

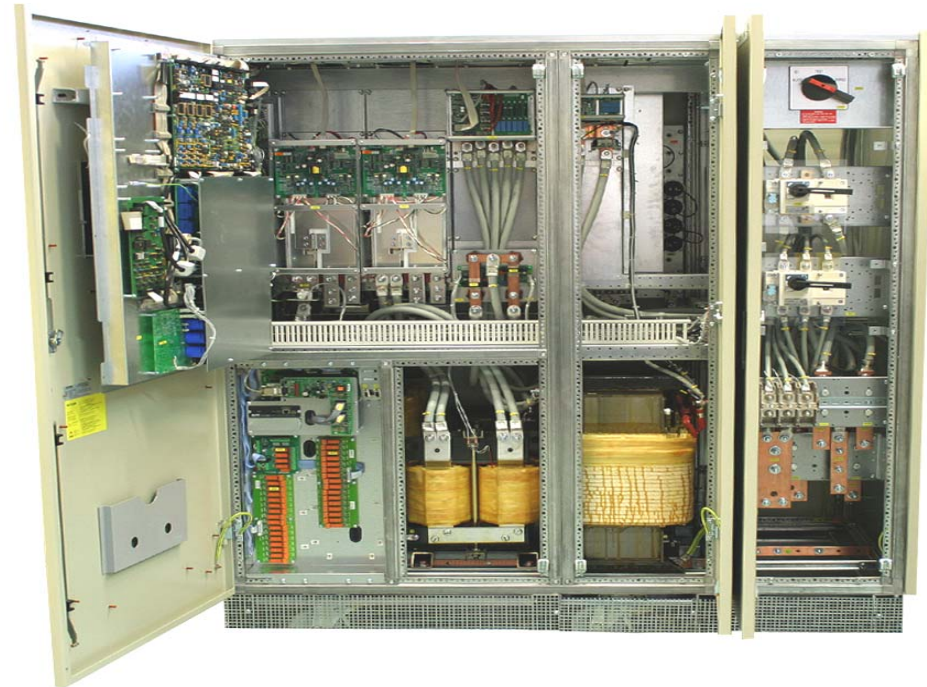
Ensure Smooth Plant Operation thanks to the most suitable Critical Power Solution

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Topics of this Presentation

- Introduction
- UPS Load Types
- UPS Power Networks
- UPS Configurations
- Configuration Comparison
- Conclusion



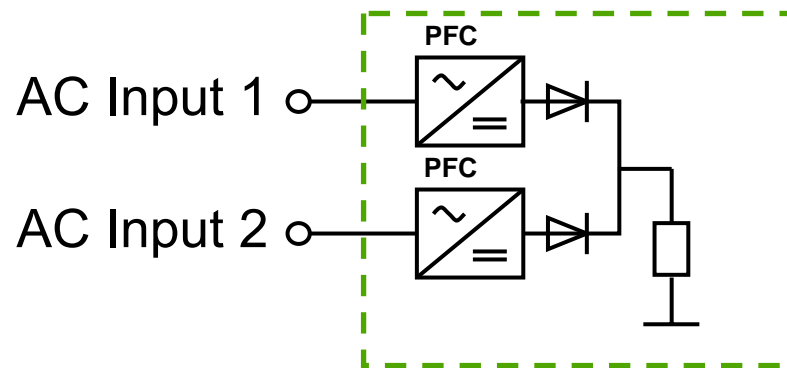
Introduction

- UPS = Uninterruptible Power Supply for critical AC-loads
- UPS main duties
 - Secure continuous power to critical loads
 - Act as a mains filter
- UPS environment
 - Upstream feeding concept
 - Downstream distribution set-up
- UPS loads
 - Input topology / Current characteristics
- There is no „one and only“ solution

UPS Load Types

Linear Loads

- Sinusoidal input current / no harmonics feed back
- Traditional loads and power factor corrected (PFC) loads
- Single- or dual inputs

