



Grid Operations, Planning, and Implementation

October 28, 2010

Kip Sikes

Planning Committee Chair

“To ensure efficient, effective, coordinated use & expansion of the members’ transmission systems in the Western Interconnection to best meet the needs of customers & stakeholders. “

NTTG Members' Transmission Facilities

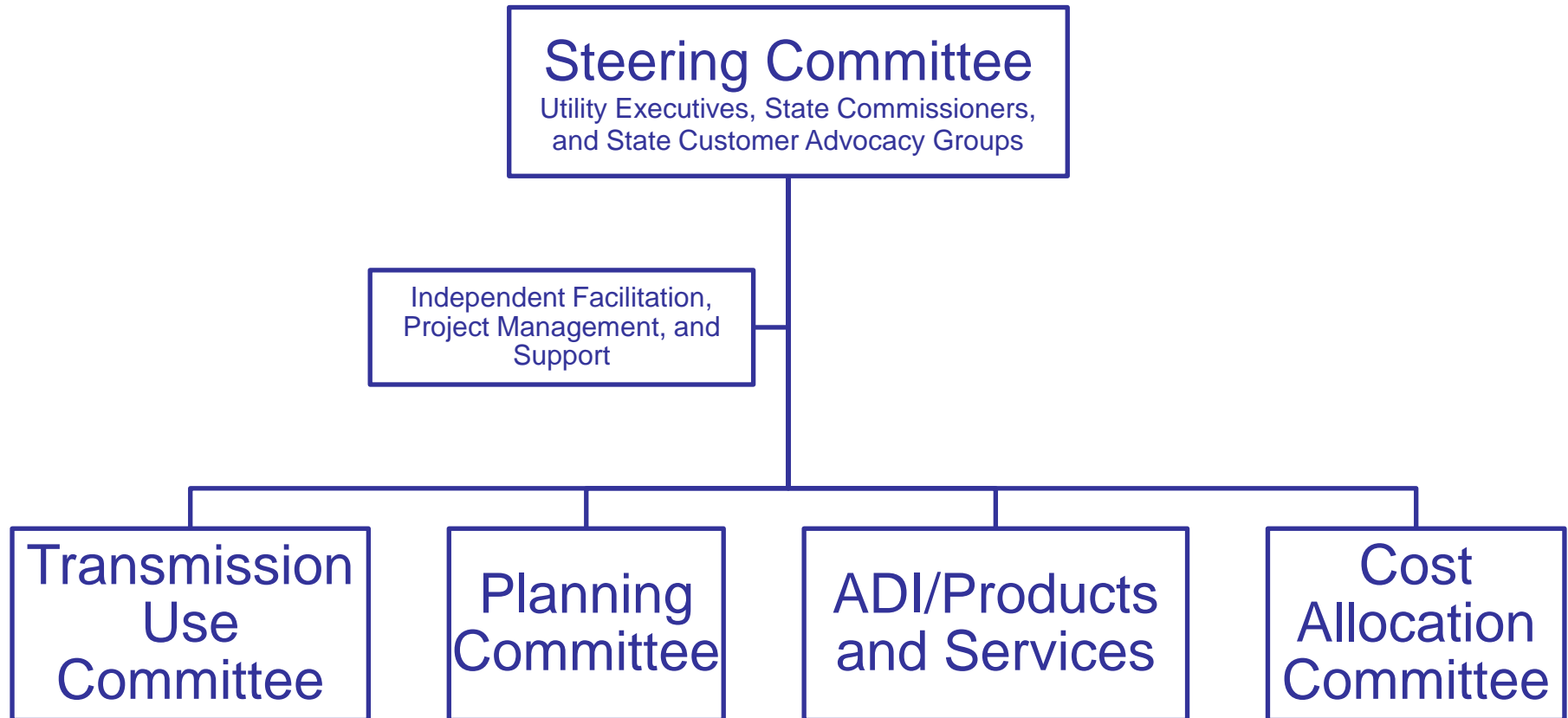
- NTTG
- Other Western U.S. and Canada Transmission



Participating Utilities

Deseret Power Electric Cooperative
Idaho Power
NorthWestern Energy
PacifiCorp
Portland General Electric
Utah Associated Municipal Power Systems

NTTG Structure



Planning Committee

Planning

“...the coordinated planning and construction of new power lines will improve our ability to deliver new resources including wind and other renewables.”

-- John Cupparo, NTTG Co-Chair and Vice President, PacifiCorp Transmission

The Northern Tier utilities are committed to working collaboratively among themselves and with their neighbors toward a grid that supports an efficient west-wide electricity market with excellent reliability. NTTG members welcome the full spectrum of stakeholders – state officials, IPPs, environmentalists, consumer representatives, and others. The result of this collaboration will bring tangible near term results and set the stage for longer lead-time infrastructure initiatives.

