

DER Integration for Peak Load Management DOE RDSI - City of Fort Collins, Colorado

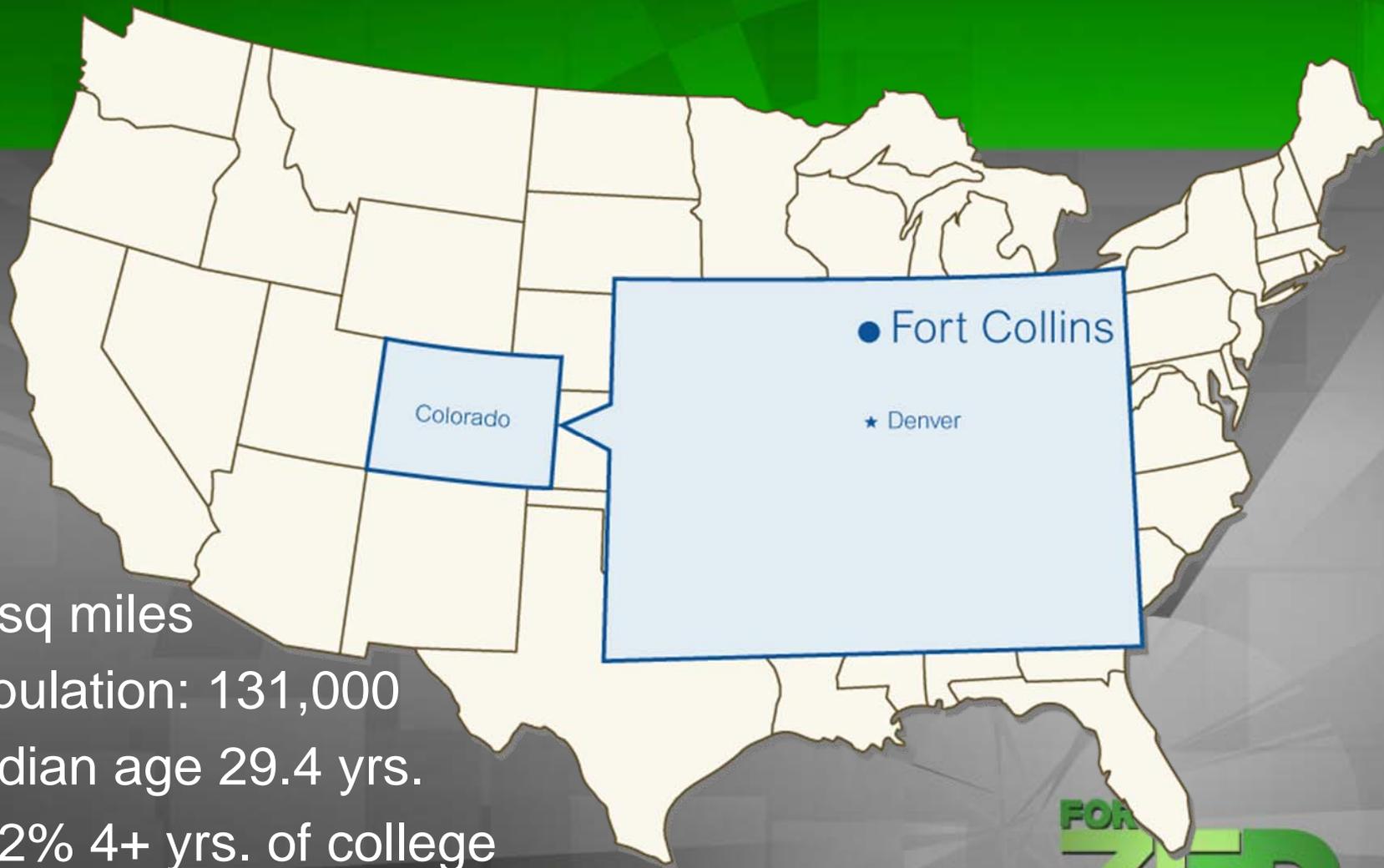
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Spirae, Inc.

