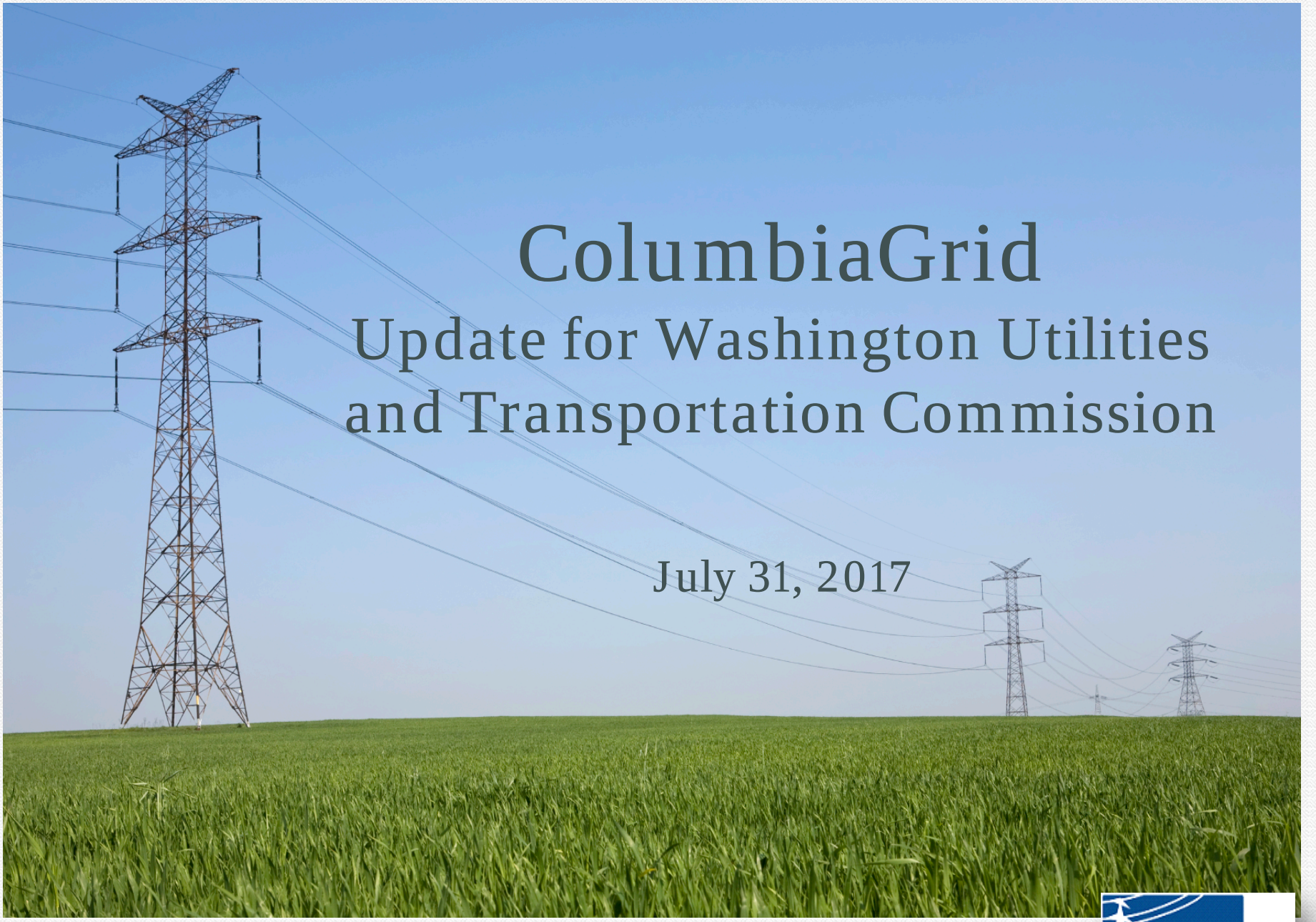


ColumbiaGrid

Update for Washington Utilities and Transportation Commission

July 31, 2017

Topics

- Corporate Overview
- Financial Performance
- Transmission Expansion Planning
  - 2017 Biennial Transmission Expansion Plan
  - Draft 2017 System Assessment
    - Sensitivities and 'plan' adjustments Fall 2017
  - New Items: Stability Model Validation; Geomagnetic Disturbances; 15-Year Study
- Order 1000
- South of Allston Independent Panel Report
- Regional Issues: WECC Anchor Dataset

Members and Planning Participants

- Avista Corporation
- Bonneville Power Administration
- Chelan County PUD
- Cowlitz County PUD*^
- Douglas County PUD*
- Grant County PUD
- Puget Sound Energy
- Seattle City Light
- Snohomish County PUD
- Tacoma Power

* Non-Member PEFA Planning Participants
^ Withdrawing from PEFA Dec. 31, 2018

ColumbiaGrid

Vision & Mission

ColumbiaGrid's vision is to be a preeminent grid-planning region in the Western Interconnection.

ColumbiaGrid's mission is to effectively and efficiently plan the expansion and continued reliability of the Northwest Transmission Grid.

- ColumbiaGrid endeavors to provide sustainable benefits for its members, planning participants, and stakeholders while considering regional interests and public policy.

ColumbiaGrid is a non-profit membership corporation with an independent Board of Directors and staff; the corporation is <u>not</u> under jurisdiction of FERC, NERC, WECC, State PUCs, nor local agencies or governments

Work Emphasis

- Grid Planning Excellence – Cost-Effective and Efficient Processes, Staffing, Systems, and Tools
- Enhancements to the Core business; Leverage Core Strengths to Provide New 'Non-Core' Services
- West-wide Cooperation and Coordination

Actual Expenses 2012 – June 2017

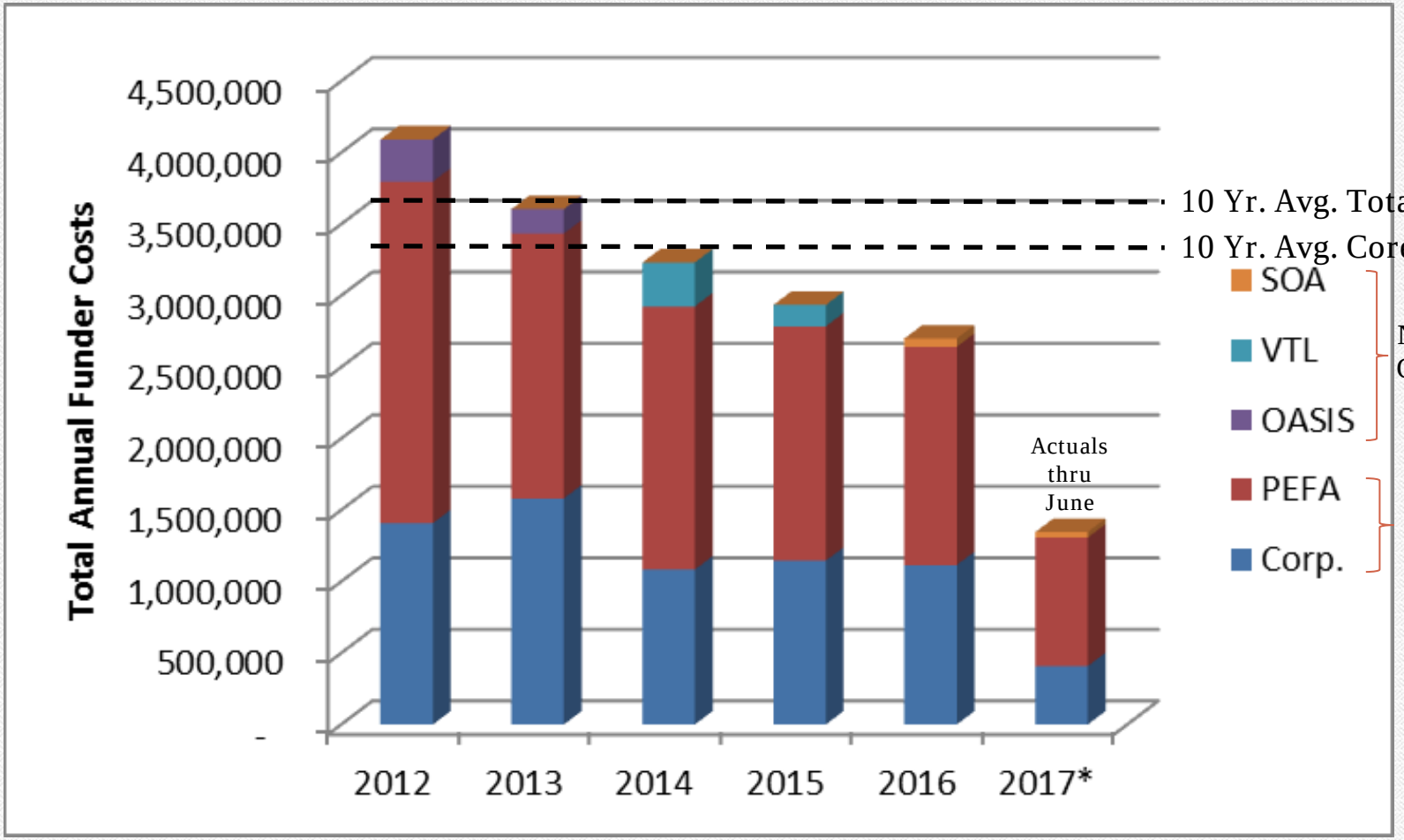
Expenses have steadily declined since peaking in 2012 due to a streamlined and focused mission and vision, staffing efficiency, and greater regulatory stability. Last year's expenses of $2.7M were the lowest in the company's 10-year history.

