



2007  
Summer  
Seminar

## Enabling Efficiency and Renewables

**Arshad Mansoor**

Vice President, Power Delivery & Markets

# Achieving and Exceeding the Prism Targets

- **Efficiency:**

- ***End Use Efficiency:*** Make electronics more efficient and use electronics to make devices smarter and efficient

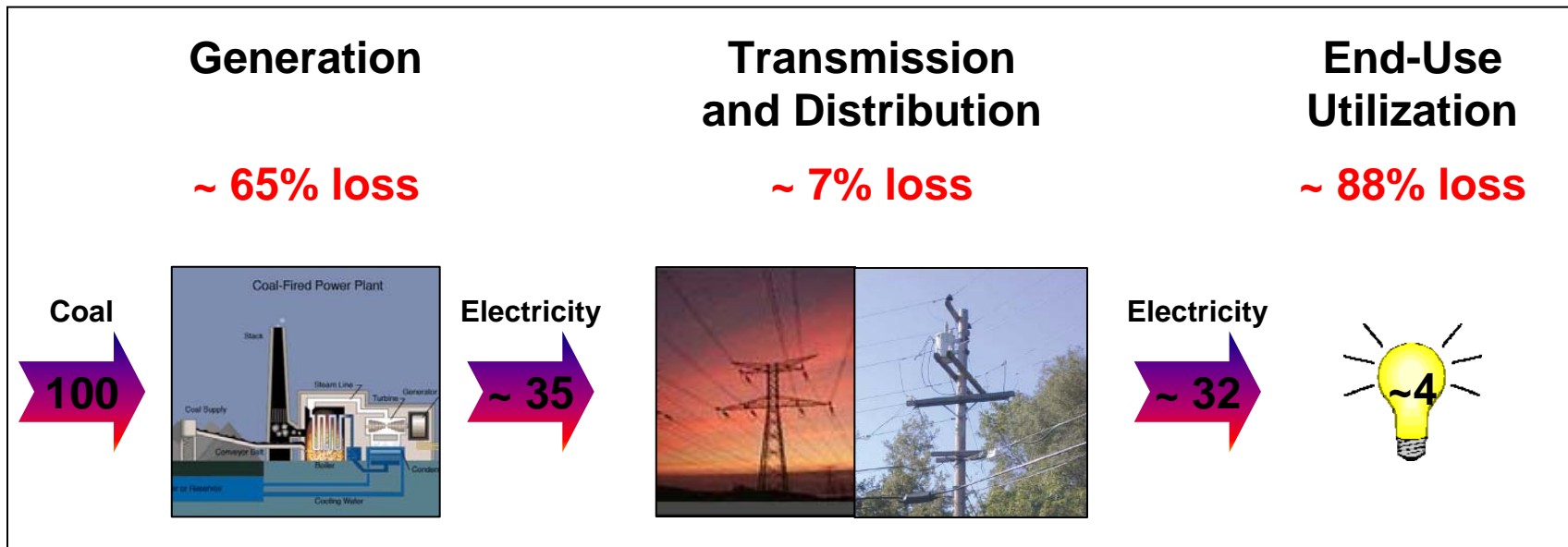
- **Smart Infrastructure:**

- ***Standards:*** Accelerate research to develop interoperability standards
- ***PHEV and Prices to Devices:*** Deploy smart infrastructure across transmission-distribution-consumer to enable Prices to Devices and Pluggable Hybrid Vehicles

- **Energy Storage:**

- ***CAES:*** Deploy first of a kind applications for advanced Compressed Air Energy Storage (CAES) technology