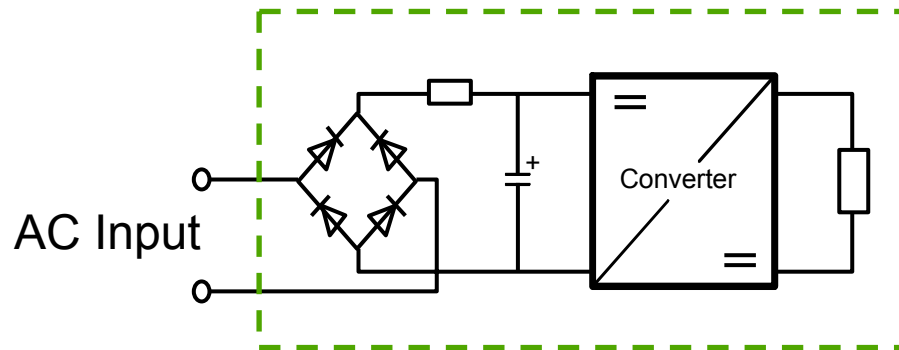


Linear Load with dual inputs

UPS Load Types

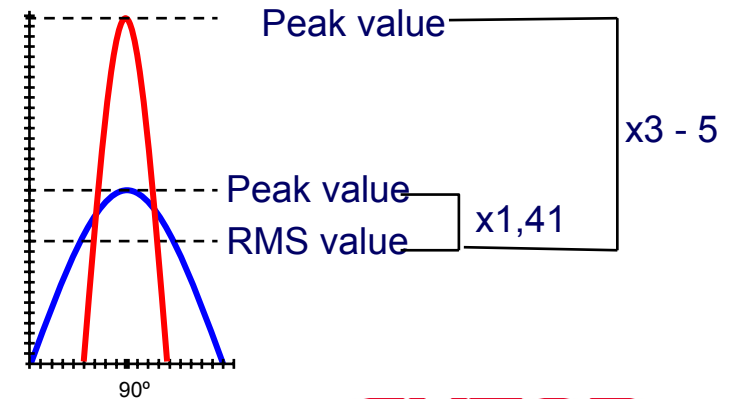
Non-linear Loads

- Distorted input current with high crest factor
- Non power factor corrected SMPS loads
- Single- or dual inputs