Planning Committee Membership

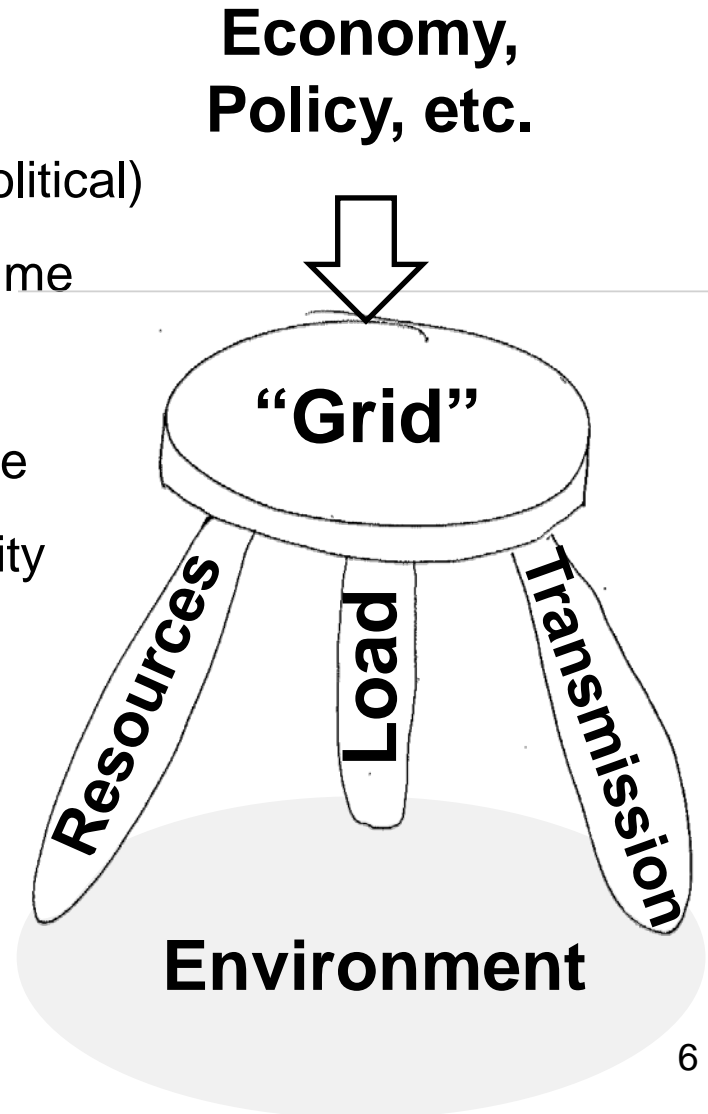
- **Kip Sikes** - Chair, Idaho Power
- **John Leland** - Vice Chair, Northwestern Energy
- **Brian DeKiep** - Montana Public Service Commission
- **Erik Egge** - Black Hills Power
- **Marshall Empey** - UAMPS
- **Darrell Gerrard** - PacifiCorp
- **Bill Hosie** - TransCanada
- **Rhett Hurless** - Grasslands Renewable Energy
- **Don Johnson** - Portland General Electric
- **Paul Kjellander** - Idaho Office of Energy Resources
- **Rodney L. Lenfest** - Sea Breeze Pacific - Regional Transmission System
- **Matthew Stoltz** - Basin Electric
- **Jim Tucker** - Deseret Power Electric Cooperative
- **Jerry Vaninetti** - NextEra Energy Resources
- **David Walker** - Wyoming Public Service Commission
- **Ted Williams** - Gaelectric, LLC