Expenses						*Actuals thru June*	*Last 5 full years*
Core:	**2012**	**2013**	**2014**	**2015**	**2016**	***2017****	**Average**
Corp.	1,408,173	1,581,597	1,083,436	1,145,241	1,115,774	408,624	*1,266,844*
PEFA	2,389,601	1,852,059	1,841,124	1,640,239	1,526,264	898,782	*1,849,857*
Non-Core:							
OASIS	294,432	171,209	-	-	-	-	*93,128*
VTL	-	-	306,823	149,125	-	-	*91,190*
SOA	-	-	-	-	57,722	39,150	*11,544*
Total	**$ 4,092,206**	**$ 3,604,865**	**$ 3,231,383**	**$ 2,934,605**	**$ 2,699,760**	**$ 1,346,556**	***$ 2,984,896***

*Total 2017 expenses are projected to be similar to 2016 with 51% of the annual budget having transpired YTD thru June

ColumbiaGrid

Actual Expenses 2012 – June 2017



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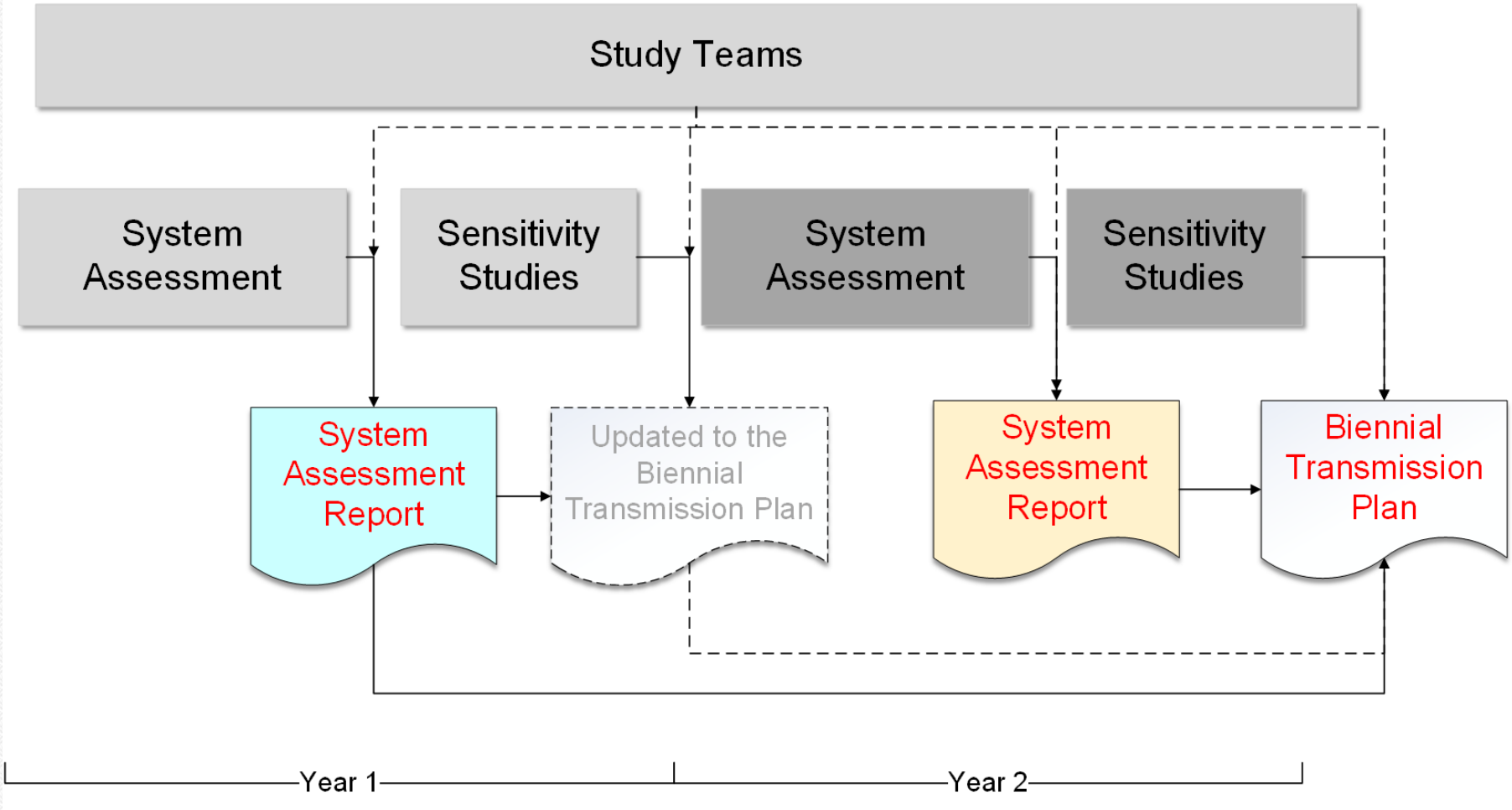
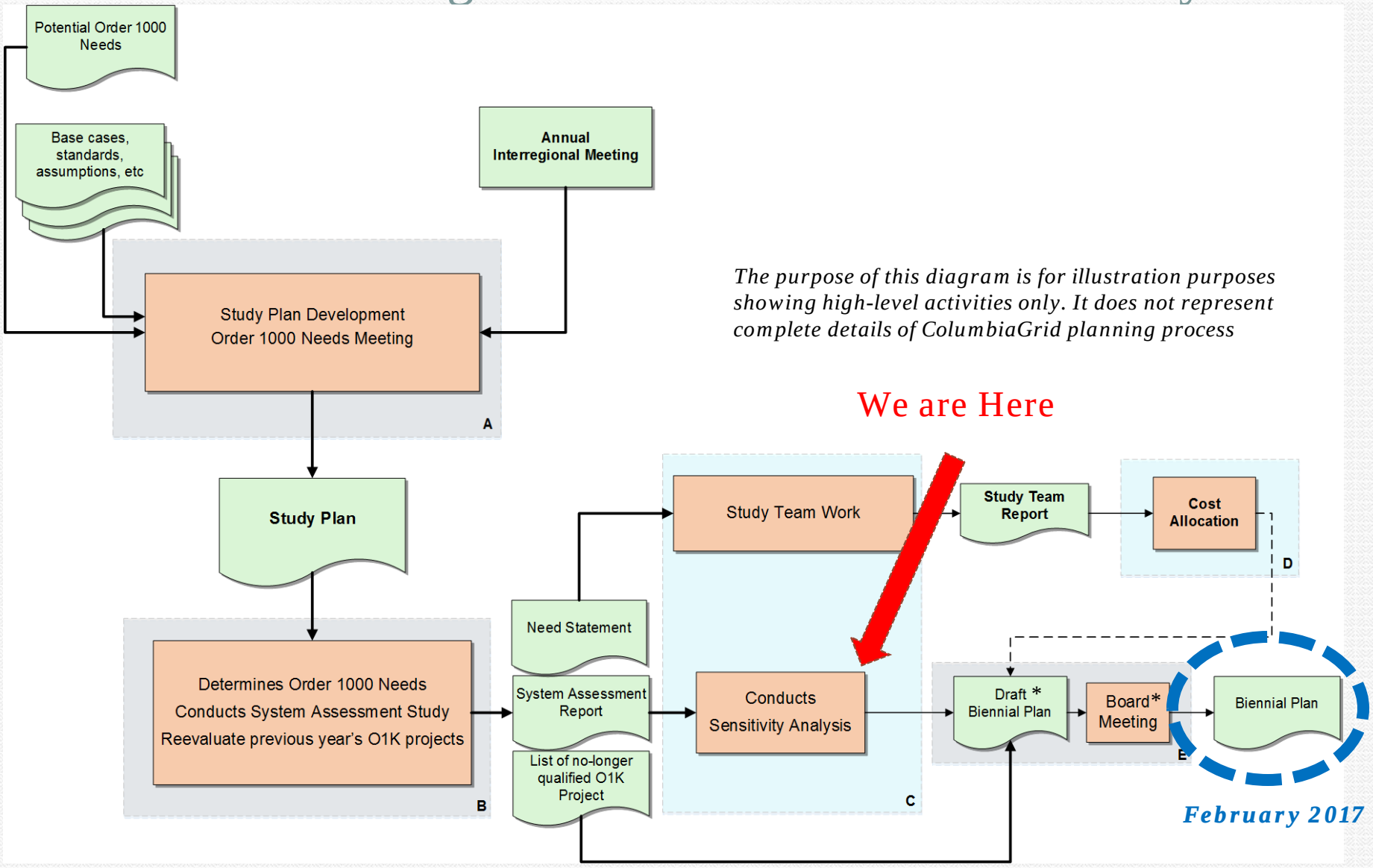
ColumbiaGrid Transmission Planning Process