EPRI PRE-CONFERENCE WORKSHOP
ACTIVE DISTRIBUTION SYSTEM MANAGEMENT
FOR INTEGRATION OF DISTRIBUTED RESOURCES

DECEMBER 9, 2008

HOTEL PALAIS DE LA MEDITERRANEE





- 53 sq miles
- Population: 131,000
- Median age 29.4 yrs.
- 48.2% 4+ yrs. of college
- 280 m of bike trails
- 300 days of sunshine

Vision

ZERO ENERGY DISTRICT: A Zero Energy District is one that creates as much thermal and electrical energy locally as it uses.



FortZED Overview

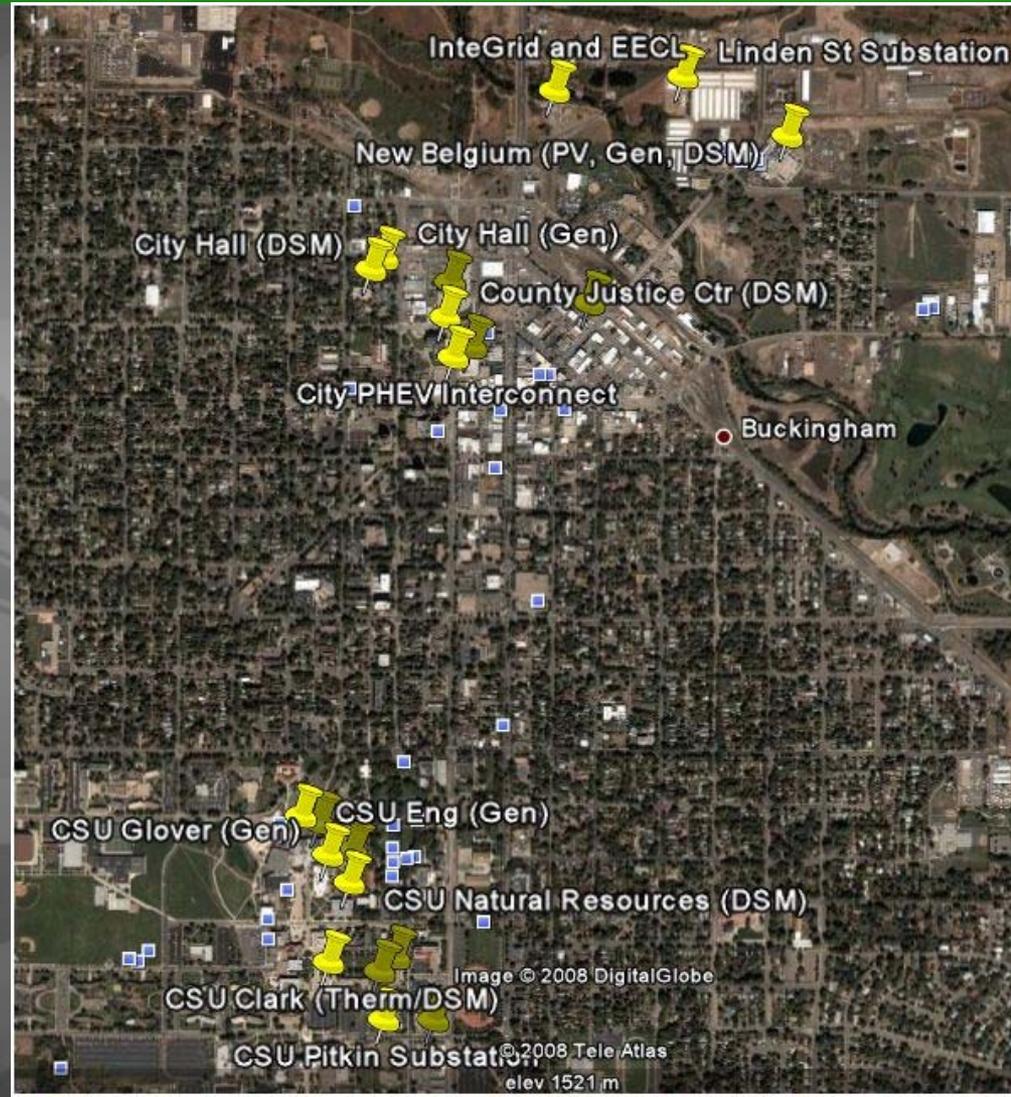


FortZED represents about 10% - 15% of FCU's system in terms of energy consumption, peak demand, and number of customers