How the Grid Works

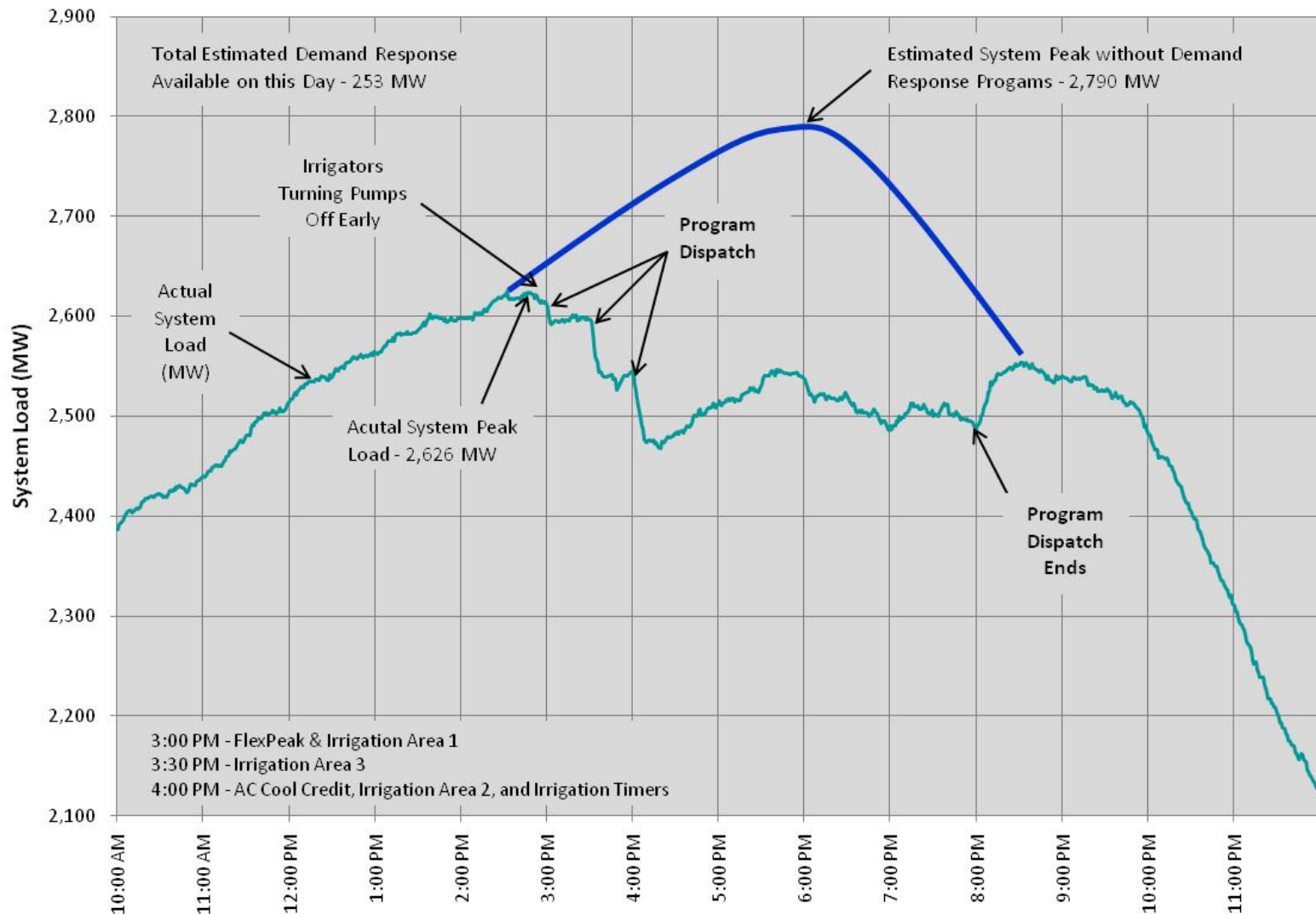
The Grid – 3 Legs of a Stool

- **The Grid must be in balance at all times**
 - e^- travels at near the speed of light (non-political)
 - Produced, transmitted, consumed in real-time
- **Changes – What is needed?**
 - **Load:** growth, efficiency, demand response
 - **Resources:** renewables, carbon, availability
 - **Transmission:** reliability, corridors, timing
- **Impacts**
 - Environmental, social, fiscal

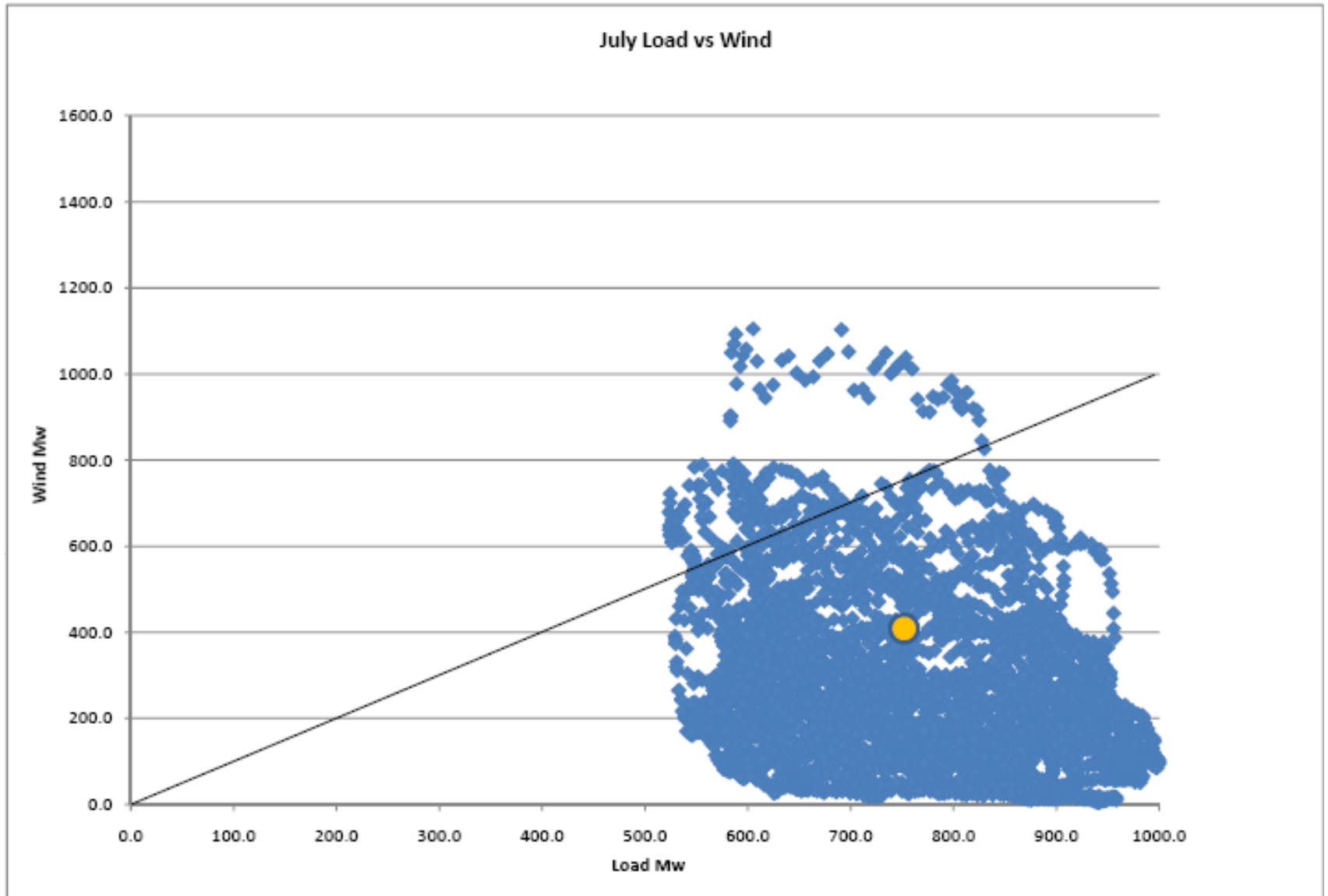


NOT INDEPENDENT!

