BPA's Long-Term Planning Process In A Dynamic Market

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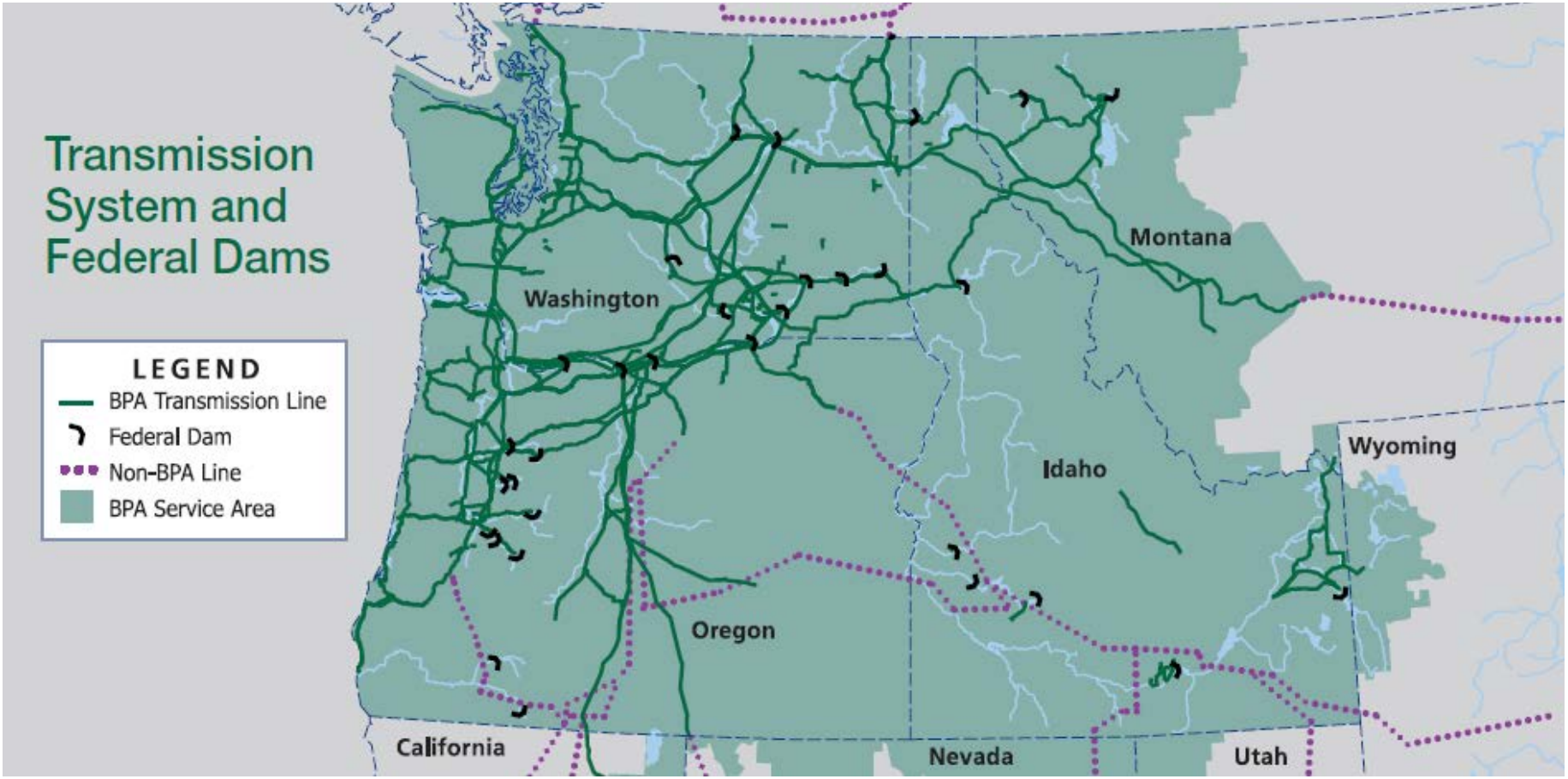
BPA Service Area



Approx. 300,000 mi^2 service area with over 15,000 circuit miles & 260 substations

BPA Transmission Strategy

- Assure a safe and reliable transmission system while meeting compliance requirements with cost effective investment guidelines.
- Balance transmission system investments with physical, economic and environmental considerations.
- Promote coordinated, efficient operation, expansion and enhancement of transmission and non-wires solutions.

