2012 Integrated Resource Plan

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Appendix

3D

Corporate Technology Roadmap

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1 Introduction

BC Hydro's Corporate Technology Roadmap identifies high-value technologies aligned with its strategic priorities and provides a framework to develop business strategies to realize that value. This summary describes the process used in 2011 to develop the roadmap and the high-level draft action plans for Energy Resources- and Smart Grid-related technologies.

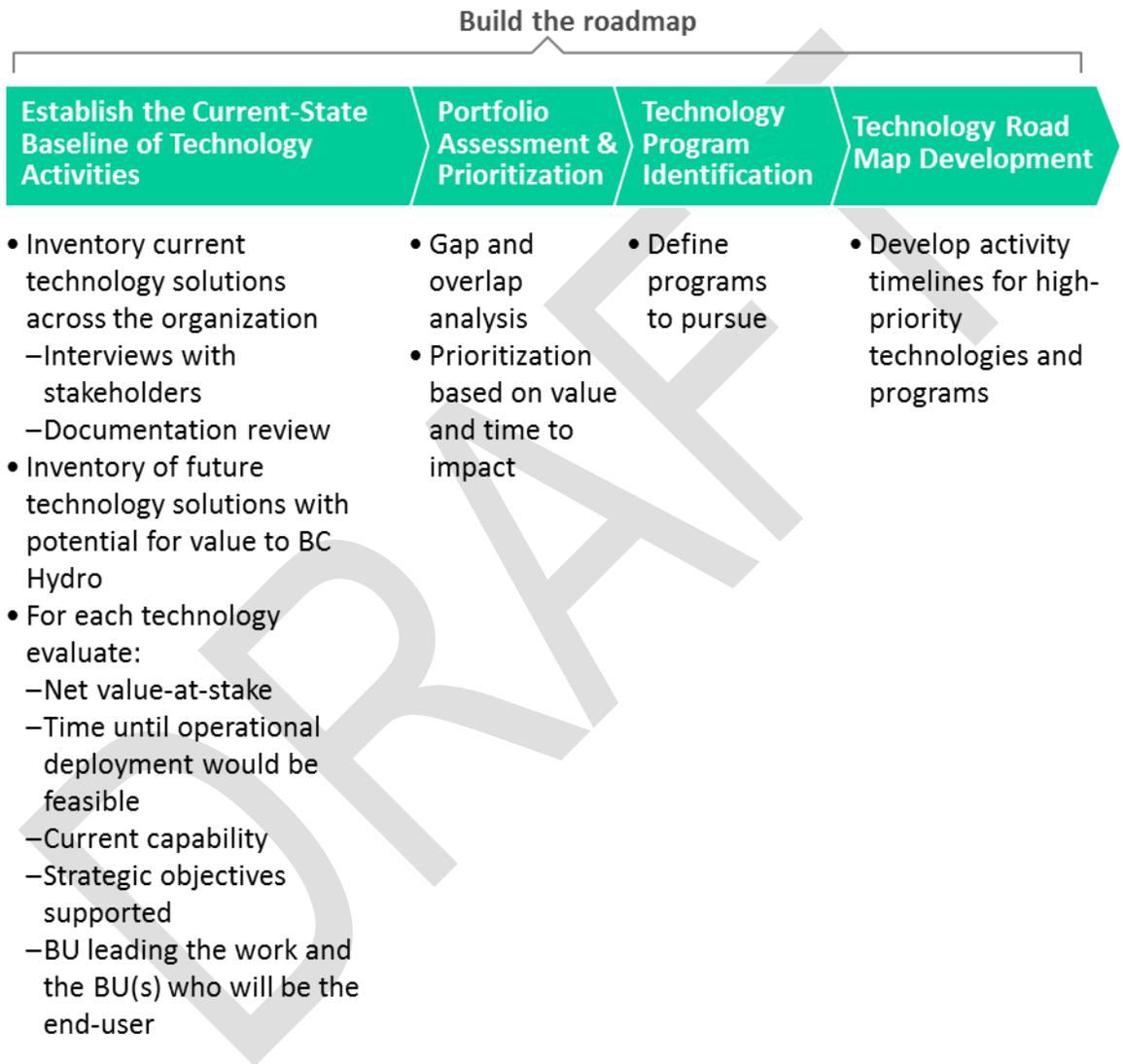Objectives of the roadmap are to:

- Provide a high level view of the interdependence between BC Hydro's strategic objectives and technologies over a 30 year timeline.

