

IESO Innovation Roadmap: preparing for electricity sector evolution and increasing value for ratepayers

IESO Stakeholder Advisory Committee (SAC) Meeting
August 22, 2018

Questions for SAC Input

- What should “innovation” mean with regards to Ontario’s electricity system and broader electricity sector?
- What role should IESO have with regards to innovation and electricity sector evolution?
- How should Ontario’s electricity system and broader electricity evolve?

Overview

- Introduce innovation roadmap concept and rationale for development
- Provide a working definition of innovation
- Outline the approach for developing the roadmap
- Seek SAC input to help shape direction of roadmap

What is innovation?

A working definition:

- Novel solutions to **important problems** for which existing solutions are inadequate
 - Solutions such as emerging technologies, new business models, practices, regulatory and policy constructs and etc.
 - Emerging technologies, business models and etc. may be both solutions to existing problems and create new challenges in and of themselves (e.g. DER proliferation)

Why is innovation needed to address the challenges facing IESO and the broader electricity system and sector?

New solutions and approaches are needed to improve costs, reliability, adequacy and sustainability

- **Decentralization, digitization, decarbonization** and **democratization** are triggering the transformation of energy systems around the world
- Need to understand/deploy ways of doing business that improve efficiency and effectiveness

Barriers to private sector innovation investment within the electricity system need to be understood and addressed as appropriate

- Removal of barriers (e.g. procedural, rules, regulatory, legislative) can increase competition amongst solution providers leading to better outcomes (cost, choice, etc.) for ratepayers
- E.g. IESO is working with the Energy Storage Advisory Group (ESAG) to review market rules, codes and regulations, to identify obstacles to fair competition for energy storage in the delivery of services and mitigating solutions

Energy sector participants are concerned about a lack of preparation for emerging technologies in Ontario's electricity sector

- Polling of >100 participants at June 2018 IESO Summit indicated that the **majority feel that not enough** is being done to prepare Ontario's electricity system for large-scale DER deployment

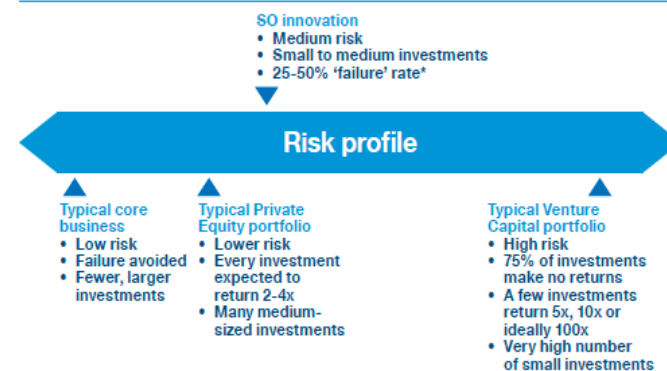
What is IESO's role in electricity system and sector innovation?

- Identify, understand and remove barriers to emerging technologies, new business models and increased competition in the electricity sector in areas within IESO's scope of accountability to support the stabilization of electricity system costs and enhanced system reliability
- Identify, understand, evaluate – and where appropriate – deploy innovative solutions to the ways in which IESO does business in order to improve efficiency, effectiveness and overall value for ratepayers
- Understand and prepare for emerging opportunities/challenges to the electricity system in order to avoid delays in realizing the potential benefits of these changes or mitigating any potential negative impacts

The modernization of Ontario's electricity sector is not "business as usual" – it requires resources, commitment and trade-offs

- IESO is working in partnership with the private sector and others to understand emerging technologies, new business models and potential changes to the way consumers use/demand/produce electricity in order to prepare the market, system and IESO operations for the onset of these changes
 - By understanding emerging solutions, we can prepare for their participation in IESO markets and avoid delays in realizing the cost and technical benefits that these solutions may bring
 - The roadmap will help prioritize and focus IESO's efforts
- Understanding and preparing for change requires dedicated resources, partnerships and a willingness to take on some risk
 - IESO up to \$9.5M/yr to fund research & development through Conservation Fund (funded 200+ projects since 2005; leveraged >\$100M of partner funding for \$50M ratepayer funding)
 - UK National Grid System Operator (UKSO) has a \$44M/yr R&D budget states that they expect between **25-50%** of their innovation projects and investment to fail (see Appendix A)
 - Failures offer learning opportunities/avoid larger bad investments
- IESO will seek to increase its leverage of partnerships for learning opportunities, resources and shared risk
 - Seek other funding (e.g. federal government, foundations, private)
 - IESO can offer expertise, data, advice, project ideas to partners

Figure 1. UKSO Innovation Fund Investment Risk Profile Compared to Private Investors