Class	# of Customers	Energy Consumption (KWh)	Peak Demand (kW)
Residential	5,903	38,969,441	20,962
Small Commercial (<50 KW)	1,264	42,216,865	
Commercial (>50 KW)	88	54,389,657	6,609
Comm/Ind (>750 KW)	2	100,482,920	18,059
TOTAL	7,257	236,058,883	45,630

FortZED Jump Start Zone

- 2 of 8 feeders serving FortZED
- Peak Demand: ~7-8 MW/feeder (1/3rd of FortZED)
- Captures both of the GS750 customers and all customer classes
- Serves as cross-cutting jump-start demo for FortZED



Project Team

Project Lead	
City of Fort Collins	Prime Contractor
Fort Collins Utilities	Utility Company

Demo Sites	DER
City of Fort Collins	Thermal Storage, DG, DSM, PHEV-V2G
New Belgium Brewing	Solar PV, DG, and DSM
Colorado State University Facilities	Thermal Storage, DG, and DSM
Larimer County	Solar PV and DSM
InteGrid	Fuel Cell, uTurbine, Conventional DG, Wind Sim, SC/SLC and others



Project Team Contd.

Tech Partner	Contribution
Spirae	Smart Grid Platform – DER/Power Management System
Brendle Group	Demand Management and Program Development
Colorado State University	Robust Controls and PHEV R&D
Advanced Energy	Photovoltaic Inverter
Woodward Governor	Power Management and Mixed Fuel R&D
Caterpillar	Distributed Generation
Eaton	Switchgear/Power Components and Small Generator Switchgear R&D
InteGrid	Platform for Controls R&D, DER Integration and Simulation



