Policy Foresight and Energy Transition

University of Ottawa

POSITIVE ENERGY – Trust in Transition

January 24, 2018

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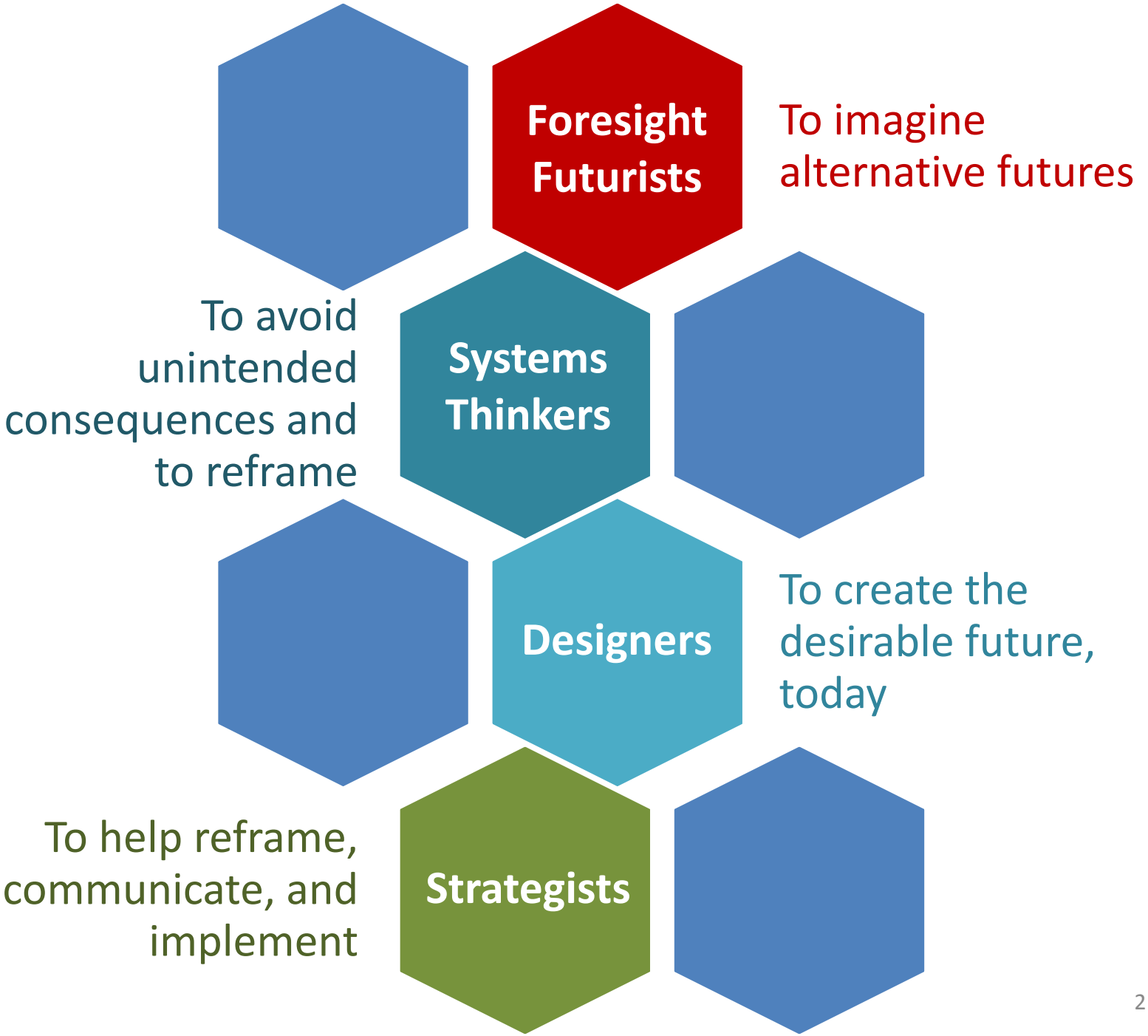
