

View from Electric Power Industry as a Whole

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- Electricity - The Crown Jewel of the US Economy

- **~\$1 trillion total asset value**
- **\$225 billion annual revenues**
- **110 million customers**
- **3200 utilities**

*Without electric power the \$10.4 trillion
U.S. economy would come to a halt*

The Oracle Speaks Clearly...

For a Change!

“If the electricity infrastructure of this country is inadequate or in some way excessively costly, it will undermine economic growth, and is therefore a major issue that must be addressed.”

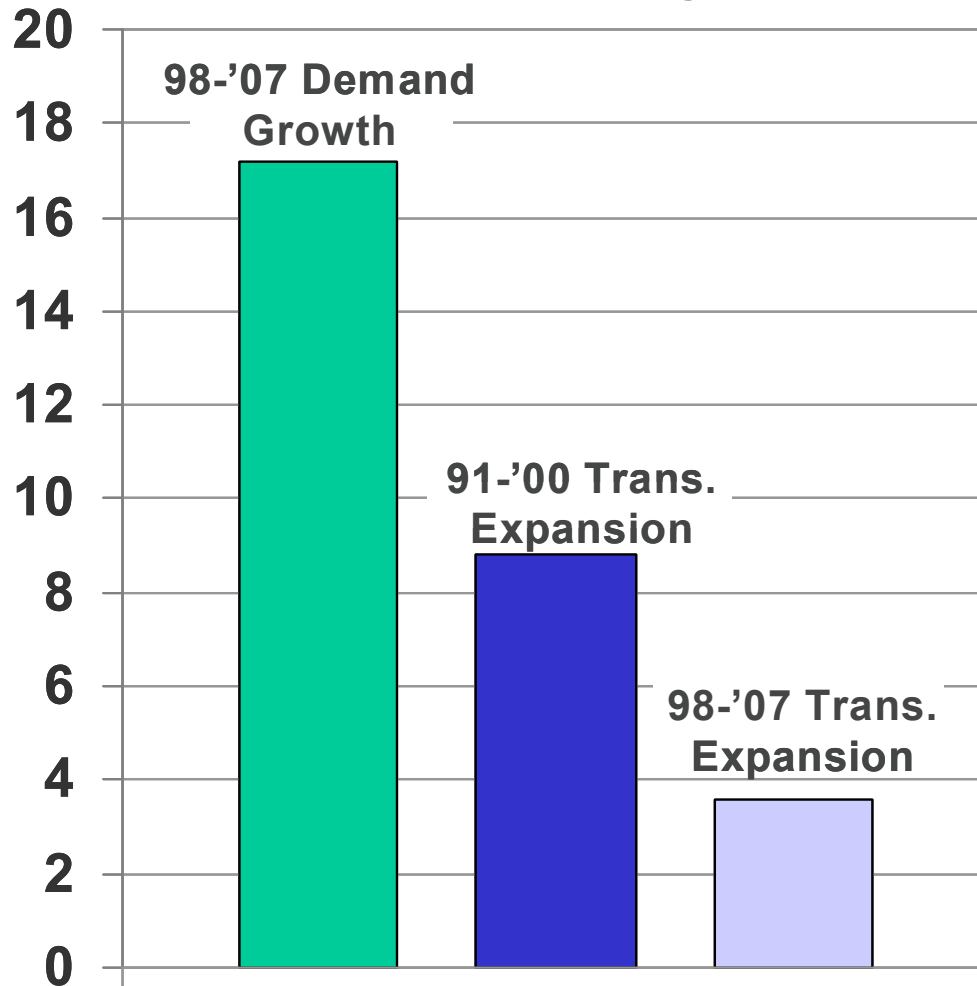
Alan Greenspan

Chairman of the Federal Reserve Board

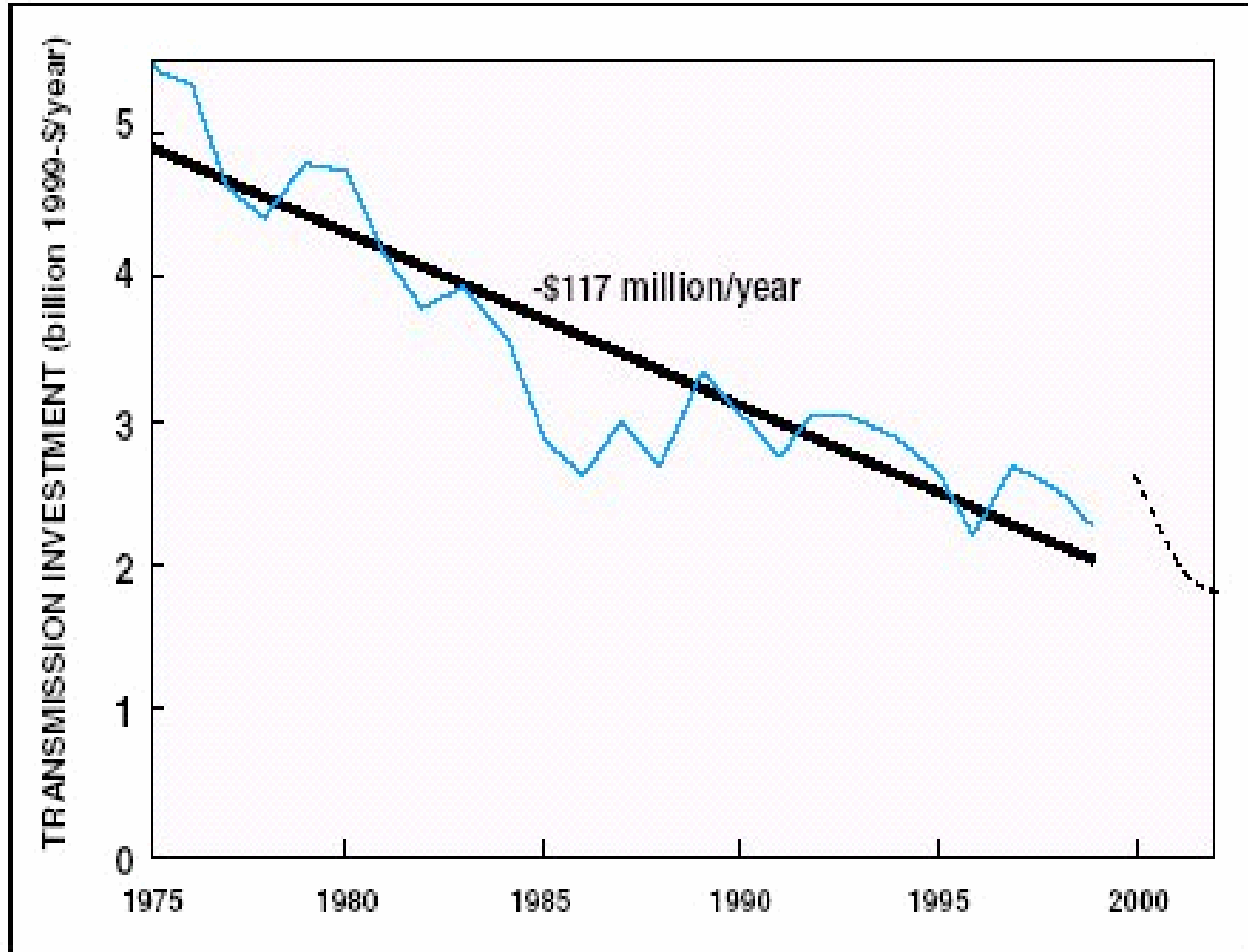
January 26, 2001

Predicted Electricity Demand & Transmission Capacity Expansion

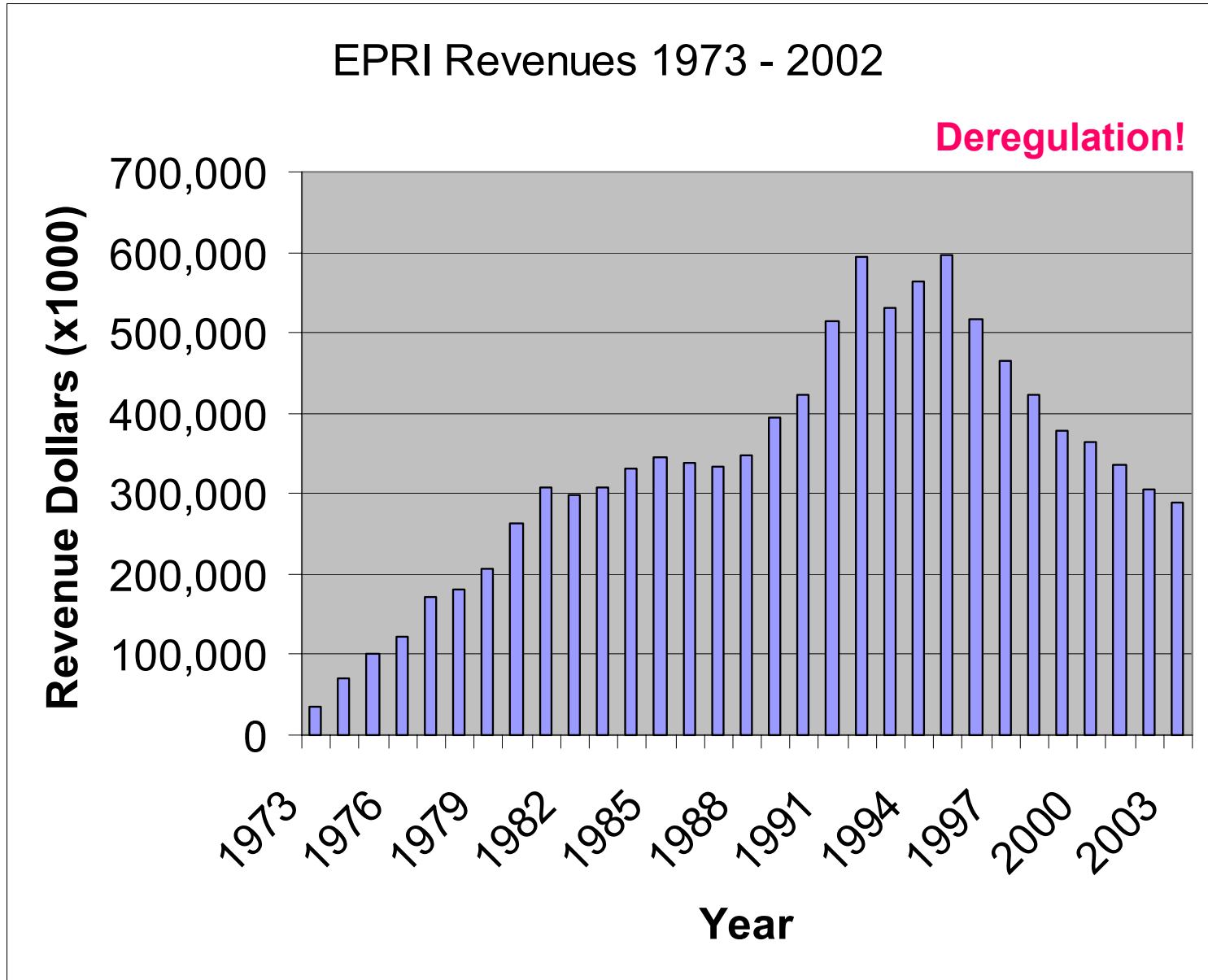
Percent Change



“Growth” in Transmission Investment



EPRI Revenue Decline Shows Trend in Industry R&D



Blackouts

Texas '03

Detroit '00

Northern California '01

San Francisco '00

Delaware '99

New Orleans '99

Chicago '99

New York '99

Northeast '03

West Coast '96

Atlanta '99

The Big Blackout

Northeast 8/14



The Party Begins...



...and Continues...



Mary Altaffer / AP

As Night Falls...



It Gets Better...



and Better...



George Widman / AP

and Finally, Really Good!



David Friedman / MSNBC.com

The Morning After



Viva New York!



So, Where Was the Outrage?

- Renewed Public Self Confidence
 - “We survived 9/11.”
- Ennui
 - “We'll always have blackouts. It's like we'll always have forest fires and automobile accidents.” *Bob Lasseter, UW, “Quote of the Day,” NYT, August 25th*
- Not a Failure of the Technology
 - “The system worked exactly as it was designed to do.” *Paul Grant, EPRI, SJ Mercury-News, August 18th*

What was the Outcome?

