

Energy Challenges in Automotive Manufacturing

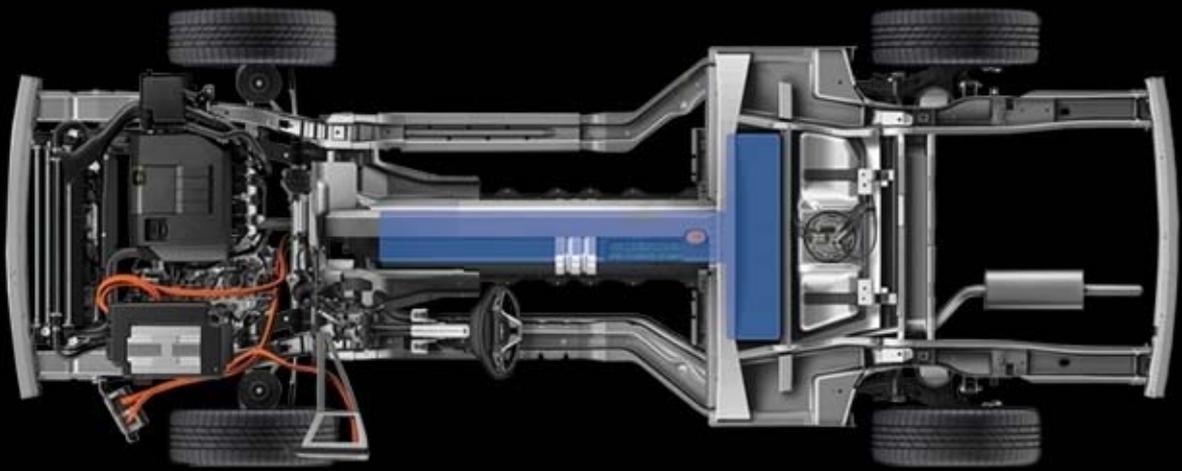
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VOLT