2017 Planning Activities: Where we are today?



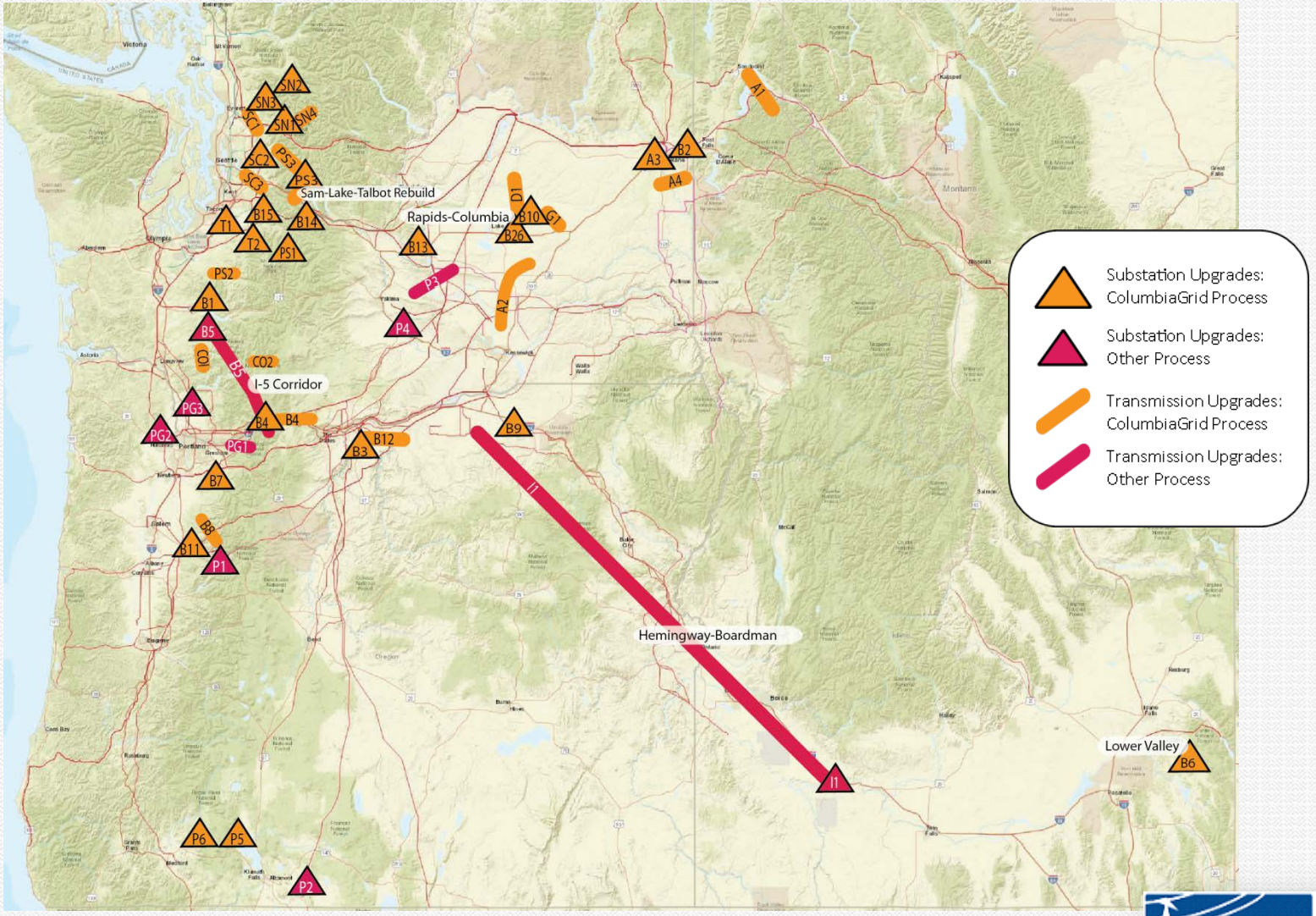
The purpose of this diagram is for illustration purposes showing high-level activities only. It does not represent complete details of ColumbiaGrid planning process

* Development of the Biennial Plan is required for the 2nd year of the planning process only. Issuance of the Update plan in the first year is optional

2017 Biennial Transmission Plan

- Open stakeholder process
- One process, two agreements - Planning and Expansion Functional Agreement (PEFA) and Order 1000 Agreement
- Identify solutions to address problem areas, or 'needs,' from System Assessment
- $2.4B, 37 projects, new transmission investment in ColumbiaGrid planning region
- Board of Directors approved February 2017 - Independent 'plan' rather than a 'long staple'

