Resource Options Update Scope & Approach Session

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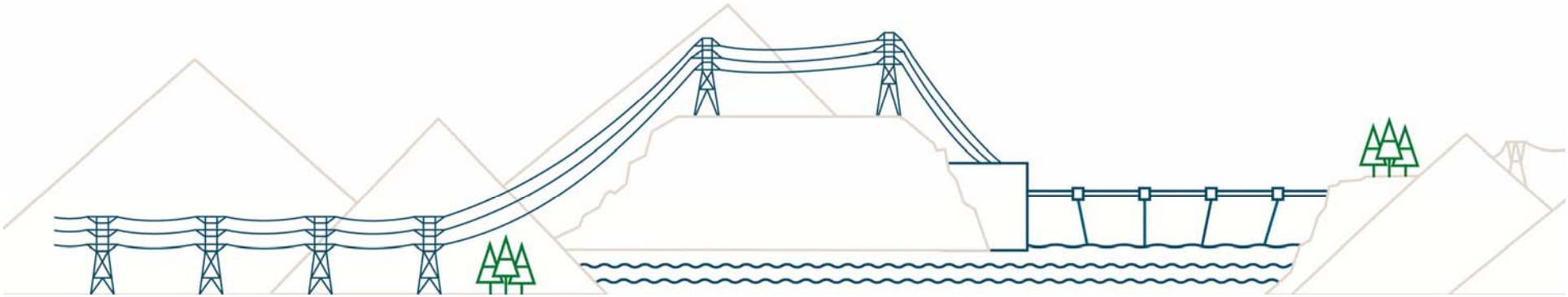

September 16, 2019

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Today's purpose

Review the scope and approach to the Resource Options Update

BC Hydro's supply-side resource options inventory is used for planning purposes and in preparation for the next Integrated Resource Plan

We'd like to hear from you!

Does the scope make sense?
Are we missing anything?
Industry expert contact suggestions?

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Outline

Review the scope and approach to the Resource Options Update

- Introduction to BC Hydro resource options database
- Supply-side updates
  - New to database
  - Existing database updates
  - Emerging resources
  - Database elements
- Process and schedule

BC Hydro's Resource Options Database

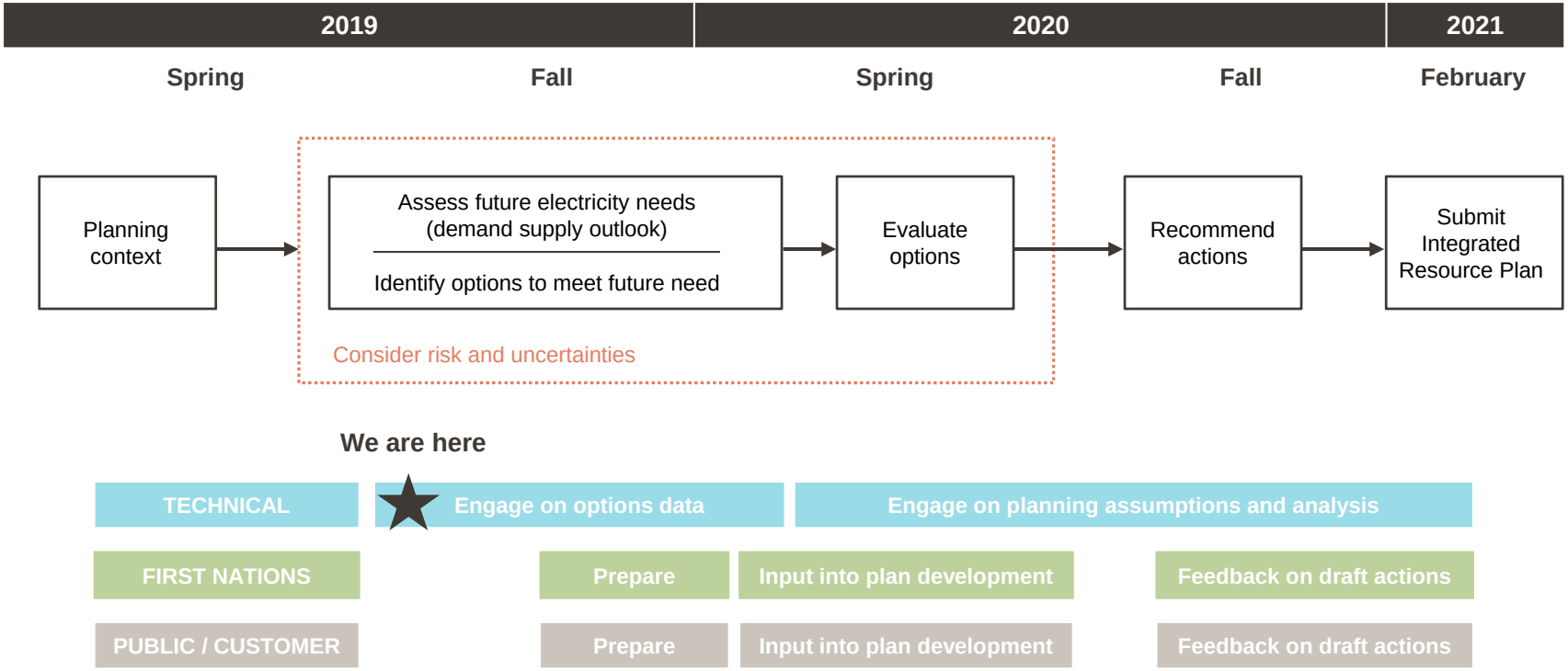
An inventory of resources available to meet future customer demand