- Provide BC Hydro's business groups with a common framework for evaluating the alignment between BC Hydro's strategic objectives, their cascading strategies, and specific technologies.

- Identify technologies that may require BC Hydro to develop a future multi-group business strategy.

- Identify current and future technology enablers required by business.

2 Steps in the Development of the Corporate Technology Roadmap

Building the roadmap entailed four steps (Figure 1). Over 300 technologies were identified, and then re-cast or consolidated into 118 technology solutions, each corresponding to a business need or strategy. These 118 technology solutions were evaluated within a common framework in terms of net-value at stake, time until deployment is feasible within BC Hydro operations, and BC Hydro's current capabilities with regard to the technology solution. Interdependencies and linkages between technology solutions were identified, and near-term activities were defined to realize the value for the highest priority technologies.

The 118 technology solutions were categorized into eight technology themes, described in Table 1. For the purpose of the IRP, the technologies and high-level action plans are only described for the energy resources and the smart grid themes.

Figure 1   Steps to Building the Roadmap

Build the roadmap

Establish the Current-State Baseline of Technology Activities	Portfolio Assessment & Prioritization	Technology Program Identification	Technology Road Map Development
• Inventory current technology solutions across the organization –Interviews with stakeholders –Documentation review • Inventory of future technology solutions with potential for value to BC Hydro • For each technology evaluate: –Net value-at-stake –Time until operational deployment would be feasible –Current capability –Strategic objectives supported –BU leading the work and the BU(s) who will be the end-user	• Gap and overlap analysis • Prioritization based on value and time to impact	• Define programs to pursue	• Develop activity timelines for high-priority technologies and programs

Notes:
1.   Business Unit (**BU**)

**Table 1   Technology Themes**

Technology Theme	Description
Automation and Control	Technologies involving sensors, decision-making analytics, and control. Examples include microgrids, real-time asset health assessment, and wide-area phasor measurement systems.
End Use Technologies	Technologies on the customer-side of the meter. Examples include lighting, motors and drives, and building efficiency technologies.
Energy Resources	Technologies that can generate or store electricity. Examples include diesel/battery solutions, marine renewable energy, and storage batteries for distribution systems.
IT & Telecom	Technologies associated with foundational communications or information systems. Examples include call centers, workflow automation, and field mobile communication technologies.
Modeling and Simulation	Technologies associated with use of digital or analog representations of an actual operational system used for the prediction or analysis of the system. Examples include load forecasting tools and predictive analysis of climate change.
Power System Components	Technologies associated with new types, designs, or elements of power system assets. Examples include solid state transformers, advanced cable designs, and composite material structures.
Robotics and Tools	Technologies using autonomous or remote-controlled intelligent machines. Examples include under-water remote operated vehicles (ROV), transmission line robots, and unmanned aerial vehicles.
Smart Grid	Communications and computing technologies to improve the electric network, so that it can operate in a more efficient and effective manner and provide incremental/new services

2.1   Energy Resources Technologies

Emerging energy resources technologies, whose primary function is to generate or store electricity, can contribute to BC Hydro's supply, improve reliability, improve financial performance, and address environmental or economic development objectives. Figure 2 illustrates the relative net-value at stake to BC Hydro, the estimated time until the value can begin to be captured, and an estimate of BC Hydro's relative level of current activity with regard to the technology. The chart is divided into six regions. For technologies in the upper left region ("Double-Down"), BC Hydro business units play a major role in confirming the business case and developing deployment plans. For technologies in the upper middle and upper right regions ("Prepare for the Future" and "Actively Learn"),

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BC Hydro technology groups lead corporate activities to confirm the technical viability and operability in a BC Hydro context, through studies and demonstration projects.

