

Energy Research Development and Commercialization (RDC)

Capacity to Deliver

Presentation by John R. McDougall

to ASRA Board Retreat

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Capacity Issues

- Need
- Focus
- Leadership and Mandate
 - Scale
 - Balance

Key Questions

- What are Alberta's needs?
- What technology will fill those needs?
- Who are the global leaders now?
- Where does Alberta stand today?
- What should we build for the future?
- What will bring industry and other supporters to the table?

Status Report

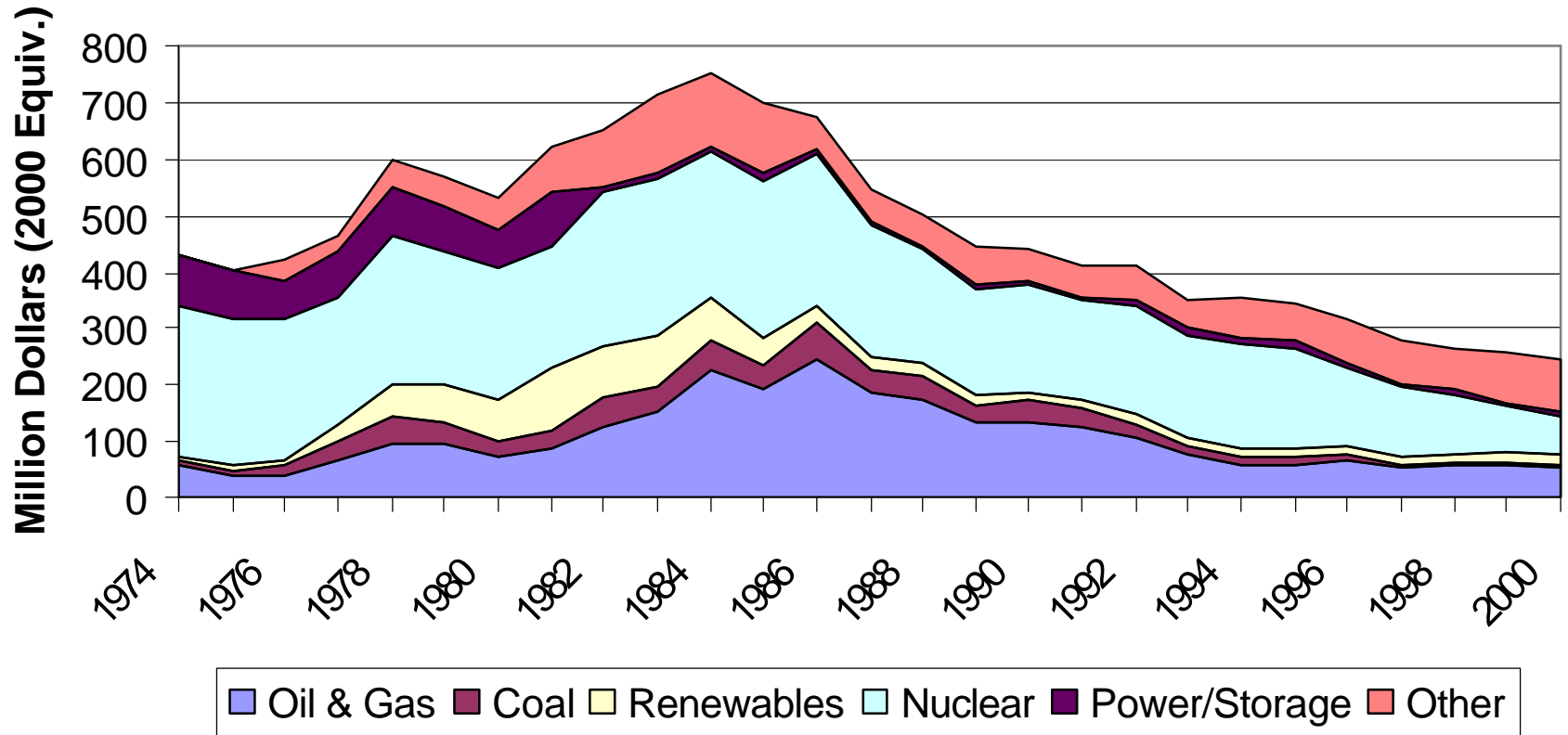
- Conceptual needs identified and accepted
 - Caucus accepted clean energy concept
 - Environment endorsed initial plan – included it in Kyoto response
- Multi-stakeholder initiative underway to develop detailed RDC plan
- But at ASRA we are stuck in “re-runs”
 - appear to be marking time, not moving ahead