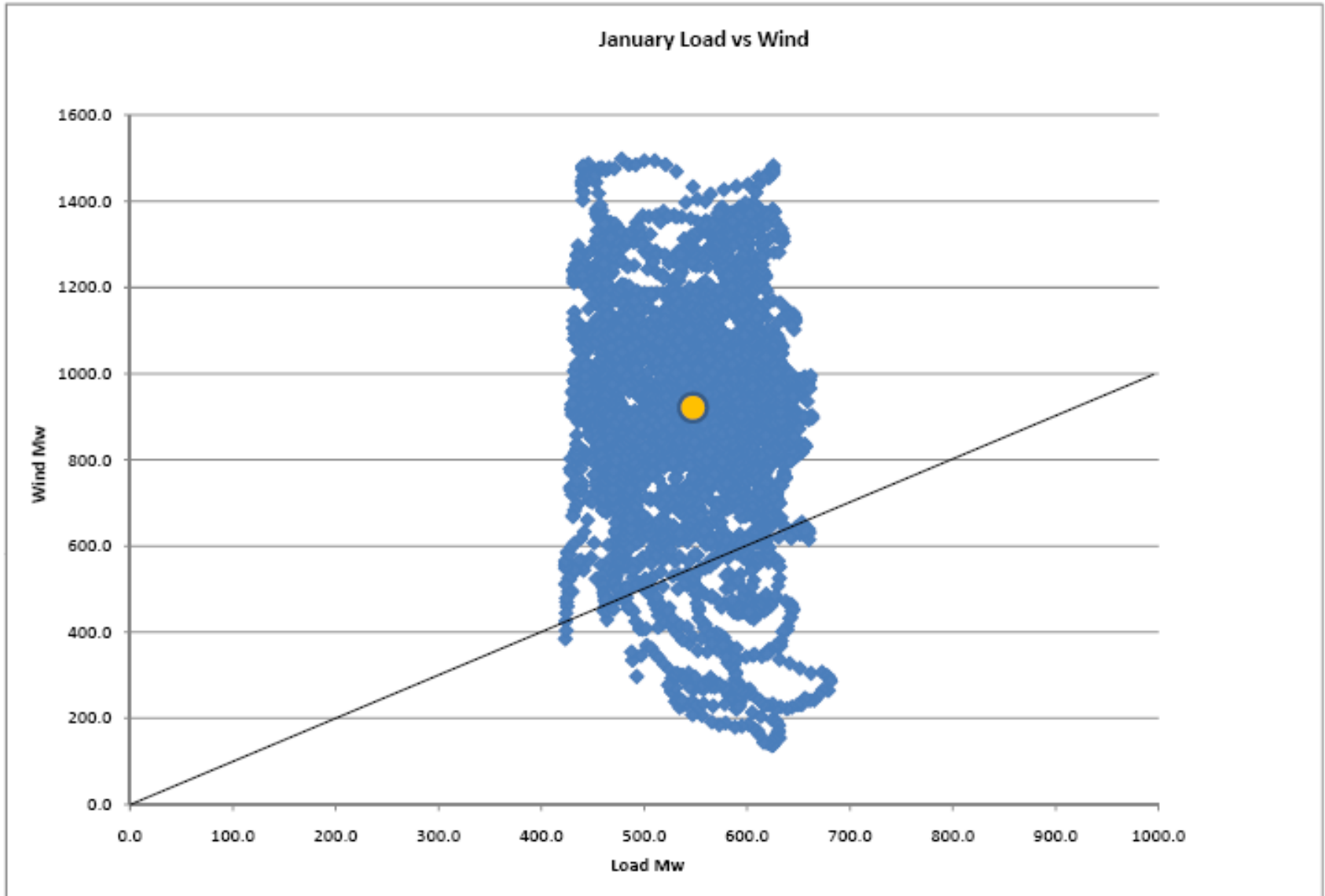
Demand Response – Shaping Load IPC on June 29, 2010



Wind Integration \neq Load (heavy load)