ColumbiaGrid (BTEP) 2017 Projects



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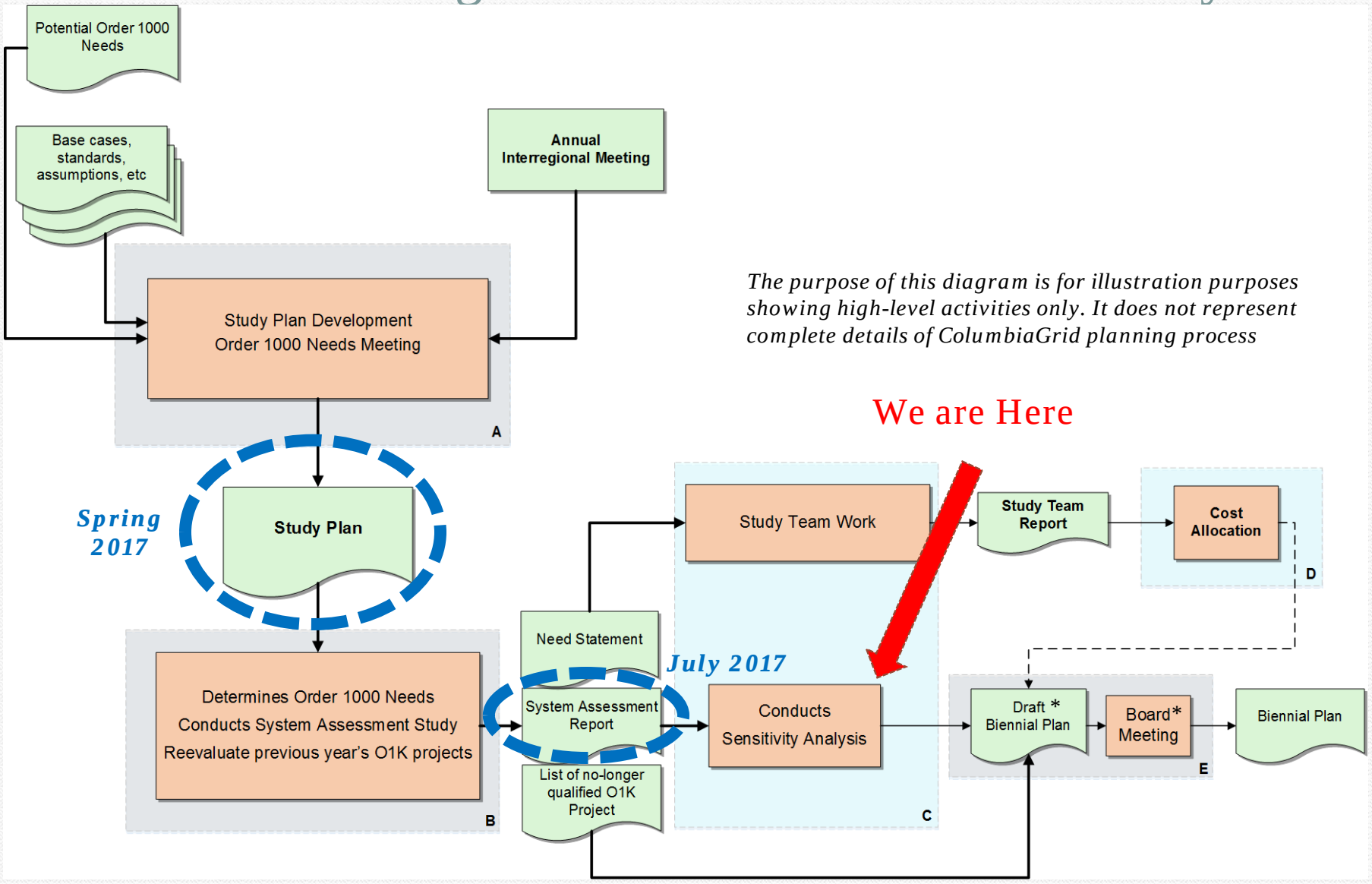

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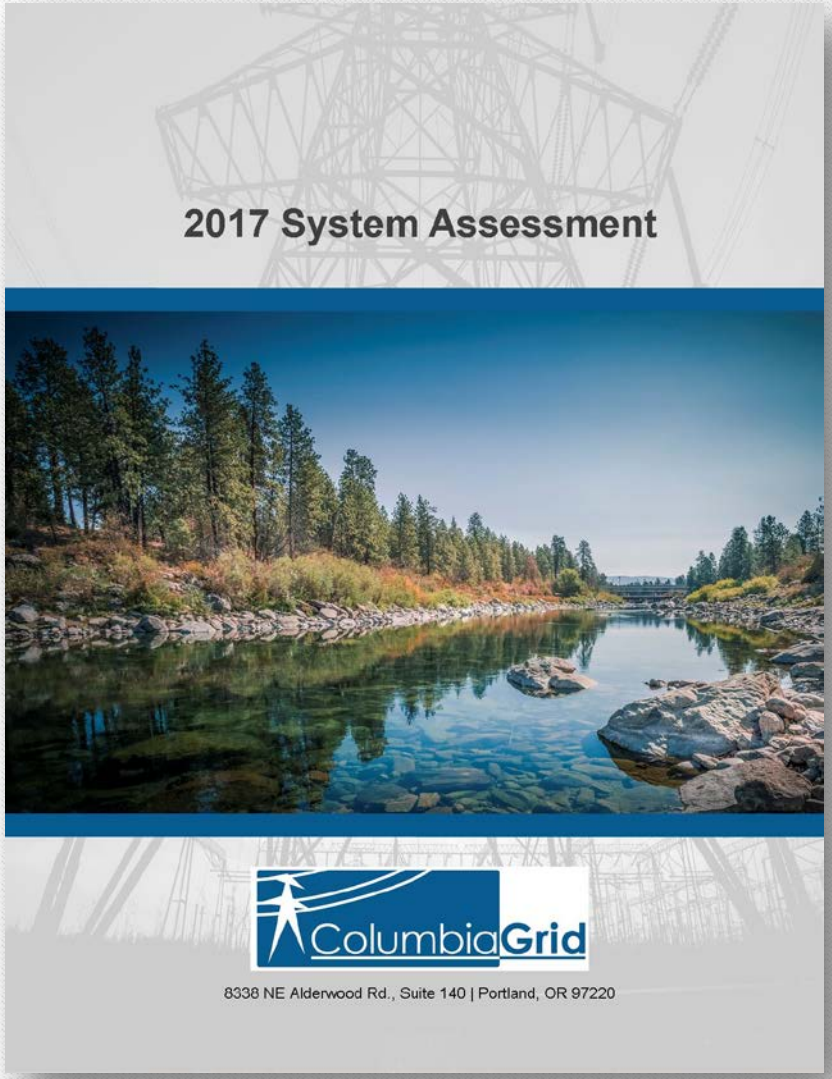
2017 Study Program

- Focus on both reliability and economic assessments
- Consist of 7 major studies, of which 3 are new:
  - 2017 System Assessment (Needs Identification)
  - 2017 Sensitivity Studies (Special Studies)
  - Transient Stability
  - Economic-Dispatch Study – High Renewables Penetration
  - Stability Model design and validation process (MOD-033)*
  - Geomagnetic Disturbance Study (TPL-007)*
  - 15 Year System Assessment (economic-dispatch and power flow if needed)*

* New studies that were included the first time in 2017 Study Program

Draft 2017 System Assessment



- Open stakeholder process
- Single Process - PEFA and Order 1000 Agreement
- Assess system – Identify Problem Areas - Develop Statement of Needs
- 10 problem areas; no new problem areas; 4 problem areas involve multiple ColumbiaGrid parties; 6 problem areas only involve one ColumbiaGrid party; all 10 problem areas were in 2017 BTEP

Draft 2017 System Assessment

- Technical studies were conducted on 4 cases (compared t0 7 cases last year)