Situational Analysis

- \$16.4 B Canadian R&D overall (2001)
- Feds spend \$168 M/year on hydrocarbons
- \$100 m+/year of energy R&D leaks from Canada
- Alberta energy spend ~\$200 m/yr
- Canadian capacity to support clean energy development is weak – *BP assessment*
- Support for Alberta energy RDC declining
- Industry labs cutting back, shutting down

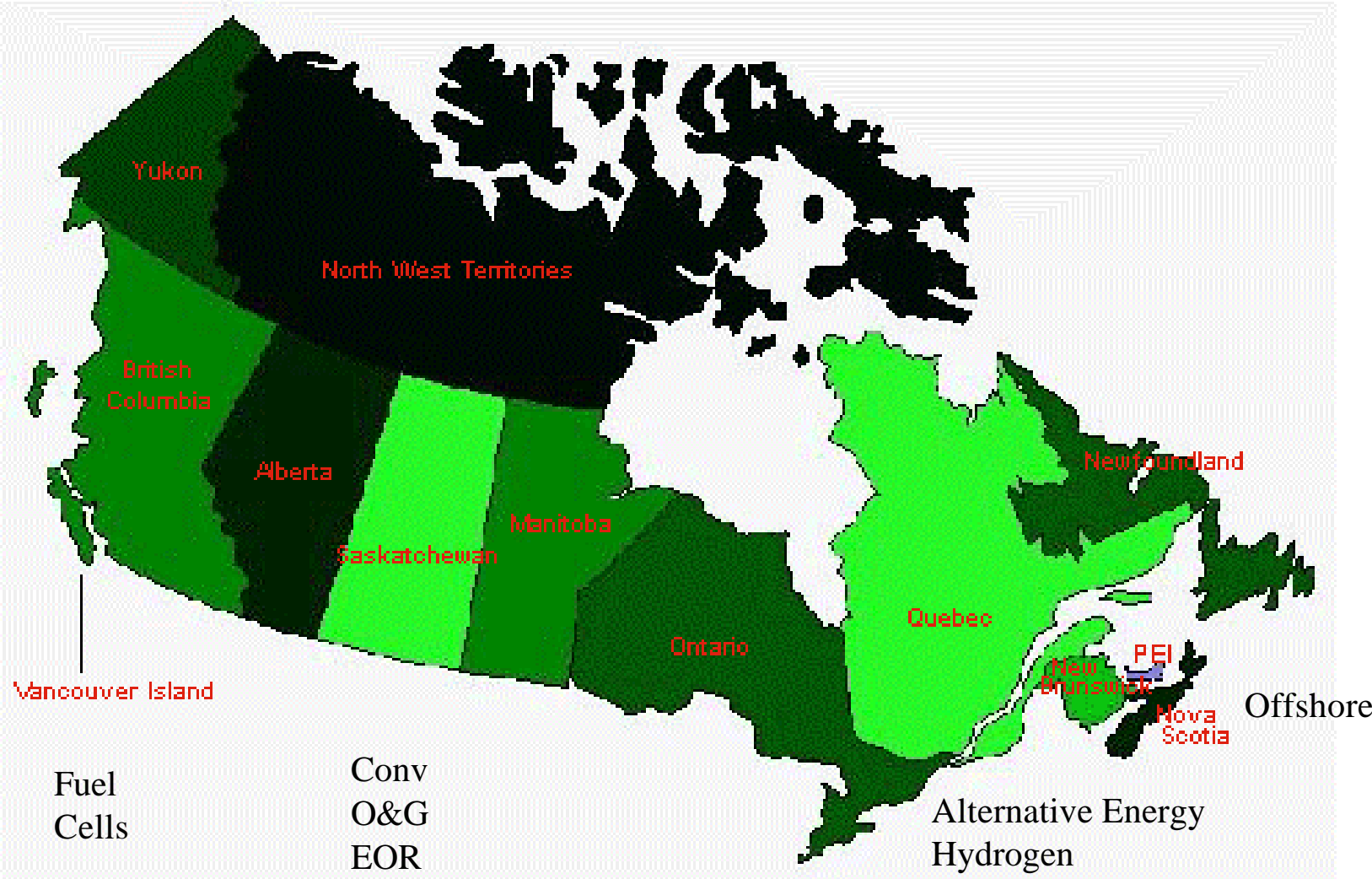
Canadian Energy R&D Funding

(IEA Statistics, 2000)



