

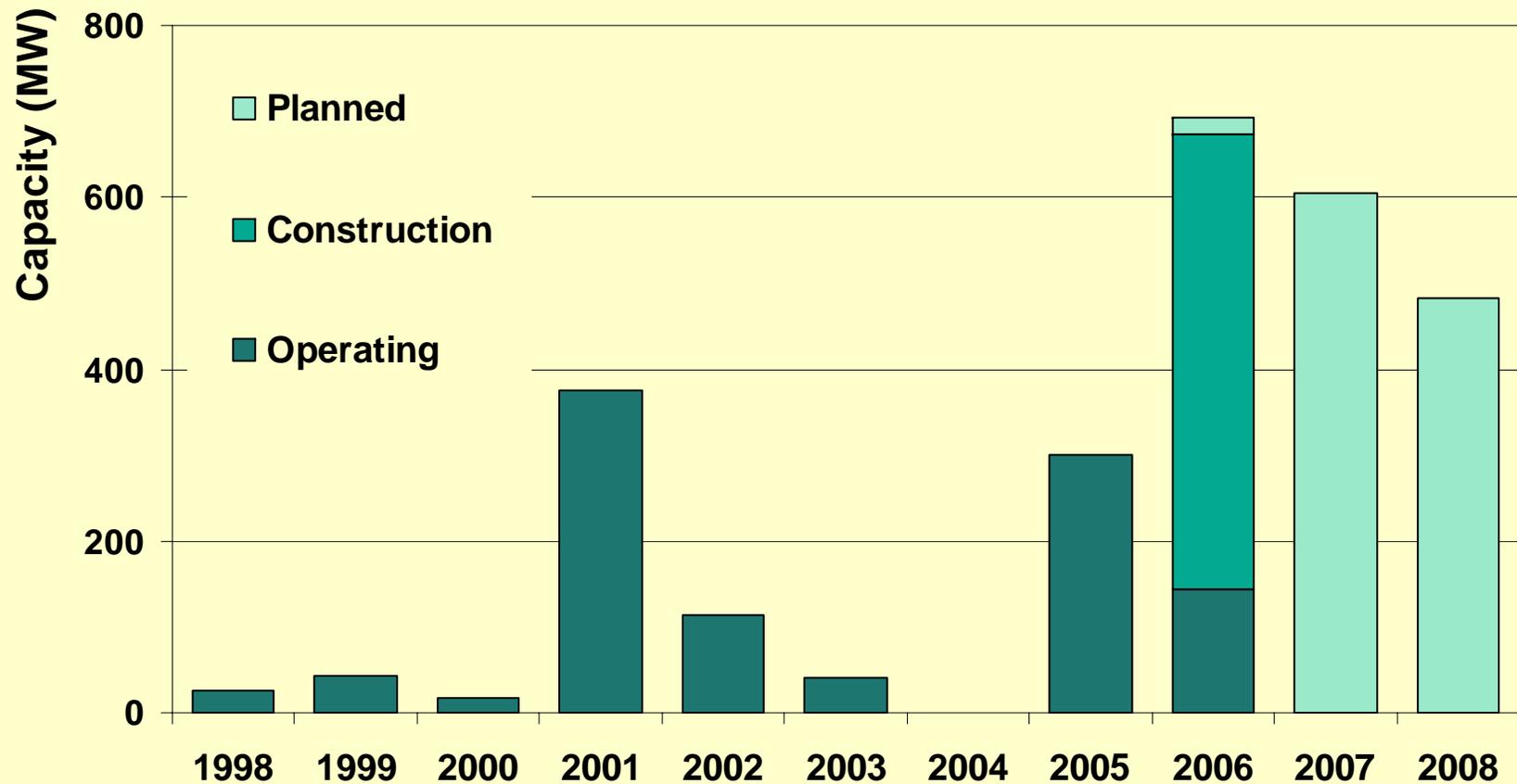
Northwest Wind Integration Action Plan

Policy Steering Committee