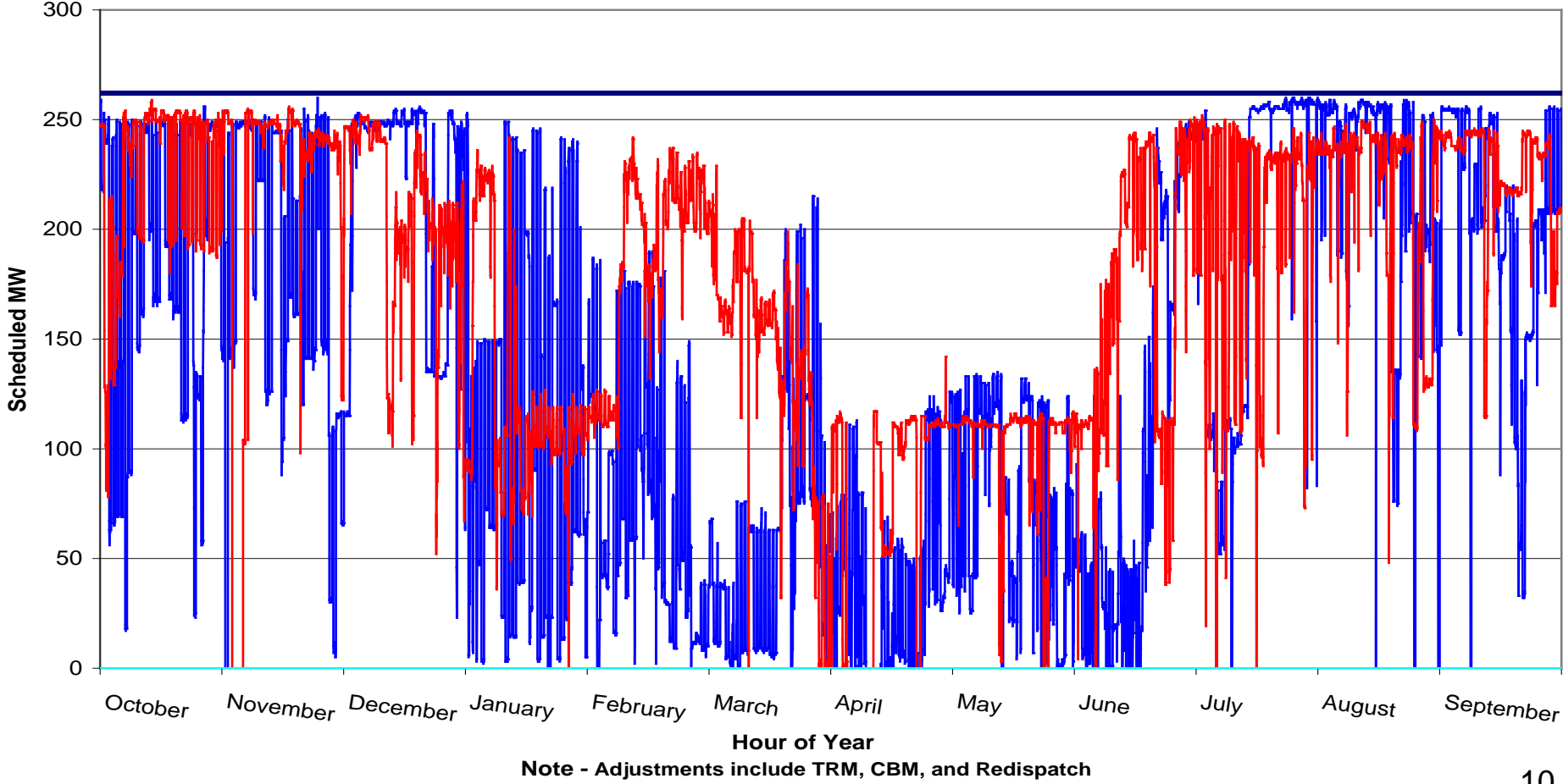


Wind Integration \neq Load (light load)



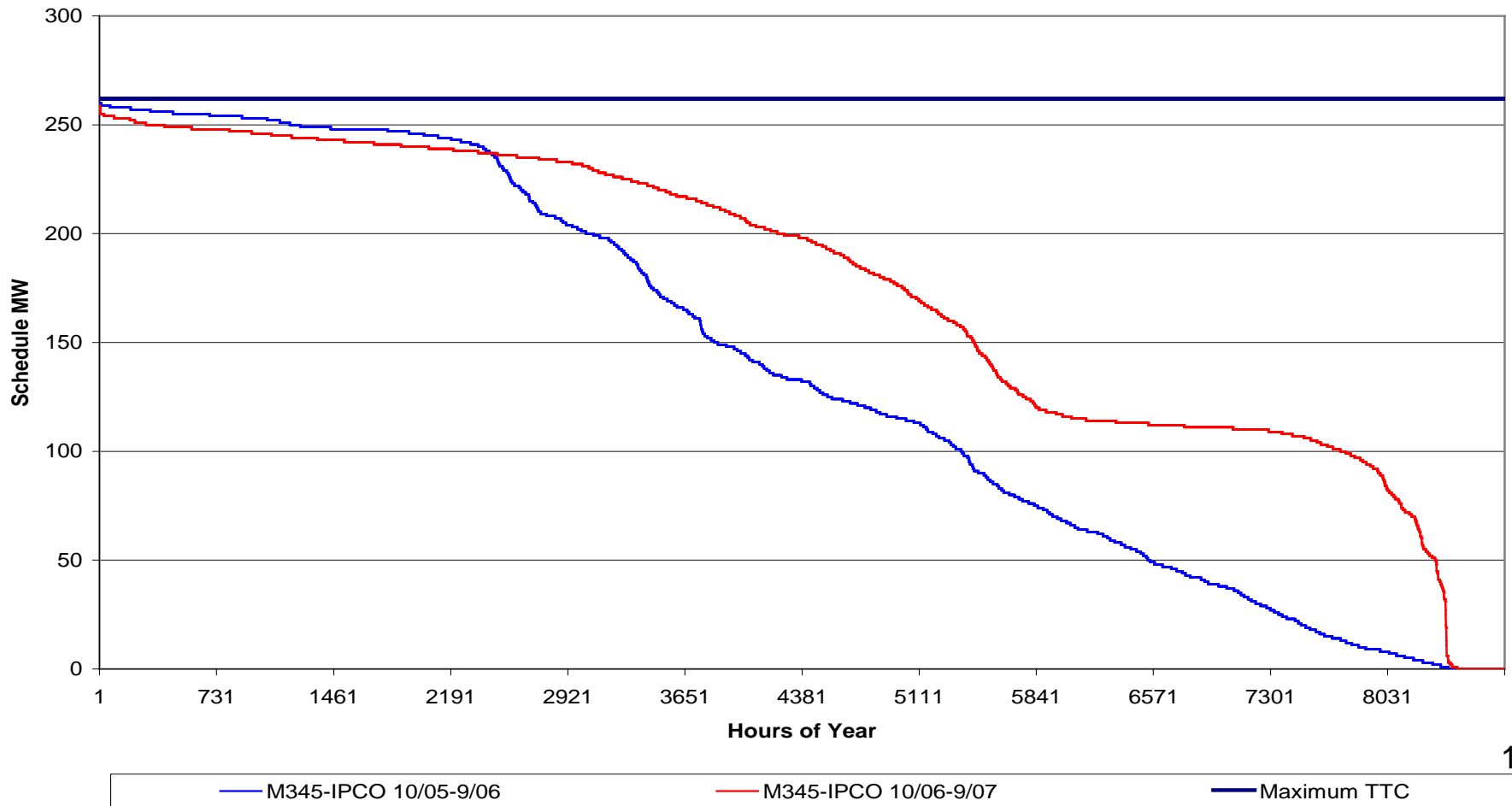
Transmission Use (Demand Varies)