# Energy Efficiency – End to End



# End-Use Efficiency

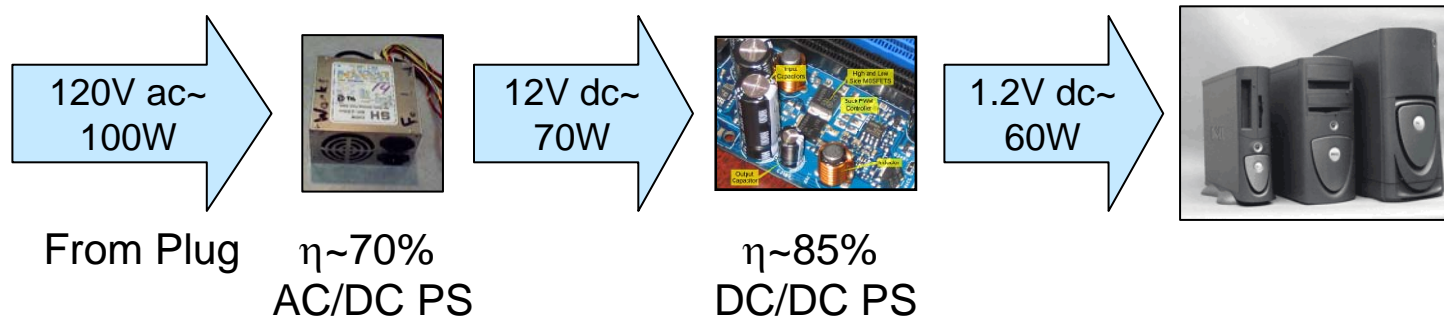
- Efficient devices make a difference:

- Replace all incandescent bulbs with CFLs in U.S. households:

- **~3.7% of U.S. electricity consumption**



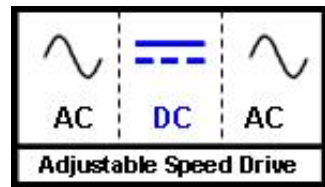
- Power supplies are prime target of efficiency improvement