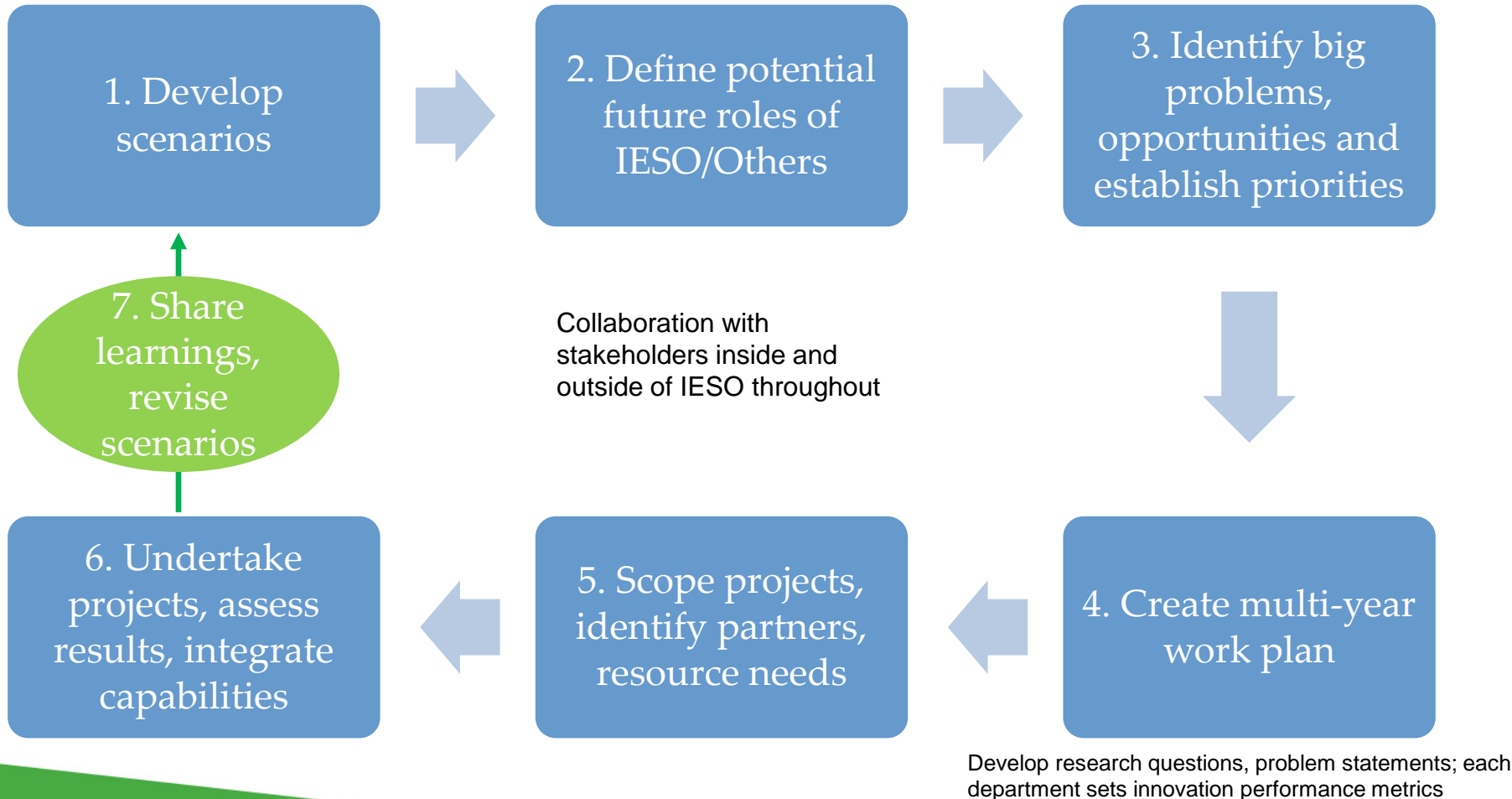


What is the Innovation Roadmap?

- The roadmap will:
 - Establish a definition of innovation to guide IESO's work
 - Facilitate an internal and external dialogue of potential future **scenarios** for the electricity and broader energy sector in Ontario including **roles** of various organizations in those scenarios and how emerging social, economic, political and environmental trends and issues may impact future state(s)
- The roadmap itself will:
 - Set innovation **priorities** beginning with a determination of the key existing and emerging challenges facing IESO and the broader electricity sector
 - Create a multi-year work plan to **focus** and **coordinate** IESO and sector efforts around a **shared set of goals** for research and development including related emerging technologies, consumer trends, business models/practices, and policy alternatives in support of electricity system/grid modernization
 - Establish a plan to identify, assess, prioritize and address opportunities and barriers to innovation by the private sector and others to address the challenges facing the electricity sector and barriers to innovation within the IESO
 - Identify/align multiple work streams towards a shared set of innovation goals
 - Include annual performance/success metrics to track progress