2017 System Assessment

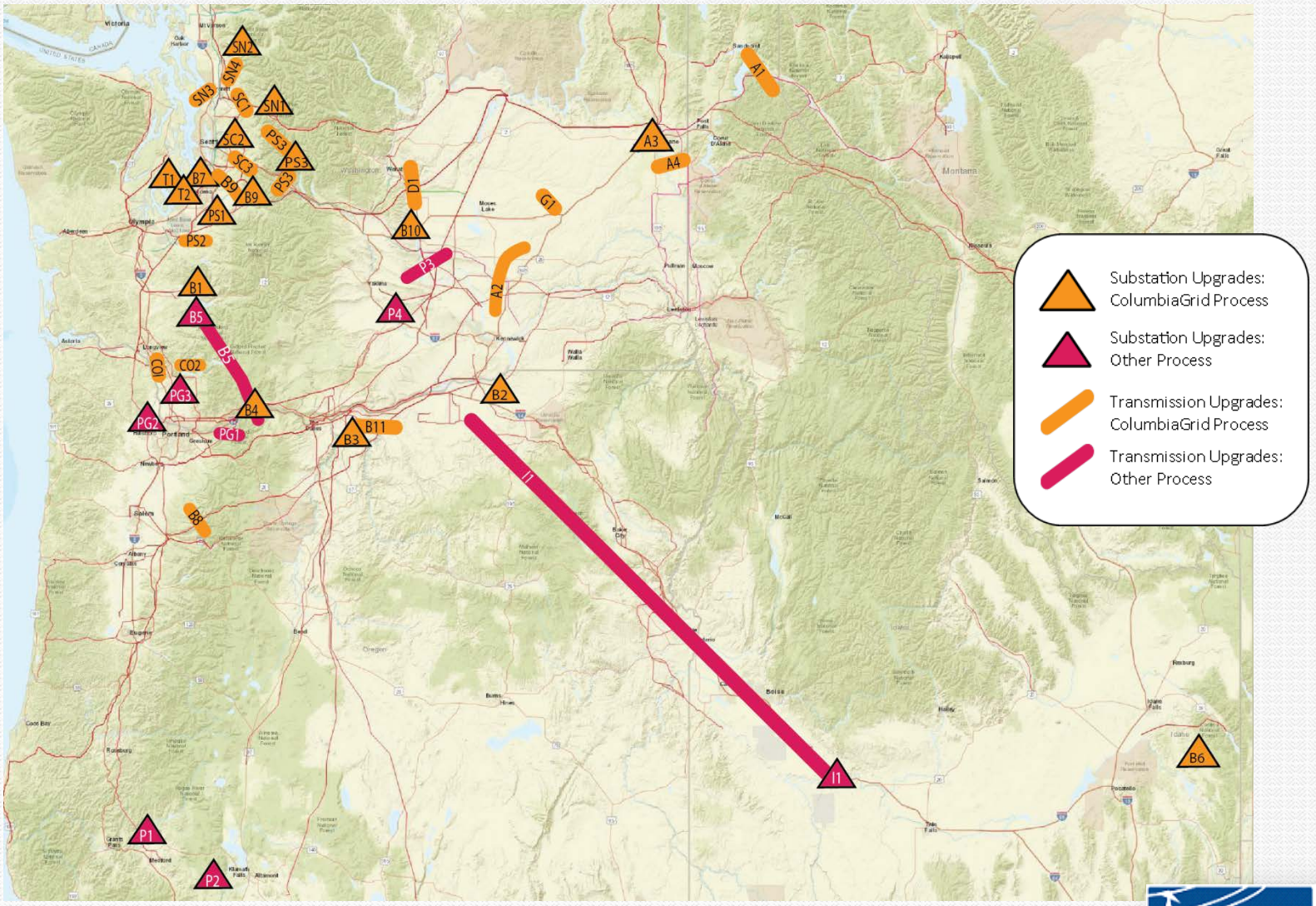
Scenario	Base Case
Near-Term	2019 Light Summer
Mid-Term	2022 Heavy Winter
Long-Term	2027 Heavy Summer
	2027 Heavy Winter

2016 System Assessment

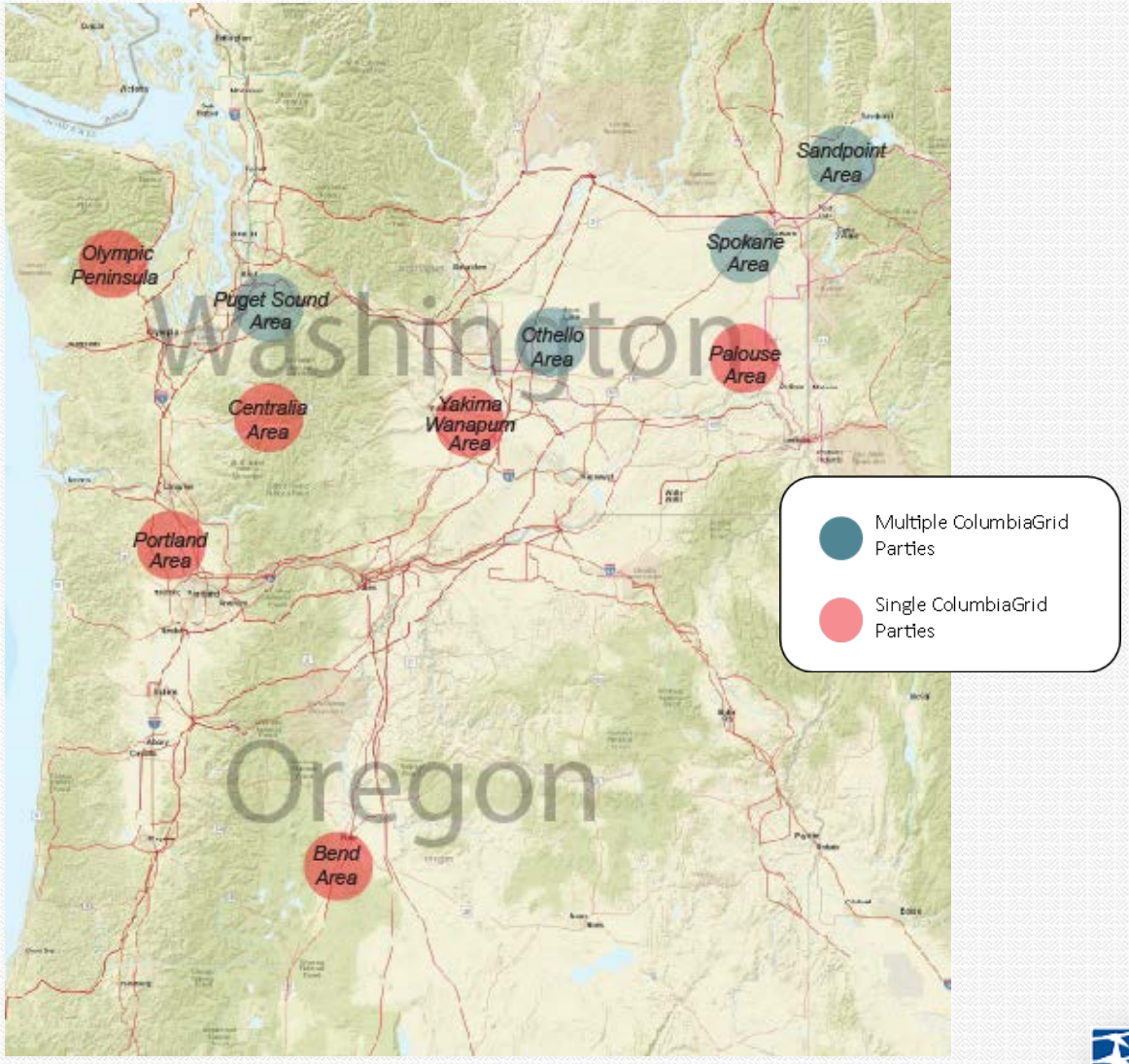
Scenario	Base Case
Near-Term	2018 Light Spring
	2018 Heavy Summer
	2018 Heavy Winter
Mid-Term	2021 Heavy Summer
	2021 Heavy Winter
Long-Term	2026 Heavy Summer
	2026 Heavy Winter

