

Swiss Re



Hydro-contingent power price structure - Conceptual outline

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Hydrological risk of a Hydro Power Generator (HPG)

HPG's physical commodity position is short fuel (e.g. water, gas, etc.) and long power

- Scenario drought:
 - HPG needs to substitute hydro power generation with thermal generation (if any) or buy power on spot market to fulfill its commitment under power off-take contracts sold to the market
 - increased costs for power generation and/or power purchases on the spot market

HPG's financial situation is influenced by a combination of weather and price risks



Conceptual solution

Index product including:

- weather index as a proxy for hydro power production (e.g. precipitation, river flow, water level in reservoirs)

and

- price risk per unit of the underlying weather index (e.g. MWh value of lost hydro power production)



Conceptual solution (cont.)

- Structure: Put on Expected Hydro Power Production (financial settlement)
- Index [MAF]: Aggregate river flow (as a proxy for Hydro Power Production)
- Conversion Factor [MWh/MAF]: constant factor (converting Index into Expected Hydro Power Production)
- Expected Hydro Power Production [MWh]: Index * Conversion Factor
- Term: 1 to 5 years
- Strike [MWh]: XXXXXXXXXXX MWh
- Tick [USD/MWh]: USD XX/MWh (USD value of hydro power production lost)
- Payout [USD]: $\text{Min}(\text{Max}(\text{Strike} - \text{Expected Hydro Power Production}, 0) * \text{Tick}, \text{Limit})$
- Annual Limit [USD]: USD XX,XXX,XXX
- Term Limit [USD]: USD XX,XXX,XXX
- Premium [USD]: _____

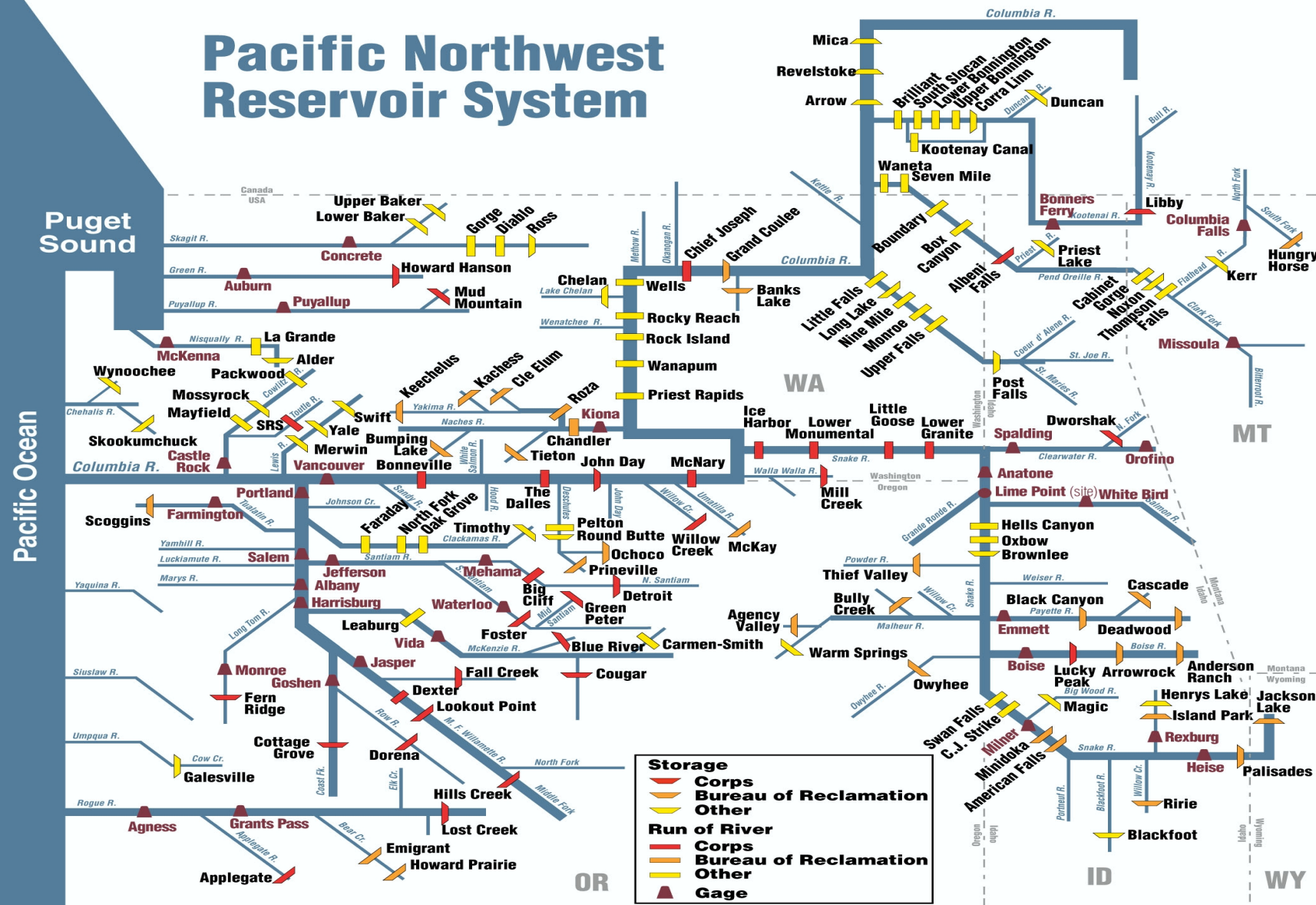


Data requirements

- All data needed to calculate Index measured and reported by independent third party
- About 30 years of reliable data to calculate Index
- MWh value based on market prices



Data requirements (cont.)





Data requirements (cont.)

- Know transactions executed in the weather market have been based on the following meteorological data:
 - 1) aggregate daily precipitation
 - 2) aggregate daily river flow measured at multiple stations
 - 3) a combination of 2) and adjustments for changes in upstream reservoir levels

- Data issues encounter include:
 - data gaps
 - manual observations sometimes made by voluntary observers
 - non-regular data reporting
 - multiple owners / operators of measurement equipment
 - no relevant data available from independent third party
 - high costs for data acquisition
 - no regular data reporting during calculation period hindering monitoring and valuation of risk and therefore trading



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