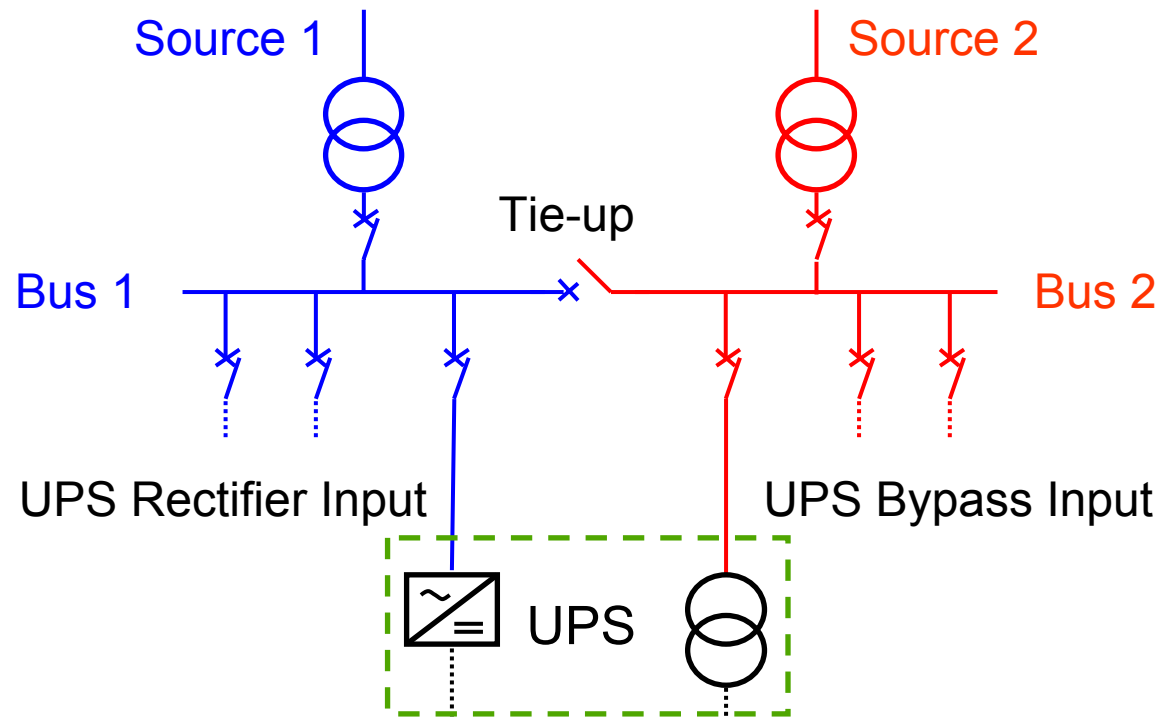
Switched
Mode
Power
Supply

Current Crest Factor



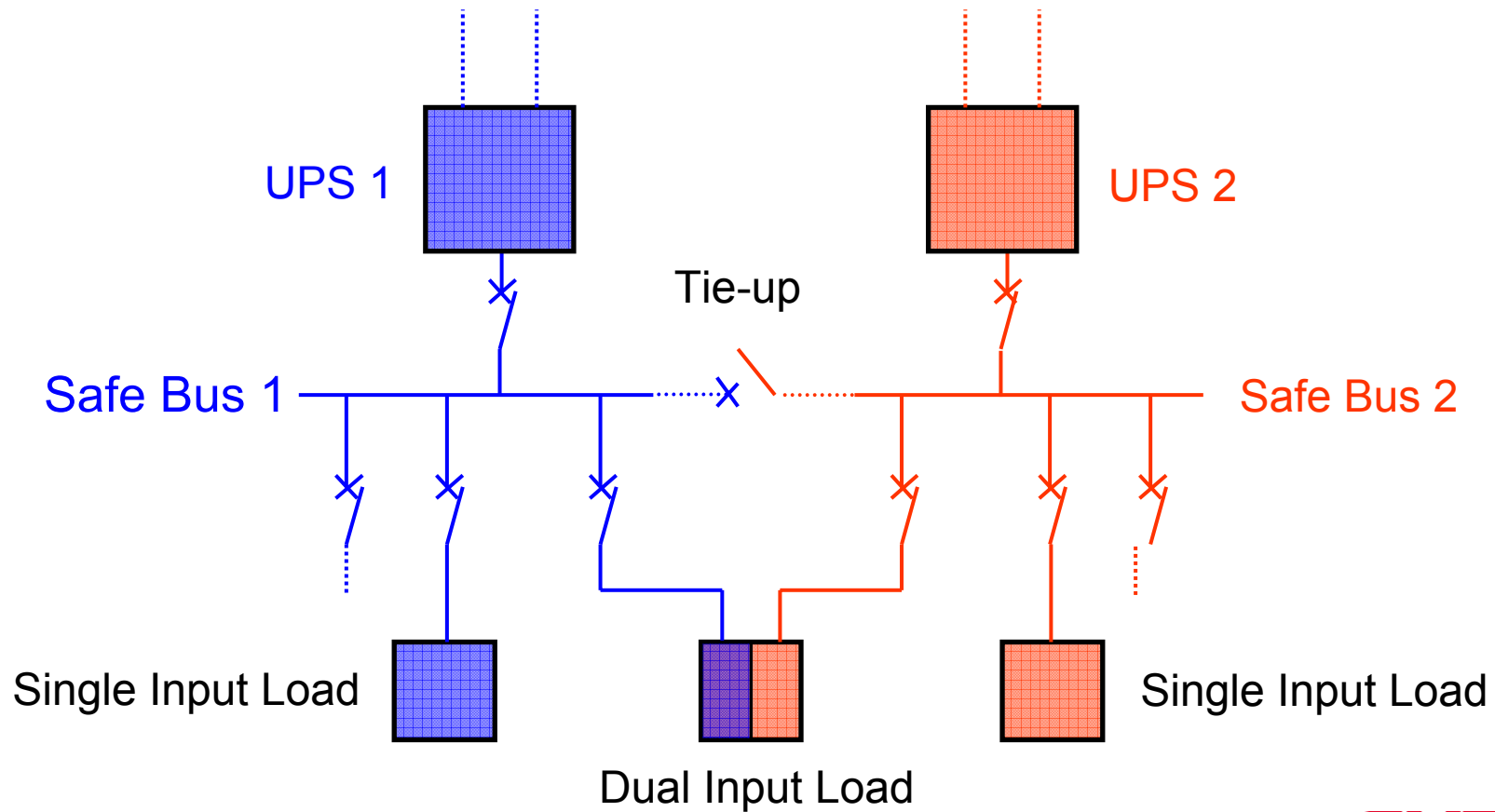
UPS Power Networks

Upstream Supply Set-up



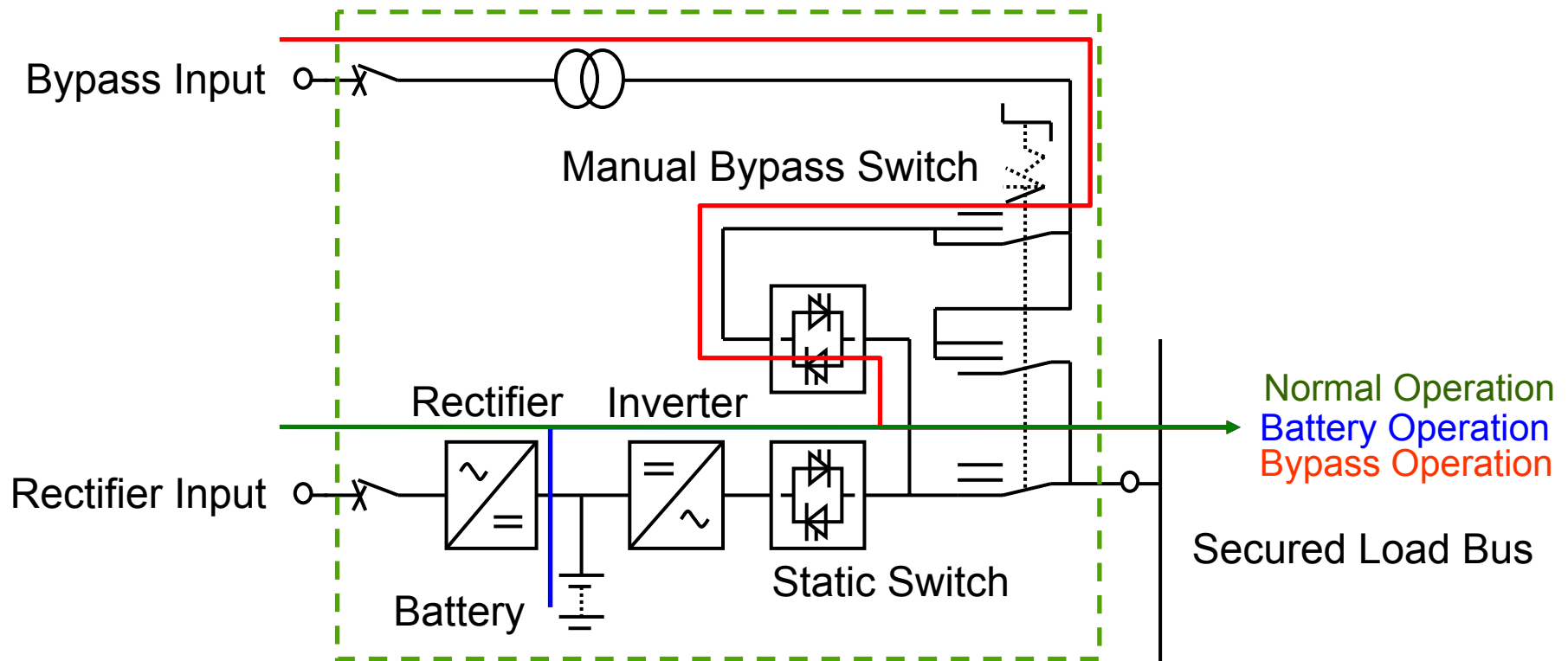
UPS Power Networks

Downstream Distribution Set-up



UPS Configurations

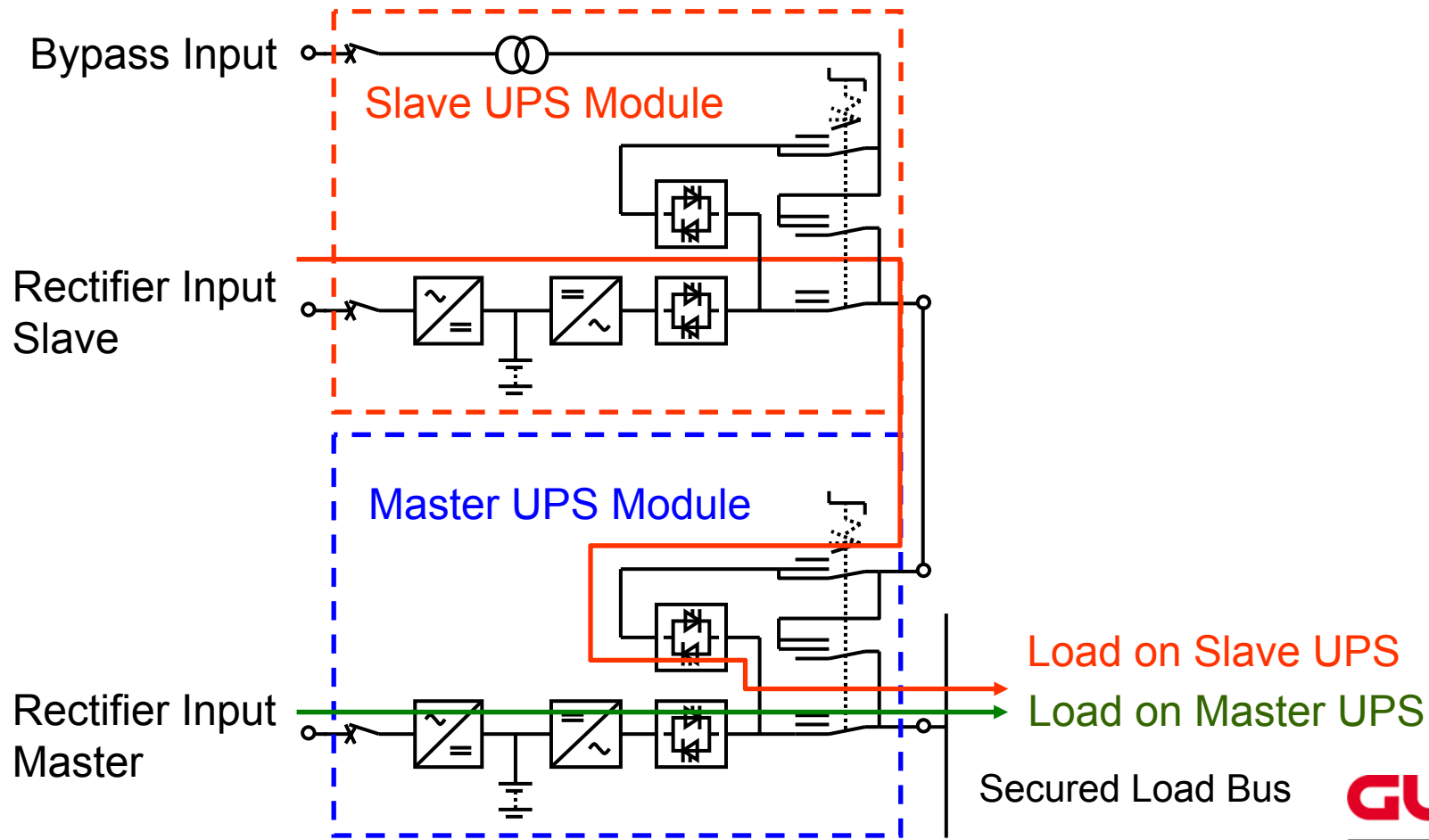
Single Unit Configuration



Double Conversion UPS System with PWM Inverter

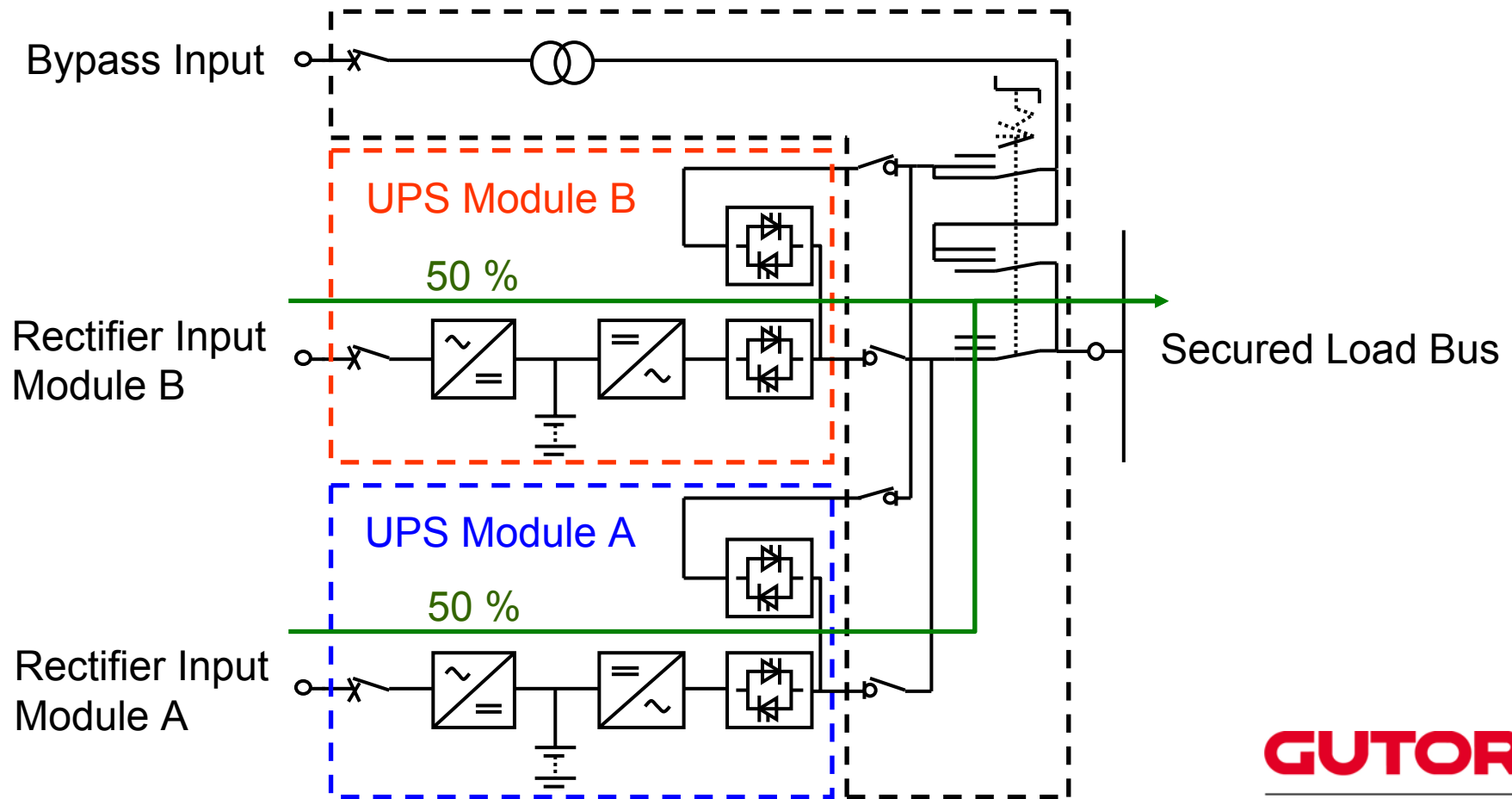
UPS Configurations

Cascade or Hot-standby Configuration



