

GRIDWEEK[™]

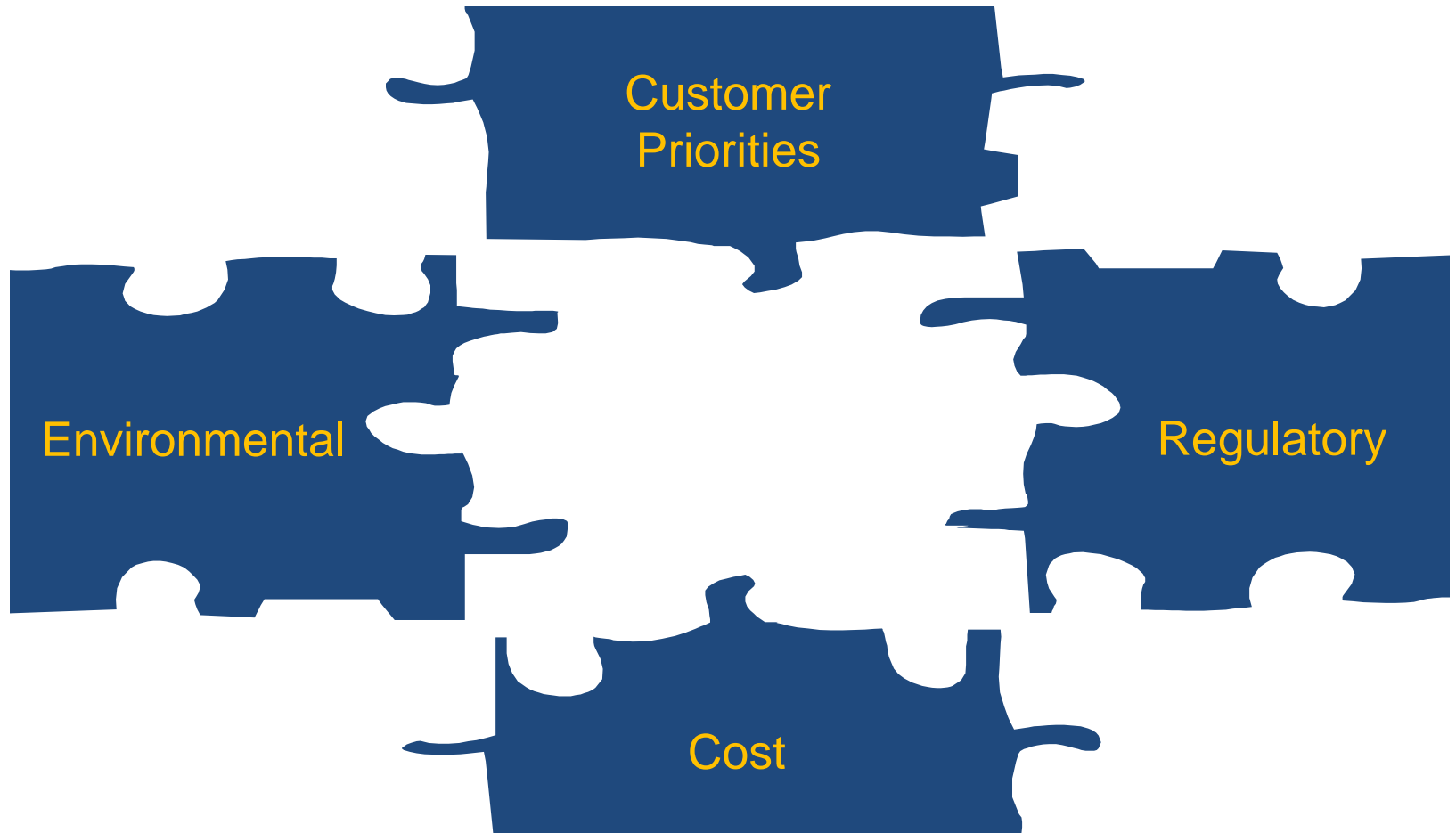
**Washington DC
April 23-26, 2007**

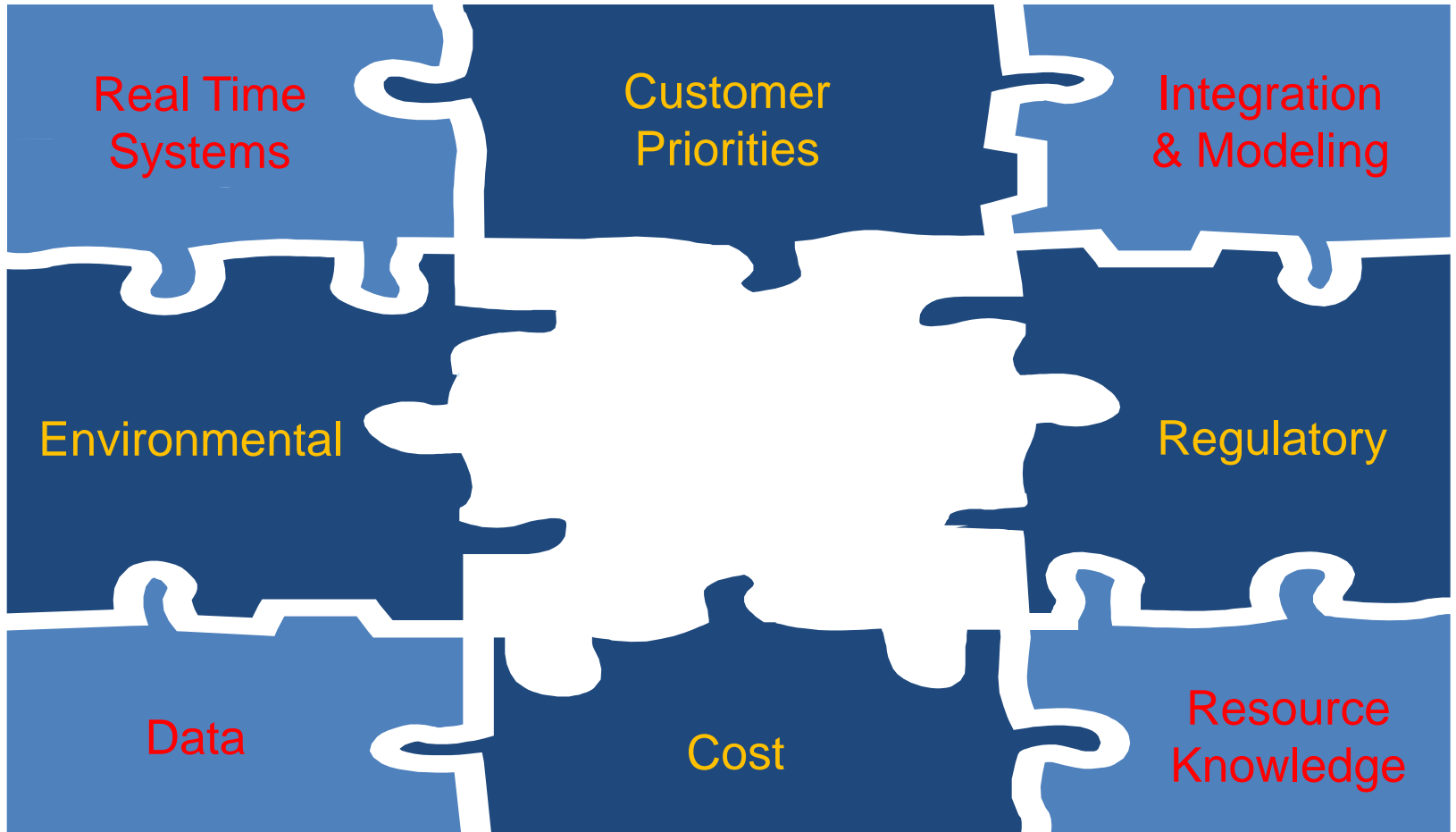
Grid Integration

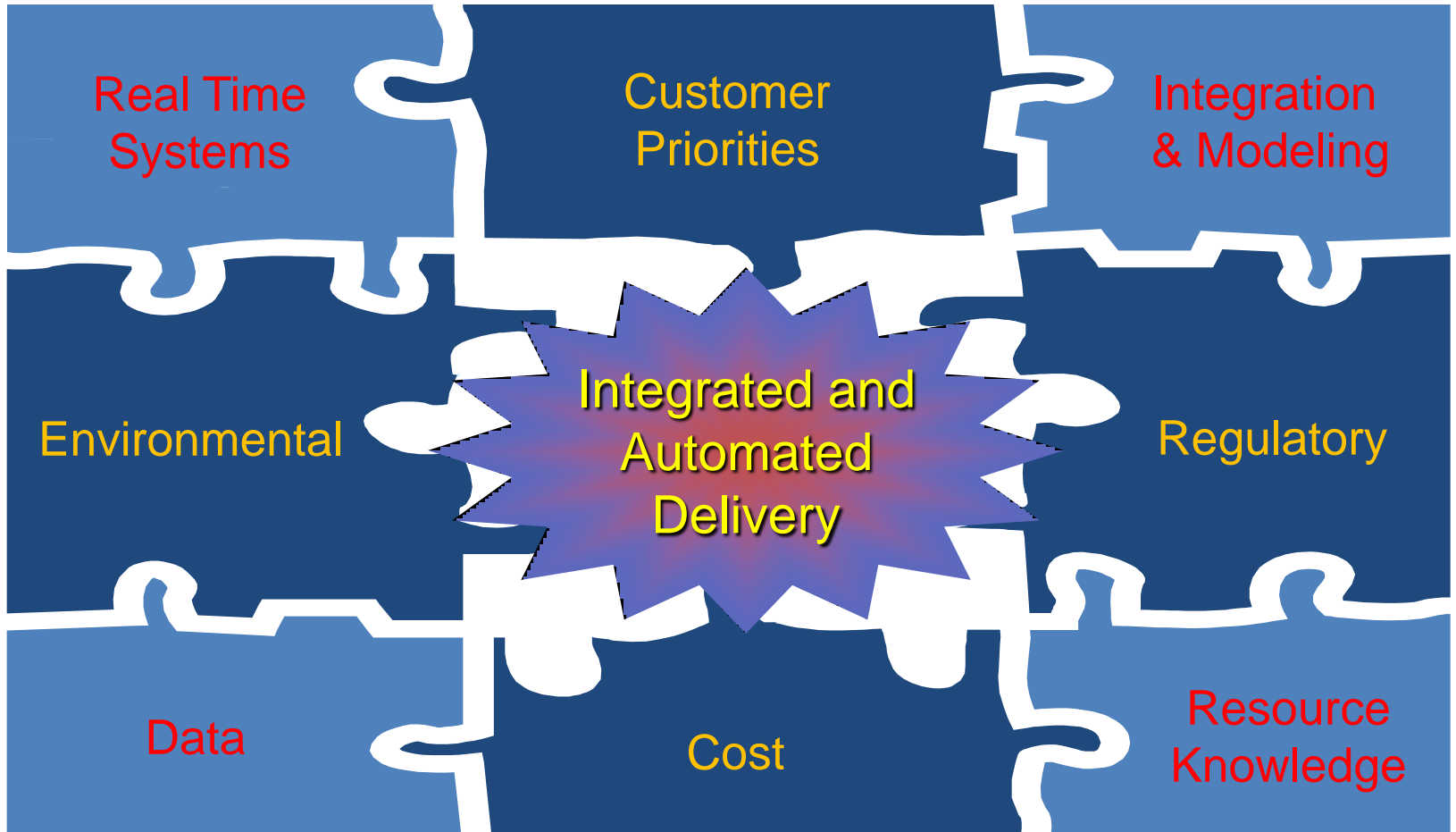
Michael Carlson

Vice President & CIO, Xcel Energy

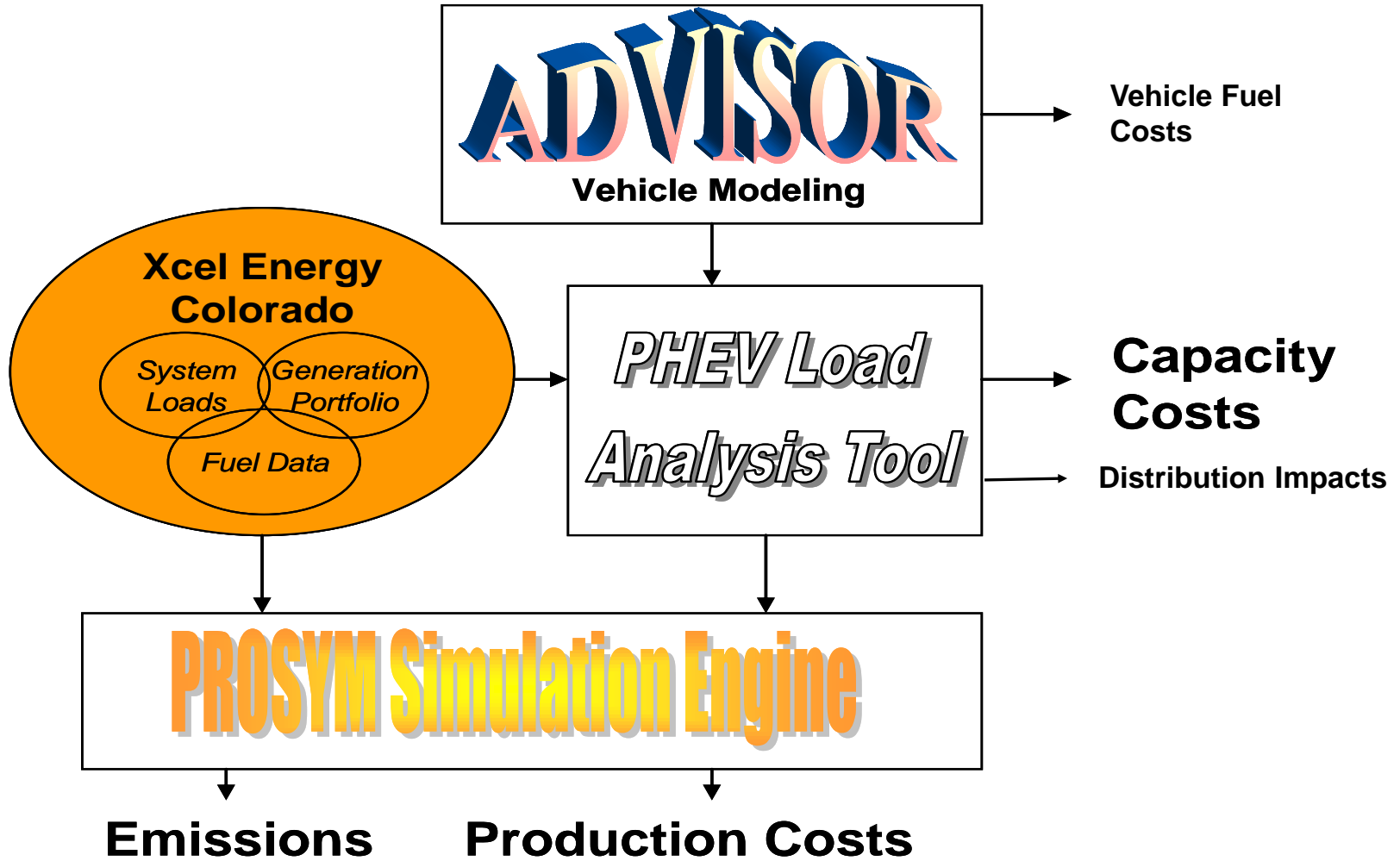
- **Needs to address all components of value chain**
- **Opportunities to integrate fuel/generation to consumer/device**
- **Growing and evolving capabilities to monitor, analyze and control in real time environment**
- **Requires a living, interconnected neural network across all components of the grid**







- **Traditional coal, gas and nuclear delivery**
- **Wind generation**
- **Wind-to-hydrogen pilot program**
- **PHEV co-generation pilot program**
- **Bio-diesel experimentation & testing**



- Positive impact on plant emissions (50% reduction from average) if off-peak charging is dominant model
- Vehicle emissions for Co₂ reduced by 40%+
- Fuel (gasoline) savings biggest financial impact from PHEV (\$0.01/mile vs. \$0.02/mile)
- Off-peak generation adequate to serve with incremental fuel costs as major consideration
- Increased distribution stress/failure likely if high utilization of on-peak charging, limited impact with off-peak charging

- **Environmental management**
- **Reliability of aging infrastructures**
- **Decreasing supply margins**
- **Aging workforce**
- **Cost of delivery**
- **Customer utilization of new program/model**

Conservative Business

- Large fixed cost
- Long life assets
- Mature industry

Investment Constrained

- Limited Utility R&D
- Uncertain recovery of costs

Risk / Reward Imbalance

- Ratepayers share upside
- Shareholder has all risk
- Market incentives limited

