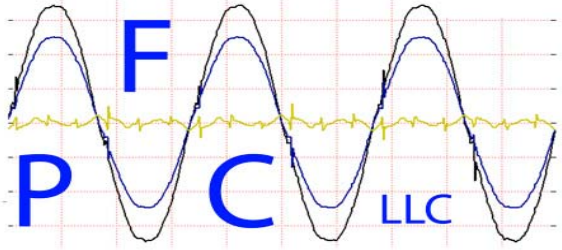
# Saving Energy and Money for the United States by Reducing Reactive Power Losses

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"Bringing The World Back Into Phase, One Step At A Time"

NYSERDA New York State Energy Research and Development Authority

# Reactive Power Losses – U.S.

- 0.3% Distribution System Line Loss
- 1.7% Customer Premise loss
- 2% Total Loss
- =10 Gigawatts average

- = The Total output of five 2 GW power plants

- (Indian Point Nuclear Plant is 2 GW)

# Fuel Requirements to compensate for U.S. Reactive Power Losses

(After Line Losses)

- **Coal: 98000 tons/day**
  - **(1100 90 - ton cars/day) 11 Trainloads/day**
- **Oil: 435,000 bbl/day or 1 tanker every 16 hours (note: "bbl" means barrels)**
- **Natural Gas: 2.6 x $l0^9$ SCF/day**
- **Uranium (as 235U): 32.5 kg/day**

# Negative Effects Caused by Inadequate Regulation of Reactive Power in Electrical Equipment

- 87,000 Gigawatt hours of wasted electricity annually in the U.S.
- 10 Gigawatts of wasted generation capacity
- Reduced Ability to Deliver Power to Consumers

# DAILY EXCESS GREENHOUSE GAS EMISSIONS RESULTING FROM REACTIVE POWER

- 2 Pounds of $CO_2$ / KWH x 10 million KW x 24 Hr
- = 480 million pounds of extra $CO_2$ Emissions
- = 240,000 tons extra $CO_2$ Emissions

# Benefits of Regulating Reactive Power to Conserve Energy

- **Technology is Developed and Relatively Inexpensive**
- **Simple to Implement**
- **Saves Energy and Money by Reducing Fuel Consumption**
- **Saves Money By Increasing the Capacity of The Electric Distribution System and Allows Deferral of Capital Expenditures**

# OTHER BENEFITS

- Less Congested Electrical Distribution system
- More Distribution Capacity for Electric Vehicle Charging
- Fewer Equipment failures

# What is Reactive Power ?

- Excess, Unneeded Energy Stored In Electrical Equipment is Sent in Reverse on the Utility Network
- Raises Currents Throughout the Utility System
- Causes Excess Thermal Losses Which Are Wasted Energy
- Amount of Reactive Power and System Efficiency is Represented by a value referred to as **Power Factor** (Power Factor of 1.0 is Optimal)

# Basis for Our Claims

- We Received a NYSERDA Grant from NY State to Determine the Feasibility of Using Power Factor Correction To Reduce Energy
- Testing and Measuring has been done in Several Venues
- Results Have Been Extremely Positive

# Conclusions

- **There are large KW and KWH savings to be gained within customer premises and on the utility distribution system by improving power factor**
- **Power Factor Correction can be cost effective to implement on the small scale.**
- **Equipment Standards must be modified to mandate a high power factor. It is less expensive to fix the problem at the factory than in the field.**
- **Power Factor correction has to be viewed from the perspective of a Public / Private (Utility/ Customer) partnership, as both parties have much to gain from its implementation.**
- **Reduced losses=Lower Rates**