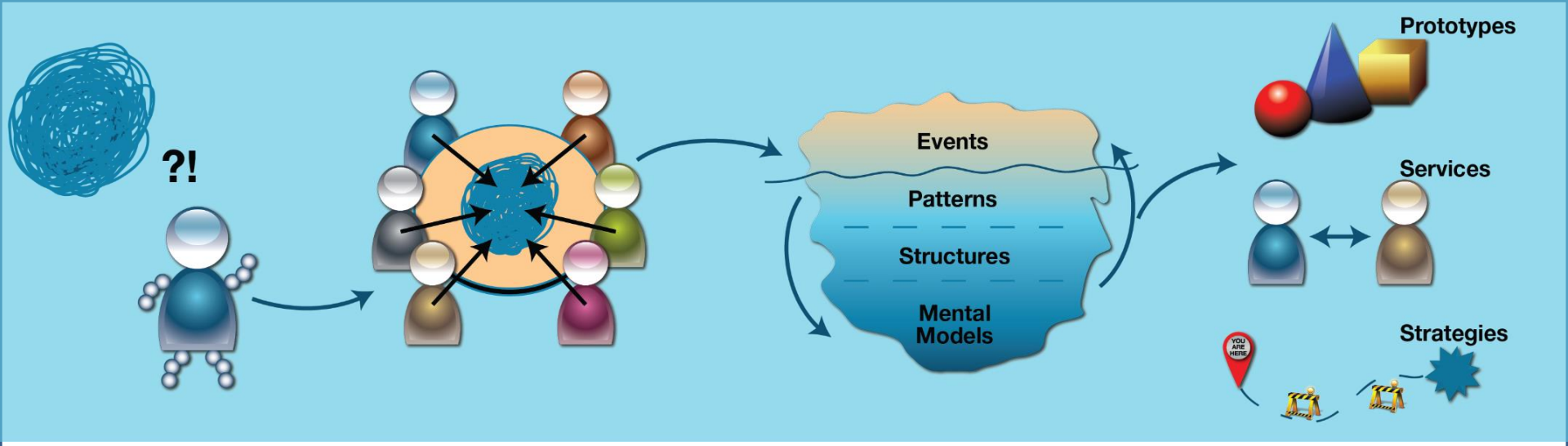
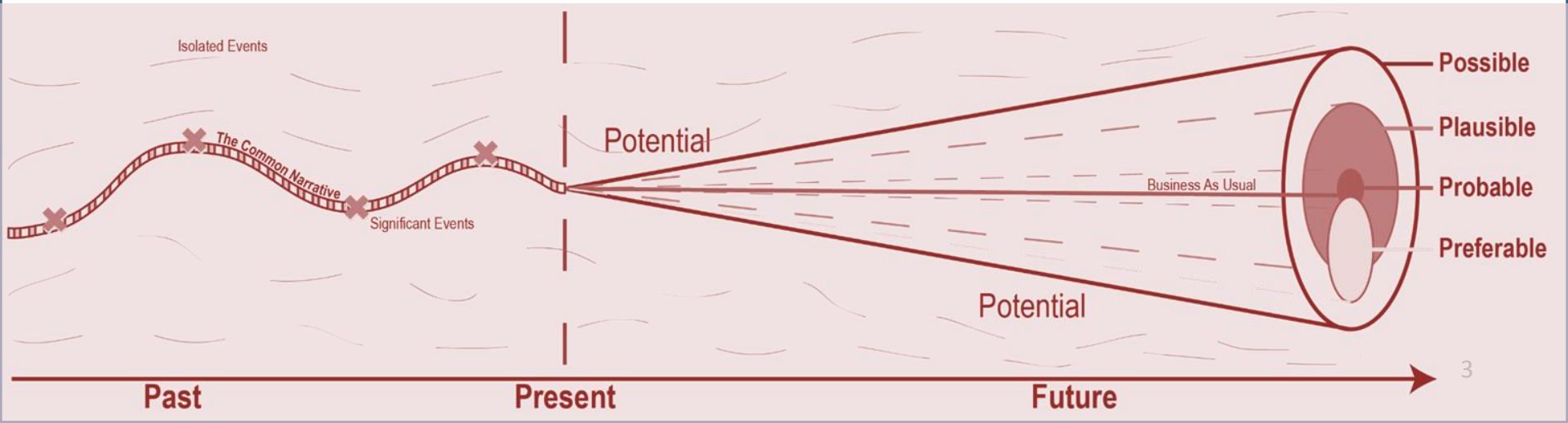
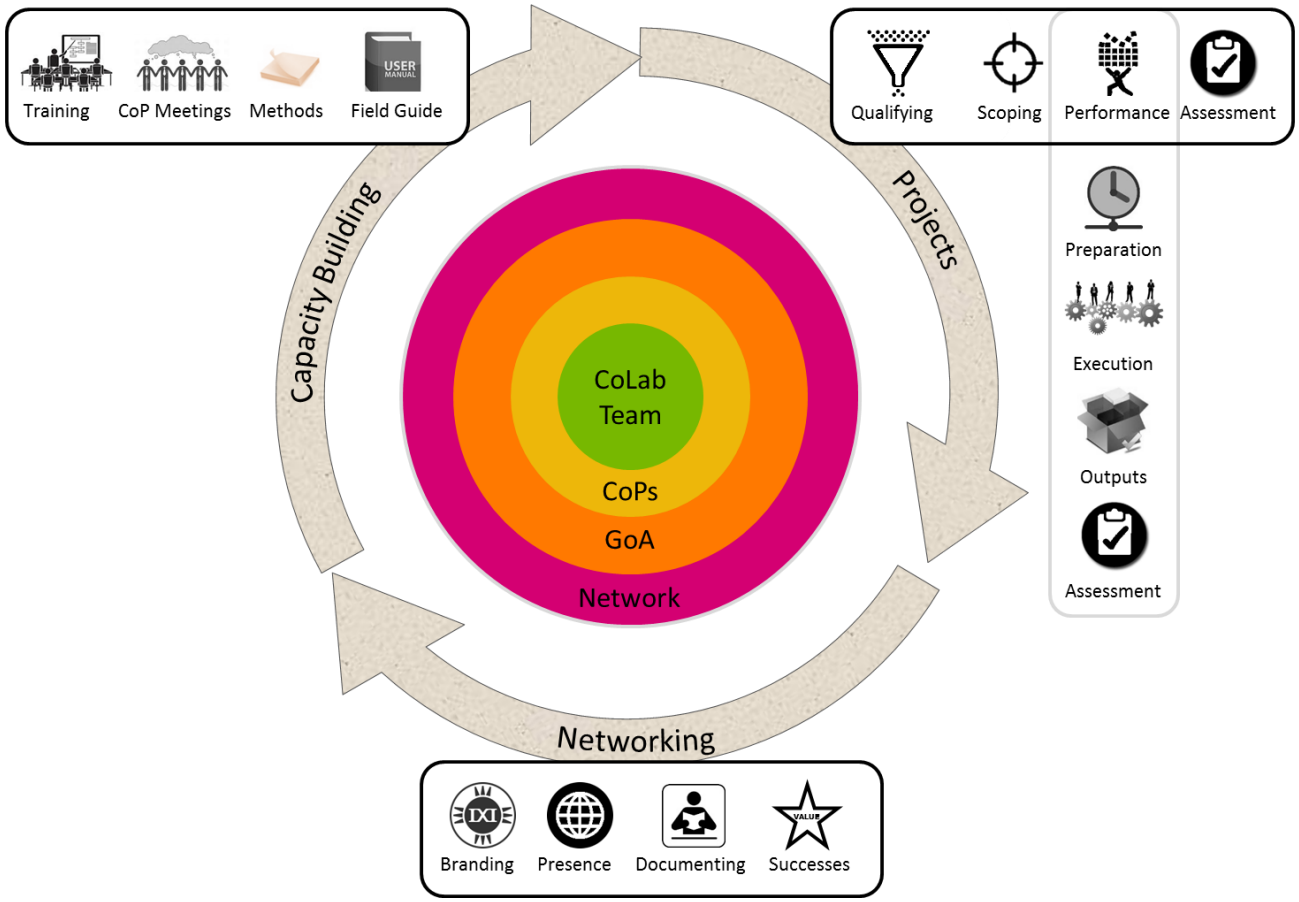