Canadian Energy RDC Centres

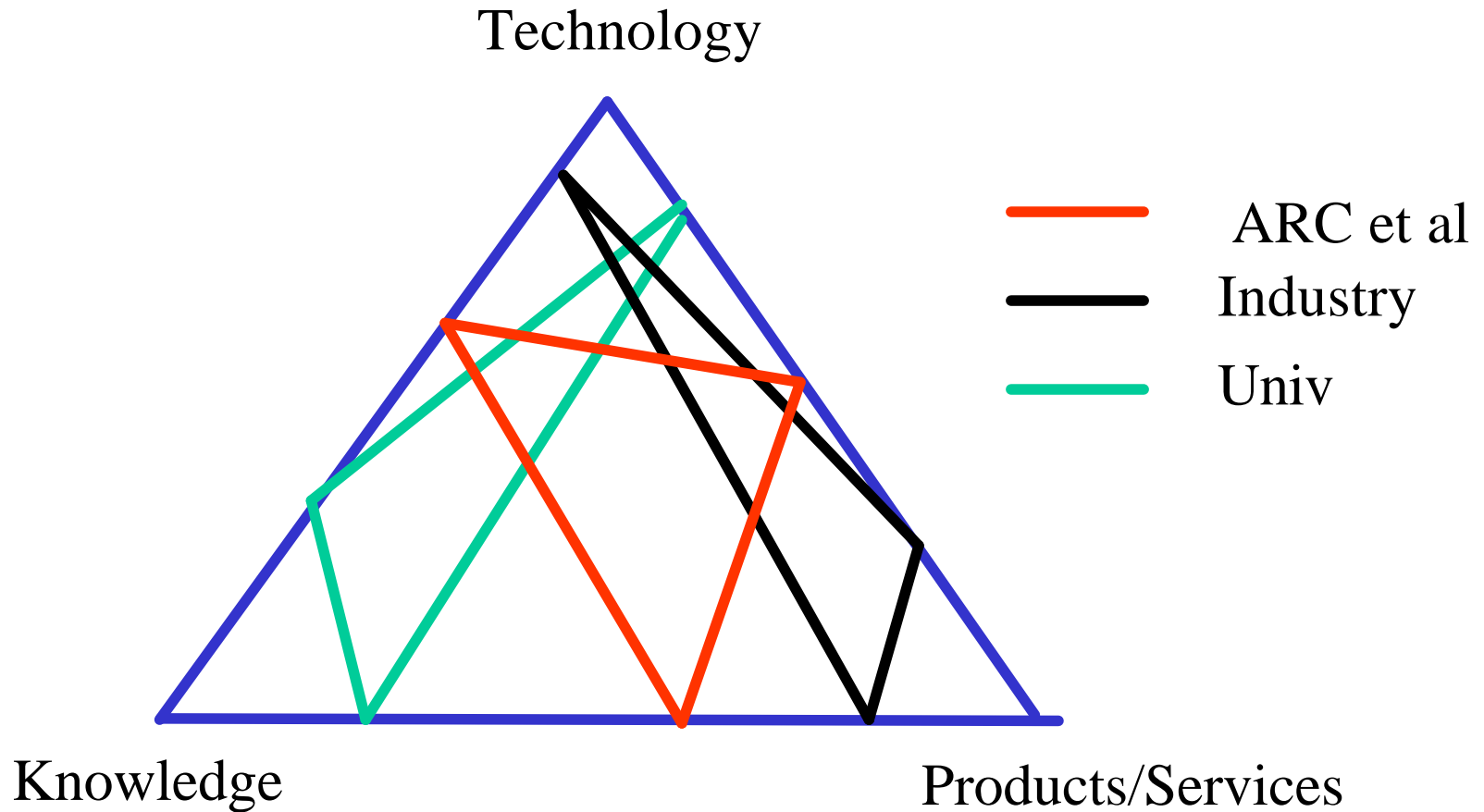
excluding Alberta



How RDC is Funded

Performer	Funder
University	Federal (NSERC, CFI), Provincial (Learning, ASRA, Ingenuity), Industry
NCE's	NSERC, CFI, Provincial, Industry
NRC	Federal
Federal Labs	Federal, industry
PRO's	Province, Govt Depts, Industry
Industry Labs	Industry, government

