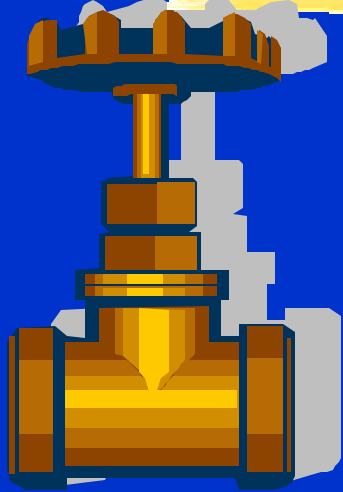


# New Energy Standards for the 21th Century

## trading old for new shibboleths



Richard O'Neill

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Chief Economic Advisor

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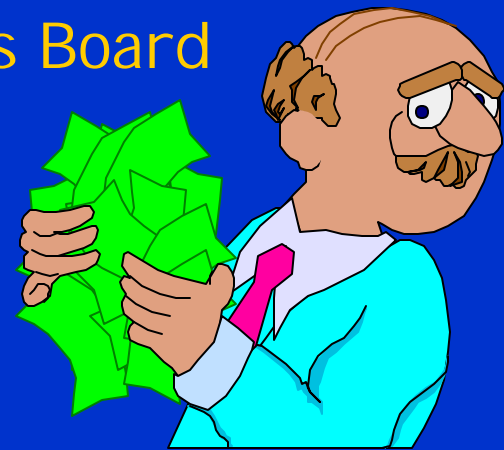
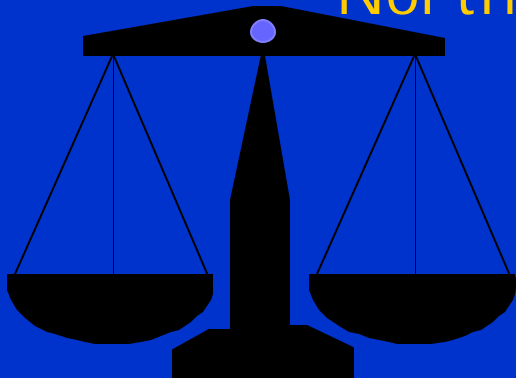


North American Energy Standards Board

Second Annual Meeting

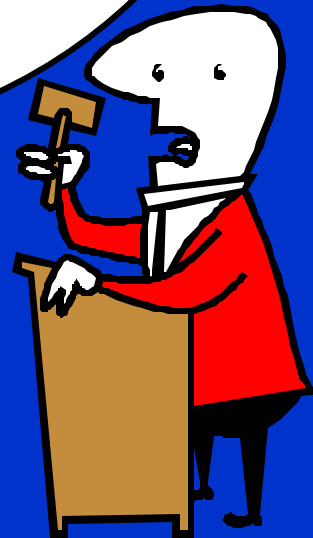
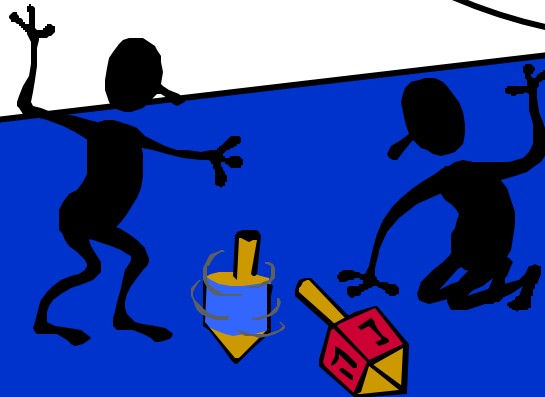
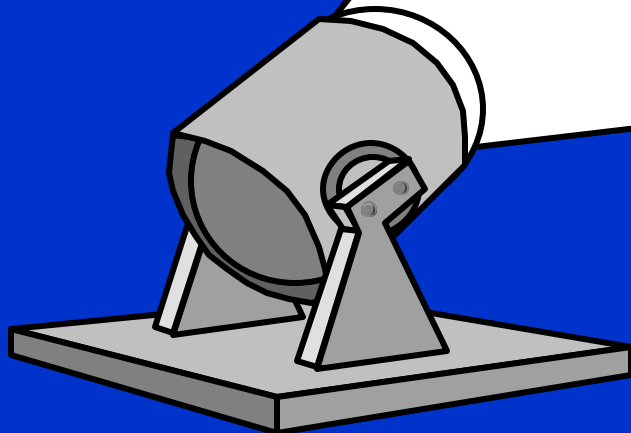
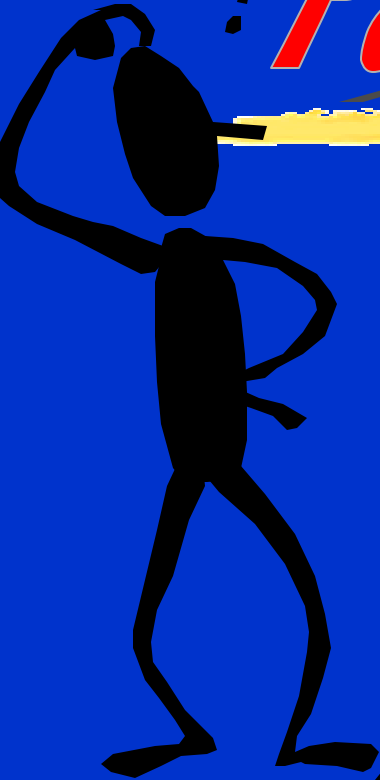
Austin, Texas