Foresight
Futurists
To imagine alternative futures
To avoid unintended consequences and to reframe
Systems Thinkers
Designers
To create the desirable future, today
To help reframe, communicate, and implement
Strategists



Systemic Design & Strategic Foresight

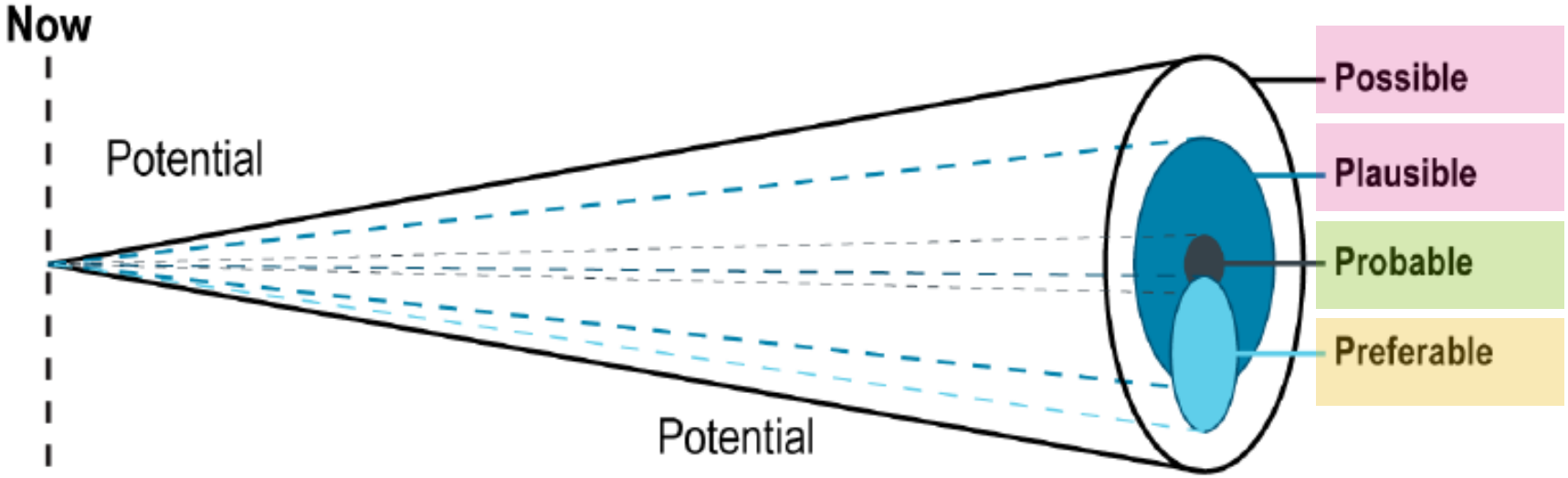


Three streams of work



Strategic Foresight

The Cone of Plausibility