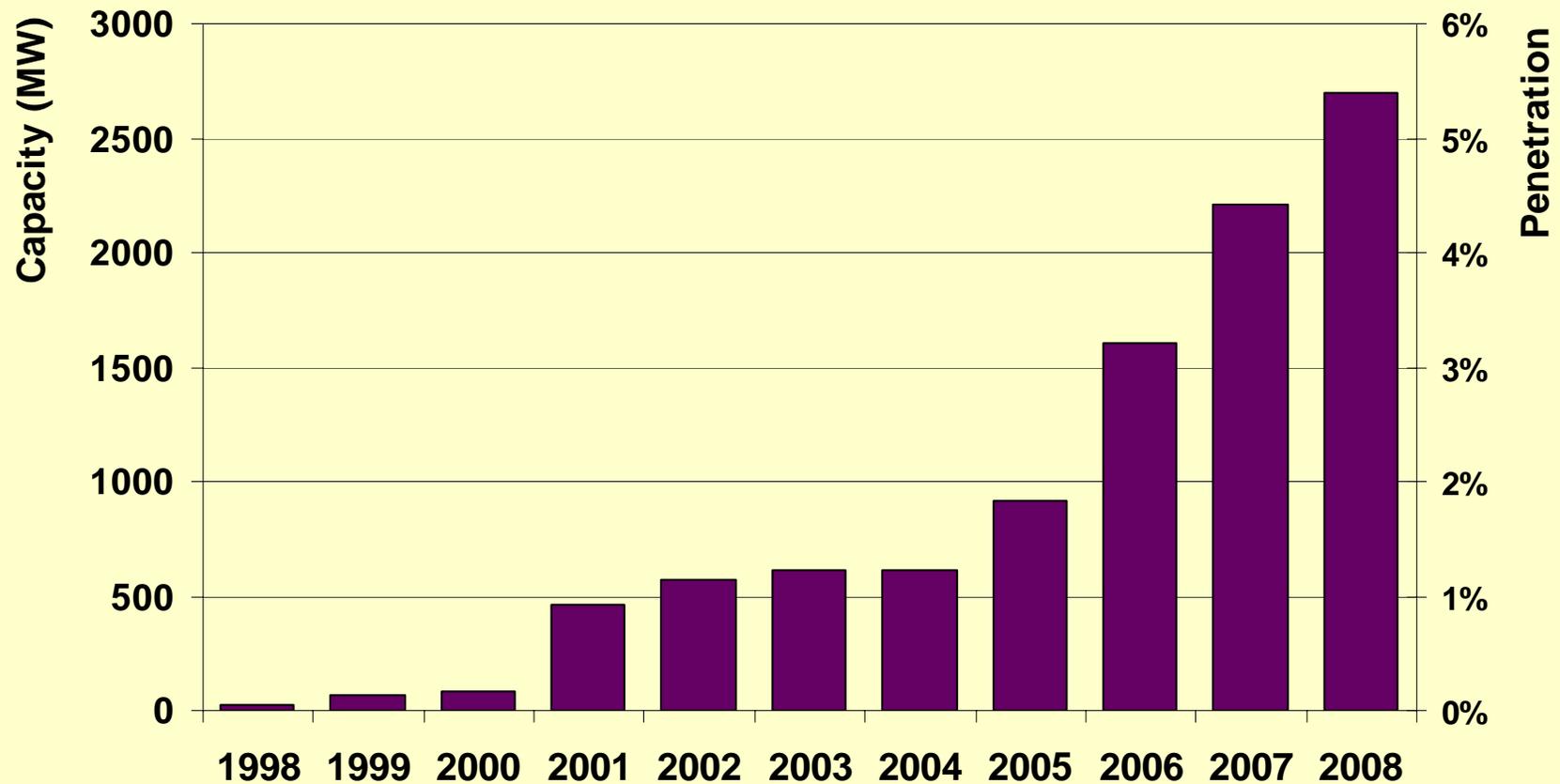
Portland, OR

August 24, 2006

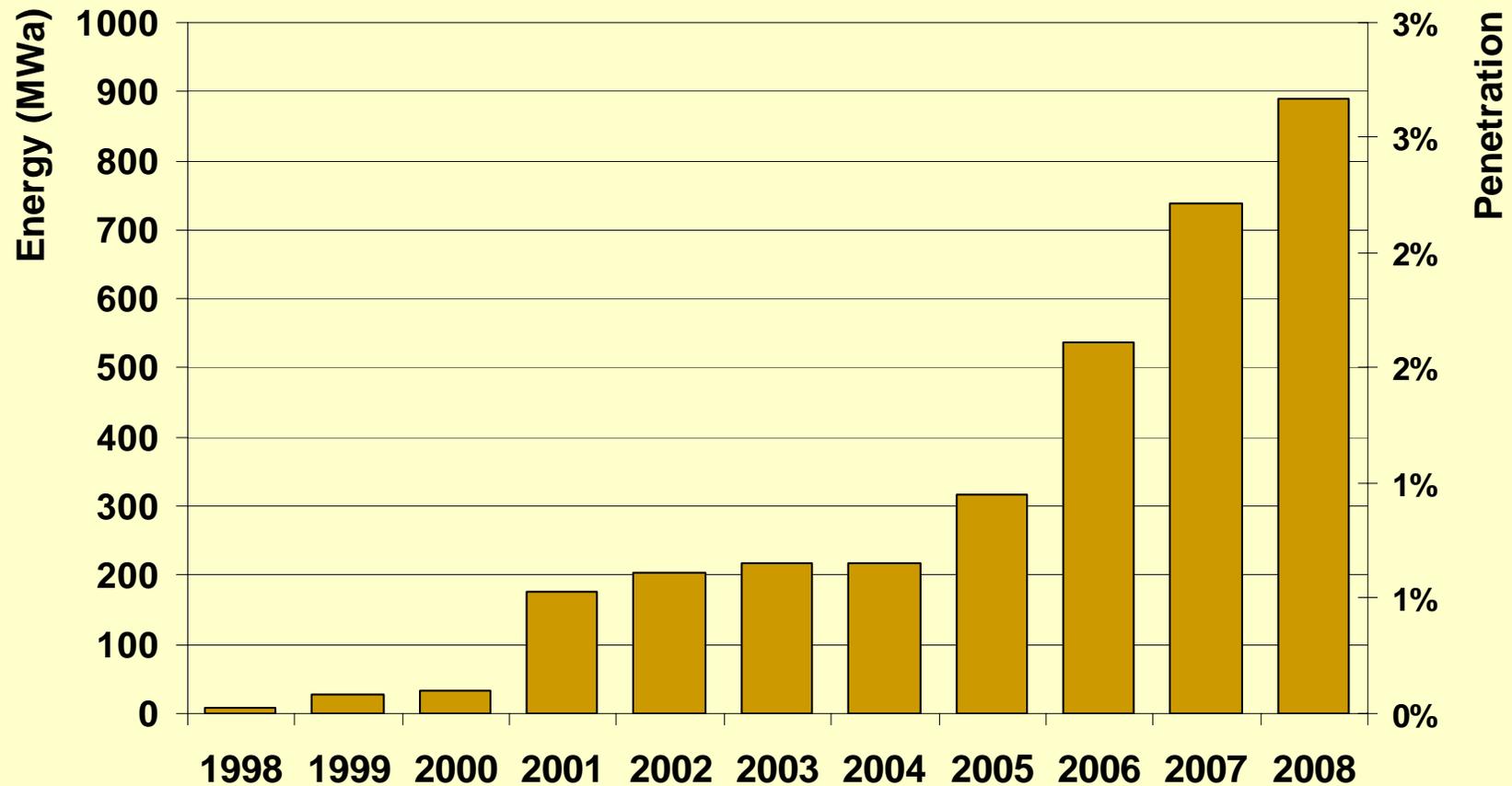
Northwest windpower capacity additions



Cumulative Northwest windpower development (Capacity)

