Bulk Power Transmission Systems & How They Work

TRANSMISSION WORKSHOP
New York State Reliability Council
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Presentation by
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NYSRC/EC unaffiliated member

Robert Waldele
NYISO
INTRODUCTION

• Let’s keep it informal
• There’s no such thing as a “dumb question”!
• Don’t wait till the end of a section
• “We’ll be covering that in just a bit”
• If we don’t see you . . .
• If you’ve heard it before . . .
• Breaks, lunch, etc.

TIME: “What keeps everything from happening at once”
INTRODUCTION (cont.)

• It’s all right to . . . laugh!
• Continuing Education Credits
• “Goodies”

• How many here are engineers? (or scientists, etc.)
• How many are economists? (or lawyers, etc.)
George C. Loehr
mini-bio

- Consultant, Expert witness, Author, Speaker
- BSEE, Electrical Engineering; MA, English Lit
- 40+ yrs. – transmission system planning, reliability
- Con Ed, NYPA – NYPP, NPCC, NERC committees
- NPCC – Executive Director
- New York State Reliability Council
- “Last man standing” – 3 blackout limit (’65, ’77, ’03)
- BBC, WPIX, CNN, CBC – FX production co.
- Published author, photographer, poet
- Really nice guy – and smart, too!
- www.eLucem.com
Robert Waldele
mini-bio

- 33 years with NYPP and NYISO (transmission planning, dispatcher training, operations engineering)
- BSEE (Comp. Sci., Power) Northwestern University
- Railfan/Photographer, Model Railroader (garden)
- Church Organist and Choir Director
- Rumored to have caused first Blackout (Nov. 9, 1965) while still in high school
- Member of “Operator Tools, Training, and EMS Performance” Team of the NERC 2003 Blackout Investigation Task Force
- Active participant in numerous IEEE-PES, NPCC, NERC and EPRI study and support groups
NO ECONOMISTS WERE KILLED OR INJURED IN THE MAKING OF THIS PRESENTATION
Albert Einstein

“Everything should be made as simple as possible – but not simpler.”
When the Laws of Physics and the Laws of Economics collide,

**PHYSICS WINS**

*always ...*
History of the World – Part 1

c13,700,000,000 BC CREATION – BIG BANG

Not much happened until…

1879 Thomas Edison invents light bulb
1882 Edison invents electric company
Late 1800s Westinghouse & AC – “Battle of the Currents”

Age of Diversity – AC, DC, many frequencies & voltages
## History of the World – Part 2

<table>
<thead>
<tr>
<th>Year Range</th>
<th>Event/Development</th>
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</thead>
</table>
| 1900 - 1965 | Age of mergers, acquisitions  
Growth of large synchronous interconnections |
| 1965       | Great Northeast Blackout |
| 1965 - 1996 | Age of Reliability:  
Cooperation & Coordination  
Regional Reliability Councils, Power Pools, NERC |
# History of the World – Part 3

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
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<tbody>
<tr>
<td>1978</td>
<td><strong>PURPA</strong> – established QFs&lt;br&gt;Utilities must buy output</td>
</tr>
<tr>
<td>1992</td>
<td><strong>Energy Policy Act</strong>&lt;br&gt;Deregulation / restructuring begins</td>
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<tr>
<td>1996</td>
<td><strong>FERC Orders 888 &amp; 889</strong></td>
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<tr>
<td>2000</td>
<td><strong>FERC Order 2000</strong></td>
</tr>
<tr>
<td>Early naughts</td>
<td><strong>FERC “big RTO” proposals</strong></td>
</tr>
</tbody>
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History of the World – Part 4

2003  August 14 Blackout
2003, 4, 5 – ? Energy Bill (?)
2005 > ??? Age of Uncertainty –
  “Where No Electron Has Gone Before” –
  Competition, Confidentiality, sometimes Confrontation