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# Service Bulletin

**Date:** August 2001  
**From:** Capstone Customer Service  
**Subject:** Electrical Input Requirements  
Model 330 and Capstone 60 MicroTurbines

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## Introduction

This document provides a review of the electrical input requirements for the Capstone Model 330 and Capstone 60 MicroTurbines. Be sure to read and comply with these instructions whenever installing a new MicroTurbine.

## Affected

All Capstone MicroTurbines that operate in the Grid Connect mode will be affected. Adherence to electrical utility service requirements will serve to ensure top performance of your MicroTurbine.

## Safety

Observe all Safety Precautions. Refer to the Important Safety Instructions section in the MicroTurbine Installation & Start-up manual.

## Description

Electrical input requirements for the Capstone MicroTurbines are quite specific. It is essential that the electrical input requirements be followed in order to ensure proper operation of the MicroTurbine.

NOTE: Contact your local utility service for specific requirements.

## Electrical Input Requirements

Electrical input requirements include the following:

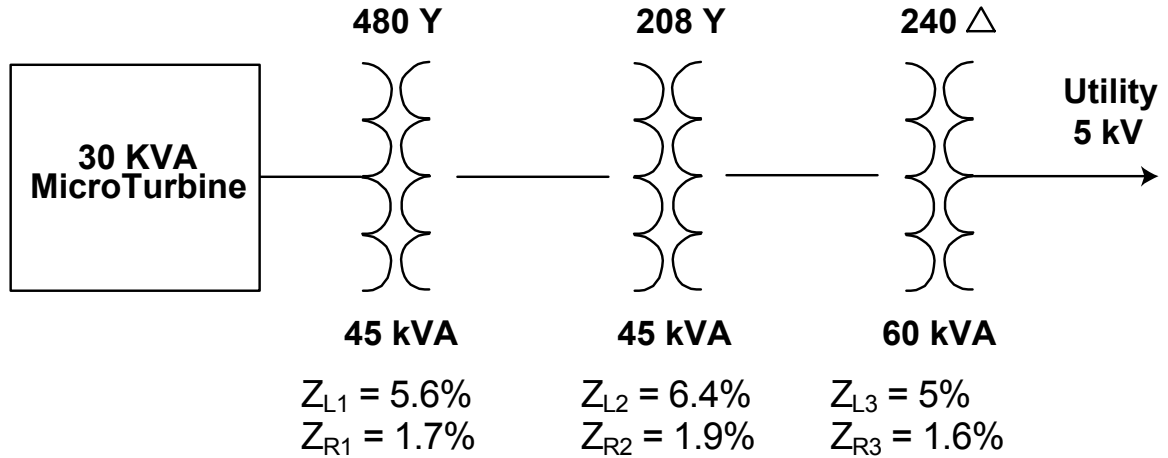
1. Total electrical input supply impedance (including utility service, transformer(s) and electrical lines) must have less than 10% inductive impedance and less than 5% resistive impedance. Refer to examples on the following pages as applicable.
2. It is recommended that the electrical service (utility and structure main service panel) be at least 4 times the capability of the maximum MicroTurbine output.
3. Total voltage imbalance must be less than or equal to  $\pm 2\%$ .
4. In Grid Connect mode, the corner grounded delta configuration is no longer recommended by Capstone. In addition, Capstone does NOT recommend interconnection to an **open delta** utility transformer configuration under any conditions or circumstances.

Refer to the MicroTurbine Installation & Start-up manual for additional information regarding electrical input requirements and parameters.

Three examples of the total electrical input supply impedance which detail the values considering the MicroTurbine output looking towards the utility are provided on the following pages.

**Example 1: (Model 330 - Considering 1 MicroTurbine)**

Total Impedance for all conductors:  $Z_L = 0.5\%$ ,  $Z_R = 1.0\%$



$$Z_{L(Total)} = 5.6\%(30/45) + 6.4\%(30/45) + 5\%(30/60) + 0.5\% = 11\%$$

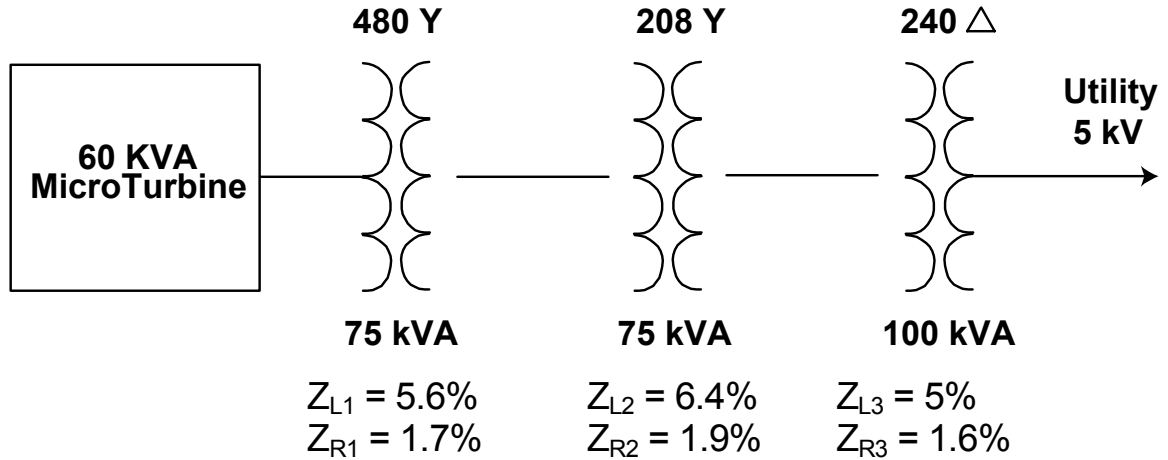
(Value exceeds acceptable limits)

$$Z_{R(Total)} = 1.7\%(30/45) + 1.9\%(30/45) + 1.6\%(30/60) + 1\% = 4.22\%$$

(Value is within acceptable limits)