September 16, 2003



# ? Paradigm Change

Transitioning from  
planning and cost-  
based regulation to  
markets and market-  
based regulation



# The standard setting problem of Urban VIII



1543: Copernicus publishes a book claiming the earth revolves around the sun then dies.

Church doctrine: earth is the center of the universe

Early 1600s: Bruno burned at the stake

Galileo develops telescope, observes the universe and irritates the Jesuits

Cardinal Barberini supports Galileo

1632: *Dialogue* is published; bubonic plague

1633 Urban orders Inquisition of Galileo

Urban probably agrees with Galileo, but will be seen as weak if he supports him. Guilty!



# Post Galileo



Cardinal Barberini became Urban:  
where you stand depends on where you sit.

Copernican model

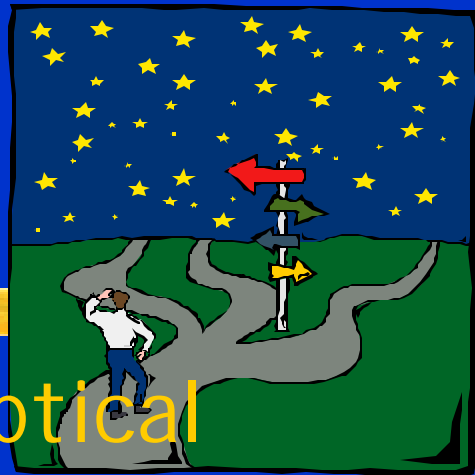
cannot answer all questions.

If the earth moves how do we stay on it?  
fails benefits test

Ptolemy's geocentric model is a better  
predictor

Should Ptolemy be the patron saint of  
econometricians or NAESB?

# Post Galileo lesson: it takes time



Copernican model gets Kepler's elliptical orbits

1642: Galileo dies; Newton is born

Newton discovers gravity and the calculus

1835: *Dialogue* removed from the Index

1992: John Paul II accepts to Galileo's approach to science

Considerable uncertainty during transition

We don't burn people at the stake anymore<sup>5</sup>

# does science get it right the first time? (Paradigm shifts we have no-ed and loved)

- History books don't always document the mistakes
- 2000+ years of Aristotelian logic
  - geocentrism: Aristotle, Ptolemy, Church,
  - heliocentrism: Copernicus, Galileo
  - Galileo's telescope provides damaging evidence
  - ether: Aristotle, Maxwell
  - atom: Democritus, Aristotle, Thomson (plum pudding), Bohr, Heisenberg, Pauli (spin)
- phlogiston/oxygen: Priestley, Lavoisier
- 1905: Albert E introduces relativity
- quantum mechanics
- Albert E: God does not play dice with the universe
- discontinuity and uncertainty rule



# The politics of paradigm shifts and cultural shibboleths

- ⇒ "there is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its outcome, than to take the lead in introducing a new order of things" Niccolo Machiavelli
- ⇒ It takes a decades to change a cultural paradigm
- ⇒ Jargon traps you in the old system
  - ⇒ Use cost-based approach language in a auction based model
  - ⇒ Fix cost recovery is not an issue in MBR
- ⇒ Small rules and culture matter
- ⇒ Tipping point: Do you need a crisis?
- ⇒ Efficiency not competition is the end goal



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# All markets are regulated the policy question is how?