Alberta RDC Structure



University/Govt RDC in Alberta

~ \$60 m, 850 people

- UA (catalytics, fluid dynamics, mining)
- UC (hydrates, hydrogen, geophysical, processing)
- ARC (carbon, heavy oil, oil sands, pipeline, fuels, climate change)
- NRCan (catalysis, separation)
- NRC – IRAP (fuel cells)

Corporate RDC in Alberta

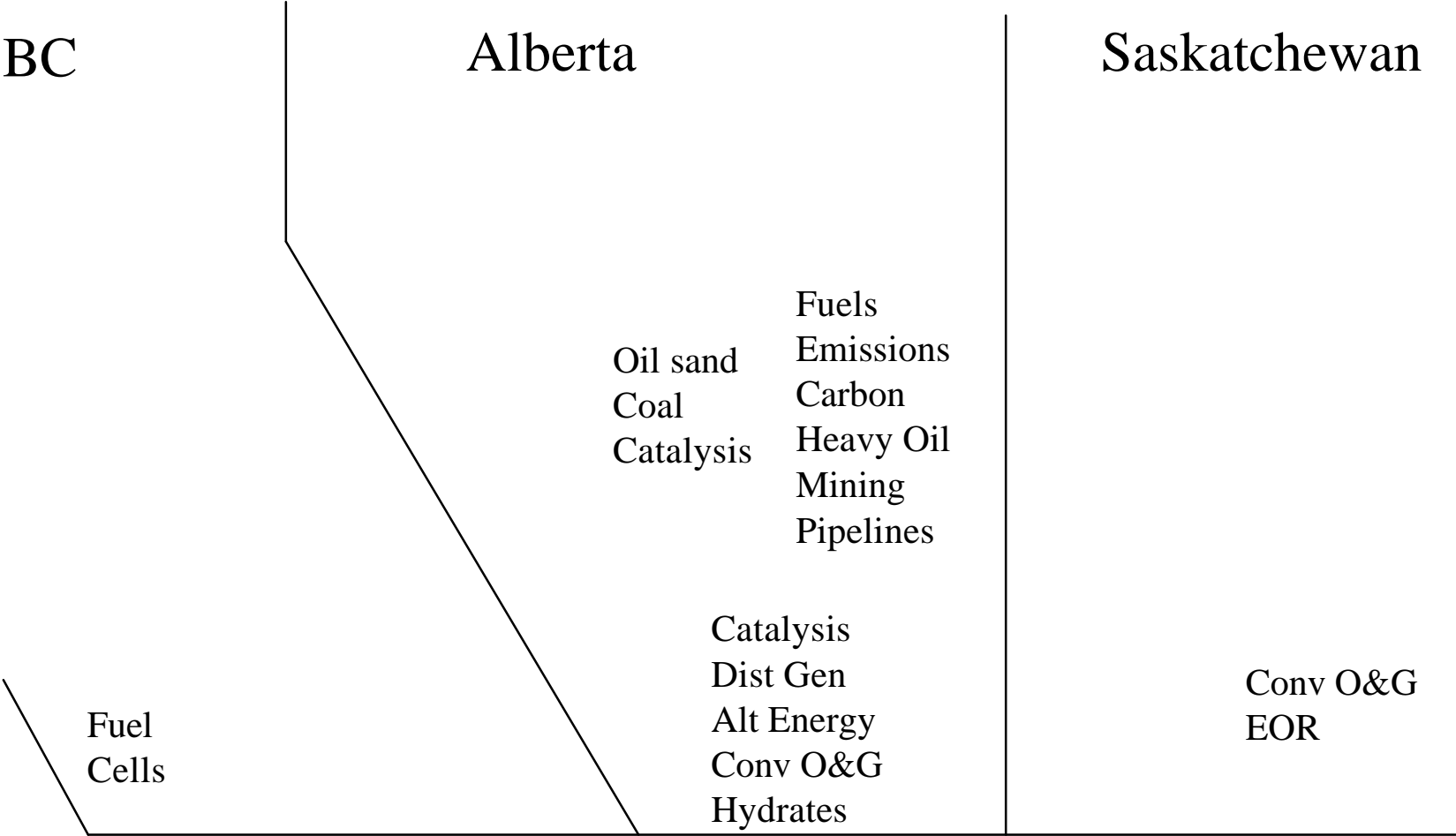
\$160-180m including contracted R&D expenditures, 1000+ people