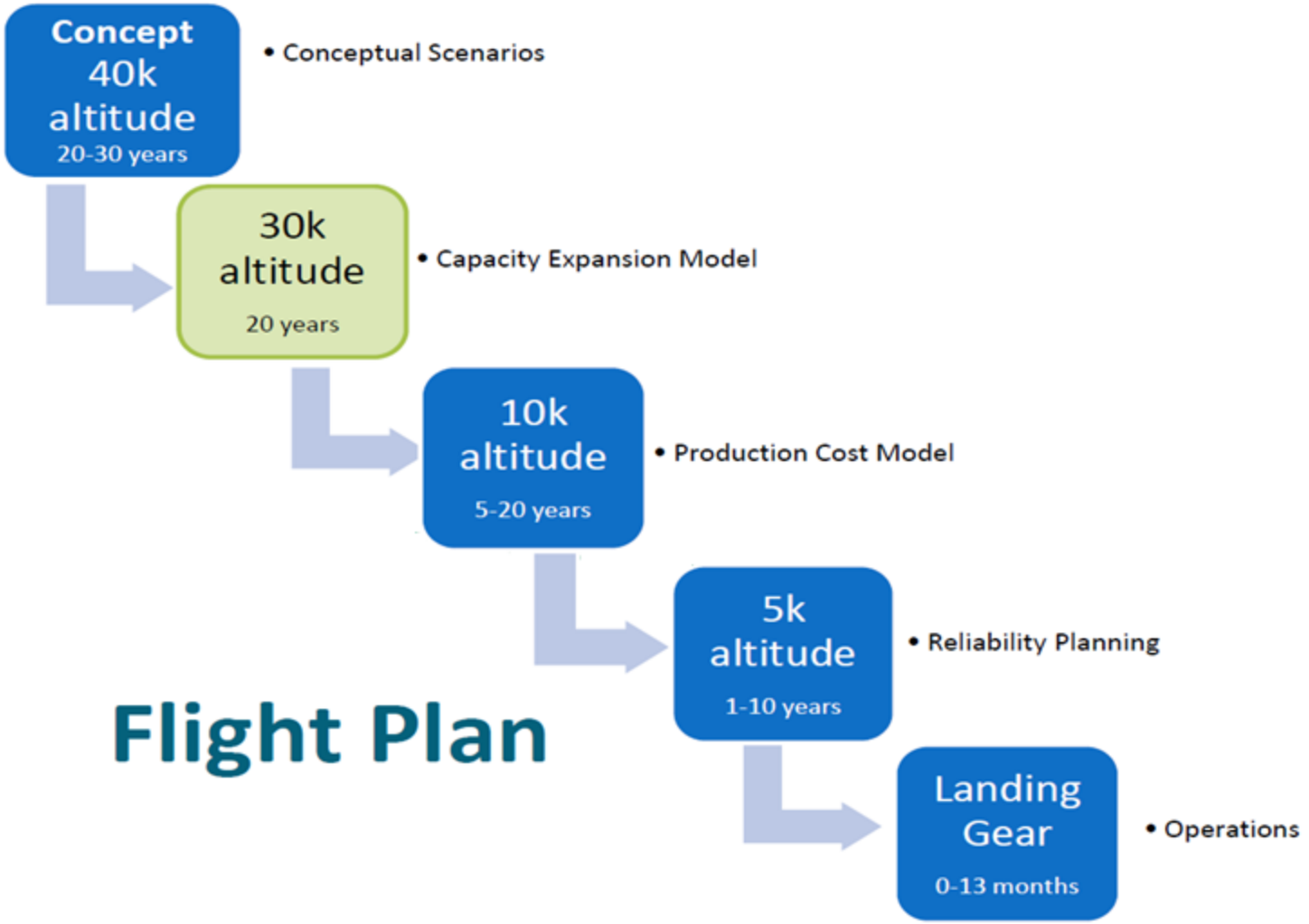
KEY TAKEAWAY: Modernizing and securing our power grid is essential to continuing to meet the challenges of the 21st century - BPA has embraced a more flexible, scalable, economically and operationally efficient approach to managing our transmission system. BPA is increasing its reliance on advanced technology, robust regional planning, industry standard commercial practices and coordinated system operations.

Context

- Public policies, technology availability and end user preferences are accelerating the shift toward a carbon-free electric sector.
- There is more than one way to achieve reduced emissions targets, but implementation affects relative performance of resource and transmission portfolios.
- Robust consideration of uncertainties is necessary to minimize the cost of being wrong.
  - No perfect forecasts
- Transmission assets have a very long useful life.

KEY TAKEAWAY: Having appropriate analytical capability including better predictive scenarios will improve BPA's ability to meet transmission customer needs more efficiently and responsively

Planning Capabilities Complement Each Other



Adopted May 2017: Scalable, Flexible, Technology Driven Approach

Coincident Utilization Example

		Gen Group B (MW)														
	Hours	0	600	1200	1800	2400	3000	3600	4200	4800	5400	6000	6600	7200	7800	8400
	-300				1	2		2	11	70	317	64	265	132		
	0	2		2	6	11	13	9	5	10	104	48	76	42		
	300	2	5	16	13	9	26	23	20	23	76	62	106	29	5	
Gen Group A (MW)	600	4	15	17	14	37	31	74	69	88	113	122	103	27	4	
	900	20	76	81	62	73	56	81	95	116	116	104	61	32	7	
	1200	14	114	89	132	177	152	164	128	170	217	119	63	20	5	
	1500	22	142	176	213	222	183	175	175	195	238	175	97	26	3	
	1800	29	138	186	217	229	189	187	197	204	203	160	99	20	3	
	2100	22	122	205	205	166	183	177	222	313	253	212	207	33	8	
	2400	17	98	145	148	158	162	203	243	299	201	131	68	12		
	2700	14	66	95	117	135	182	216	276	381	275	129	31	25	1	
	3000		25	35	49	93	142	182	339	419	257	70	20	2		
	3300		3	15	20	49	70	108	164	276	214	46	12			
	3600		1	4	14	12	23	17	20	16	9	2				
	3900															

12 years of hourly samples from July and August (measured data). Correlation Coefficient = -0.1662

These two groups of generators never peak at the same time in most limiting months – Realistic dispatch assumptions are needed for planning.

TSEP Needs Assessment

- Power flow scenario analysis is used to estimate flowgate needs in response to transmission service requests (TSR).
  - Winter, spring, and summer seasonal conditions for load and hydro
  - High variable resource cases and high dispatchable resource cases for each season
  - Intertie import/export assumptions appropriate for each condition
  - Limiting condition varies by flowgate

Integrated Planning Concept