**Figure 2   Value at Stake for Energy Resources Technologies**
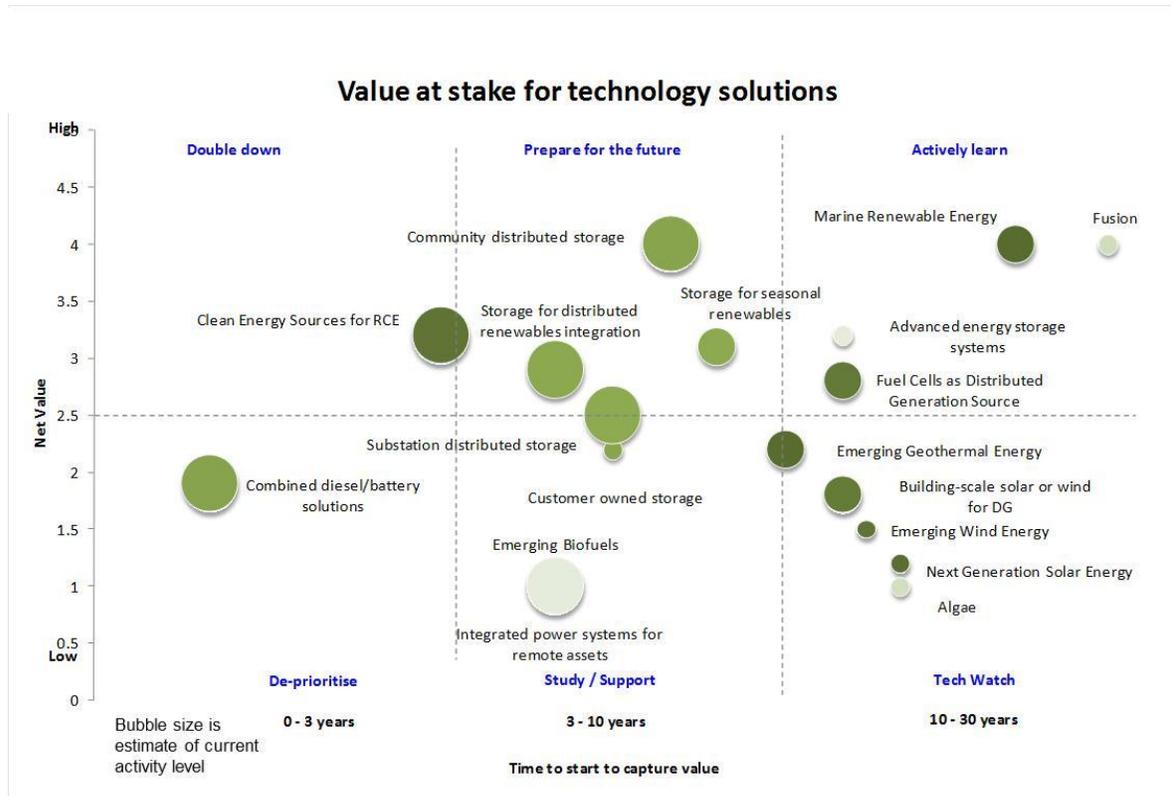
Notes:
1.   Distributed Generation (**DG**)
2.   Remote Community Electrification (**RCE**)

2.2   Smart Grid Technologies

Emerging smart grid technologies can contribute to BC Hydro's reliability, efficiency, and financial objectives. Figure 3 illustrates the relative net-value at stake to BC Hydro, the estimated time until the value can begin to be captured, and an estimate of BC Hydro's relative level of current activity with regard to the technology.

Figure 3   Value at Stake for Smart Grid Technologies

Value at Stake for Technology Options
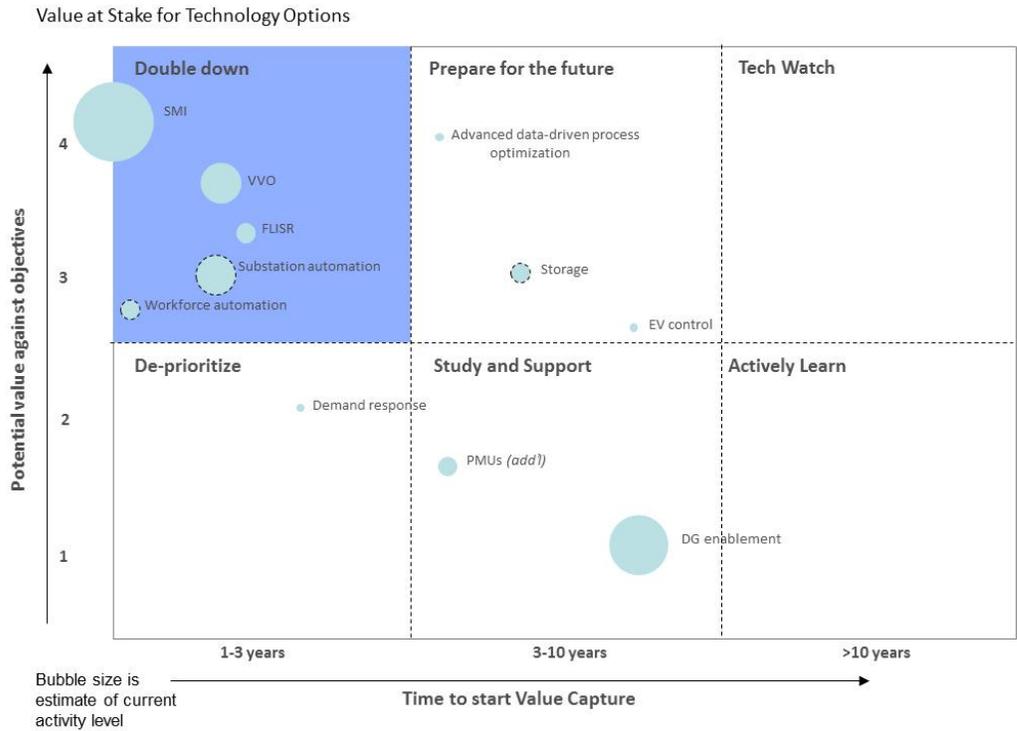
Notes:
1.   Electric Vehicle (**EV**)
2.   Fault Location, Isolation and Restoration (**FLISR**)
3.   Phase Measurement Unit (**PMU**)
4.   Smart Meter Infrastructure (**SMI**)
5.   Voltage/Var Optimization (**VVO**)