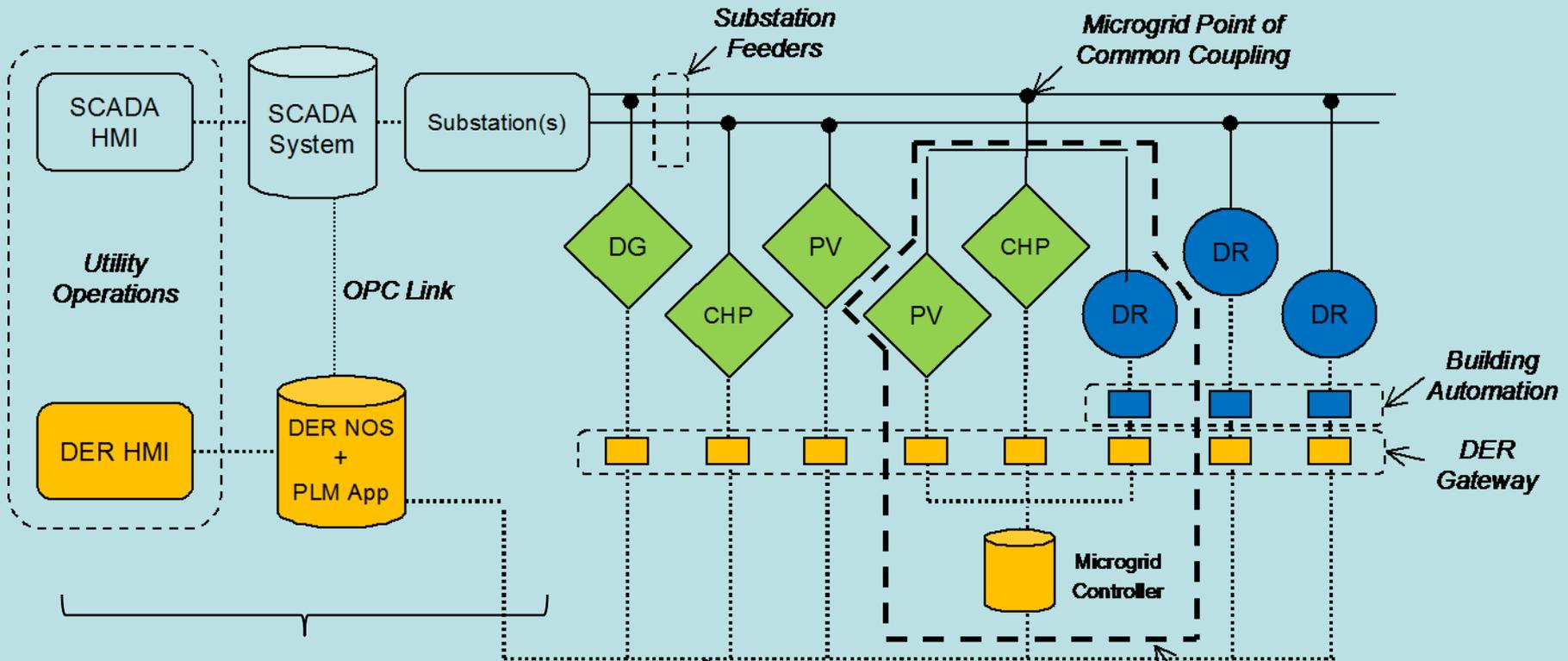
Distributed Energy Resources

Site	Description	Details	kW
New Belgium Brewing	New PV Array	AE Inverter	200
	Gauscor CHP – Methane	Upgraded Woodward Controls for Fuel Blending and Eaton Switchgear	292
	CAT 3508C CHP – Methane		650
	New Thermal Storage	HVAC in main brewery	135
	Load Shedding	Blowers, HVAC, prog therms, etc.	160
InteGrid Laboratory	Conventional Generator	Onan NG Genset	80
	Conventional Generator	Onan NG Genset	80
	Conventional Generator	CAT NG Genset	300
	Microturbine	Ingersoll Rand	80
	Microturbine	Bowman	80
	Wind Turbine Simulator	Cummins Diesel and Induction Gen	100
	Fuel Cells	2 Plug-Power fuel cells	10

Distributed Energy Resources

Site	Description	Details	kW
City of Fort Collins Facilities	Conventional Gen - City Hall	Woodward controls, Eaton switchgear	500
	Thermal Storage	City hall	92
	New PV Array	215 N. Mason	5
	HVAC and VFD DSM	Ventilation schemes and reheat	62
	PHEVs - 2 Ford Escapes	City Fleet	10
Larimer County	New PV Array	Parking garage	10
	Water Fountain Control	2-1HP motors on full shutoff	1.5
CSU	Thermal Storage	100 tons (1/3 of Clark A-Wing load)	80
	Fan Variable Speed Drives	Natural Resources and Clark Buildings	80
	Water fountain pumps	College of Engineering	21.6
	Hot water heater controls	Facilities Services South Building	3.6
	Daylight control, load shed	College of Engineering	6
	Conventional Gen (5 sites)	Woodward controls, Eaton switchgear	950
		Total	3,988.7