- Property rights : contracts and common law
  - eminent domain
- Institutional rules: SEC, CFTC, DOJ, FTC, FERC,...
- Antitrust (monopoly): pre se: collusion; ex post
  - Does Nash behavior violate antitrust law? No or maybe
- Utility regulation: just prices; ex ante
- Punishments for illegal behavior
  - Restrictions on behavior
  - disgorgement of profits
  - compensation of harm
  - Fines and jail time



# Commodity competition

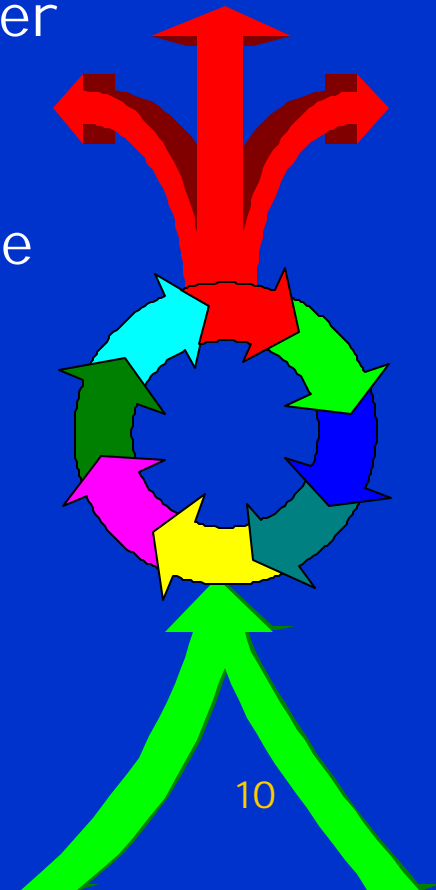


- ⇒ Pre-1980s prices were regulated
- ⇒ Trading: Phone booth, role of quarters, guesstimate billing
- ⇒ Price discovery
  - ⇒ Early 1980s: trade press editor publishes prices to stop large volume of phone calls
  - ⇒ trade press reporting: structured whispering
  - ⇒ Price reporting becomes a significant profit center
- ⇒ NYMEX futures and options
- ⇒ risk management
- ⇒ Commission pushes EBBs/e-trading
- ⇒ Enron told the Comm Enron online was a bad idea!
- ⇒ Pricing anomalies ignored
  - ⇒ Henry hub and Chicago: cover fuel costs
  - ⇒ Atlanta and New York: arbitrage
  - ⇒ October 22, 2003 Permian Basin and California border: manipulation



# MARKET CENTERS ENHANCE EFFICIENCY AND RELIABILITY

- Increasing access to sources of gas and capacity
  - pipelines often have highly correlated demand
  - makes short-term deals and long-term deals easier
  - creates deeper markets
- Lowering transactions costs
  - reduced search costs and faster market response
  - real price information
  - simplifying multiple pipeline exchanges
- Lowering reaction time in emergencies
- Using multiple system responses
  - greater aggregation through market centers
  - one storage facility can serve many pipelines



# Order 637



@ e-commerce

@ EBBs become Web sites: still MtoM

@ posting of daily transactions and capacity

✉ efficient primary rates:

✉ term differentiated, seasonal

🔑 equality of secondary market

🔑 encourages voluntary e-auctions

🔑 segmentation if operationally feasible

🔑 imbalance trading not indexed cash outs

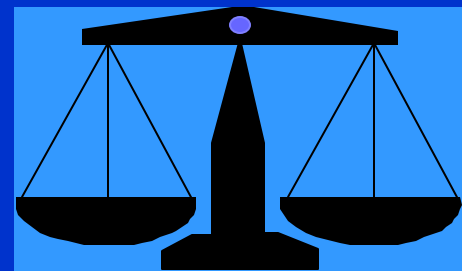


# Virtual pipelines

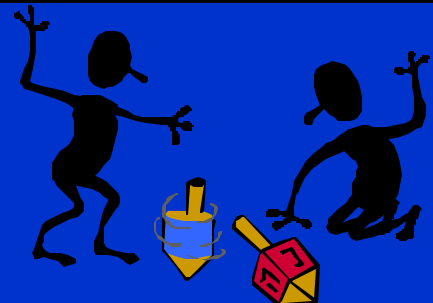
- = Order 637 requires firm contracts to look like competing pipelines
- = segmentation equality/full tradability
- = nomination and confirmation equality
- = primary firm service is more attractive
- = better information
- = imbalance markets
- = no harm/no foul penalties
- = incentives to limit OFOs

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↑ efficient markets



# The Affiliate Game



# 'Wall Street' in the late 1990s: easy money



- Too much money chasing too few good investments
- Equity analysts shade analysis to get bonus based on investment business
- the 'new' economy: dot.coms and energy traders
- gross revenues become more important than profits!!!! New theory: Profits follow revenues
- Why aren't all companies following Enron?
- Late 1990s: system breaks down
- Early 2000s: credit downgrades
- Regulatory credit problems