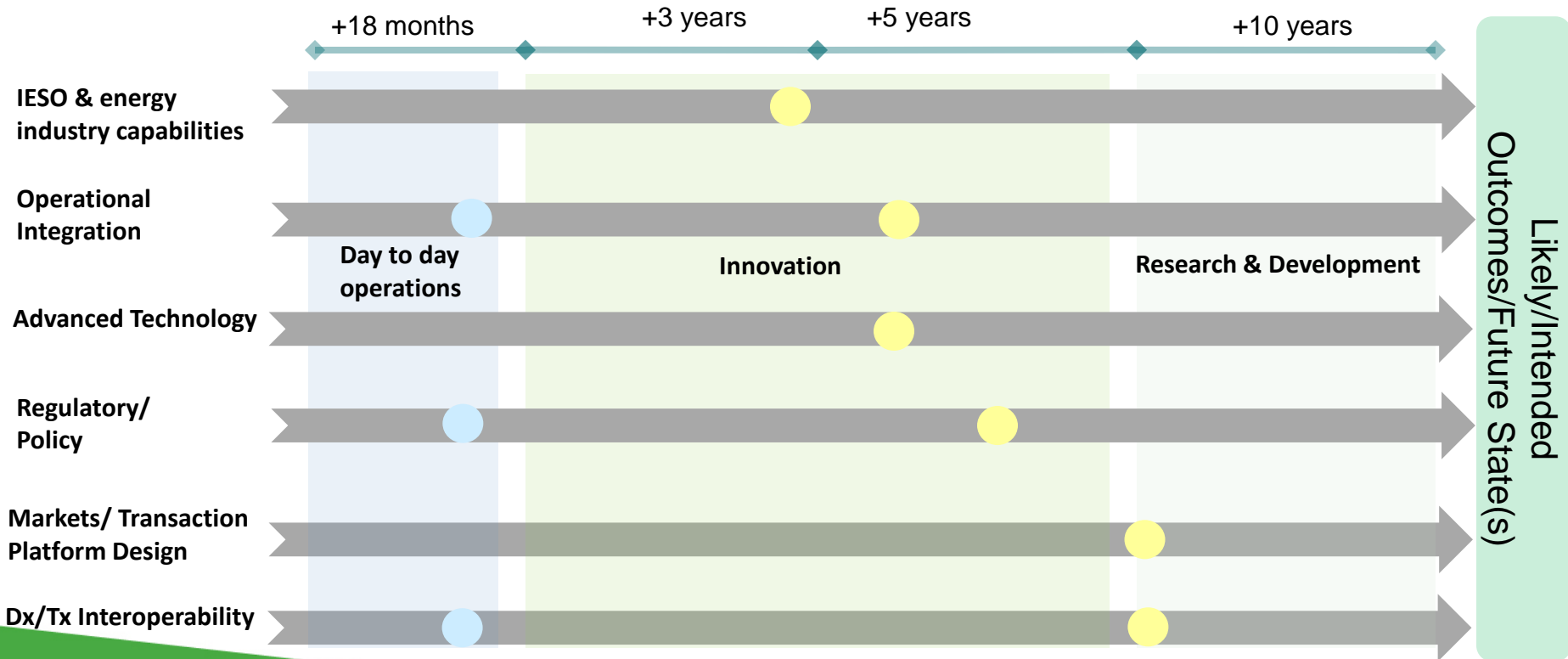
Approach to development and implementation of the Innovation Roadmap

Determine likeliness/desirability of each scenario from multiple perspectives



Innovation Roadmap & Work Plan Concept

- Work streams for different areas of IESO business
- All work streams coordinated within roadmap and focused on supporting intended future state and roles of IESO/others
- Priorities supported across work streams (e.g. DER, storage, data access)
- Outputs: Innovation roadmap/workplan; partnerships plan; communications plan
- Identify trade-offs that must be made as issues/projects are prioritized



E.g. potential priorities (illustrative only):

Enhancing visibility of DER ●

Understanding DSOs ●

Innovation: Engagement and Partnership Throughout the Process

1. Develop scenarios

- IESO, Energy Transformation Network of Ontario (ENTO), IESO Stakeholder Advisory Committee (SAC)

2. Define potential future roles of various electricity system entities

- IESO, ETNO, SAC

3. Identify big problems/opportunities and establish priorities

- IESO, SAC, other stakeholders/parties

4. Create multi-year work plan

- IESO, SAC, other stakeholders/parties

5. Scope projects, identify partners, resource needs

- IESO, SAC, other stakeholders/parties

6. Undertake projects, assess results, integrate capabilities

- IESO, Project Partners

Next steps & timelines

- Initiate work plan development (Sept. 2018)
- Engage IESO Stakeholder Advisory Committee (SAC) and others in roadmap development (Fall 2018)
- Review roadmap/workplan with IESO Board (December 2018)

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Appendix A: Example System Operator Approach to Innovation: UK National Grid System Operator (“UKSO”) Innovation Strategy

- First UKSO innovation strategy created in 2018
- UKSO takes various forms of involvement in innovation projects:
 1. Direct funding – primary sources:
 - OFGEM’s Network Innovation Allowance (NIA) - \$10 million/yr; for earlier-stage R&D/demonstration
 - OFGEM’s Network Innovation Competition (NIC) - ~ \$34 million/yr annual competition open Network Licensees; larger-scale projects
 2. Provide time, expertise, data, offering problems for third parties to solve
 3. Support 3rd parties’ bids for grant funding (include commitments to offer time, data, expertise)
- Note: IESO is currently participating in learning partnership with UKSO set up by Natural Resources Canada (NRCan)

UKSO Innovation Priorities and associated investment and effort levels