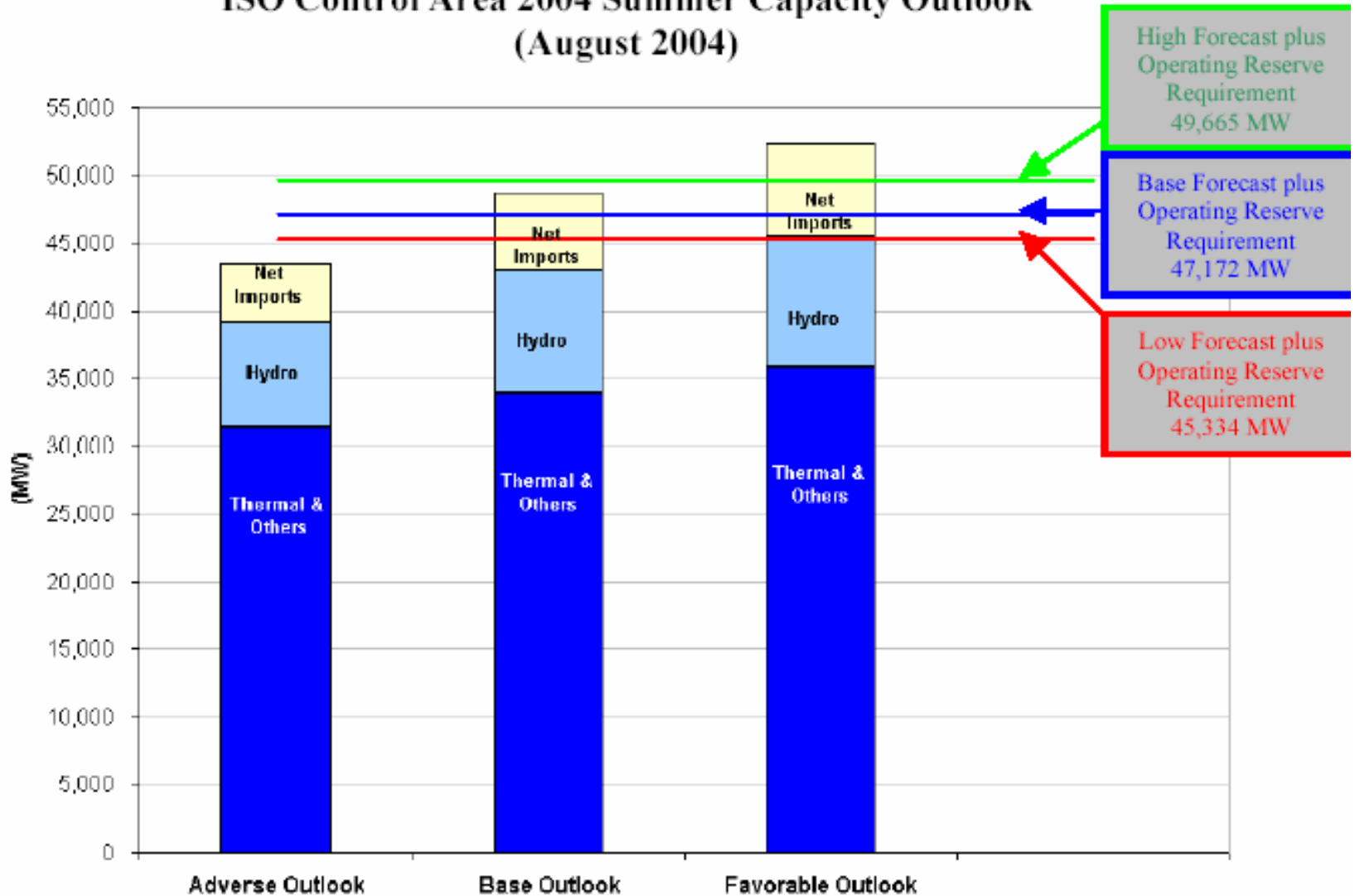
- US – Canada Finger Pointing & Sniping
- Utilities failed to follow NERC standards
- 2003 Energy Bill Failed to Pass
 - Regional bickering over FERC and SMD
- 25% OETD FY04 Appropriation Earmarked for Local Projects
 - e.g., burning waste carpet for fuel
- No New Energy Bill in Sight
 - Energy not on the 2004 campaign agenda

What's Happening Now?