Chronological Graph



Transmission Use (Energy)

Schedule Duration Curve



Renewable Energy and the Grid

- **Reliability – Keep the Lights On!**

- Intermittency – must change the way we operate the grid
- Requires additional backup/investment to ensure availability (pay twice?)
- Diversity – sources, geographical, time (production and demand)

- **Policy and Local Decisions**

- Lead times
 - Transmission 7-10 years
 - Local generation 2-5 years
 - Load programs 1-3 years
- Uncertainty and inconsistency in state and federal policies impedes investment in infrastructure (build gas outcome)
- Strategic options – no mistakes, no regrets



Transmission Planning

NTTG Planning Process

- **Biennial Cycle w/ “bottom-up” and regional inputs**
 - Incorporate Integrated Resource Plans and public policy
 - Reliably meet local load service obligations and resource integration
 - Include import/export requests

Figure 1: NTTG Study Cycles

NTTG Biennial Transmission Planning Cycle

	Quarter	Activity
Year 1	Qtr 1	Information Gathering *
	Qtr 2	Study Plan and Assumptions *
	Qtr 3	Draft Plan Analysis *
	Qtr 4	
Year 2	Qtr 5	Draft Study Results and Review *
	Qtr 6	Economic Studies and Cost Allocation Process
	Qtr 7	Final Plan Report and Review *
	Qtr 8	Final Plan Approval

* Stakeholder and public participation required

NTTG Economic Planning Studies

	Quarter	Activity
Year 1	Qtr 1	Receive and Prioritize Requests *
	Qtr 2	Study
	Qtr 3	Report/Review Results *
	Qtr 4	
Year 2	Qtr 1	Receive and Prioritize Requests *
	Qtr 2	Study
	Qtr 3	Report/Review Results *
	Qtr 4	

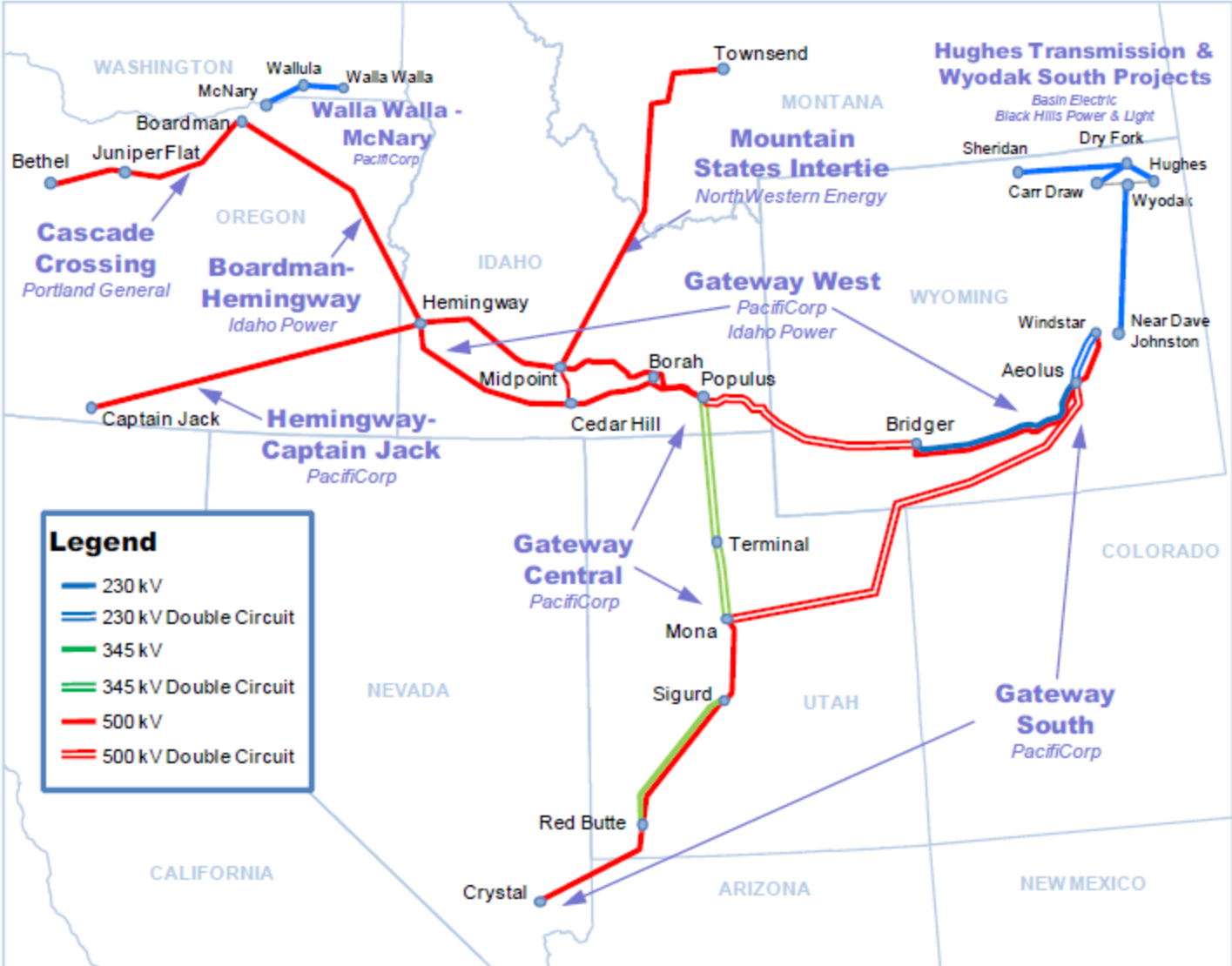
Project Summaries

[Link to NTTG 2009 Biennial Transmission Plan](#)