- Need Statement: Reliability Assessment identified 10 areas of concerns (similar to last year)
- Draft report was issued on July 19 for comments
- Mitigation plans have been proposed/evaluated

ColumbiaGrid 2017 SA Projects



Draft 2017 System Assessment

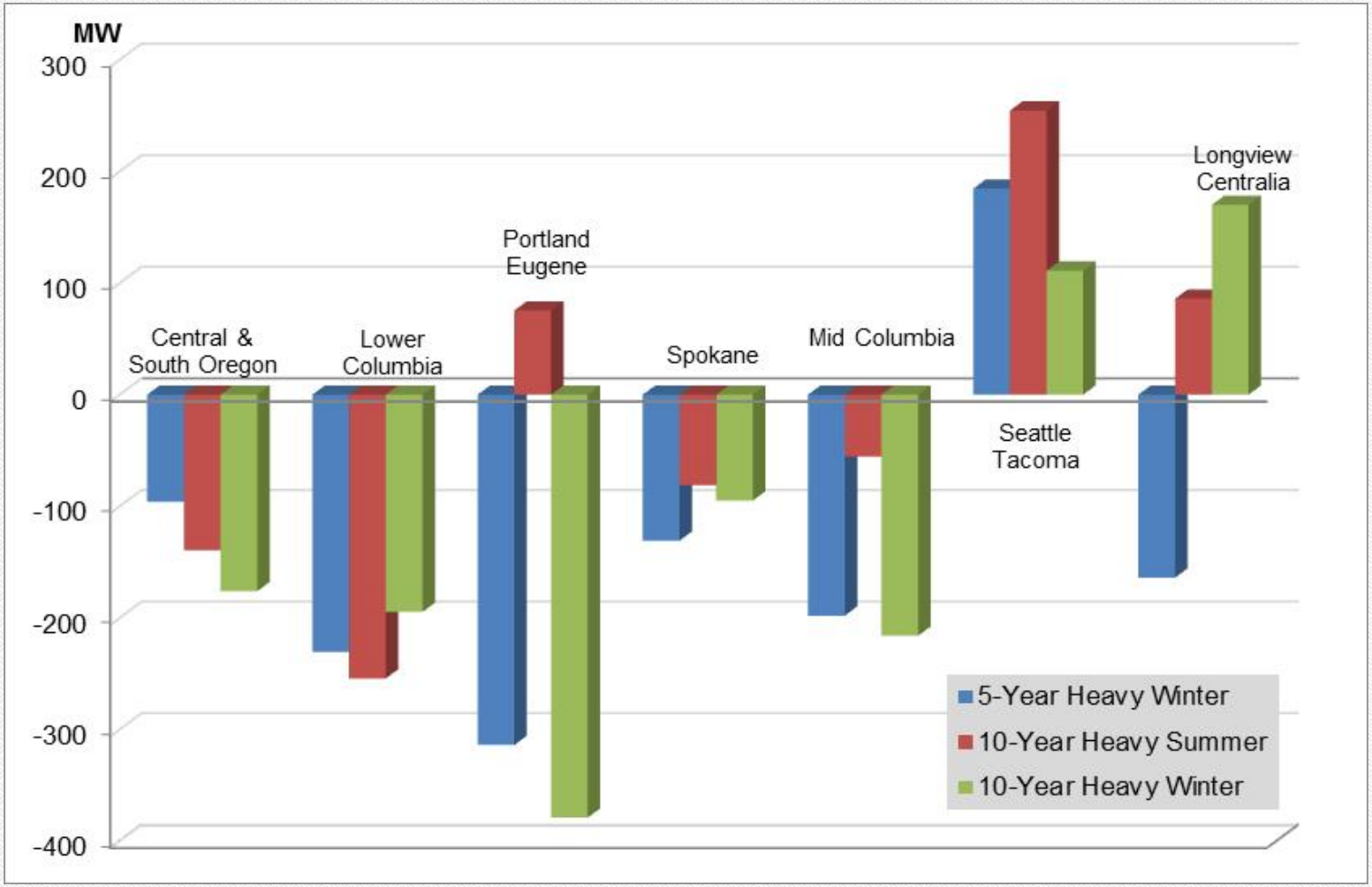


Draft 2017 System Assessment

- Compare to 2016 System Assessment results
  - Load forecast reductions* were observed in most areas. However, load forecast increases were also observed in two areas
  - Low load growth, reduction of significant industrial loads, deployment of Energy Efficiency (EE) and other demand-side activities are likely to be the primary factors causing load reduction

* Comparison of load forecasts for similar scenarios that were used in last year and this year System Assessments

Draft 2017 System Assessment



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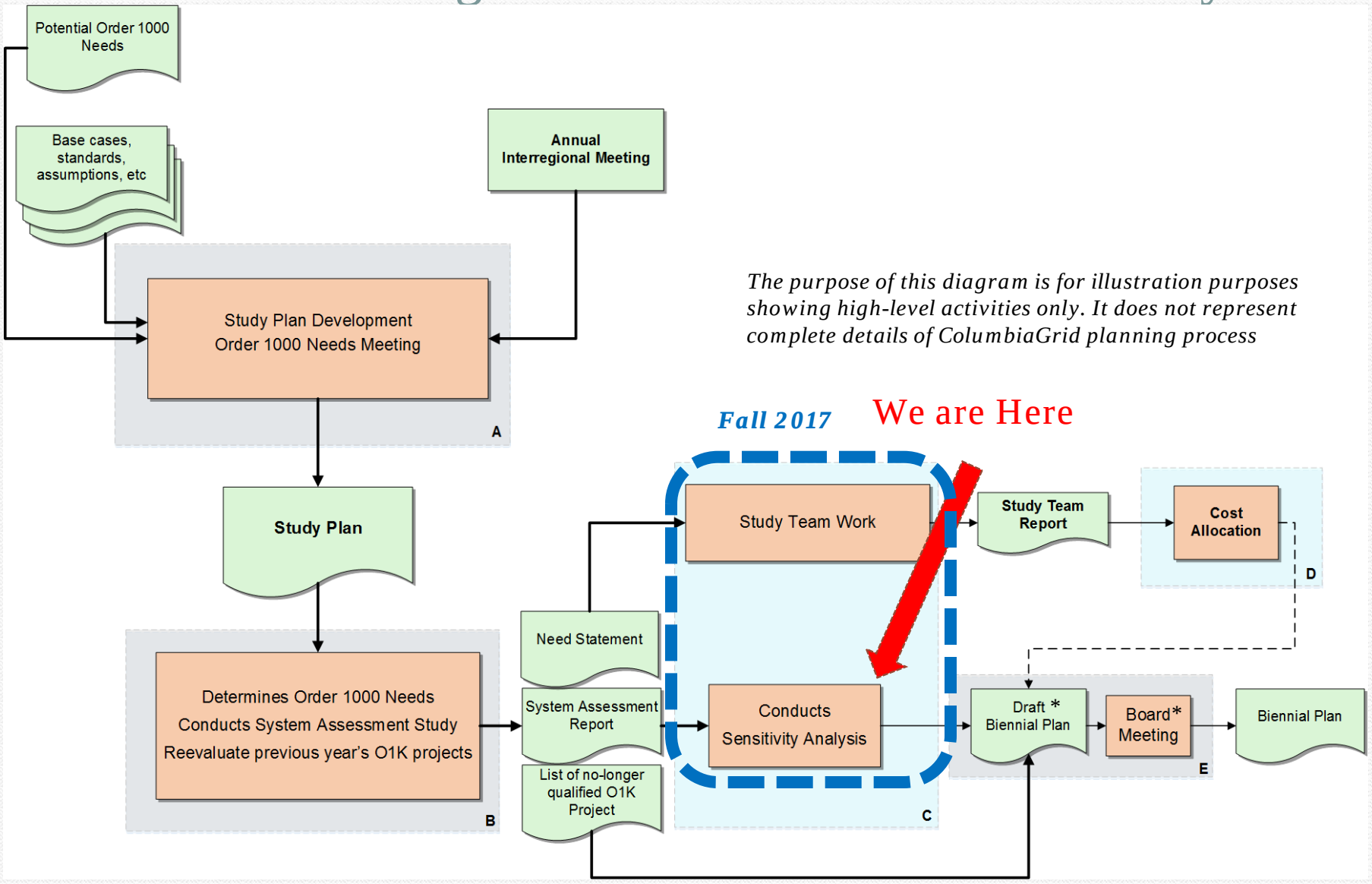
2017 Planning Activities: Where we are today?