Inventory of demand-side and supply-side resources are used for planning purposes:

- Characterize B.C.'s resource options in technical, financial, environmental and social attributes
- Updates – 2010, 2013, 2015 and 2017
- Utility collaboration with FortisBC – shared dataset
- Engage industry experts for input and/or feedback on data
- Will be an input into the 2021 Integrated Resource Plan (IRP)

2021 IRP process

Planning for our future – where we are now



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Scope of the IRP resource options

Planning options include new generation, expansion, demand and transmission options

Topic for today's meeting

- Supply-side options – the clean revolution is underway
  - Rapid technological advancement and new technologies
  - Declining costs of renewables

Additional updates

- BC Hydro assets – resource smart options
- Demand-side management options – energy efficiency and capacity-focused
- Transmission options

Supply-side options update

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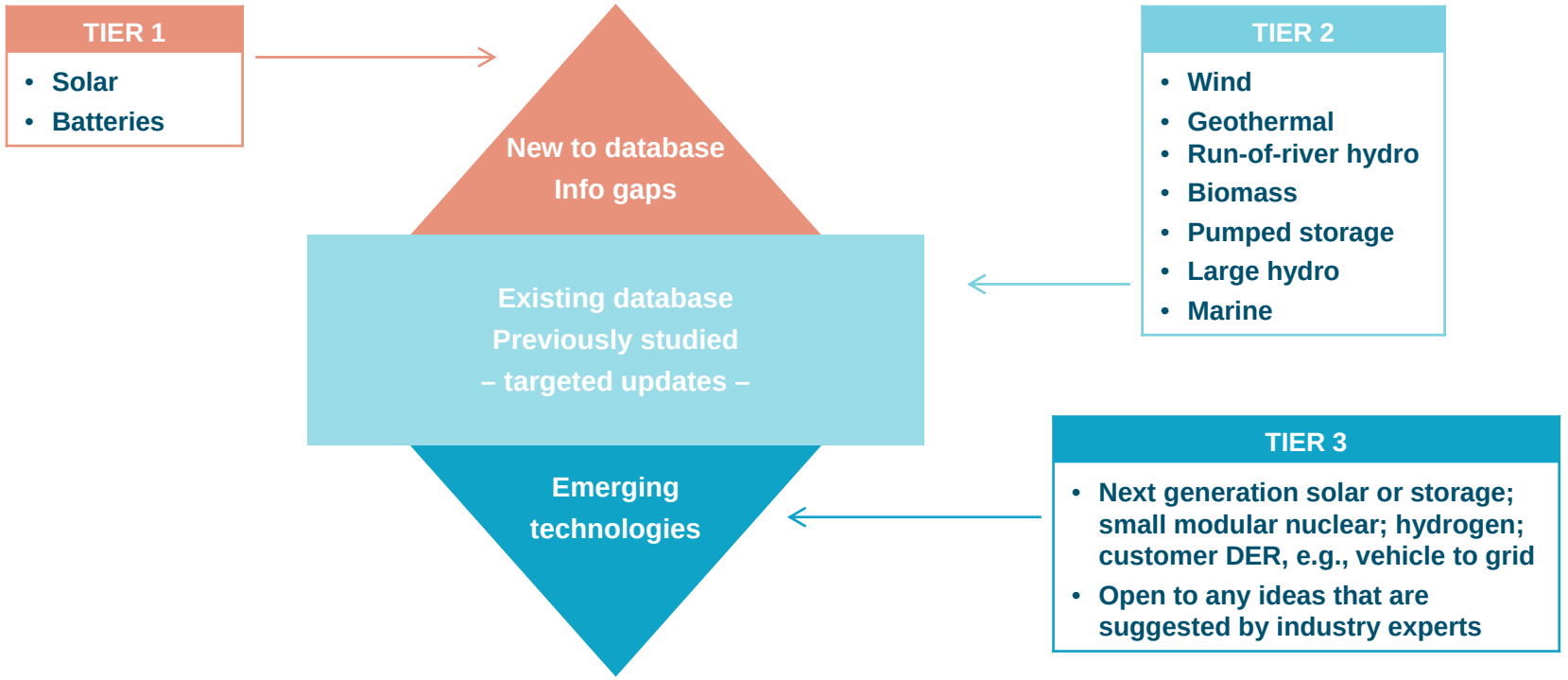
Overview of update