DER Integration



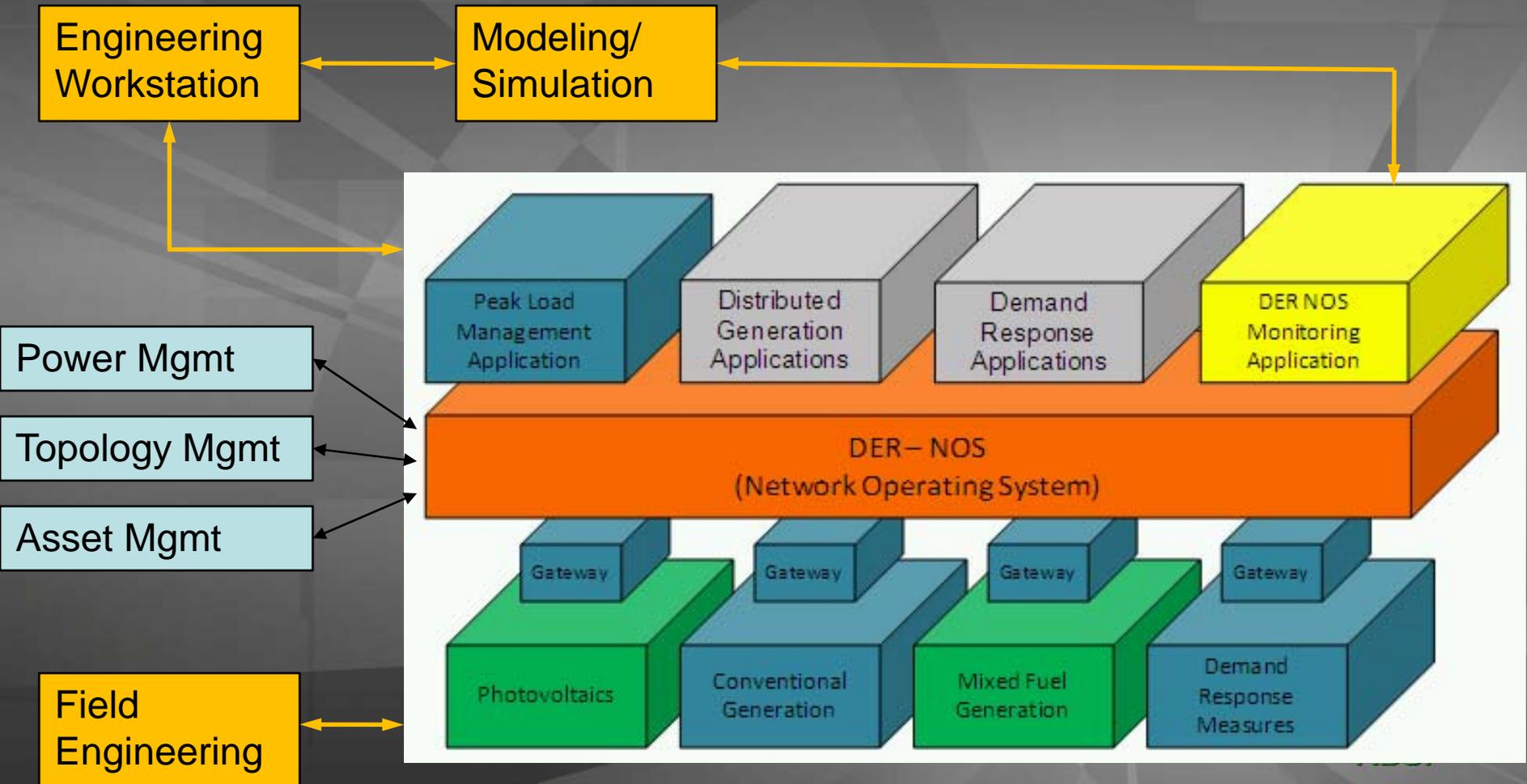
Functional Capabilities

- Monitor Substation Loads
- Monitor DER Assets
- Issue Dispatch Commands
- Monitor and Track Response
- Store Data and Analyze