**Make Electronics More Efficient**

# Enabling Efficiency with Smart Devices

## Variable Speed Compressor



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## Electronic Ballast



**Use Electronics to Make Equipment Smart and More Efficient**

# Enabling Efficiency With Smart Infrastructure

Day-ahead Hourly Prices

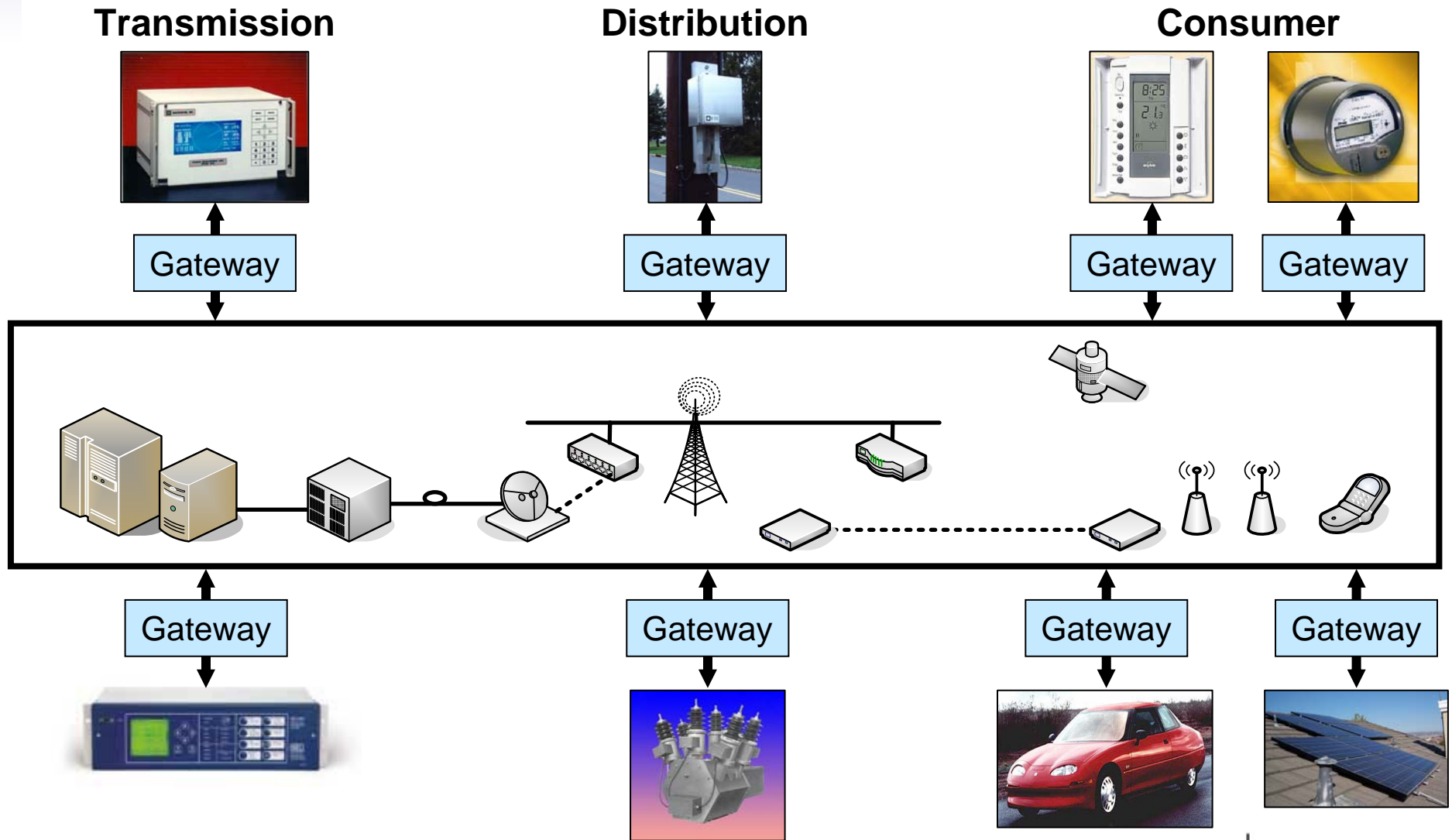


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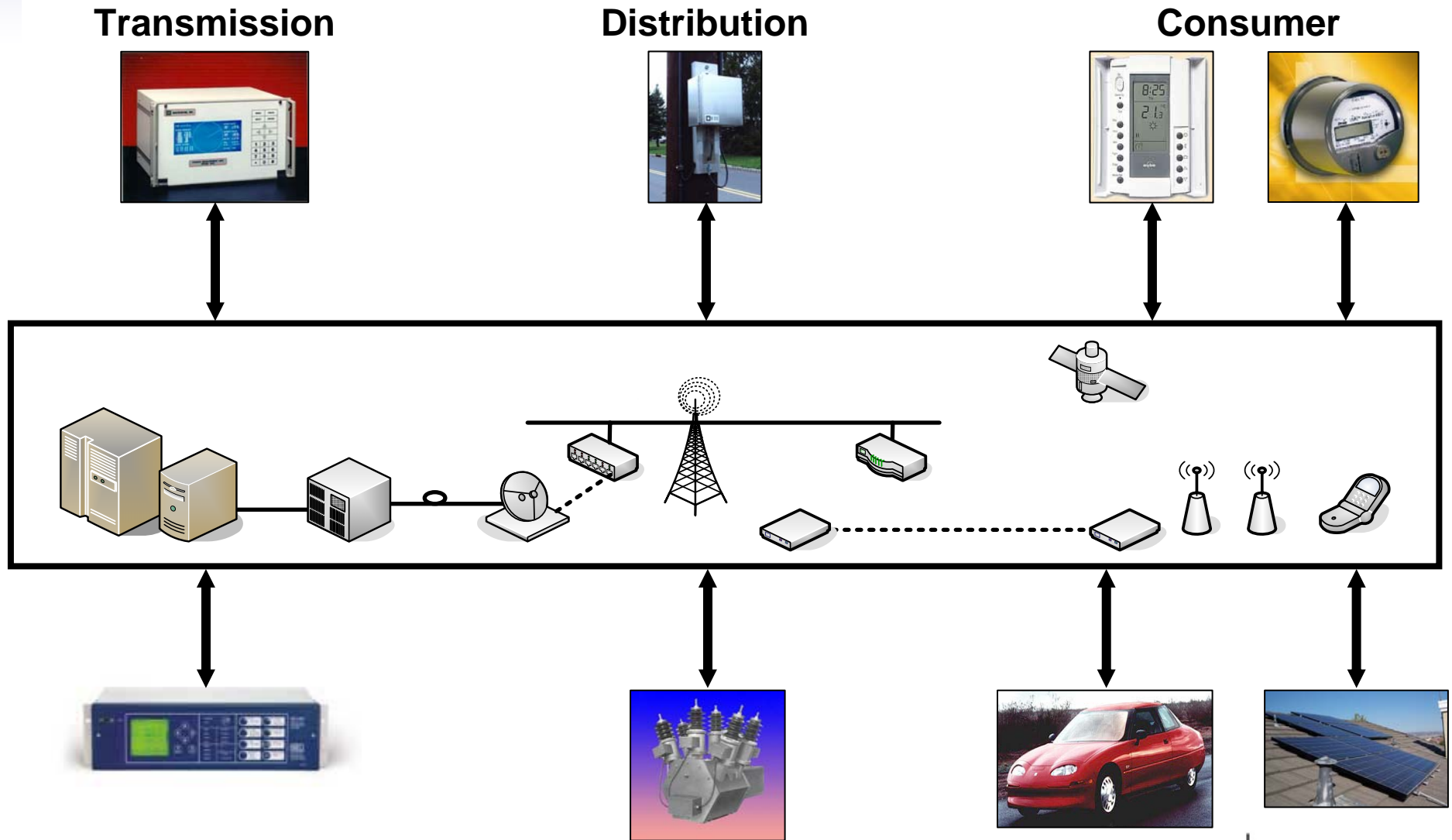