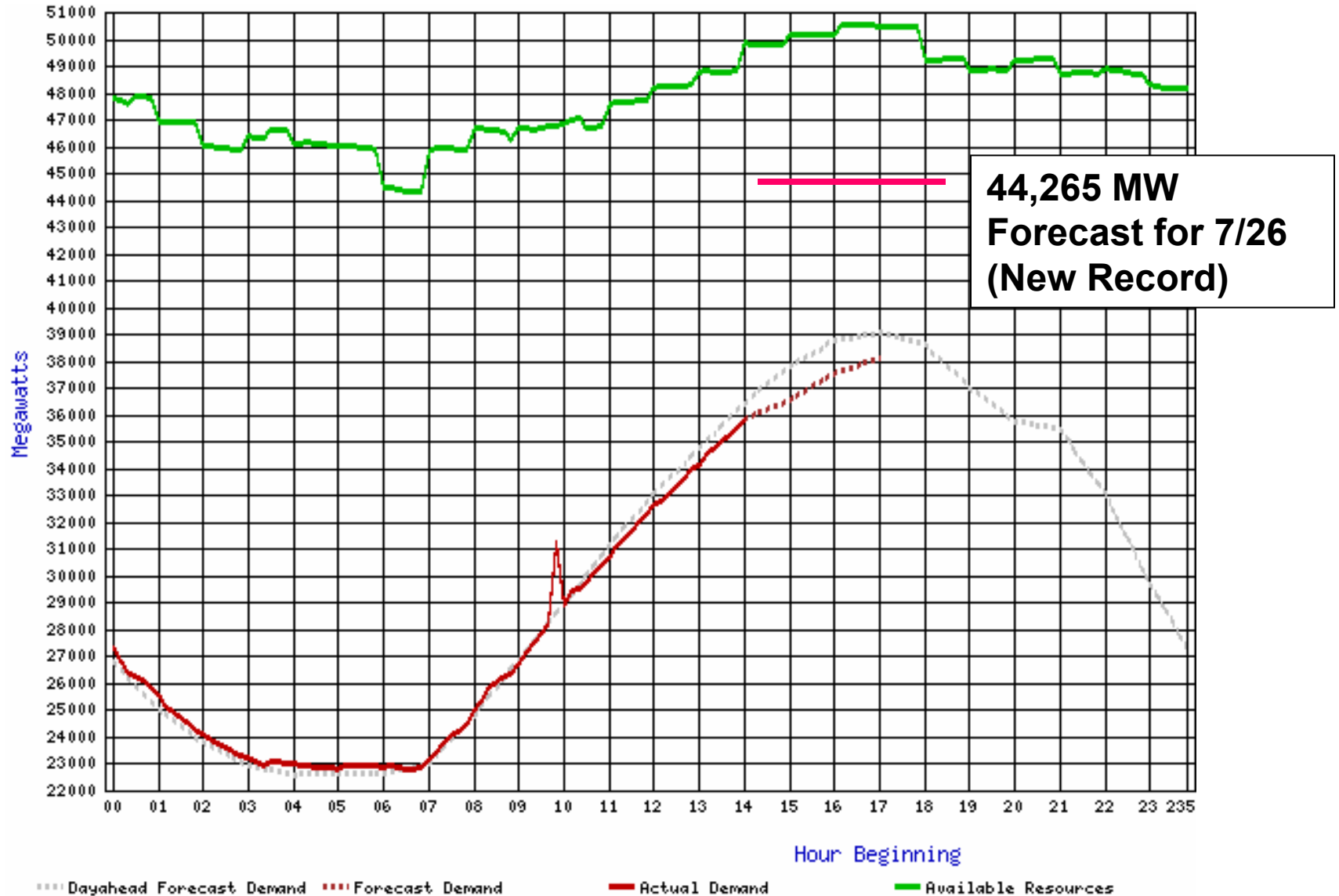
- FERC makes NERC guidelines “Regulatory Law” in response to 8/14
- 20 senators say FERC is exceeding authority (7/20)
- Region price hits \$106/MWh in California, Path 15 still a problem (7/19)
- FERC makes IOU purchases of IPGs “difficult and expensive.” (7/9)
- EMF-phobia in California blocks permitting new transmission ROWs...even underground! (7/19)

