, Feed Level Redundancy

Cons: Higher Risk, Less Control, Many "Single Points of Failure"

Class 3: Dual Feed - Dual Substations

Class 3 dual feed data centers use two discrete substations to provide power to a single facility. This is a less commonly deployed configuration than Classes 1 or 2, but is used in rare cases where the facility has readily available access to multiple substations. One feed comes from each substation to connect into the ATO switch. The separate substations provide an additional level of redundancy over a single substation by reducing the likelihood of prolonged outage if a single substation or its respective feed fails.



Only one power feed at a time is passed from the ATO to the transformers.

Class 3: Key Identifiers	Class 3: Components
1. Two power lines above ground or below	1. Dual Substations
2. The use of an ATO switch	2. Two Transformers
3. Two substation	3. Dual Feeds
4. Single input feed into the transformer(s)	4. Single ATO
5. Utility control of most components	5. Pseudo redundancy

Like Class 2, the ATO remains a single point of failure within the power chain and provides a higher level of risk and less control to the data center. In addition to the ATO being a single point of failure, the Class 3 data center has to also be concerned with only one feed coming from the ATO to the data center transformers. If anything happens to the line from the ATO switch to the facility, the data center will have to rely on generator power indefinitely. If any future construction is planned on or near the site, the impact of accidental line cutting between the ATO and facility is greater than having two independent lines to the building.

Transformer outside a data center

Again, the location and control of these components is important, as they will require more maintenance to run, and have a higher risk of failure being exposed to the elements.

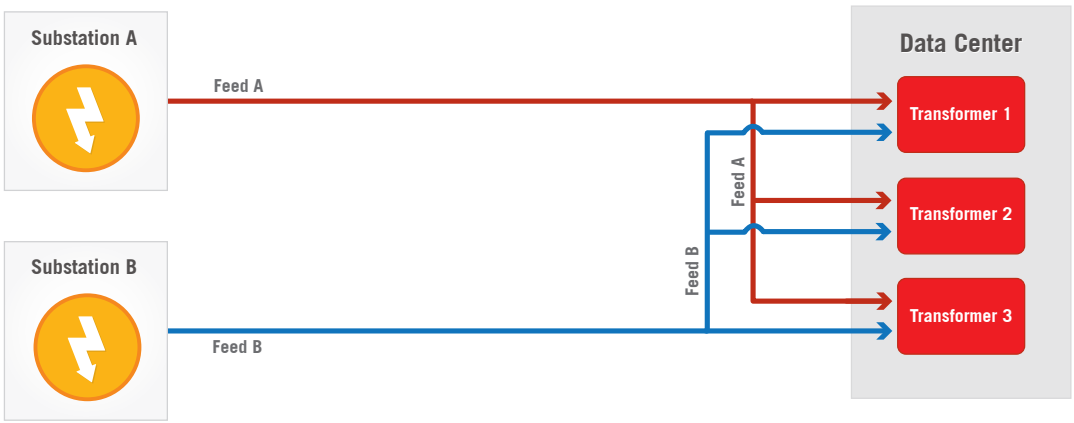
Pros: Substation & Feed Level Redundancy, Lower Cost than Class 4

Cons: Less Control, ATO is a "Single Points of Failure"

Class 4: Dual Feed - Fully Redundant

Class 4 data centers are very rare but have a markedly lower risk of failure than the previous three classes. As illustrated in the figure below, the Class 4 data center uses two separate substations, and a single independent feed from each much like Class 3. However, a Class 4 data center brings both substation feeds directly into each of transformers located inside the building. There are no single points of failure in a Class 4 configuration, and power loads within the facility are shared.

By balancing the power load across the two feeds, the operator has the flexibility to adjust in case of power surges, brown outs, or complete failure of a single source. This also allows for instant redundancy as there is a lower percentage of power to transfer if a source completely fails.



Only one power feed at a time is passed from the ATO to the transformers.

Class 4: Key Identifiers	Class 4: Components
1. Two power lines above ground or below	1. Dual Substation
2. Absence of the ATO switch	2. Two transformers
3. Two substations	3. Dual feeds to each transformer
4. Dual input feed into each transformer	4. Power load balance
5. Data center controlled transformer(s)	5. Complete redundancy

Additionally, by bringing the transformers inside the data center facility, the Class 4 operator reduces the wear caused by exposure to the elements and makes it easier for the maintenance and security staff to manage them. The omission of the ATO switch and the use of internal transformers means that less control is given to the utility company and subsequently reduces your overall risk of prolonged outage.

However, this configuration is more expensive to implement and only found in premium data centers. The facility's staff also assumes additional responsibility for proper maintenance and for execution of the throw-over from one power source to another when a substation fails.

Pros: Substation & Feed Level Redundancy, Load Balancing, Data Center Control, Lower Risk

Cons: Fewer Available Options, Higher Cost

Pros and Cons Summary:

	Class 1	Class 2	Class 3	Class 4
Pros	• Low Cost • Many Operators	• Feed Level Redundancy • Less Expensive than Class 3 and 4	• Substation Redundancy • Feed Level Redundancy • Less Expensive than Class 4	• Substation Redundancy • Feed Level Redundancy • Load Balancing • Data Center Maintenance/Control
Cons	• No Redundancy • Utility Maintenance/ Control – "Run to Failure" maintenance • Single Point of Failure: Single Substation • Single Point of Failure: Single Feed	• No Redundancy • Utility Maintenance/ Control – "Run to Failure" maintenance • Single Point of Failure: Single Substation • Single Point of Failure: Single Feed	• Utility Maintenance/ Control – "Run to Failure" maintenance • Single Point of Failure: ATO/MTO Switch	• Available Vendors • Cost

The Truth:

Power is the lifeblood of any data center facility. Having reliable power does not allow a data center to eliminate backup engine-generators or UPS units. However, the most reliable data center will spend the least amount of time possible running on its UPS batteries or on its backup engine-generators. The more those safety devices are used, the more likely it is that the entire site will experience a complete power interruption. It is crucial that anyone considering a data center for colocation, disaster recovery, or worksite recovery understand the differences between each of the above methodologies and how those differences affect your organization. Don't rely on the operator's use of the term "dual feed" as a surety of redundant power. The truth or the lack thereof could result in major issues and even downtime for your organization. **The truth about dual feeds is simple; they are not all created equal.**

About Data Foundry

Data Foundry provides comprehensive wholesale and retail data center outsourcing, colocation, and disaster recovery services. The company provides its customers with secure premium facilities for servers and equipment, emergency workspace and carrier-neutral network accessibility, supported by experienced onsite technicians and customer support 24/7/365. The company supports more than 1,000 enterprise customers across a variety of industries including energy, healthcare and financial services. Founded in 1994, Data Foundry was the first Internet Service Provider in San Antonio and one of the first 50 Internet Service Providers in the United States. Today, Data Foundry operates data centers in Austin and Houston and owns private networks in Austin, Houston, San Antonio and Dallas. For more information, visit www.datafoundry.com or call 1.888.839.2794.

DATA FOUNDRY®

1.888.839.2794

www.datafoundry.com

TEXAS 1
4100 Smith School Rd
Austin, TX 78744

ADC - Austin Data Center
7401 East Ben White Blvd, Ste 1000, Bldg One
Austin, TX 78741

HDC - Houston Data Center
5555 San Felipe, Ste 625
Houston, TX 77056