Smart End-Use Devices

# Today's Smart Infrastructure is Customized



# The Interoperable Infrastructure is Smarter



# Enabling Renewables

## Transmission Infrastructure



**Increased Power Flow**



**HVDC and EHV/UHV**



**Advanced Grid Operations  
and Planning Tools**

## Storage



**Short Term  
(Ultra Cap, Flywheels)**



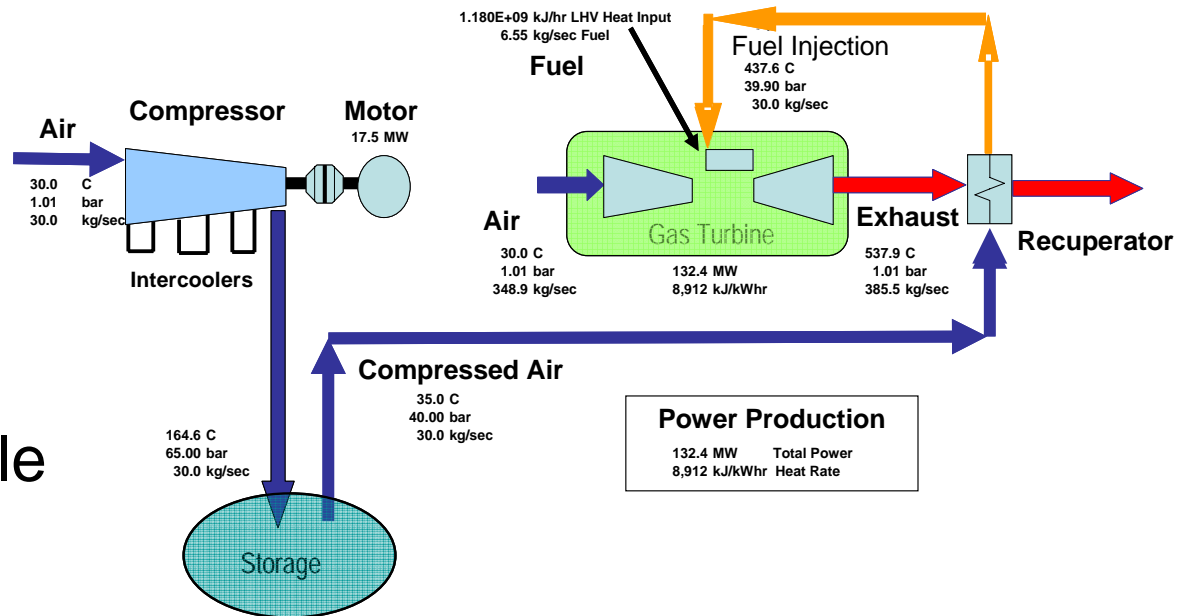
**Mid Term  
(NaS, Vanadium Redox)**



**Long Term  
(Advanced CAES)**

# New – Compressed Air Energy Storage

- Based on standard combustion turbine module, readily available
- Allows flexibility for deploying small scale above ground or subsurface storage
- Leverage existing Combustion Turbine installations



CAES-CT Air Injection Design  
Energy Storage and Power Company (ESPC)

**Opportunity for First of a Kind Deployment**