2004 California Summer Outlook

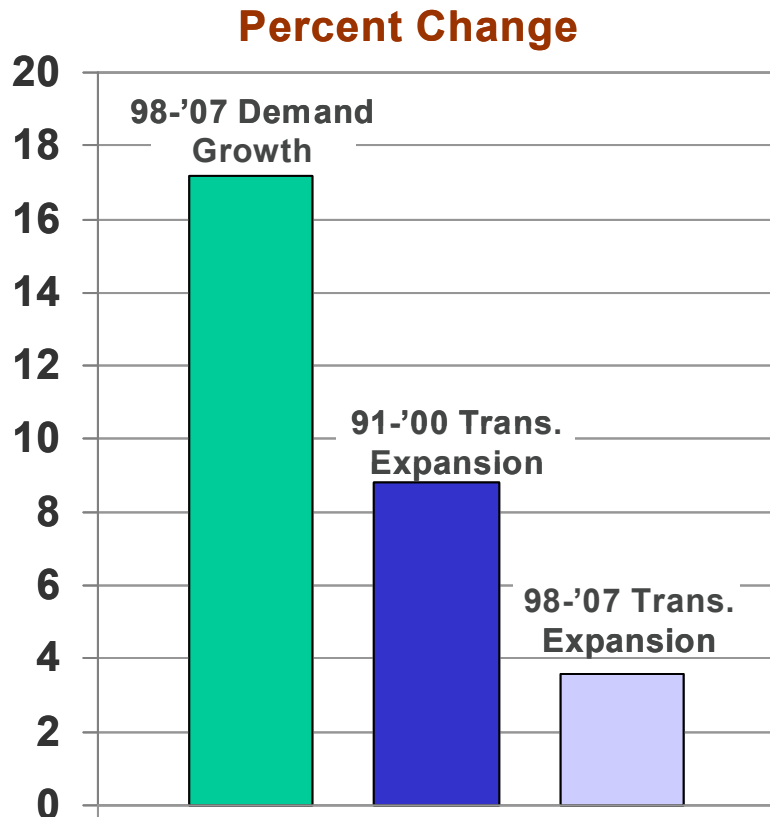
Figure II-B
ISO Control Area 2004 Summer Capacity Outlook
(August 2004)