# The Enron phenomenon

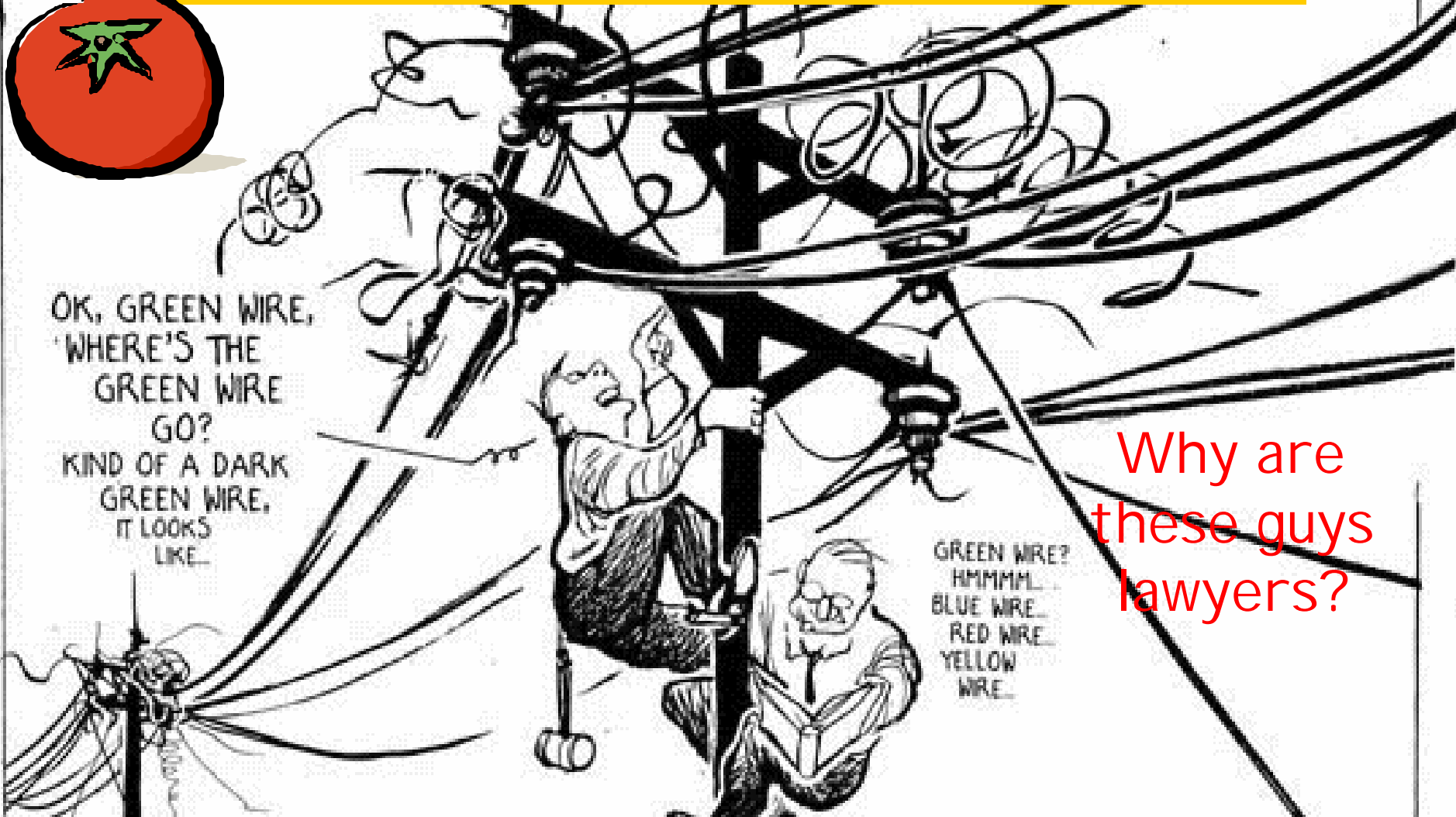


- ☹️ Enron goes asset-lite; creates ether money
- ☹️ Wall Street encourages Enron clones
- ☹️ California market designed by Enron and clones with intense lobbying
- ☹️ we jumped to reasonably unfettered markets
- ☹️ Result: Rube Goldberg market rules
- ☹️ Flaws were known but dismissed
- ☹️ Western market crisis exploits rules
- ☹️ Memo to Cal. strategies: Fat Boy, Get Shorty