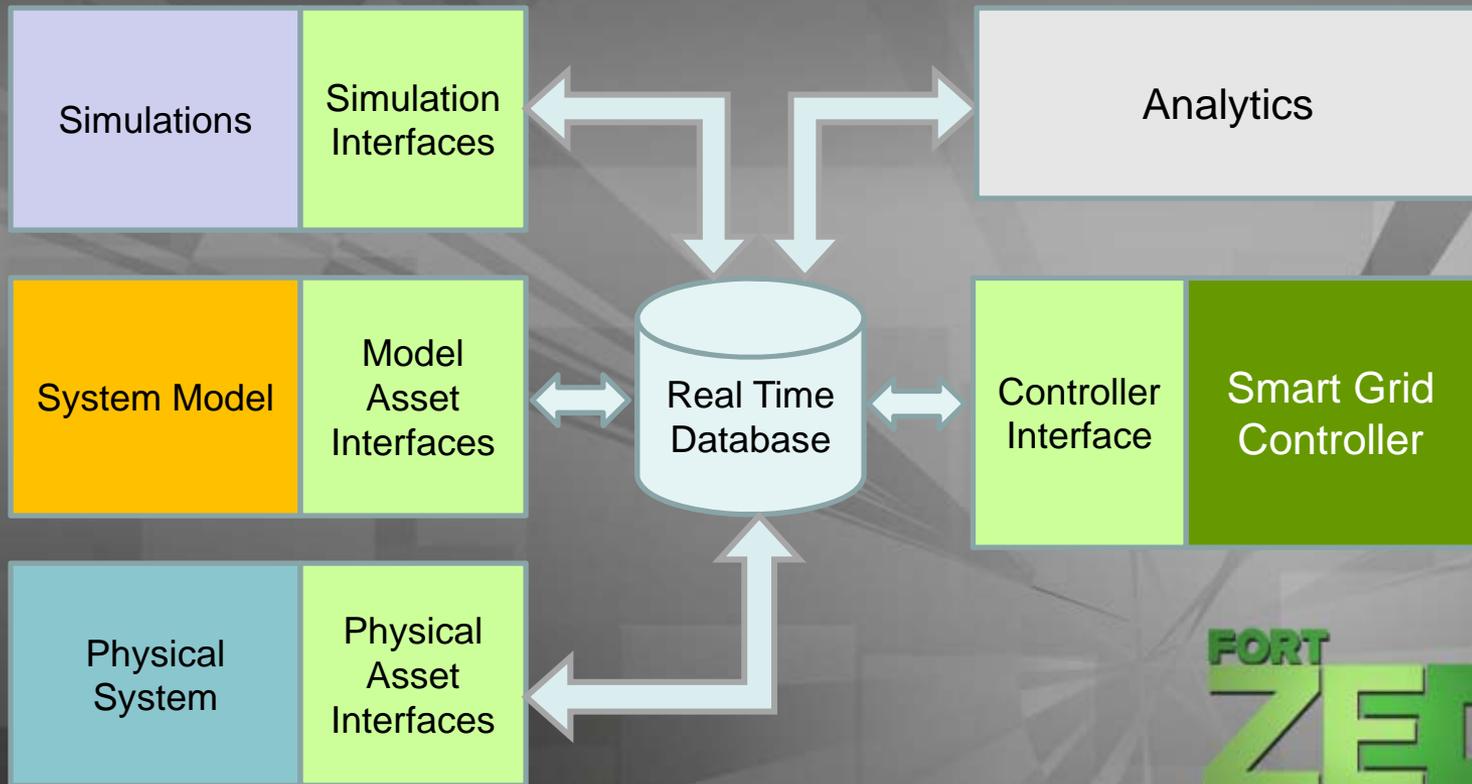
Measurement and Control

- Metering
- Availability, Status
- Dispatch

Platform Architecture



Interoperable Domains



R&D Activities

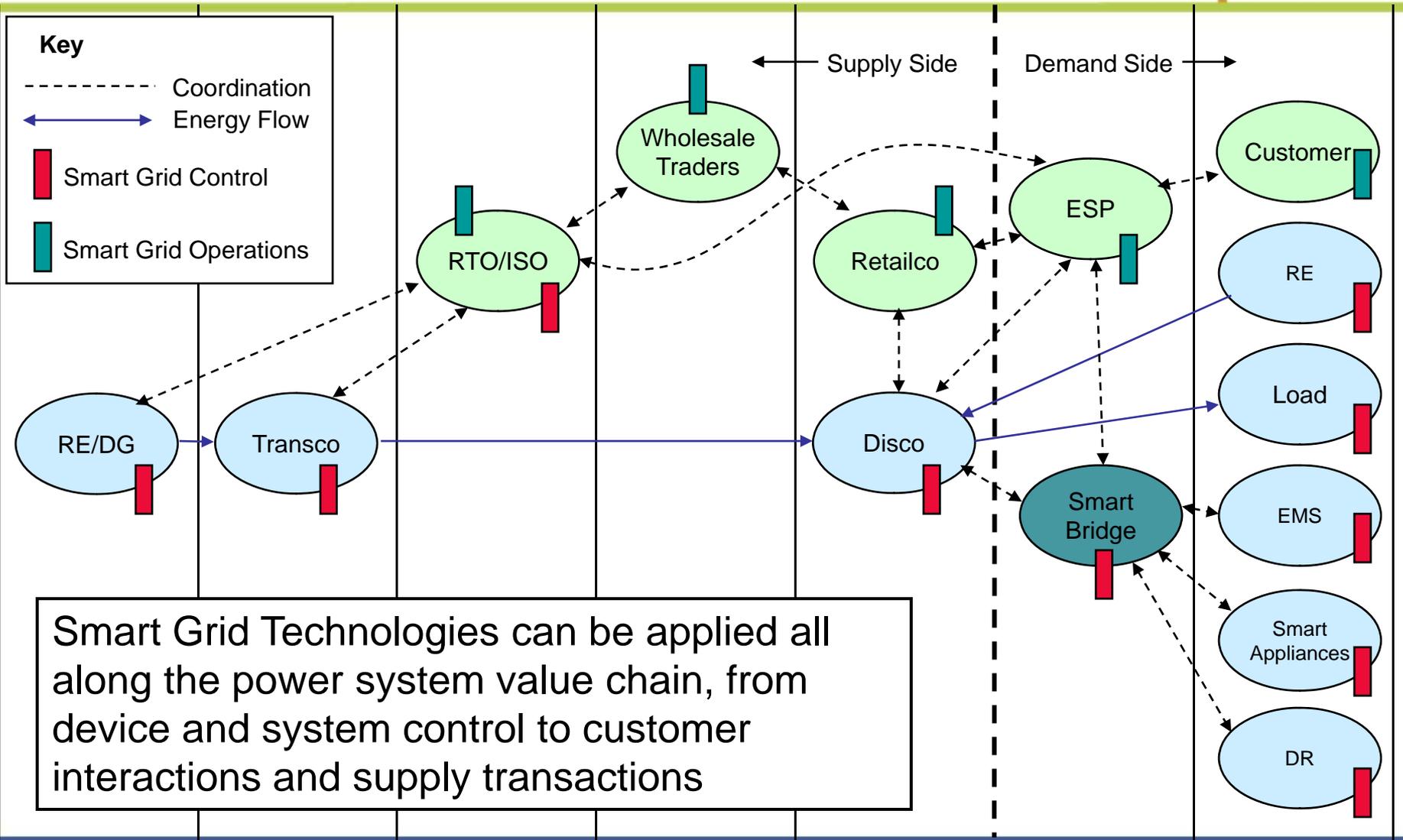
- **Mixed Fuel Control System – Woodward**
- **Ion Detonation Detection – Woodward**
- **Small Gen Transfer Switch – Eaton**
- **Robust Controls for Grid Mgmt – CSU**
- **Environmental Impact Study – Brendle Group**
- **Demand Response Cost/Benefit – Brendle Group**
- **System Perf Vs. Comm uncertainties – Spirae**
- **Multi-source DER integration – Spirae**
- **Hardware in the loop sims – Spirae**
- **PHEV/V2G – InteGrid Lab**
- **Fuel Cell – InteGrid Lab**



Schedule

Activity	Deliverables	Duration
Project Mgmt and Reporting	Plan, Schedule, resource alloc, reports	Ongoing
Requirements Specifications	Site, Utility, and Sys Performance req	Now – Q2 '09
Detailed Design	Design specs, drawings, BOM	Q1 '09 – Q2 '09
Development and Lab Testing	Operational system, Lab test results	Q1 '09 – Q2 '10
Procure, Install, Commission, Test	Operational system, Field test reports	Q1 '09 – Q2 '10
Research and Development	Technical reports	Q1 '09 – Q2 '11
Demonstration	PLM Demo and Data Collection	Q1 '11 – Q4 '11

FotZED Vision: Integrating Controls and Contracts



Smart Grid Technologies can be applied all along the power system value chain, from device and system control to customer interactions and supply transactions

Q&A

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