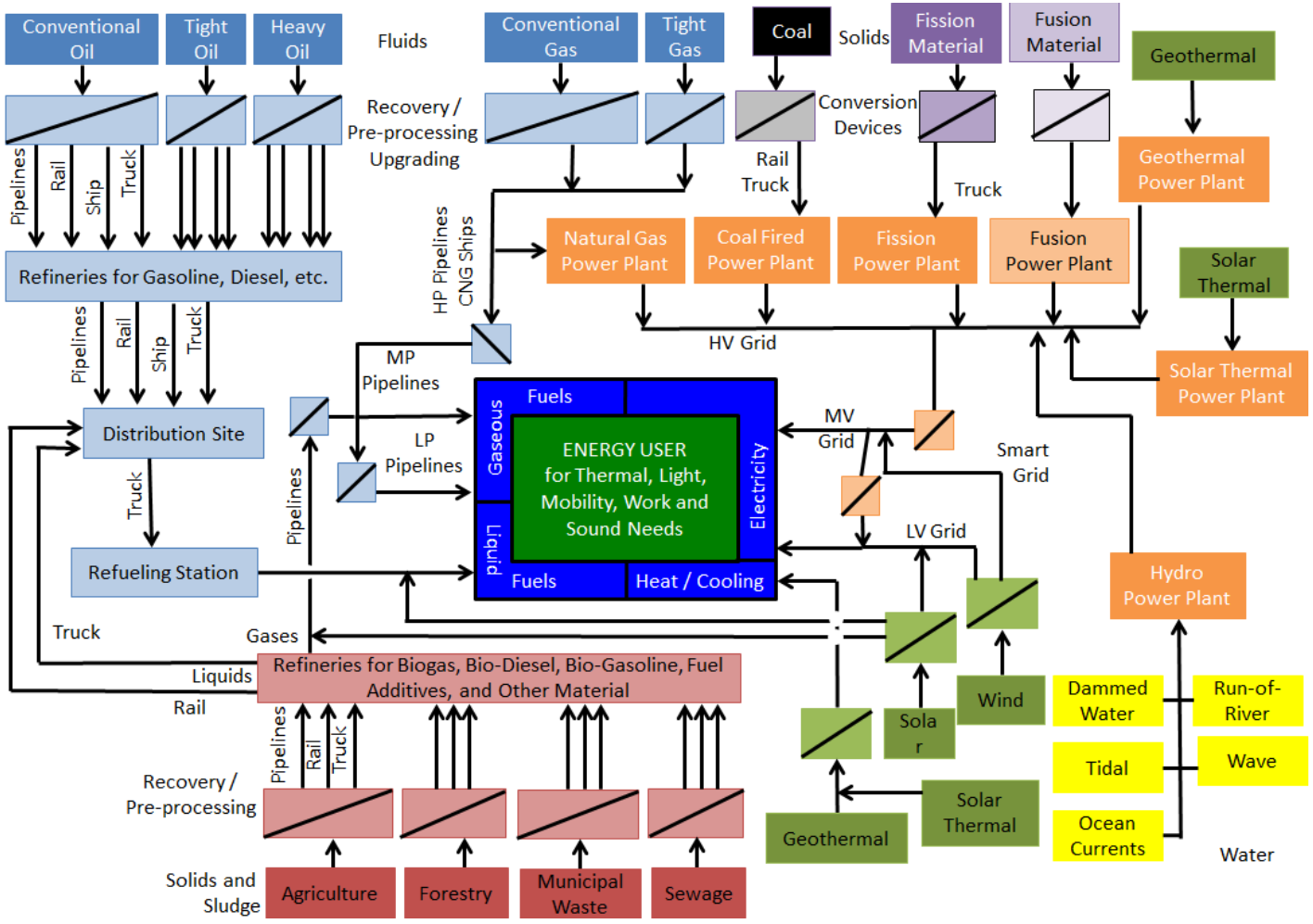


EXPLORATORY: what *might* or *could* be

PREDICTIVE: what is *likely* to be (business as usual - BAU)

NORMATIVE: what *ought* to be

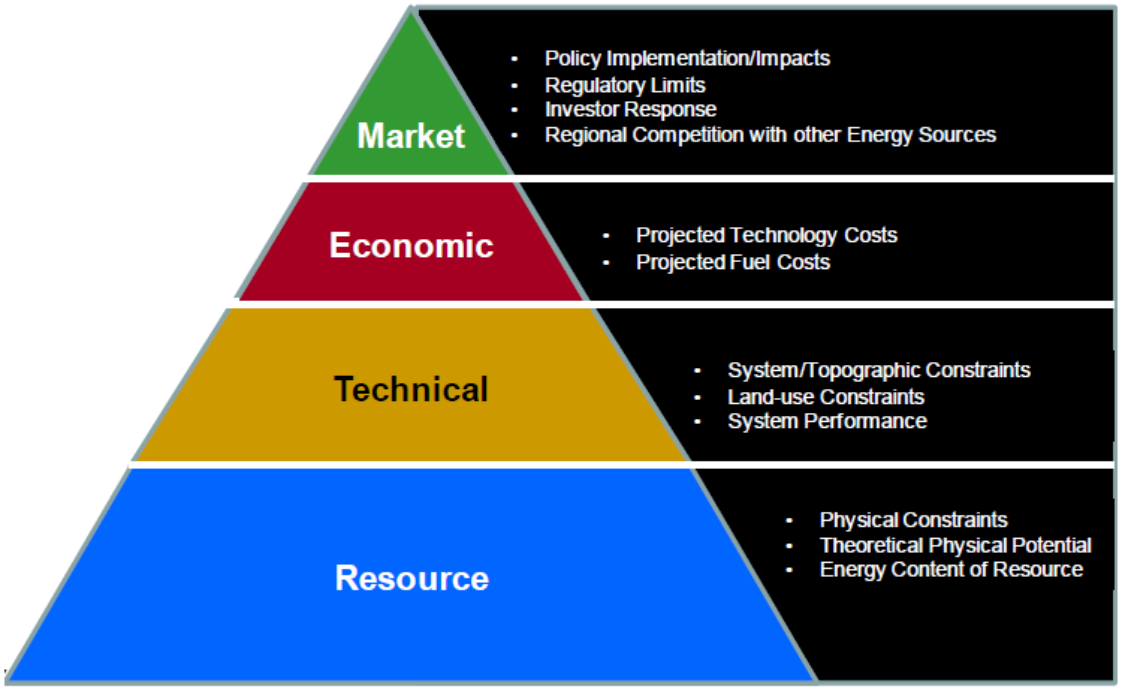
A Techno-economic Approach…



Source: Future Energy Systems Research Institute (FESRI)

A "**Techno-Economic Assessment**" approach in ensuring linkages with emerging energy transition priorities