- Nova Chemicals (reactors/catalysis)
- Syncrude (oil sands)
- Encana (EOR)
- TransCanada (flow)
- PetroCanada
- DBR (fluid behaviour)
- Imperial Oil (includes Sarnia)
- Shell

Alberta RDC Capability Matrix

Research Area	Global Leaders	Alberta Players					
		UA	UC	ARC	NRCan	NRC	Other
Oil Sands	Alberta	++		+++	+++		++
Heavy Oil		+	+	+++	+		+
Coal	Europe, US, Aust	++		+	+++		
Power	US, Europe, Japan				****		
Conv O&G	US, North Sea, Latin America	+	+	+			+
Hydrates	US, Canada, Japan		++		***		**
Carbon Mgmt	Alberta , Norway, Aust			**			
Pipelines	UK, US, CFER			++	+		
Fuel Cells	BC, Germany, US, Ont	+	+	+	+	***	**
Distrib Generation	Europe		+	+	+		+
21 st Century Fuels	Europe, Asia	+		+			
Environment	Europe, Canada, US	+	+	+		+	+

Energy RDC Clusters



Preliminary Conclusions

- Scope and Scale Challenges
 - Lack of depth – many 1 person programs
 - Fragmentation – do a little everywhere
 - Duplication
- Visible and credible champion(s) needed
- Support requires a tangible plan with clear focus, outcomes, milestones and costs
- Reacting to CFI has consumed available resources
 - Creating excellence not necessarily useful application
- Building capacity requires staying power

What do do about it

- Select where to play
- Where does a practical and realistic future lie?
 - Get beyond thin and precarious capabilities of today to depth and strength tomorrow
- Challenge will be attracting people and creating facilities
 - paying the price for people
 - funding priority infrastructure

Capacity to Deliver - Issues

- What will bring industry to the table?
 - Leadership
 - Results Focus – measurable goals and milestones
 - Scope and scale – impact
 - Integration – networks, work space
 - Investing wisely – break down silos and fiefdoms
 - Staying power – long term commitment
- Build on prior success
 - Oil Sands, Tailings program, AACI, PTAC, CONRAD

Energy RDC Goals

- Establish Alberta as a world leader in clean energy research.
- Position Alberta as a major player in carbon, hydrogen and nitrogen management
- Develop leading edge environmentally friendly technology to exploit Alberta's energy resources