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15

# California Market Standards

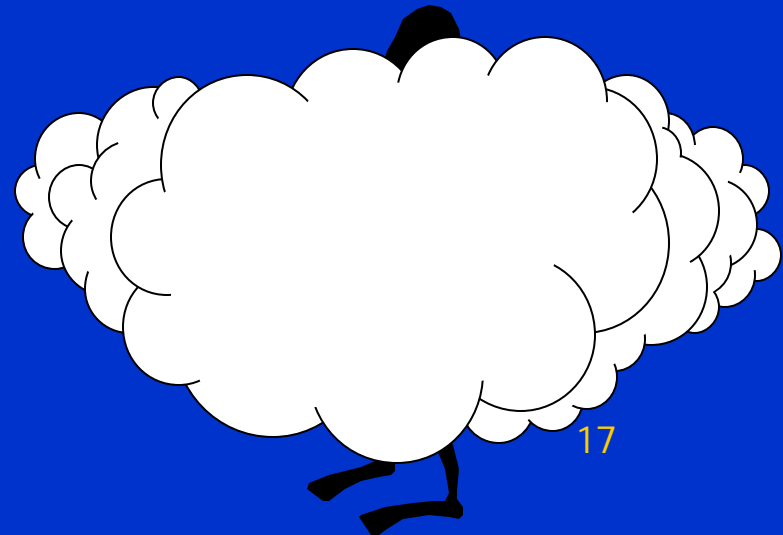


- ✓ Rube Goldberg design to chase MPs into the 'bilateral'
- ✓ PX and ISO rushed and incomplete
- ✓ CPUC says play the 'bilateral' at your 'risk'

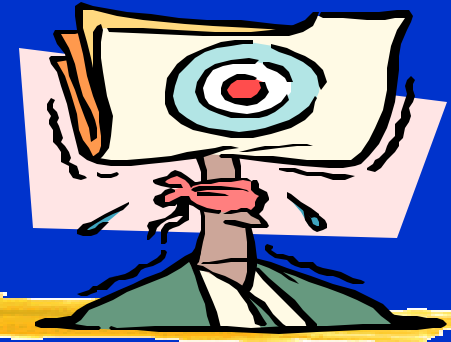
# Financial accounting standards succumb to affiliate consulting incentives

---

- ↪ Book (lamppost) cost: wrong measure but hard to manipulate
- ↪ Mark to market: correct measure but easy to manipulate
- ↪ Mark to hypothetical market: bad measure but easier to manipulate
- ↪ Mark to *magic*

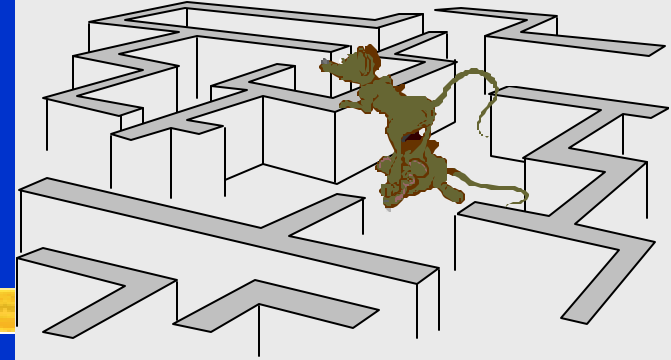


# portfolio schizophrenia: spot v. contract



- ☯ Utility Comm's test on hedging: Spot is prudent
  - ☯ Lower than spot: get an 'at a boy'
  - ☯ High than spot: threaten disallowance/prudence hearing
  - ☯ Result: buy spot
- ☯ Decision framework with and without forward contracts
  - ☯ Without forward contracts
    - ☯ play the spot market
    - ☯ defer capital expenditures
  - ☯ With forward contracts: hedge input prices
    - ☯ put gas in storage to hedge commitment
    - ☯ capital expenditures to meet commitment

# The Index Game



- ↪ State commissions accept index purchasing
- ↪ Distribution Co.'s purchase at index
- ☹ Large portion of trade is on index prices
- ☹ What does it mean have a forward contract to be settled at the spot index price?
- ☹ Fixed price trading thins: 3% of trade?
- ☹ Fixed price market attracts manipulation
- ☹ Distinguish good (scarcity) and bad (manipulation) volatility

# The price discovery breakdown



## ☹️ validity questioned

- ☹️ 'statistical': sampling is voluntary not random
- ☹️ All trade press report essentially the same number
- ☹️ traders fib: it's wire fraud!!!!
- ☹️ Wash and round-trip trades inflate 'revenues' and distort reported prices
- ☹️ Trade press claims it filters them out based on intuition