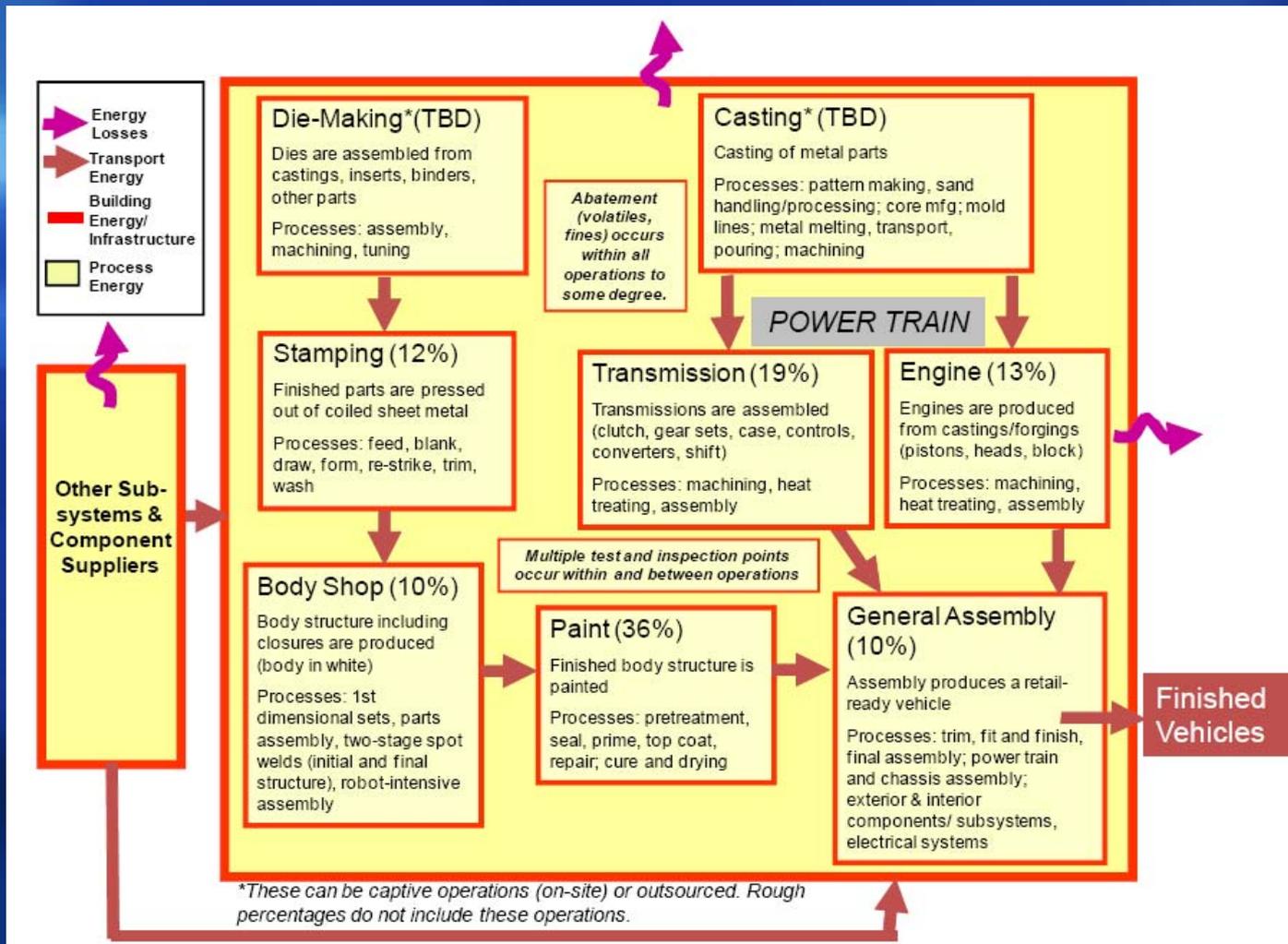


Energy Efficient Automotive Manufacturing

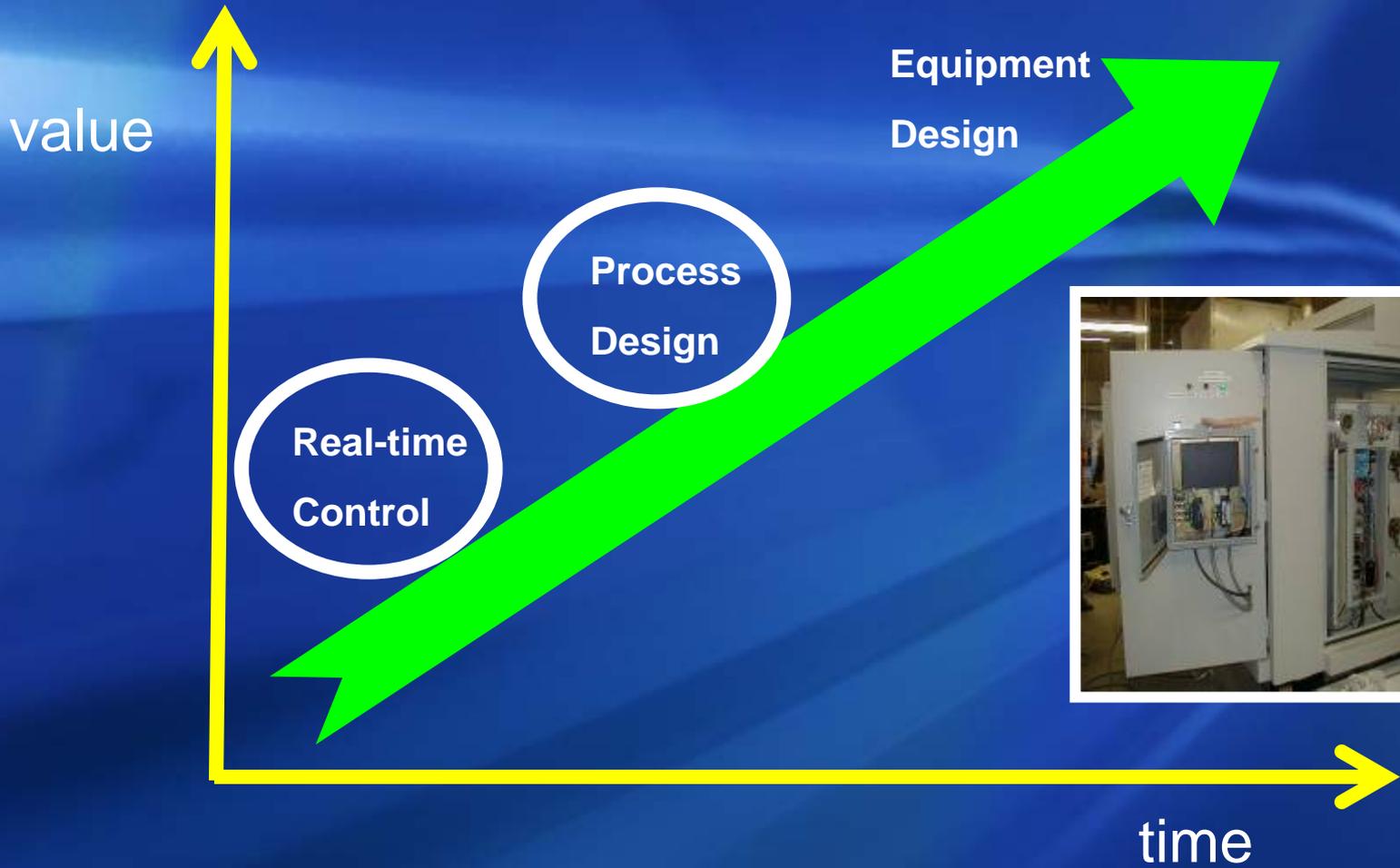


Where are the greatest energy (carbon) savings opportunities?