Sunday, 25 July 2004

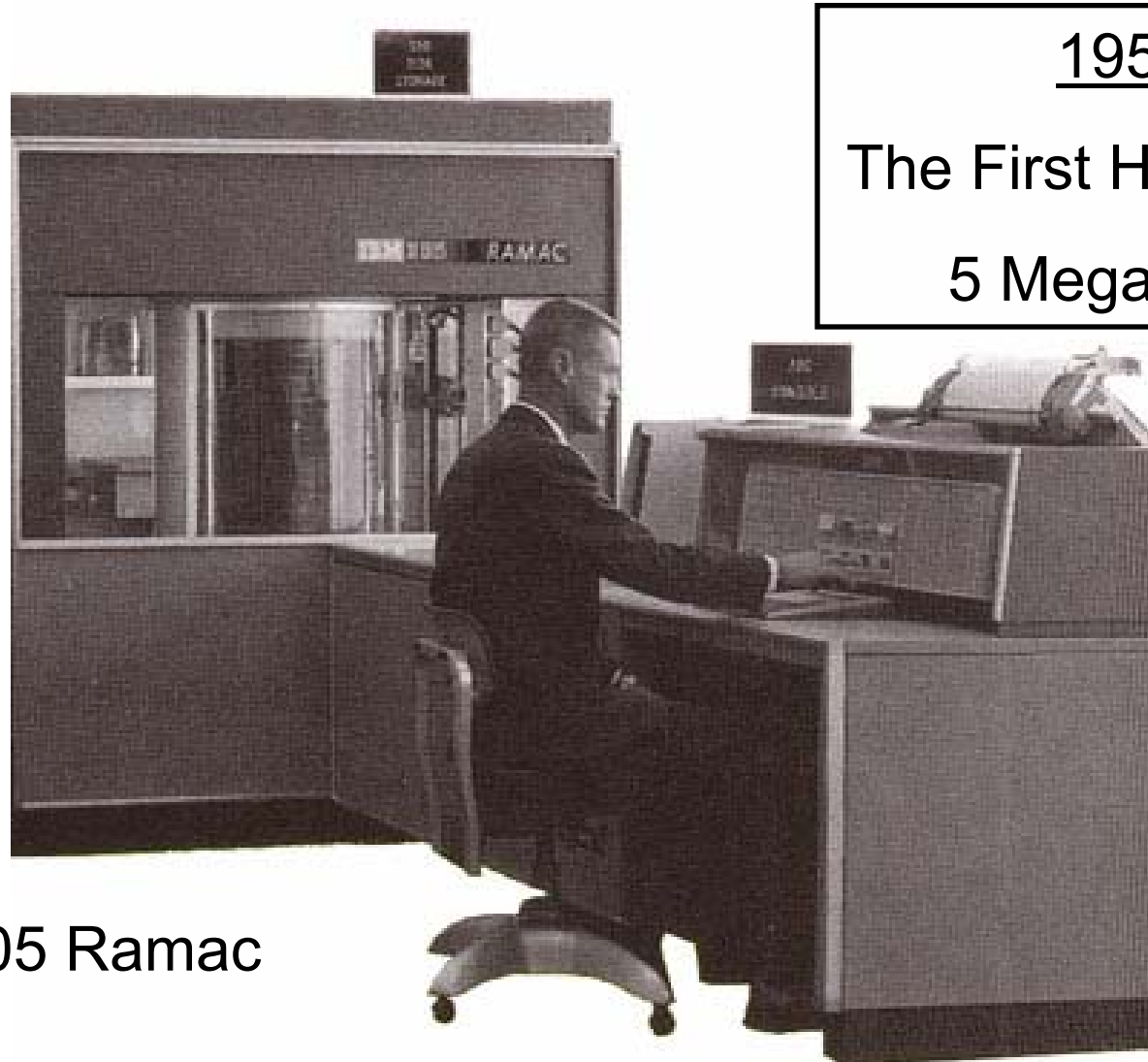


The Problem's Still There, But...



- Utilities and RTO's are playing together more nicely, now.
- ISO's are ever getting more clever in handling load and transmission
- A “power generation glut” is looming – 38 new plants licensed in California

...and old technology can go on
and on and on...



1956
The First Hard Drive
5 Megabytes

IBM 305 Ramac

...Almost 50 Years Later



2004
The Apple iPod
40 GB

8000 times the
Ramac in your
hand

Can “New” Transmission Technology Help?