Getting the right Information…



Source: Modified from National Renewable Energy Laboratory (NREL), 2012

Methodology:

I) **Technical** Feasibility
II) **Commercial** Feasibility
III) **Emissions** Feasibility

Sample Metrics

I. Relevance
II. Scope
III. Severity
IV. Impact
V. Probability
VI. Timing
VII. Visibility

US EPA

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Technology Reviews

Speed, scope, and economic value at stake of 4 potentially economically disruptive energy technologies

	Illustrative rates of technology improvement and diffusion	Illustrative groups, products, and resources that could be impacted[1]	Illustrative pools of economic value that could be impacted[1]
 **Autonomous and near-autonomous vehicles**	**7** Miles driven by top-performing driverless car in 2004 DARPA Grand Challenge along a 150-mile route **1,540** Miles cumulatively driven by cars competing in 2005 Grand Challenge **300,000+** Miles driven by Google's autonomous cars with only 1 accident (which was human-caused)	**1 billion** Cars and trucks globally **450,000** Civilian, military, and general aviation aircraft in the world	**$4 trillion** Automobile industry revenue **$155 billion** Revenue from sales of civilian, military, and general aviation aircraft
 **Energy storage**	**40%** Price decline for a lithium-ion battery pack in an electric vehicle since 2009	**1 billion** Cars and trucks globally **1.2 billion** People without access to electricity	**$2.5 trillion** Revenue from global consumption of gasoline and diesel **$100 billion** Estimated value of electricity for households currently without access
 **Advanced oil and gas exploration and recovery**	**3x** Increase in efficiency of US gas wells, 2007–11 **2x** Increase in efficiency of US oil wells, 2007–11	**22 billion** Barrels of oil equivalent in natural gas produced globally **30 billion** Barrels of crude oil produced globally	**$800 billion** Revenue from global sales of natural gas **$3.4 trillion** Revenue from global sales of crude oil
 **Renewable energy**	**85%** Lower price for a solar photovoltaic cell per watt since 2000 **19x** Growth in solar photovoltaic and wind generation capacity since 2000	**21,000 TWh** Annual global electricity consumption **13 billion tons** Annual CO_2 emissions from electricity generation, more than from all cars, trucks, and planes	**$3.5 trillion** Value of global electricity consumption **$80 billion** Value of global carbon market transactions

Source: Modified from www.mckinsey.com (2016)

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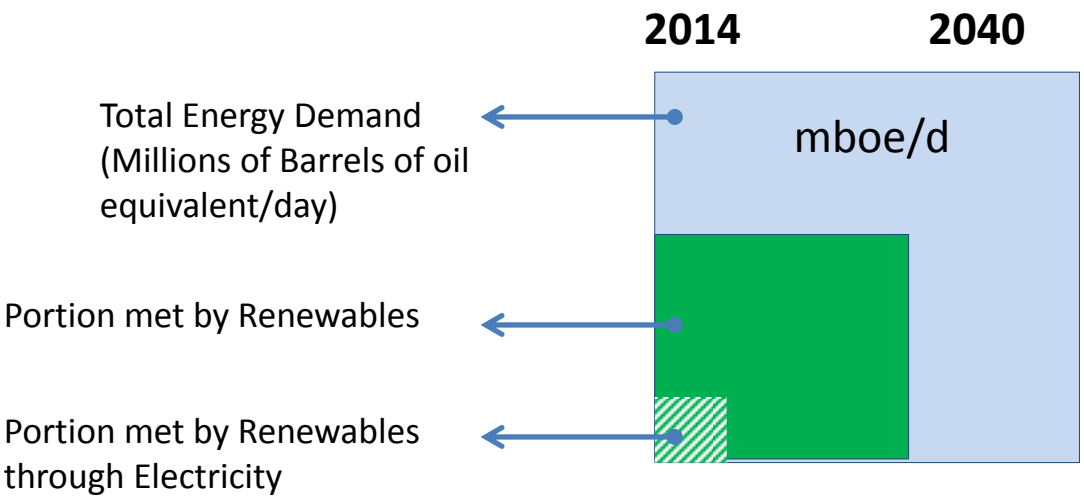
Alternative Energy Futures

Sustainable Mobility

BAU

Disruptive



Areas of Impact

- **Enhanced Engagement**
- **Enhanced Options Development for Decision-Makers**
- **Capacity Building within the Public Service**
- **Integration across the Energy System**

CoLab Engagement