3 Energy Resources – Draft Action Plan

Description

		Description
Co-ordinate activities across BC Hydro around key Energy Storage Technologies	**a** Energy Storage Strategy	▪ Develop co-ordinated demonstration and deployment plan to understand the impacts and benefits of Energy Storage Technologies at various scales to the various business groups in BC Hydro
	b Substation Storage Demonstration	▪ Pursue megawatt-scale energy storage demonstration to validate transmission deferral capabilities, with support for federal government funding agencies
	c Community Scale Storage Demo	▪ Evaluate impacts of storage technologies in distribution microgrid application associated with distributed renewable resources
	d Storage – Diesel Integration	▪ Identify opportunities to explore energy storage to improve efficiency of diesel generators in Non-Integrated Areas
Facilitate community-scale clean energy resources	**e** Alignment with Power Acquisition programs	▪ Incorporate provisions into the Standing Offer Program and the Community-Based Bioenergy Call to accommodate demonstration-stage community-scale technologies ▪ Collaborate with Distributed Generation program to ensure acquisition and interconnection processes are efficient for community-scale resources
Technology Watch and Evaluation for high-value applications	**f** Non-Integrated Areas	▪ Evaluate technology risks of biomass technologies for use in remote communities
	g Geothermal	▪ Conduct further review to identify appropriate role of utility in enabling access to available low-cost resources using proven geothermal technologies
	h Marine	▪ Participate in Marine Renewable Energy Technology Roadmap with industry stakeholders to monitor developments in emerging sector
Establish Technology Listening Post	**i** Subject Matter Experts	▪ Formalize technology watch and trend-spotting function with internal and external subject matter experts to monitor technology progress

4 Smart Grid - Draft Action Plan

		Description
Launch focused programs targeting high-value Smart Grid solutions	**a** FLISR program	▪ Launch programmatic effort to deploy FLISR across the grid, including definition of internal standards, feeder selection/sequencing, lean optimization of deployment efforts, and regular generation of project plans
	b VVO acceleration	▪ Accelerate VVO deployment, and ensure VVO function via engineering work and coordination with SMI and DMS initiatives; optimize deployment process
	c WFA project	▪ Leverage automated dispatch, crew information, and field IT to improve workforce productivity; build on P&S Work and DMS Field Client strategy
	d Data exploration	▪ Explore opportunities to leverage field data for advanced asset planning and grid operations with relevant functional groups
Integrate Smart Grid into cap-ital planning process	**e** Prioritization approach	▪ Identify core Smart Grid projects and track through prioritization to determine whether any adaptations are necessary (e.g., allowance for "foundational" projects) ▪ Build on effort underway to a create single T&D investment prioritization process
Ensure alignment with broader BC Hydro	**f** IT/Communications Alignment	▪ Coordinate IT roadmap and communications strategy with T&D deployment plans
	g SMI Alignment	▪ Ensure alignment between SMI specification/timing and T&D plans
	h Broader Alignment	▪ Disseminate Smart Grid information as needed throughout BC Hydro to ensure alignment and coordination: OCTO, Communications, Safety, etc.
Address key capability gaps	**i** Address identified gaps	▪ Take indicated measures to fill important capability gaps
	j Detailed gap assessment	▪ Conduct deeper analysis of capabilities and address results

Notes:
1. Distribution Management System (**DMS**)
2. Office of the Chief Technology Officer (**OCTO**)
3. Procurement & Supply (**P&S**)
4. Transmission & Distribution (**T&D**)
5. Workforce Automation (**WFA**)