Builds on our existing database



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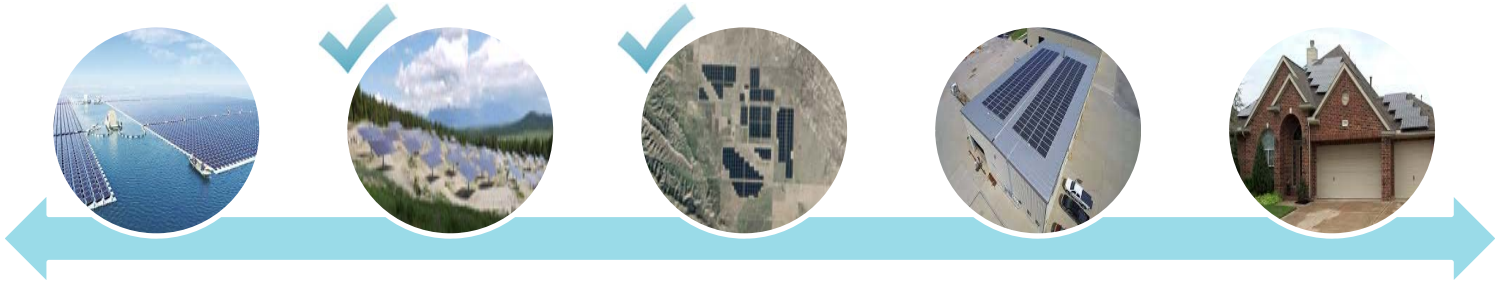
Solar

What we know today

- Preliminary assessment of 12 representative 5 MW solar sites in B.C. (2015)

Information we're collecting

- Province-wide resource assessment
- Updated solar costs for large scale (~100 MW) and distributed scale (1-15 MW)
- Costs for solar project development in B.C. context
- Solar favourability map – potential solar resources at utility and distributed scale



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Battery storage

What we know today

- High-level cost assessment of generic battery storage facility (2018)

Source: National Renewable Energy Laboratory

Information we're collecting

- Study with National Resource Council
- Identification of lowest cost sites to host battery storage facilities
- Assessment of resource potential at each of those sites
- Cost assessment of battery storage facilities

Existing database

Characteristics we're updating

Resource	Data to be updated
Wind – onshore	Cost and performance for new turbine technologies
Wind – offshore	Cost and performance of new offshore turbine technologies
Geothermal	Exploration and equipment costs for low, medium and high temperature resources at 12 sites. Updated lead time in B.C. context
Biomass – Wood	Incorporating latest information on resource potential, inflate costs
Biomass – Municipal solid waste	Changes to tipping fees; inflate costs
Large hydro	Inflate costs

Existing database ...continued

Characteristics we're updating

Resource	Data to be updated
Natural gas	Inflate costs
Pumped storage	Escalate costs based on historical construction escalation factors
Run-of-river	Update capital costs based on 2017 Deloitte study
Small storage hydro	Resource potential and costs based on 2018 report
Marine (wave/tidal)	Costs updated based on 2019 report
Biogas	Confirm biogas-to-electricity not competitive with biogas-to-clean NG alternative

Qualitative update of emerging types

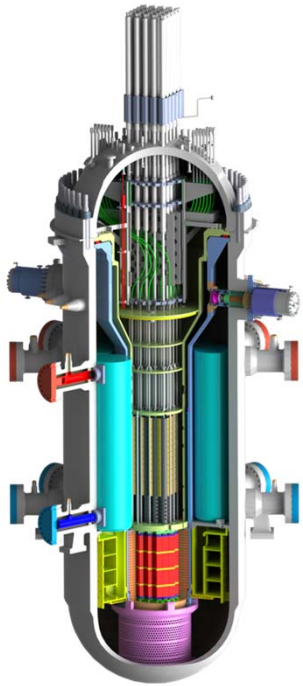
We're tracking what's on the horizon – an evergreen list