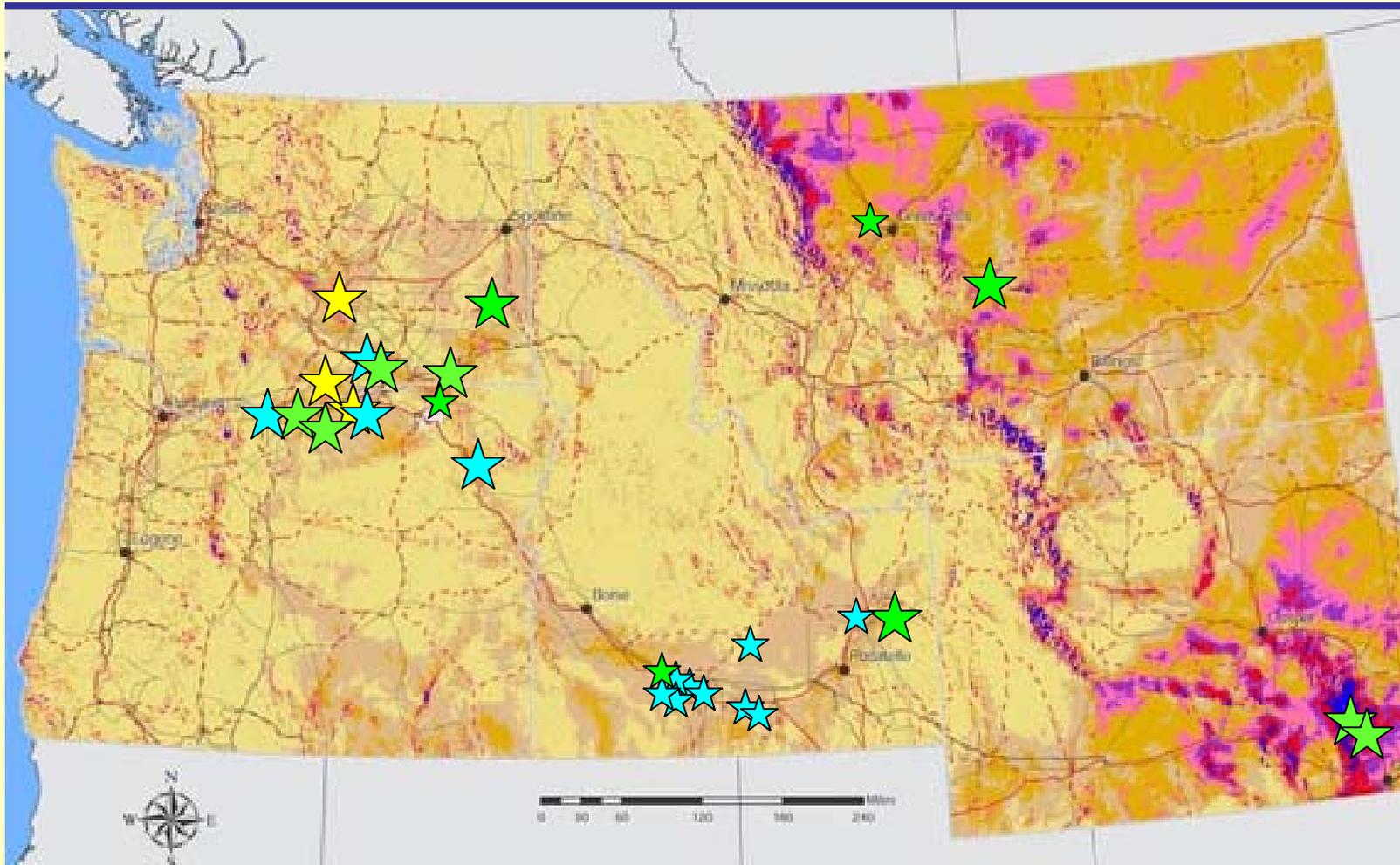


Cumulative Northwest windpower development (Energy capability)



Northwest wind projects (Aug 2006)