## ➡️ Answer: open auction markets

- ➡️ Real trades
- ➡️ Auditable
- ➡️ Better information

## ➡️ Major oils become dominant traders

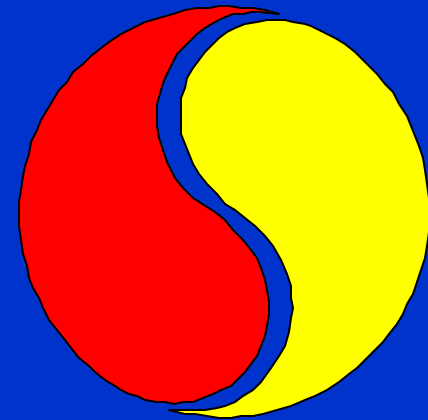
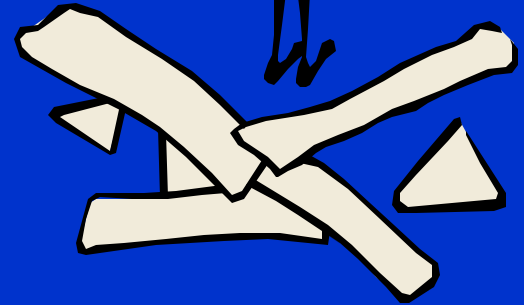
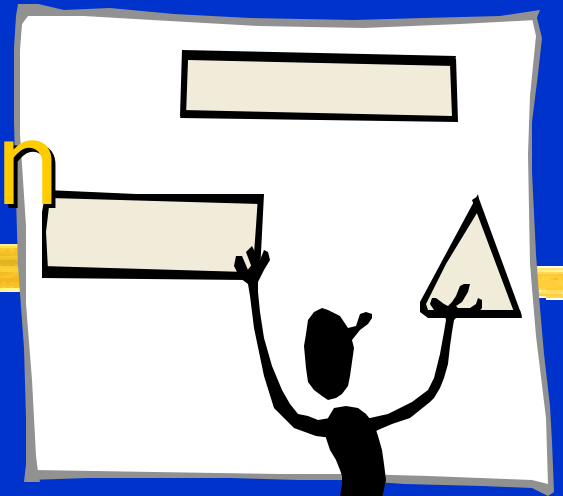
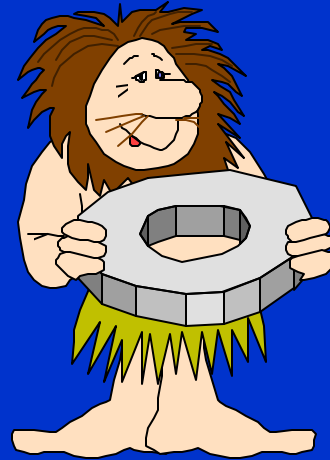
# Metaphysics of Electric Markets



- ☯ Physics can be inconvenient
- ☯ ATC: how do you calculate it?
- ☯ contract path and TLRs to simplify trading?
- ☯ DC power does not flow across states
- ☯ lossless transmission/vertical demand 'curve'
- ☯ price signal for an infeasible market? (CAPX)
- ☯ market power: assume a larger market (CAISO)
- ☯ In reality based markets eventually the fictions/scaffolding must be jettisoned

# Basics of market design

- ⇒ Contracts (not compacts)
- ⇒ Marginal/incremental cost pricing
  - ⇒ Start-up and min run
- ⇒ Trading rules
  - ⇒ Financially sound
  - ⇒ Market clearing
- ⇒ Incentives
  - ⇒ For doing "good" things
  - ⇒ For not doing "bad" things
  - ⇒ With collars for political reasons



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⇒ Information

# Failed market designs



- ☹ Zonal markets (Cal, PJM, NE, UK)
- ☹ Sequential markets for energy and anc services
- ☹ One settlement systems
- ☹ Infeasible markets (Cal PX and UK)
- ☹ Ignore non-convexities (start-up and no-load)
- ☹ Ignore market power
- ☹ As-bid/first-price pricing
- ☹ all ended in administrative intervention**
- ☹ No property rights to market power or poor market design**