- Yes, but probably not superconductivity in a big way, at least for a while.
- More likely, “smart” grid stuff will come first
 - HVDC cables and lines
 - FACTS to increase present corridor capacity by 30%
 - IT and communications plus an “OS/360” to more effectively and efficiently management power flows

How's it Going to Happen?

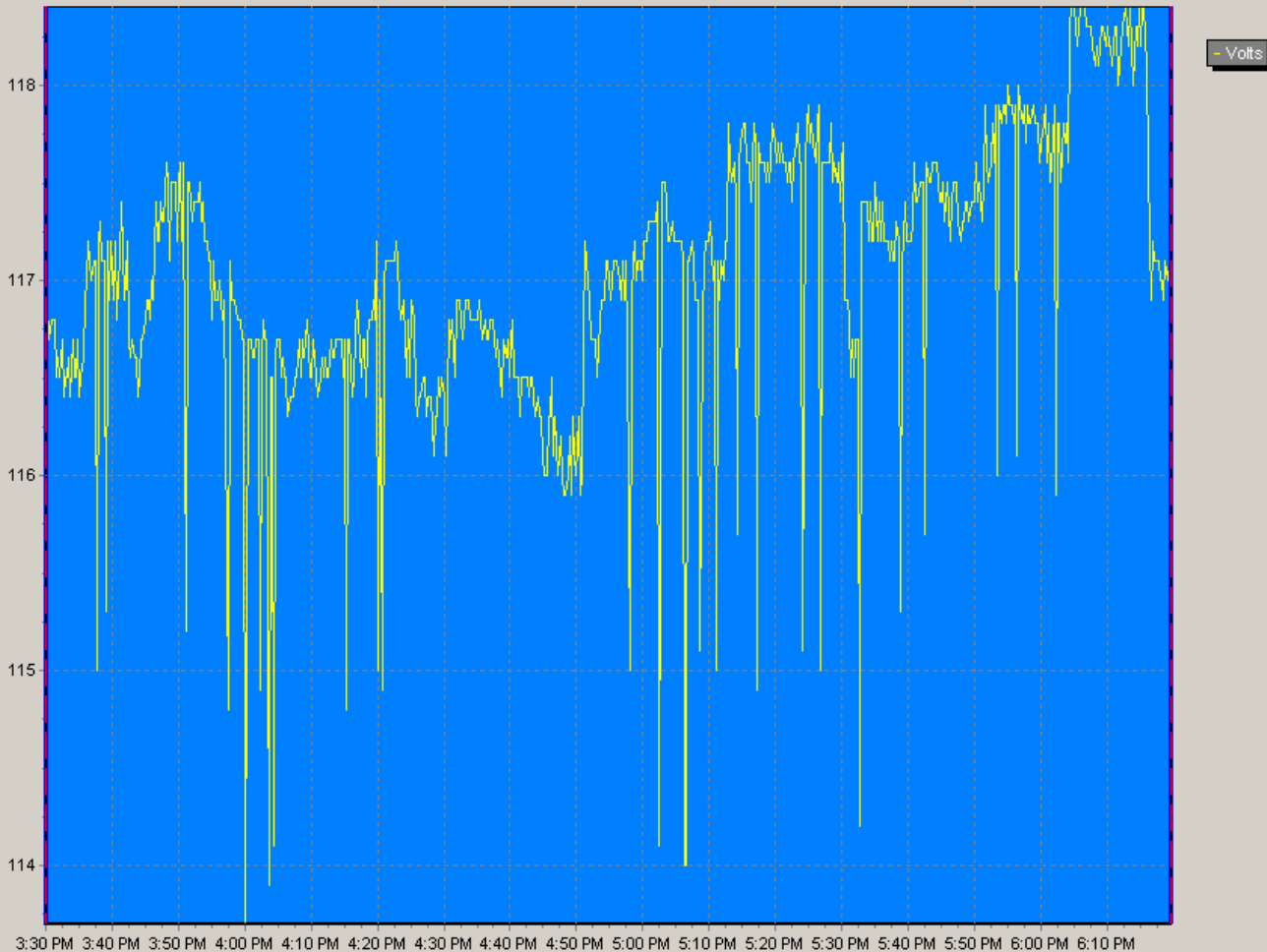
- Deregulation has caused support for electricity strategic R&D to virtually vanish
- DOE has to live hand to mouth, year by year, at the will and whim of Congress and the current administration
- Lack of national will and leadership