RDC Program Concept

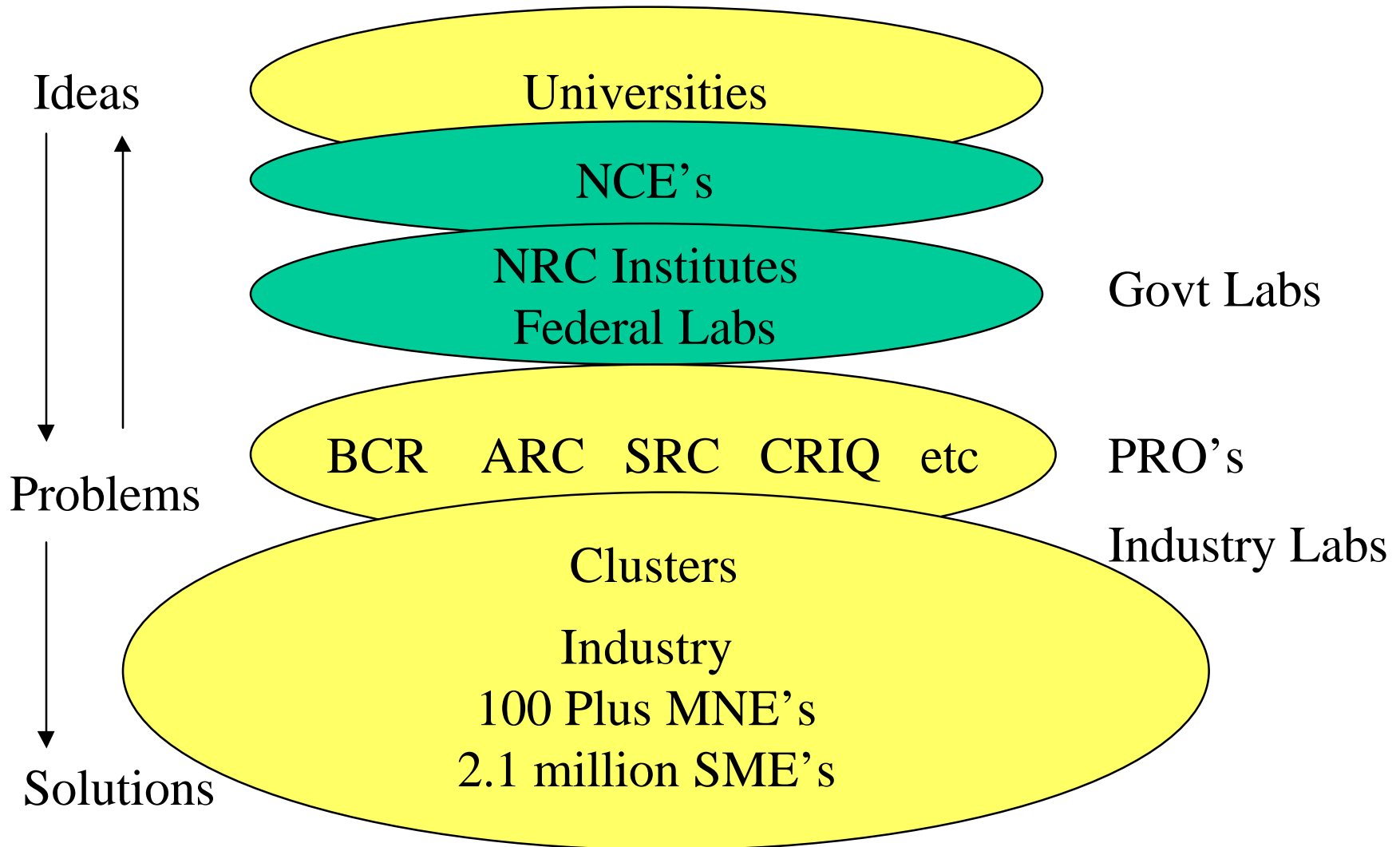
Program	Focus	Status	Action
Oil Sands	Production – low energy, high efficiency. Upgrading Water Tailings	World class	Expand in-situ Maintain mining Expand upgrading Launch tailings initiative
Conv O&G	EOR processes	Substantial	Minor Player with SRC to lead
Coal	Clean coal – combustion, separation, emission control, gasification	Largely Absent	Maintain Mining Build presence in new areas
Integrated Energy Systems	Hydrogen and Carbon management	Weak	Become Leader
Carbon Management	Coal Bed Methane	World Class but shallow	Strengthen leadership, build added depth
Policy and Economics	Regulatory and economic framework	Emerging	Strengthen and build added depth
Environment	Cumulative effects, integrated landscape management, water	Emerging	Maintain capacity Build IRM program
Power	Generation and Transmission	Minor	Watching brief

Program Implications

- What a program costs depends on the level at which one plays:
 - Major player → \$30-50 m/yr
 - Minor player → \$5-10 m/yr
 - Watching brief → \$1-5 m/yr

A New Innovation Structure

Integrated Collaborative Centres of Innovation



Measures of Success

- Research program integration
- Public commitment – 1/3, 1/3, 1/3 funding model
- Industry support and buy-in
- Tangible projects – field pilots, working scale demonstrations, supply chain development
- Milestones – timely and sustained actions
- World class recognition
 - Technology product and service exports including RDC

Recommendations

- Leadership – name a champion, build a team
- Target Scope and Scale
 - Integrated programs that build on strengths
- Endorse the Plan
- Infrastructure Capacity and Build-up
 - Strengthen innovation - Centres of Innovation
 - Foster Excellence - Networks and collaboration
- Funding Mechanism
 - Gasoline levy? Portion of GST collected on energy consumption? Production levy?
- Staying Power – multi-year commitment
 - Long term challenges – impacts occur in 8 years plus