# Auction Design Principles

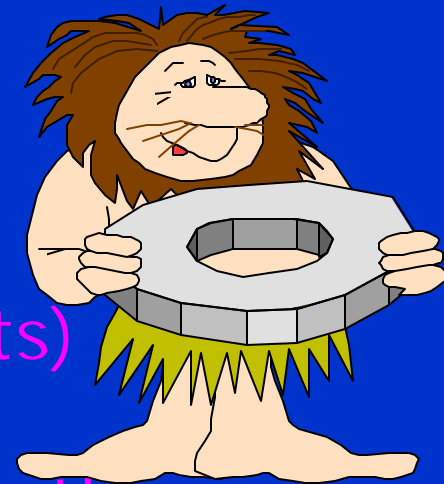
"Everything should be made as simple as possible ... but not simpler." Einstein

↓ Don'ts  $B = 22/7$

- ↓ Create gaming opportunities in the name of simplicity
- ↓ Foreclose marginal (incremental) cost bids
- ↓ Assume away non-convexities
- ↓ increase risk
- ↓ Allow bids that are not firm offers
- ↓ favor large players

↑ Do's  $B = 4[1 - 1/3 + 1/5 - 1/7 + \dots]$

- ↑ Allow marginal cost bidding
- ↑ market clearing price (with scarcity rents)
- ↑ make the process internally consistent
- ↑ Create property rights and simple alternatives
- ↑ Allow self scheduling



# A market design that works



## ⇒ Pre-day-ahead markets

- ⇒ for transmission rights: CRT/TCC/TRCs/FGRs
- ⇒ for generation capacity/reserves (ICAP)
- ⇒ market power mitigation via options contracts

## ⇒ day-ahead market for reliability (value substitute)

- ⇒ simultaneous nodal market-clearing auctions for energy, ancillary services and congestion
- ⇒ allow multi-part bidding
- ⇒ higher of market or bid cost recovery
- ⇒ allow self scheduling
- ⇒ allow price limit bids on ancillary and congestion

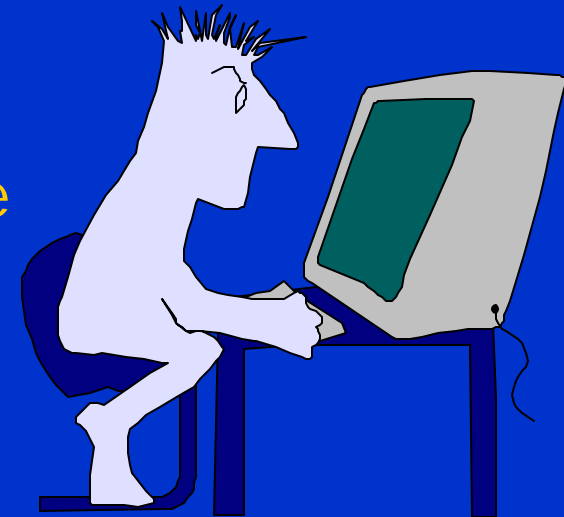


## ⇒ Real-time balancing myopic market

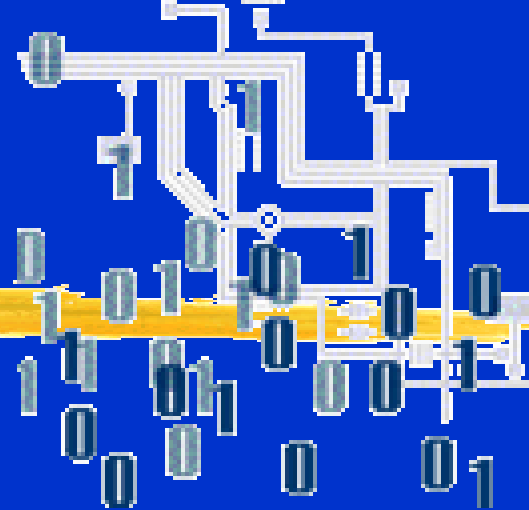
⇒ markets are nodal-based LMP with fish protection

# Modular Software Design

- 🔔 Transparency: no black boxes
  - 🔔 understand what software does
  - 🔔 Understand pricing
  - 🔔 available
- 🔔 Testability:
  - 🔔 understand and compare performance
  - 🔔 Need test problems
  - 🔔 Benchmark statistics
- 🔔 Modularity: plug compatible
- 🔔 Creates competition and lowers costs
- 🔔 October 22, 2003 Allows for evolution



# Computational Considerations



- ☺ Bixby: wall clock time reduced by  $10^6$
- ☺  $10^3$  in hardware and  $10^3$  in software
- ☺ 1 year in 1990 becomes 30 sec in 2000
- ☺ What will happen between 2000 and 2010?
- ☺ Tradeoff between accuracy and solution time
- ☺ Market design should drive algorithms
- ☺ Algorithms should not drive market design