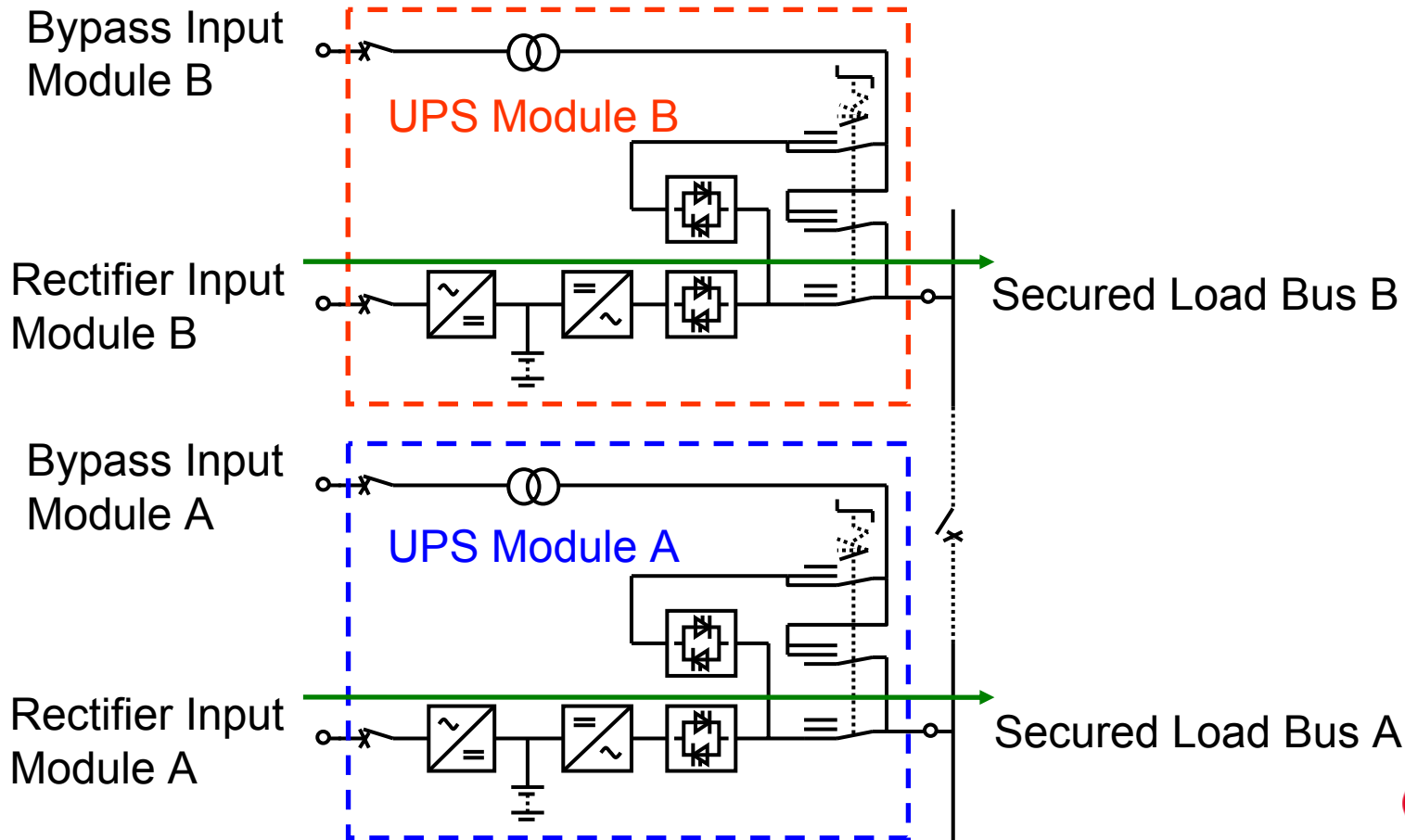
UPS Configurations

Parallel Redundant Configuration



UPS Configurations

Dual UPS Configuration



UPS Configuration Comparison

Functionality

- Ability of a UPS System to supply the loads uninterrupted
- Immunity against external influences (supply, environment)

UPS Configuration	Score Rates	
	Single Feed Loads	Dual Feed Loads
Single Unit	3	3
Cascade	3	3
Parallel Redundant	4	4
Dual Units	3	5

UPS Configuration Comparison

Reliability