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2017 Study Teams

- Two active Study Teams in 2017, one new Study Team is being formed:
- Sensitivity of Alcoa load
  - Evaluated potential impacts due to load reduction
  - Almost complete (results are being reviewed)
- Puget Sound Area Study Team (PSAST)
  - Continue to monitor system conditions driven by load changes
- Potential Impacts in Othello Areas (being formed)
  - Evaluate potential impacts from interconnection requests in Othello area

2017 Planning Activities: Next Steps

- Update to 2017 Biennial Plan (optional)
  - Anticipated completion: Feb 2018
- Specifics:
  - 2017 Sensitivity Studies (N-1-1 and High Renewable)
  - Transient Stability Analyses
  - MOD-033 Stability Model Validation
  - TPL-007 Geomagnetic Disturbance Analyses
  - 15-Year Study (Production Cost and possibly Power Flow)

2017 Sensitivity Studies

- N-1-1 study evaluates potential impacts from the combination of contingencies
  - Support PRC-026 and TPL-001-4 compliance
  - Simulate large number of contingencies due to combination

2017 Sensitivity Studies

- Coincident Renewable – Non-typical Snapshot
  - Identify non-typical hour, or 'snapshot,' with:
    - Low NW load
    - High NW Hydro and
    - Coincidently high renewable generation
  - 10 year time frame with planned resources
  - New scenario not required in typical reliability assessment
  - Rely on Production Cost Modeling and historical data to determine the hour when such conditions may occur
  - Use power flow to identify potential system impacts

Transient Stability

- Ongoing study
  - Capability to evaluate system behavior during transient period (e.g. 0-20 seconds after major outages)
- Focus on 2 major areas
  - Model validation: Fix inaccurate/insufficient data
  - Evaluate system dynamic performance: Identify potential major reliability issues (in addition to Power Flow and PCM)
- Support NERC standards compliance
  - Transmission Planning standards (TPL)
  - Model Validation standards (MOD)

Stability Model Validation (MOD-033)

- A new activity to support MOD-033 compliance
- Two major components of MOD-033 requirements
  - R1: Develop performance guideline document and a study to compare actual system behaviors with simulation results
  - R2: Data sharing/providing requirement
- The scope of this activity is in Requirement 1, as noted above
- Current status:
  - Development of the performance guidelines was complete
  - The comparison study is ongoing

Geomagnetic Disturbances (TPL-007)

- A new activity to support TPL-007-1 compliance
  - New technical study
  - Evaluate potential impacts from major geomagnetic events
- The scope of this activity focuses on 2 tasks
  - Develop Geomagnetic Disturbances Base Cases & Geomagnetic Disturbances data
  - Run high-level Geomagnetic Disturbances assessment, focusing on NW system

Geomagnetic Disturbances (TPL-007)

- Current status:
  - Geomagnetic Disturbances data was reviewed and corrected; Geomagnetic Disturbances base cases were developed
  - Initial Geomagnetic Disturbances assessment (2019 scenario) is complete

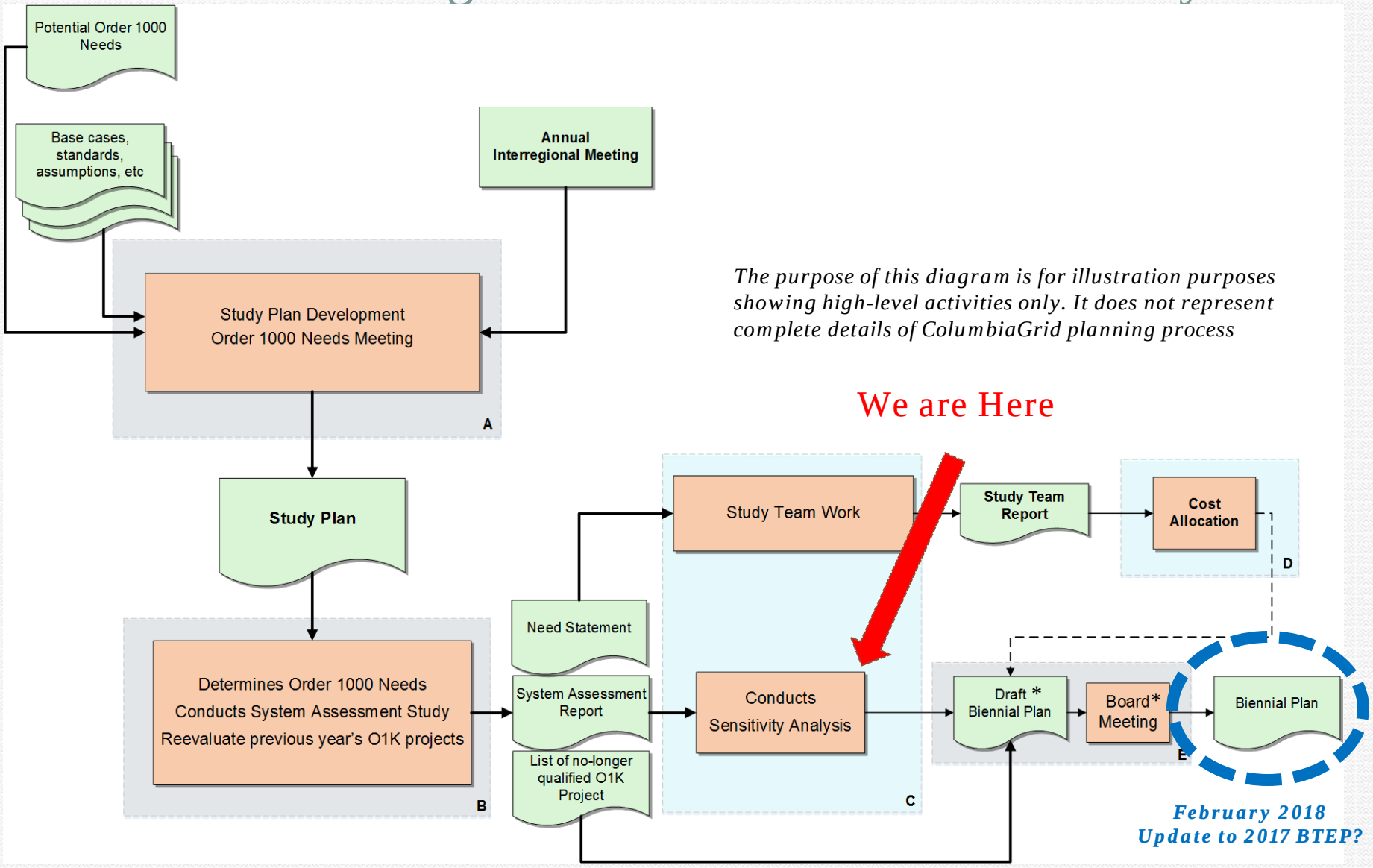
Geomagnetic Disturbances (TPL-007)