# RTO Rule: O2K

Dec 1999



## Characteristics

 independence

 appropriate  
regional  
configuration

 operational  
authority

 short-term  
reliability

## Functions

 tariff adm and design

 congestion management

 parallel path flows

 ancillary services supplier

 real-time balancing market

 efficient rate designs

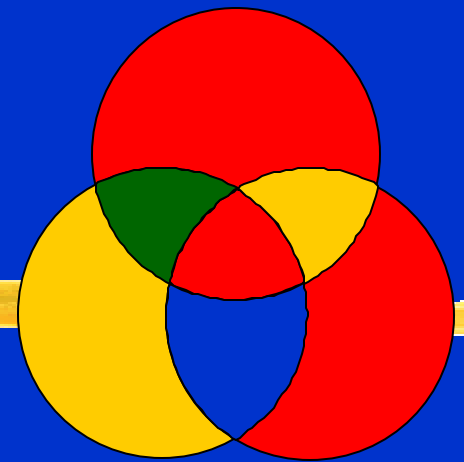
 **Information:** OASIS/TTC/ATC

 market monitoring

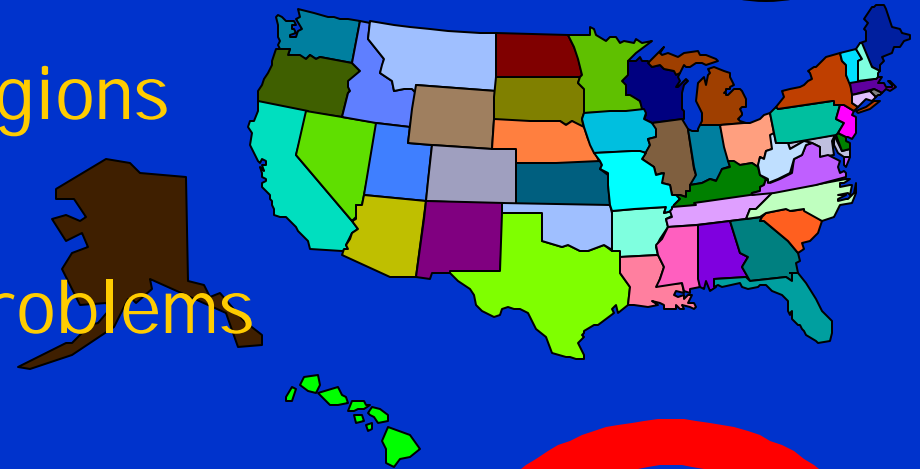
 planning and expansion

 open architecture

# Regional boundaries: the coloring problem



- ✂ east/west
- ✂ regional reliability regions
- ✂ open architecture
- ✂ Inter Control Area Problems  
the Seams Problems



- ☞ need coordination
- ☞ miss economic trades
- ☞ need better communications
- ☞ need better software



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# Buyer Market Participation is like the weather

- ☹️ No motivation; time invariant prices; moral hazard
- ☹️ If electricity was cars,
  - ☹️ no fuel gage, no posted gas prices
  - ☹️ Get reading once a month on fuel use and price of gasoline
  - ☹️ Increased outage insurance or fill up more frequently
- ☹️ Transactions costs and risks
- ➡️ Solution
  - ➡️ Portable entitlements (p and q) not price cap
  - ➡️ First: Generation in drag
  - ➡️ Day 2: Real demand side bidding 24x7
- 😊 retail market agents offer innovative demand response programs

# Portable Entitlement Program

- POLR/SOLR makes and maintains entitlements under state regulation and resource adequacy requirements
- Portable entitlement program (fixed p and q)
  - Long-term entitlements includes CRRs
  - Attached to the customer
  - Auto buy/sell for under/over entitlement in SMD spot market
  - entitlement moves when the customer moves .
  - Terminates when the customer leaves the SOLR

➤ **NO SOLR PRICE CAPS**

# What is needed for competition?



- ☺ good information and market design
- ☺ organizing principle: compatible incentives
- ☺ recognition and mitigation of market power
- ☺ recognition of how displacement markets work.
- ☺ understand the choices
  - ↓ free market (Coasian dream). NOT
  - ↑ markets with market rules
  - ↓ administrative rules (TLRs and OFOs)
  - ↓ State socialism



# Wholesale Market Design AGORAPHOBIA

You don't always  
get it right the  
first time.

Now you have  
experience

Try SMD

NO, WE DIDN'T NUKE OUR-  
SELVES BACK INTO THE STONE-  
AGE. WE DEREGULATED OUR  
ELECTRIC UTILITIES...

Are you a  
Copernican or  
a Ptolemain?

*All power corrupts, but we need the electricity*