- Continuous UPS up-time duration between critical failures
- MTBF figure (Mean Time Between Failure) for load supply

UPS Configuration	Score Rates	
	Single Feed Loads	Dual Feed Loads
Single Unit	2	2
Cascade	3	3
Parallel Redundant	4	4
Dual Units	2	5

UPS Configuration Comparison

Maintainability

- Safe UPS maintenance work without disturbing the load
- Switching procedures reduced to an absolute minimum

UPS Configuration	Score Rates	
	Single Feed Loads	Dual Feed Loads
Single Unit	2	2
Cascade	3	3
Parallel Redundant	4	4
Dual Units	2	5

UPS Configuration Comparison

Operability

- User friendly operation- and monitoring scheme
- Co-ordinated operation mode control between UPS modules

UPS Configuration	Score Rates	
	Single Feed Loads	Dual Feed Loads
Single Unit	4	4
Cascade	3	3
Parallel Redundant	4	4
Dual Units	3	3

UPS Configuration Comparison

System- and Installation Costs

- UPS solution costs scaled to single unit with single feed loads
- Including power distribution network- and installation costs

UPS Configuration	Relative Solution Costs	
	Single Feed Loads	Dual Feed Loads
Single Unit	100 %	120 %
Cascade	180 %	200 %
Parallel Redundant	180 %	200 %
Dual Units	200 %	220 %

Conclusion

- UPS solutions must be considered in their entirety
- Final judgement on „what is always best“ is impossible
- Parallel Redundant Systems are very suitable for any loads
- Dual Units with pure Dual Feed Loads is the „high-end“ choice
- The most expensive & complex solution is not always best
- Investing in the right UPS solution is a good insurance