Energy Consumption in Automotive Manufacturing

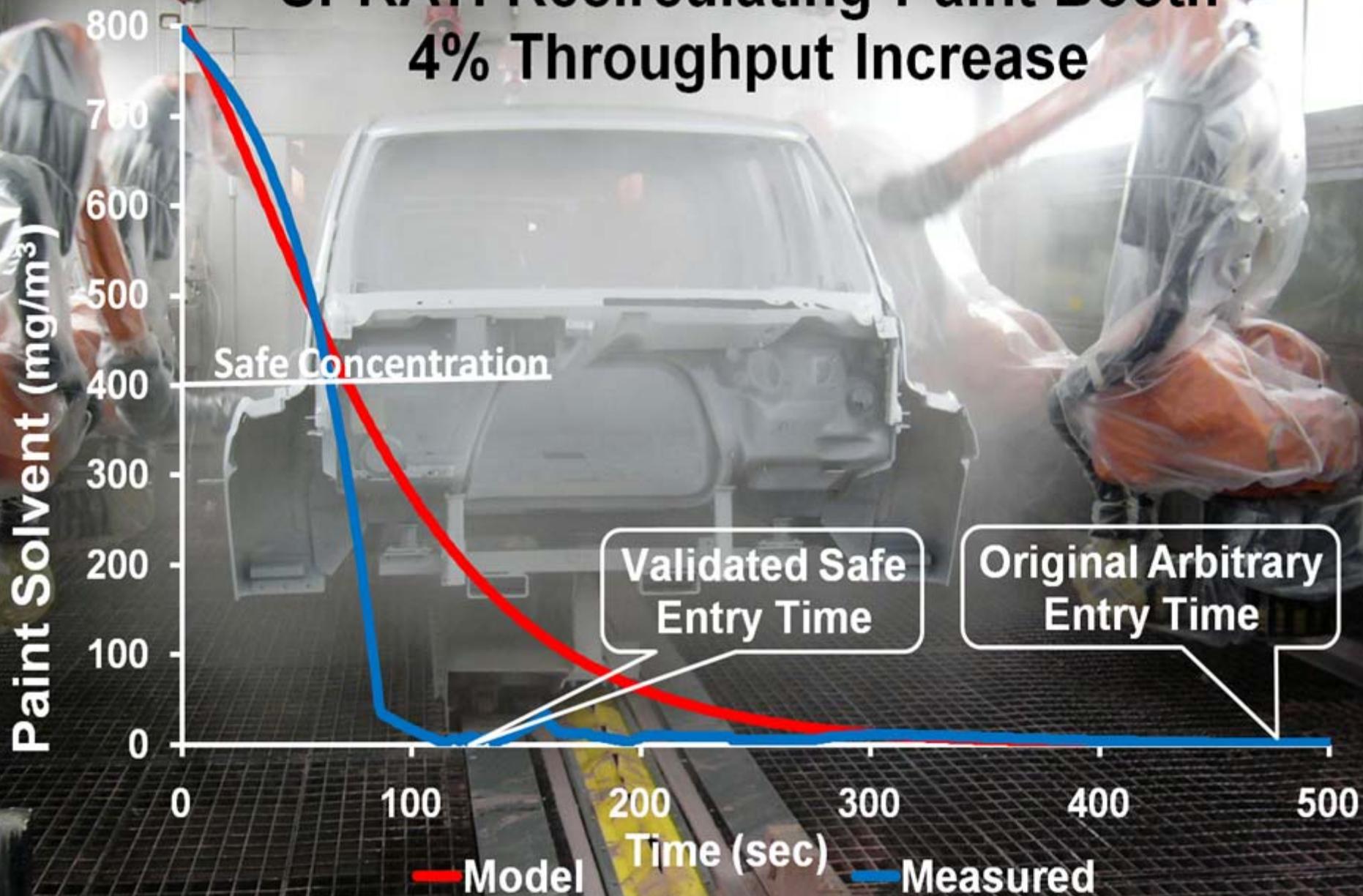


Path to Energy Savings



SPRAY: Recirculating Paint Booth

4% Throughput Increase



What prevent us from getting there?