	Projected in-service	WECC Rating	Purpose	MW Capacity	Miles	kV
Project 1: Hughes Transmission Project	2009	construction	growth/reliability		140	230
Project 2: Wyodak South Project	2010	planned	growth/reliability	550	110	230
Project 3: Mountain States Transmission Intertie	2013	Phase 2	renewables/market capacity	950-1500	430	500
Project 4: Gateway South, Segment 1: Mona – Crystal	2016	Phase 1	renewables/market capacity	1500	330	500
Project 5: Gateway South, Segment 2: Aeolus – Mona	2016	Phase 1	renewables/reliability	3000	395	500
Project 6: Gateway Central: Populus – Terminal Segment	2010	Phase 2	growth/reliability	700-1400	136	345
Project 7: Gateway Central: Mona – Oquirrh Segment	2012	Phase 2	growth/reliability	1500	86	345/500
Project 8: Gateway Central: Sigurd – Red Butte – Crystal Segment	2013	Phase 1	growth/reliability		280	500
Project 9: Gateway West, Segment 1A: WindStar – Bridger	2014	Phase 2	renewables/growth/reliability	2000-3500	298	500
Project 10: Gateway West, Segment 1B: Bridger – Populus	2014	Phase 2	renewables/growth/reliability	3000	191	500
Project 11: Gateway West, Segment 1C: Populus – Midpoint	2015	Phase 2	renewables/growth/reliability	3000	135	500
Project 12: Gateway West, Segment 1C: Midpoint – Hemingway	2015	Phase 2	renewables/growth/reliability	3000	136	500
Project 13: Boardman – Hemingway	2015	Phase 2	renewables/growth/reliability	800-1300	300	500
Project 14: Hemingway – Captain Jack	2014	Phase 0	renewables/growth/reliability	1500	375	500
Project 15: Walla Walla – McNary	2010	Phase 1	renewables/growth/reliability	400	56	230
Project 16: Southern Crossing	2013	Phase 1	generation interconnections	1500	200	500
				26,650	3,598	

2009 NTTG Planned Projects

Figure 2: Northern Tier Transmission Group Planned Transmission Additions





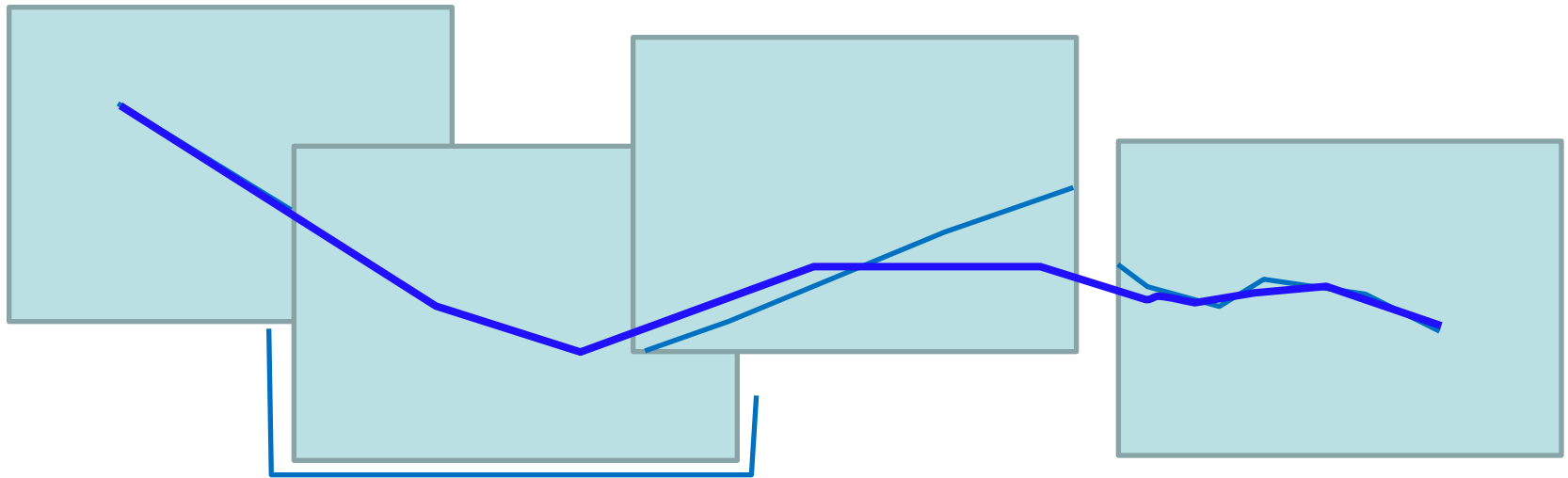
Project Implementation

Birth of a Transmission Project - when is it real?