Where's the "Gold Rush?"

- What's the analogy to the Erie Canal, Railroads, REA, TVA, Interstate Highways that opened the country to economic development?
 - Reliability? Maybe
 - Power Quality? Nah

How many 9's?

Watts Up Data



07/25/04

3:30-6:00 PM

Sunday

Voltage

W2AGZ

Server

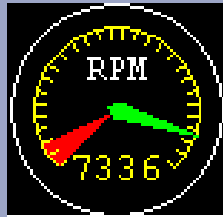
Motherboard Voltages

Sunday Afternoon

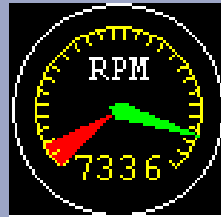
25 July 2004

W2AGZ Server

Fan



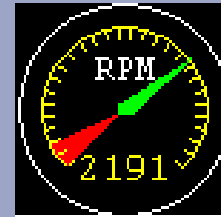
CPU1



CPU2

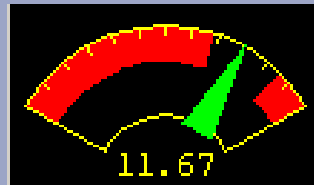


Chassis 1



Chassis 2

Voltage



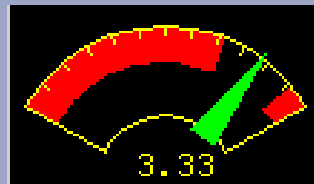
+12V



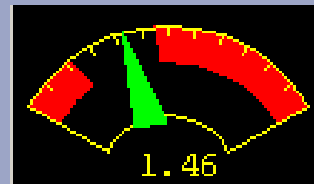
+5V



+3.3V



3.3Vsb



Vccp



-12V

Temperature



CPU1



CPU2



System

What Then?

- An Electricity Infrastructure to Sustain and Expand the American Economy for this and the Next Generation.
 - In the absence of crisis or a “Gold Rush” need, to assure this goal will require unusual dedication, leadership and financial over many years.
- How can we maintain and perform the long range R&D this objective will require?

I. Establish a “National Bank” for Transmission R&D

Electricity Consumption	\$300 B/yr
Transmission Tariff 10%	\$30 B/yr
Investment for Transmission Grid R&D 2%	\$600 M/yr

II. Create a “Fannie Mae” for Electricity

- X % of revenue to be administered by DOE for basic and strategic research in the electrical sciences to be carried out by the National Laboratories and the nation’s Universities.
- (100-X)% to be divided amongst and administered by the RTOs to underwrite specific R&D interests of the RTO and its member utilities and to be carried out by contracts with private for-profit and non-profit organizations (Bechtel, EPRI, SRI, MRI, etc.)

Carry out demonstration projects!

III. Annual “Crunch” Review

- Each program will undergo an annual “technical audit” by a new standing committee of the National Academy of Engineering to assure funds have been directed to fulfill sound technical goals and submitted to Congress.
- A report will be submitted to the Secretary of Energy with recommendations to redirect portions of the DOE program, if deemed necessary.
- A report will be submitted to FERC on the progress, or absence thereof, of the RTO programs. FERC will have the authority to fine a given RTO, or RTOs, for lack of due diligence in pursuit of its program.