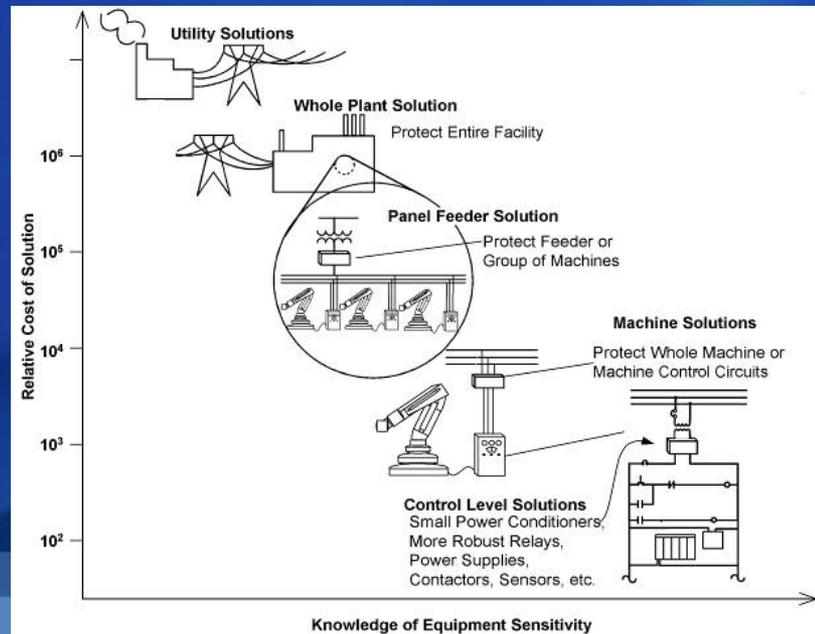
¶ Better data

Energy Performance Metrics

Data is presently too coarse to identify opportunities...

- ↑ MWh / Vehicle - Assembly
- ↑ MWh / tonne shipped - Stamping
- ↑ MWh / avg powertrain - Powertrain