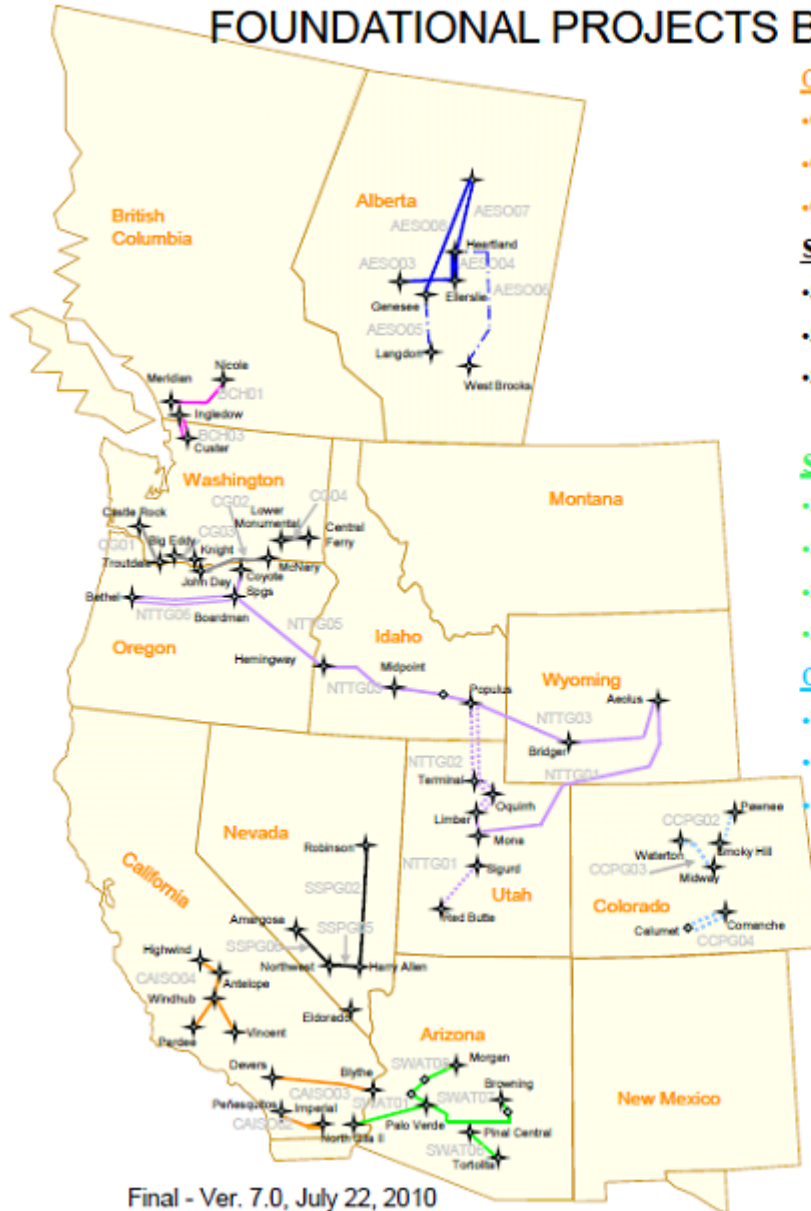
- Under the Federal Regulatory Energy Commission jurisdictional Open Access Transmission Tariff (OATT), Transmission Providers must plan for expansion of the transmission grid for both local and wholesale/interstate needs.
- When a customer makes a request for service – generator or load, we are required to construct and build the transmission to deliver.
- Part of the decision process is when can it be in service, how much capacity, and what will it cost?
- Specific timelines for study processes per the OATT
- Denial of service results in no commercial access, requires other options
- **COMMERCIALLY VIABLE AFTER PERMITS**

Linear Feature Permitting

- Minimize impacts for total project, not only locally
- Things change during a project's life (if it takes too long)
- Public/Private lands issues – need alignments to match (WWC example)



FOUNDATIONAL PROJECTS BY 2020



CAISO

- CAISO02 Sunrise
- CAISO03 Blythe-Devers
- CAISO04 Tehachapi Upgrade

SSPG

- SSPG02 SWIP South
- SSPG05 TCP Harry Allen - Northwest
- SSPG06 TCP Northwest - Amargosa

SWAT

- SWAT01 PV-NG#2
- SWAT06 Pinal Central - Tortolita
- SWAT07 Southeast Valley (SEV)
- SWAT08 PV - Morgan

CCPG

- CCPG02 Pawnee - Smoky Hill
- CCPG03 Waterton - Midway
- CCPG04 San Luis Valley

NNTG

- NNTG01 Gateway South Phase 1
- NNTG02 Gateway Central Phase 1
- NNTG03 Gateway West Phase 1
- NNTG05 Hemingway - Boardman
- NNTG06 Cascade Crossing

CG

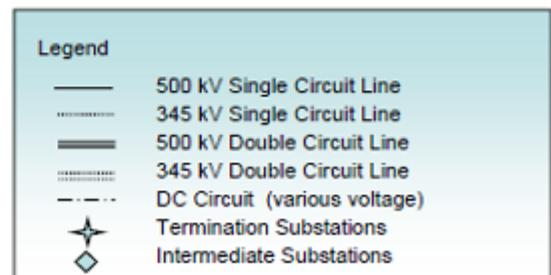
- CG01 I-5 Corridor
- CG02 West McNary
- CG03 Big Eddy - Knight
- CG04 Little Goose Area Reinforcement

BCH

- BCH01 Nicola - Meridian
- BCH03 BC-US Intertie

Alberta AESO

- AESO03 1202L Conversion
- AESO04 Heartland
- AESO05 West HVDC
- AESO06 East HVDC
- AESO07 Fort McMurray - East Line
- AESO08 Fort McMurray - West Line



Final - Ver. 7.0, July 22, 2010

(1) Map does not reflect 230 or 240 kV lines that are included in the Foundational Transmission
 (2) Internal reinforcements projects not shown for clarity.
 (3) Lines shown are for illustrative purposes only and may not reflect final line routing.

System Reliability – Must Have

- **Credible Events – Resources + Transmission impacts on Loads**
 - Fires, storms, human-caused, etc.
 - System designed to withstand, but there are cost trade-offs
- **Corridor Versus a Single Transmission Line**
 - Co-locating concentrates impacts and risks
 - Public lands versus private lands
 - Who wants it?
- **NEPA – Local Issues and Linear Features**
 - Energy Policy Act 2005 – corridor designation and FERC
 - Agency management plans, people, lawyers
- **Balance Issues, Mitigation and Impacts**