**Example 2: (Capstone 60 - Considering 1 MicroTurbine)**

Total Impedance for all conductors:  $Z_L = 0.5\%$ ,  $Z_R = 1.0\%$



$$Z_{L(Total)} = 5.6\%(60/75) + 6.4\%(60/75) + 5\%(60/100) + 0.5\% = 13.1\%$$

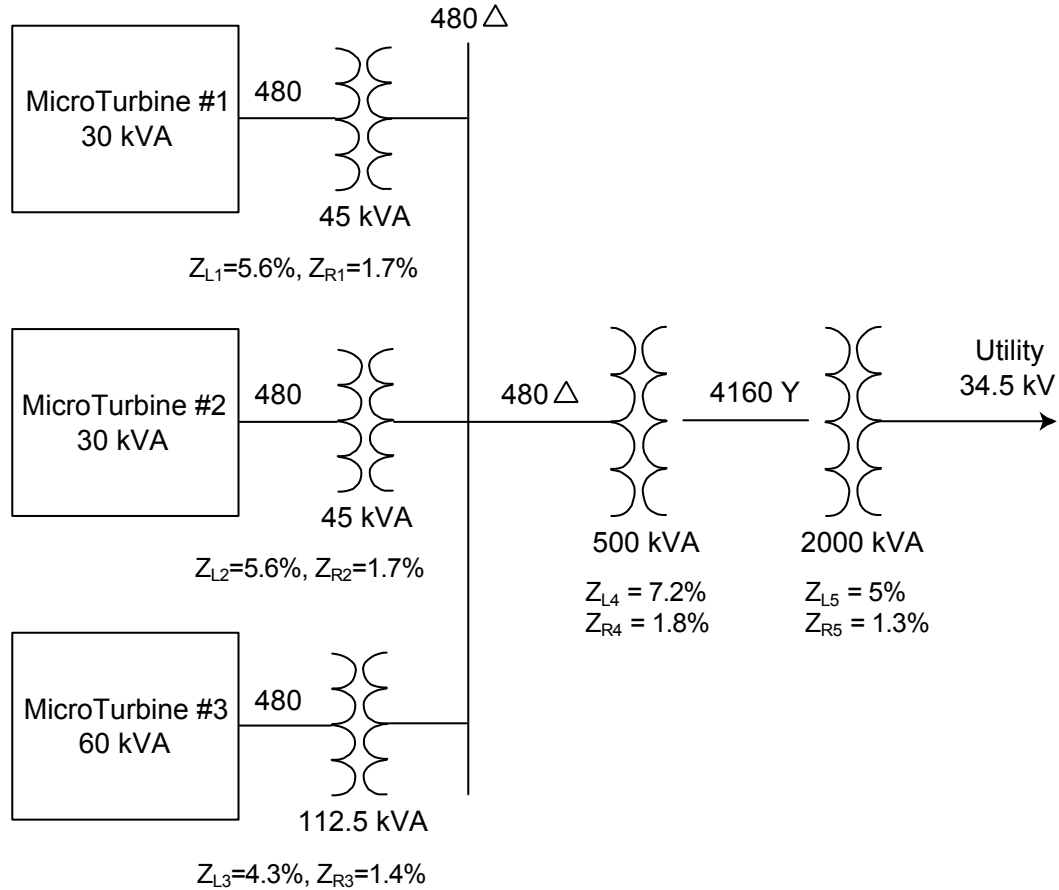
(Value exceeds acceptable limits)

$$Z_{R(Total)} = 1.7\%(60/75) + 1.9\%(60/75) + 1.6\%(60/100) + 1\% = 4.85\%$$

(Value is within acceptable limits)

### Example 3: (Considering 3 MicroTurbines)

Total Impedance for all conductors:  $Z_L = 0.5\%$ ,  $Z_R = 1.0\%$



#### MicroTurbine #1 (30 kVA):

$$Z_{L(MT1)} = 5.6\%(30/45) + 7.2\%(120/500) + 5\%(120/2000) + 0.5\% = 6.3\%$$

(Value is within acceptable limits)

Note: In these calculations, the number 120 represents the sum of the MicroTurbine outputs (30+30+60)

$$Z_{R(MT1)} = 1.7\%(30/45) + 1.8\%(120/500) + 1.3\%(120/2000) + 1\% = 2.7\%$$

(Value is within acceptable limits)

### MicroTurbine #2 (30 kVA):

$$Z_{L(MT2)} = 5.6\%(30/45) + 7.2\%(120/500) + 5\%(120/2000) + 0.5\% = 6.3\%$$

(Value is within acceptable limits)

$$Z_{R(MT2)} = 1.7\%(30/45) + 1.8\%(120/500) + 1.3\%(120/2000) + 1\% = 2.7\%$$

(Value is within acceptable limits)

### MicroTurbine #3 (60 kVA):

$$Z_{L(MT3)} = 4.3\%(60/112.5) + 7.2\%(120/500) + 5\%(120/2000) + 0.5\%$$

= 4.9% (Value is within acceptable limits)

$$Z_{R(MT3)} = 1.4\%(60/112.5) + 1.8\%(120/500) + 1.3\%(120/2000) + 1\%$$

= 2.3% (Value is within acceptable limits)

## Capstone Customer Service

These instructions will take effect immediately to prevent possible failure problems associated with Capstone Model 330 and C60 MicroTurbines. For additional information or if specific questions arise, please contact Capstone Customer Service as noted below:

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