Each technology type will be described in terms of:

- Summary of the technology concept or innovation
- Technology maturity and time until commercialization (Gartner Hype Cycle)
- Commentary about B.C. context

Examples

- Next generation storage or solar
- Small modular nuclear
- Hydrogen and fuel cells



Source: American Nuclear Society

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Summary of data elements

Database will describe technical and financial attributes of each project

Technical attributes	Financial attributes
Location	Capital cost
Nameplate generation capacity	Operating / maintenance cost
Monthly generation profile	Transmission / road construction cost
Dependable capacity / effective load carrying capacity (ELCC)	Unit energy cost (UEC) at gate
Project lead time	UEC at point of interconnection
Technical risk/uncertainty	Cost assessment uncertainty

Summary of data elements (evolving)

Database tracks environmental and economic development attributes

Attributes	Measure
GHG emissions	Tonnes/GWh CO2e
Local air pollutants	Tonnes/GWh NOx, SOx, CO, VOC, PM
Land impacts	Hectares – urban, rural, remote, wilderness
Aquatic impacts	Km – affected stream length Hectares – affected area
Economic development	Jobs – person years (full-time, temporary) Provincial GDP

Process & Schedule

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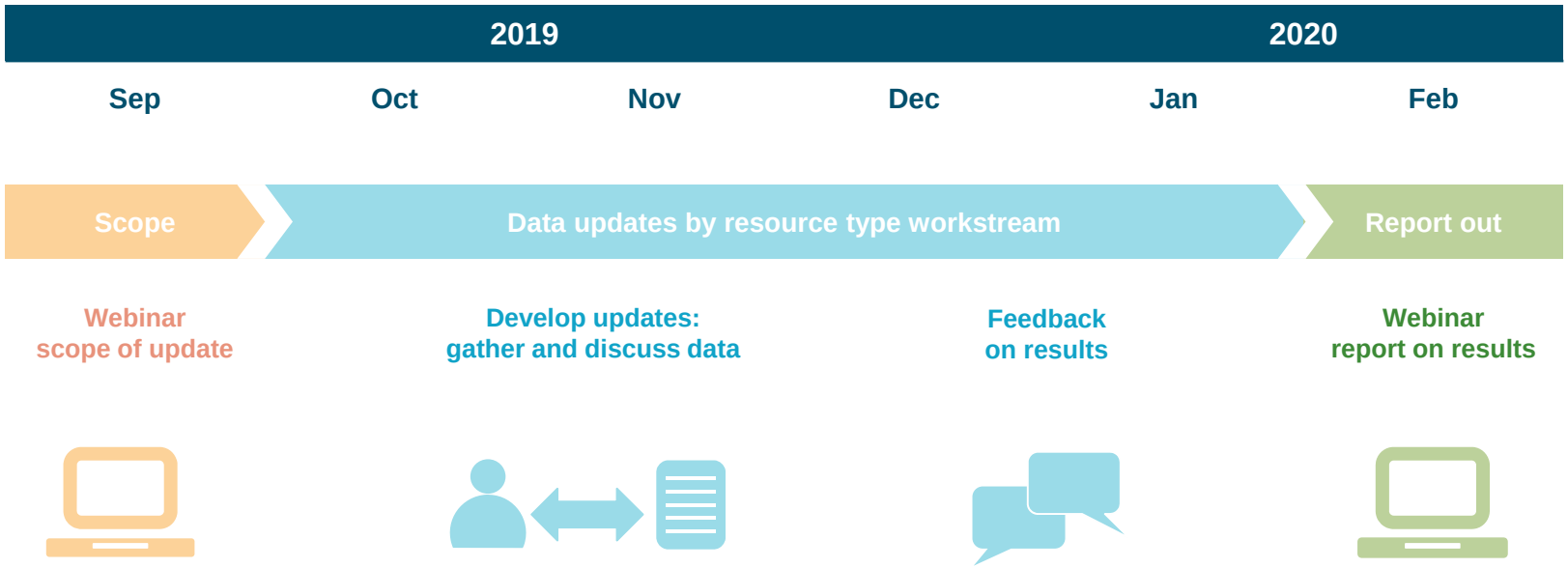
Resource Options Update process

Develop updates this fall and report out in the new year



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Thank you!

Additional information…

Does the scope make sense?
Are we missing anything?
Industry expert contact suggestions?

Contact us by September 23th if you have additional feedback

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