- ★ Operating
- ★ Under construction
- ★ Planned



★ 30+ MW ★ 10 - 30 MW 5

Northwest Wind Integration Project

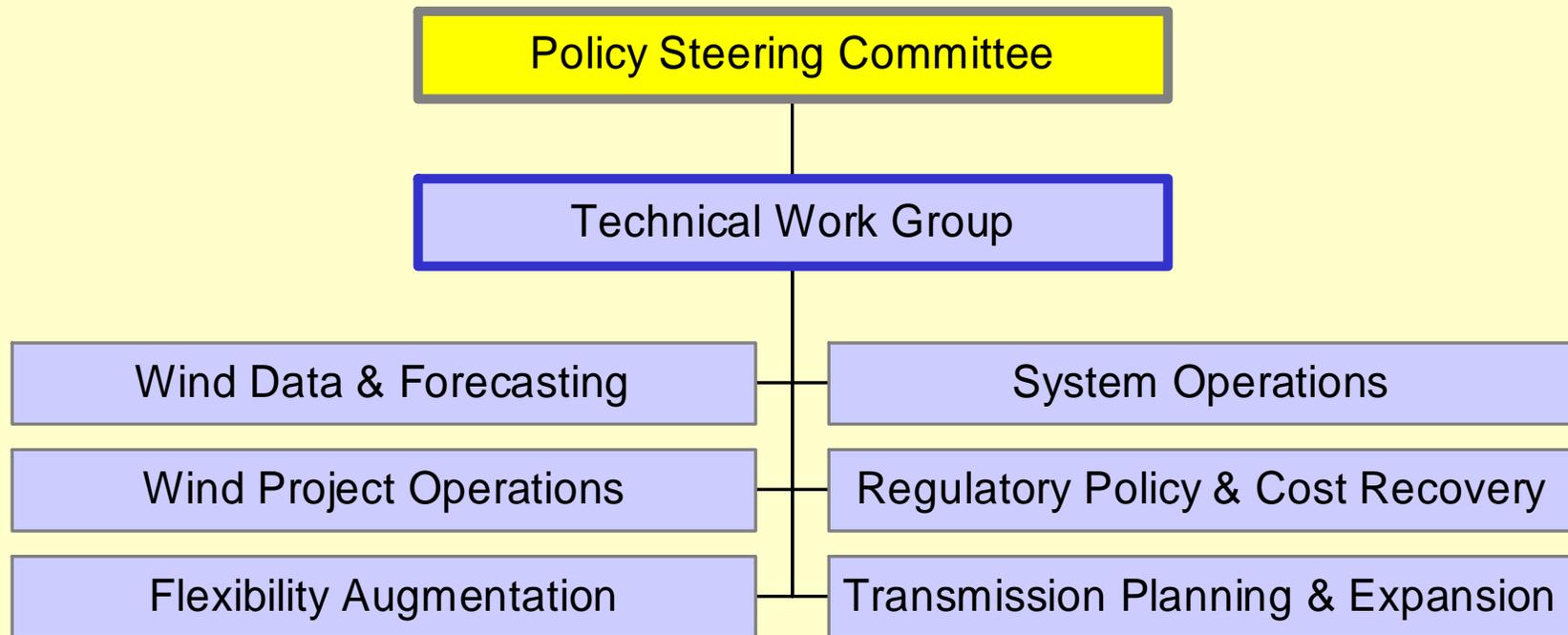
Purpose: Identify cost-effective ways to integrate a substantial wind energy portfolio in the Northwest

Product: Findings and recommendations in the form of an action plan, endorsed by the leaders of the major organizations involved in renewable energy development in the Northwest

Key Northwest wind power integration issues

- **System flexibility**
 - Regulation (within hour)
 - Load-following (hourly and greater)
 - Cost allocation
- **Capacity value of wind**
- **Transmission planning and expansion**

Organization



General approach and schedule

- **Phase I:** Review experience and studies to date, assemble needed data
Start immediately; target 3 mos to complete
- **Phase II:** Identification of strategies to integrate near-term (2006 – 09) windpower development
~ 3000 MW, or more of wind (in aggregate)
Start immediately; target January 2007 completion
- **Phase III:** Identification of operational, infrastructure, market and policy requirements to integrate long-term windpower development
6,000 MW, or more of wind
Start identified tasks immediately, but not to impact Phases I or II; 12-24 mos to complete,
Possible additional tasks identified at conclusion of Phase II

Phase I tasks

- 1.1: Forecast nature and magnitude of expected near-term windpower development
- 1.2: Review Northwest utility integration studies
- 1.3: Review Northwest regional study efforts
- 1.4: Review extra-regional and international operating experience
- 1.5 Collect and analyse regional wind data
- 1.6 Review experience with allocation of regulation costs

Phase II tasks

- 2.1: Identify within-hour operational impacts associated with the near-term growth of regional wind generation
- 2.2: Develop individual within-hour control area operating strategies
- 2.3: Explore cooperative within-hour control area operating strategies
- 2.4: Establish benefits, data requirements and costs for improved region-wide wind forecasting
- 2.5: Explore strategies for active wind project output management

Phase II tasks (Continued)

- 2.6: Identify power system impacts and costs over the hour-ahead and longer time horizon
- 2.7: Develop individual hour-ahead and day-ahead control area operating strategies
- 2.8: Explore cooperative hour-ahead and day-ahead operating strategies
- 2.9: Scope data requirements, analytical framework, cost and timeframe for longer-term regional wind integration tasks (remaining Phase III tasks)

Phase III tasks (currently identified)

- 3.1: Assess transmission planning & expansion issues, activities and future options
- 3.2: Assess the capacity value of wind
- 3.3: Identify flexibility augmentation strategies and costs
- 3.4: Assess the architecture of a potential regional wind forecasting network
- 3.5: Assess national experience and policy regarding allocation of regulation costs associated with wind and other generation resources