**Mike Terbrueggen, CEO, O-T-S**

Mike Terbrueggen is the CEO and Principal Engineer at Operations-Training-Solutions, which he founded in 1994. He designs, develops, and delivers advanced training seminars, develops training programs and materials, and provides consulting services for power operations and engineering personnel.

Mike received his undergraduate degree in Electronics Engineering from the University of Michigan (Go Blue!) and his graduate degree in Power Engineering from the University of Colorado.

Mike was born in Detroit, Michigan. After high school, he entered the U.S. Army and was stationed at Fort Carson, Colorado. He was in the 4th infantry with the 4th Combat Engineers. Mike has two daughters, one son, and four grandchildren. He lives in Longmont, Colorado, where he enjoys golf, music, and home improvement projects in his spare time.

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**NERC**

**Operations-Training-Solutions** and **Otter Tail Power Company** are recognized by the North American Electric Reliability Corporation as a continuing education provider that adheres to NERC Continuing Education Program Criteria.

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**SPRING 2020**

**DAK-Subregion**

**PSR Drill and Training**

**Week 1:** April 13–16

**Week 2:** April 27–30

**Week 3:** May 11–14

**Bigwood Event Center**

**Fergus Falls, MN**

**Primary Business Address**

215 South Cascade Street

Fergus Falls, MN 56537

**Phone:** 218-739-8264

**E-mail:** tsmith@otpco.com

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**HOSTED BY**

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2020 DAK-Subregion PSR Drill and Training

Dynamics of Disturbances

Presented by Mike Terbrueggen, CEO, O-T-S

This 32-hour NERC CEH-approved course will include theories of frequency control, voltage control, and angle stability. A few of the topics Mike will be covering include: governor operation, operating reserve, AGC, Reactive Power, Ferranti rise, Synchronizing process, and Phasor diagrams.

Mike will also step through and describe numerous disturbance events that have happened throughout the years and illustrate what happened during each event.

The last day of this training session will be the DAK Subregion PSR Drill using Otter Tail Power Company’s State Estimator.

This course is designed not only to provide an annual review of our region’s restoration procedures, but is also an excellent chance to interact and train next to the individuals you would work alongside in the event of an actual blackout event within our region. Power Plant Personnel are also encouraged to attend.

Partial NERC CEH Credit will not be issued, but if a student wishes only to attend the PSR Drill, they may do so for no fee. Please note that OTP_002 will not issue NERC CEHs for participation in the restoration drill only.

Spring 2020 Course Schedule

(Schedule is the same for all three weeks)

<table>
<thead>
<tr>
<th>WEEK 1: April 13–16</th>
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<tbody>
<tr>
<td>MONDAYS: Dynamics of Disturbances 0900–1800</td>
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<tr>
<td>• Theory of Frequency Control</td>
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<tr>
<td>• Governor Operation</td>
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<tr>
<td>• Types of Operating Reserve</td>
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<tr>
<td>• AGC</td>
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<tr>
<td>• Sequence of events: 2/14/08, 11/9/16, 5/10/11</td>
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<tr>
<td>TUESDAYS: Dynamics of Disturbances 0800–1700</td>
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<tr>
<td>• Theory of Voltage Control</td>
</tr>
<tr>
<td>• Reactive Power</td>
</tr>
<tr>
<td>• Causes and Effects of High and Low Voltage</td>
</tr>
<tr>
<td>• Ferranti Voltage Rise</td>
</tr>
<tr>
<td>• Sequence of events: 7/2/96, 8/14/03, 3/13/89, 4/7/15</td>
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<tr>
<td>WEDNESDAYS: Dynamics of Disturbances 0800–1700</td>
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<tr>
<td>• Theory of Angle Stability</td>
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<td>• Factors that Drive MW and MVar Flow</td>
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<tr>
<td>• Synchronizing Process</td>
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<tr>
<td>• Angle Stability and Angle Instability</td>
</tr>
<tr>
<td>• Phasor Diagrams</td>
</tr>
<tr>
<td>• Sequence of events: 6/25/98, 6/14/04, 2/26/08, 9/8/11</td>
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<tr>
<td>THURSDAYS: DAK-Subregion PSR Drill 0700–1600</td>
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<tr>
<td>• DAK-Subregion PSR Overview</td>
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<tr>
<td>- System restoration plans, restoration priorities, building of cranking paths, synchronizing</td>
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<tr>
<td>• DAK-Subregion PSR Drill using OTP State Estimator</td>
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</tbody>
</table>

Registration

NAME
COMPANY
BILLING ADDRESS
PHONE
EMAIL
NERC CERT#

Fee: $1,100.00 per attendee  
(Includes hotel breakfast, breaks, and lunches)

Method of payment:  
☐ Bill me  ☐ Check

Hotel accommodations:  
Country Inn and Suites (Bigwood Event Center)  
218-739-2211 or 800-830-5222  
cx_ffmn@countryinn.com  
925 Western Avenue, Fergus Falls, MN  56537

A block of 20 rooms has been held from Sunday–Thursday for the week. Rooms are blocked under Otter Tail Power Company Training.

Room rate:  
$90.00 for Otter Tail Power Company. Government rate available upon request.

To register, email this form or contact:

Tammy Smith  
Otter Tail Power Company  
215 South Cascade Street  
Fergus Falls, MN 56537  
218-739-8264  
tsmith@otpco.com

Participating Companies

Otter Tail Power Company  
GREAT RIVER ENERGY  
MONTANA-DAKOTA  
MINNOKTA POWER COOPERATIVE, INC.  
Xcel Energy