- Preliminary study results (under review)
  - No major issue found in the NW
  - Only 2 transformers have induced current >75 A
  - Potential further improvement from modeling lower voltage system (<200 kV) is in the study
- Next steps
  - Continue the assessment on more scenarios
  - Work with ColumbiaGrid members and other participants to include more detailed system modeling
  - Anticipated completion: December 2017

15-Year System Assessment

- Assessment of potential grid impacts that may occur beyond 10 year planning horizon due to key factors
  - New resources e.g. RPS, Behind the Meter
  - Resource retirement
  - Major changes in load pattern
  - Major transmission projects
  - Impacts from new technologies, etc.
- The study will rely on both Production Cost Modeling and PowerFlow
  - To ensure both reliability & economic aspects are captured
  - Anticipated completion: December 2017

2017 Planning Activities: Where we are today?



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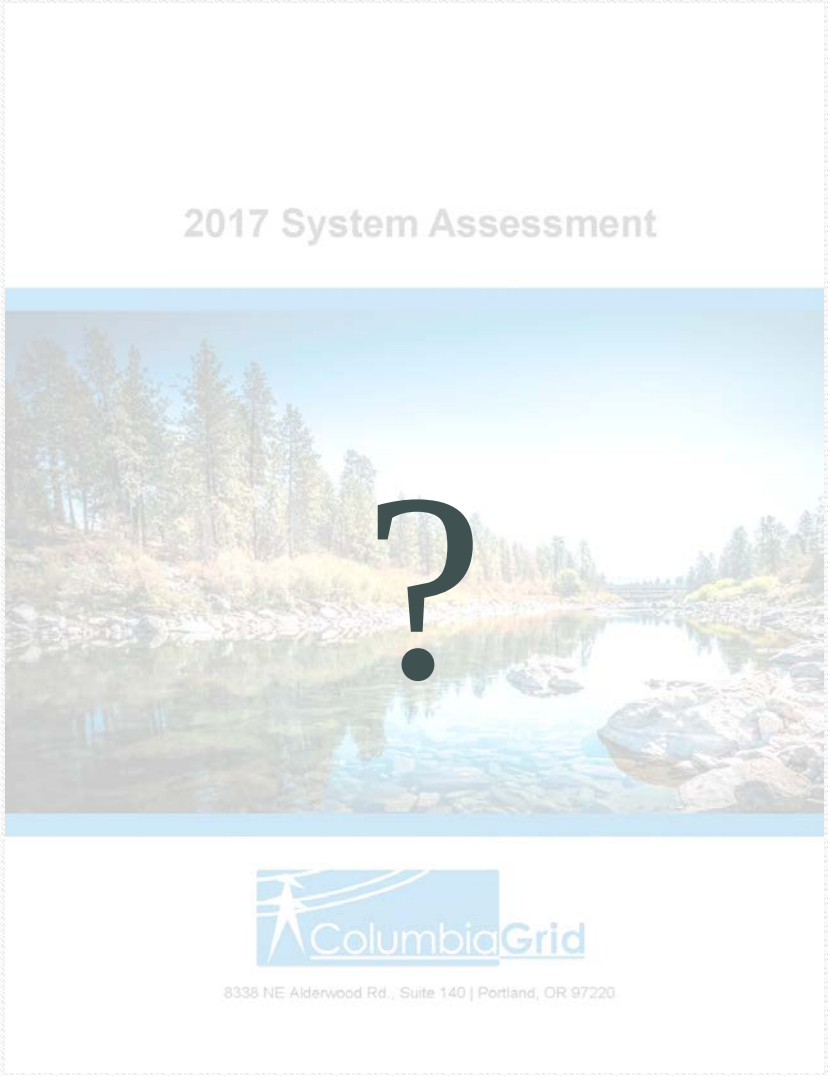
2018 Update to the 2017 BTEP?



- 2017 Sensitivity Studies (N-1-1 and High Renewable)
- Transient Stability Analyses
- MOD-033 Stability Model Validation
- TPL-007 Geomagnetic Disturbance Analyses
- 15-Year Study (Production Cost and possibly Power Flow)

FERC Order 1000

- In 2017, ColumbiaGrid hosted 2 meetings that are related to Order 1000
  - Feb 9, 2017: Order 1000 Needs Meeting
  - Feb 23, 2017: Annual Interregional Coordination Meeting
- Major issues from the meetings and other activities
  - There were no Order 1000 Potential Needs submitted to ColumbiaGrid
  - No regional needs were identified in the latest studies from ColumbiaGrid, NTTG, and WestConnect
  - California ISO is conducting an informational study to accommodate 50% RPS.

FERC Order 1000

- Four Interregional Transmission Projects (ITP) were proposed and are being evaluated

No	Project Name	Company
1	Cross-Tie Transmission Project	TransCanyon, LLC
2	HVDC Conversion Project	San Diego Gas & Electric
3	SWIP-North	Great Basin Transmission, LLC
4	TransWest Express Transmission Project	TransWest Express, LLC

- ColumbiaGrid is not a Relevant Planning Region in any of these ITPs but it will continue to participate/assist the evaluation
- Anticipated completion: December 2017

South of Allston Project Independent Review

- In mid-2016, Bonneville Power Administration requested that ColumbiaGrid organize an independent panel to review the proposed South of Allston Project, including to:
  - Assemble an Independent Review Panel that consists of a diverse, industry-wide, group of experts
  - Coordinate, facilitate, and assist the Panel in their review effort (i.e. ColumbiaGrid was not a member of the Panel)
  - Coordinate and facilitate development of the Independent Panel's Review Report
  - Issue the Report to Bonneville (completed January 2017)
  - Post the Report for public review on ColumbiaGrid's website, subject to confidential and critical energy infrastructure information (expected mid-August)

South of Allston Project Independent Review

- In Oct 2017, the Independent Review Panel was formed:
  - Alison Silverstein, Consultant
  - Ayman Samaan, Southern California Edison (SCE)
  - Ben Kujala, Northwest Power & Conservation Council
  - Fred Heutte, Northwest Energy Coalition
  - Ian Grant, Tennessee Valley Authority (TVA)
- The Panel concluded their review in late 2016 and completed their report in January 2017
- Currently, Bonneville Power is reviewing the report for potential confidential or critical energy infrastructure information

Regional Planning Coordination

- ColumbiaGrid participates in 2 types of regional coordination
  - With other planning regions in the west – CAISO, NTTG, WestConnect
  - With WECC
- Coordination with other planning regions occurs on a weekly basis
  - Weekly coordination call
  - Part of Order 1000 and Order 890
- Coordination with WECC occurs on a regular basis and focuses on the new WECC process

Regional Planning Coordination

- In Dec 2016, WECC board approved a proposal to restructure its planning activities
  - Eliminate the Planning Coordination Committee (PCC) & Transmission Expansion Planning Policy Committee (TEPPC)
  - Create the Reliability Assessment Committee (RAC) and transfer the works under PCC and TEPPC to RAC
  - Create the Anchor Data Set (ADS) for power flow and production cost
  - Anticipated completion: September 2017
- ColumbiaGrid participated in the implementation of ADS and RAC
  - Provide data & develop the 2028 ADS
  - Participate in RAC subcommittees , taskforces, and workgroups
  - Two Potential Issues: WECC considering their own GMD studies; Modeling of unknown or fictitious resources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