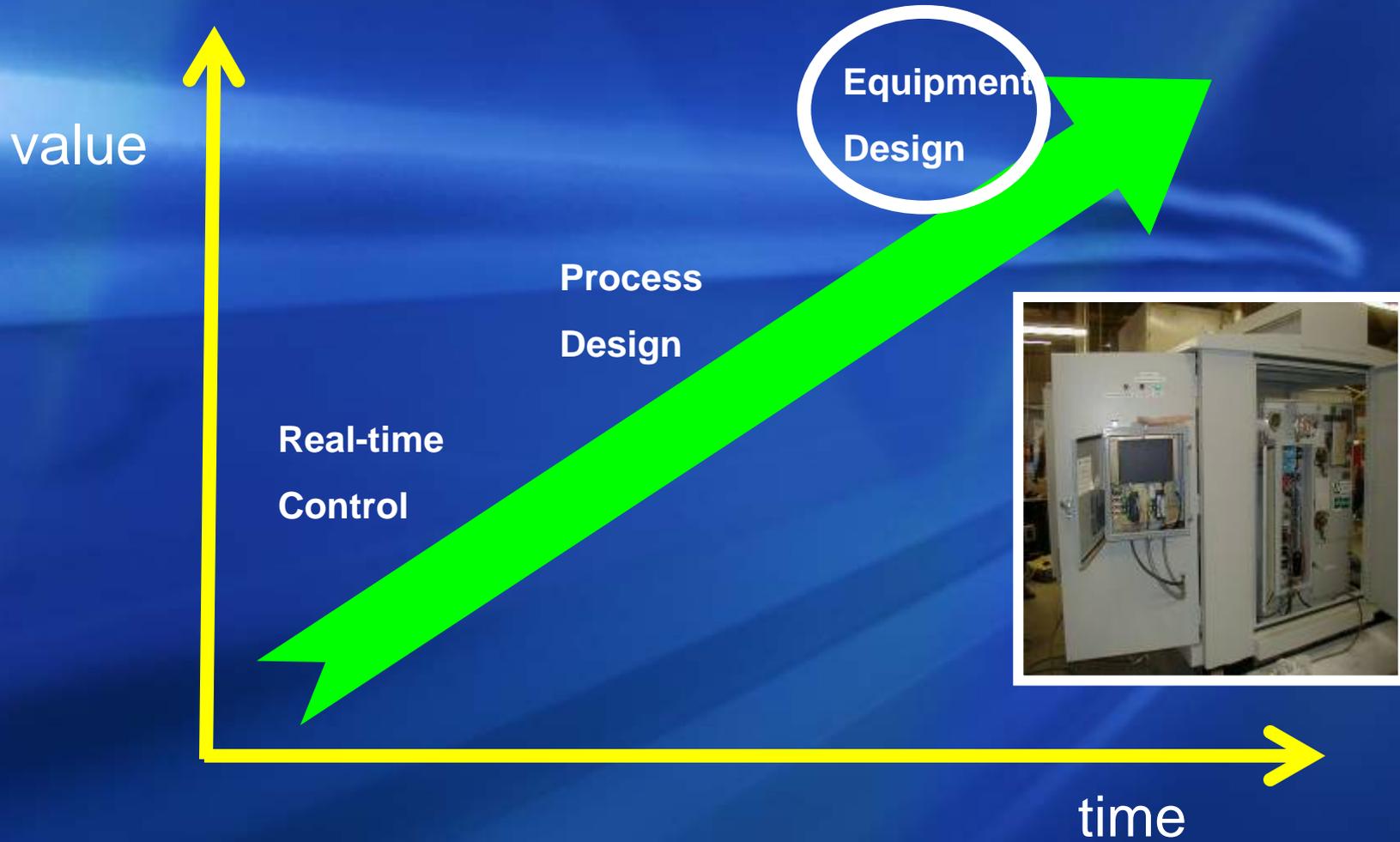
Utility
Plant
Feeder
Machine
Component



What prevent us from getting there

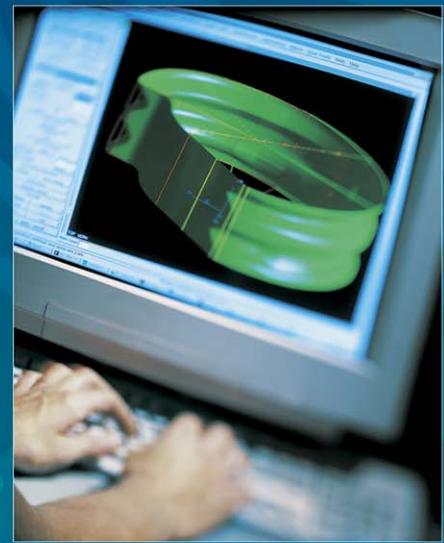
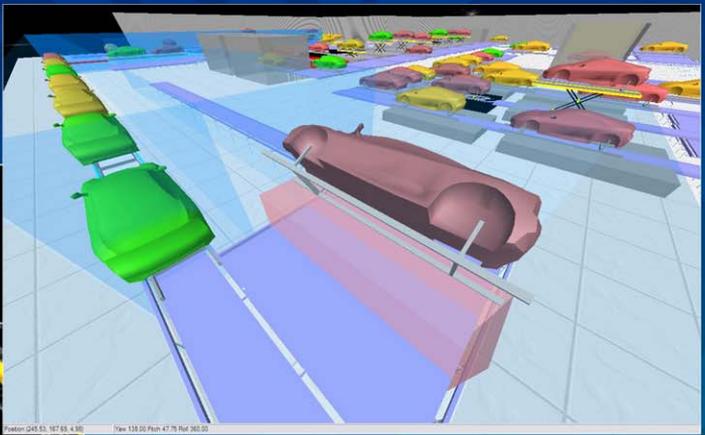
- ¶ Better data
- ¶ Better standards
- ¶ Better measurement methods
- ¶ Interoperability of devices to more consistently collect energy/environmental-related data

Path to Energy Savings



Gaps and Challenges

Accurate, Easy-to-Use, Pervasive and Persistent Virtual Capability



assembly

Energy budget for every process and vehicle

- ¶ Activity Based Energy (ABE) allocation?
 - 1) Based on process: How to get energy metrics and standards into virtual design software?
 - 2) Based on product: (very high energy consuming products which may not be priced correctly)
- ¶ These tools may be extended into the supply base for additional energy saving benefits.

Research Opportunities

Energy Efficient Automotive Manufacturing needs:

- ¶ Information models (data, metrics, standards, methods) for better energy decision making at the operational level (eg. ABE).
- ¶ Quantification of how much carbon is generated in the production of a specific type of vehicle (configuration).
- ¶ How to optimally allocate credits when considering remanufacturing supply chains?

