



Commercialization of Green Chemicals

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The Size of the Prize

Green H₂S Scavenger



Biodegradable material

Replaces 8 million liters toxic chemicals used annually in DK alone

Halophilic Biocide



Replaces 4 million liters toxic chemicals used annually in DK alone

Green Corrosion Inhibitor

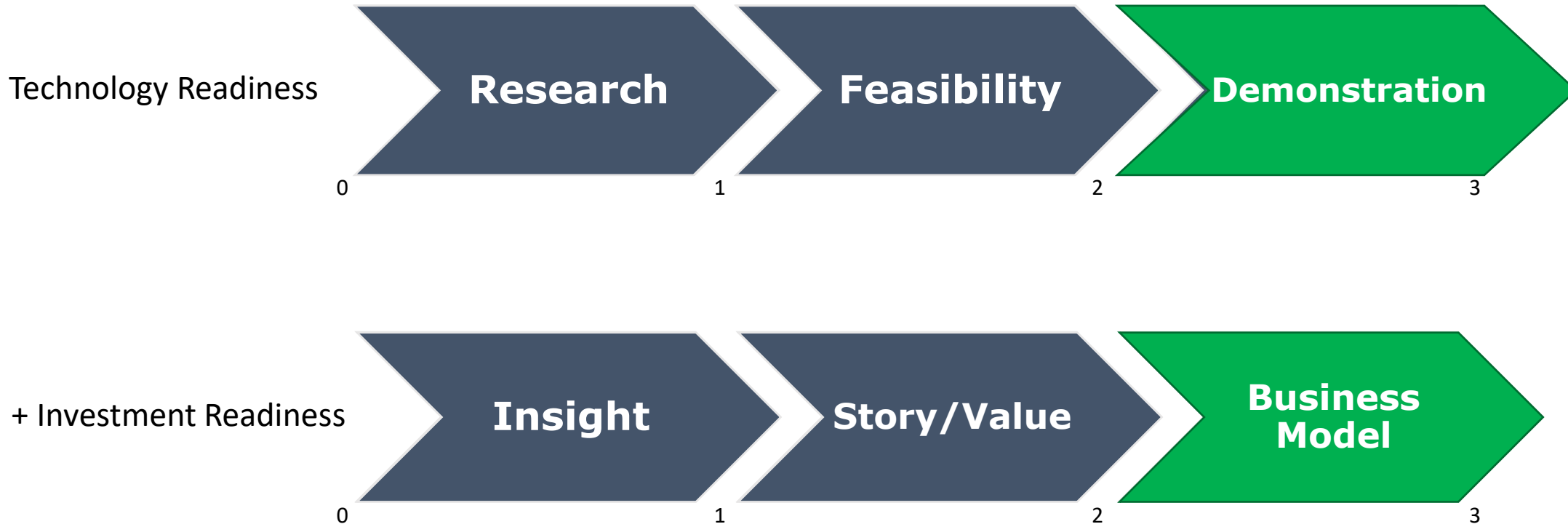


Replaces 3 million liters toxic chemicals used annually in DK alone

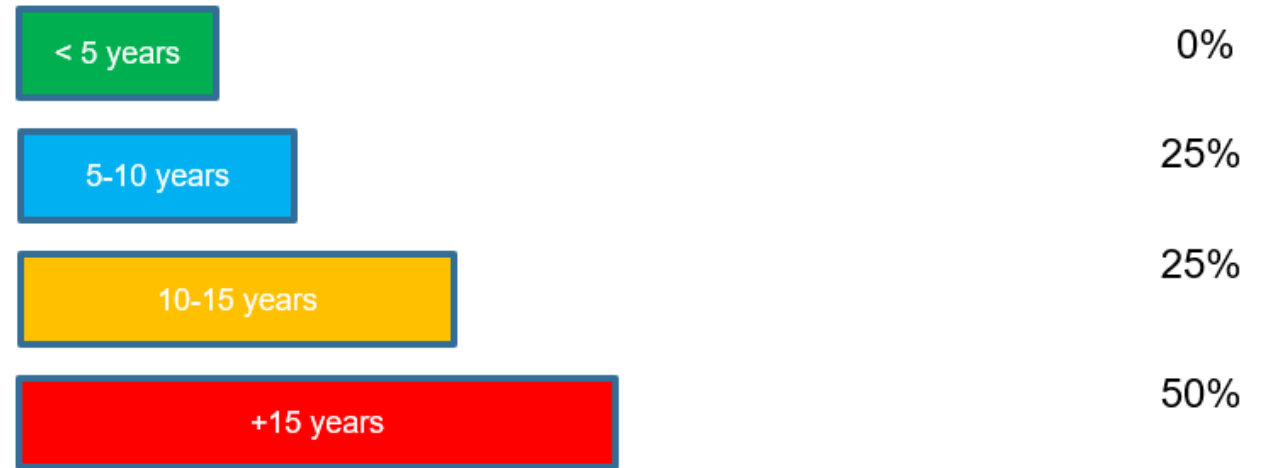
Commercialization Strategy:

Increase speed and probability of application

Application Readiness = **Commercialization**



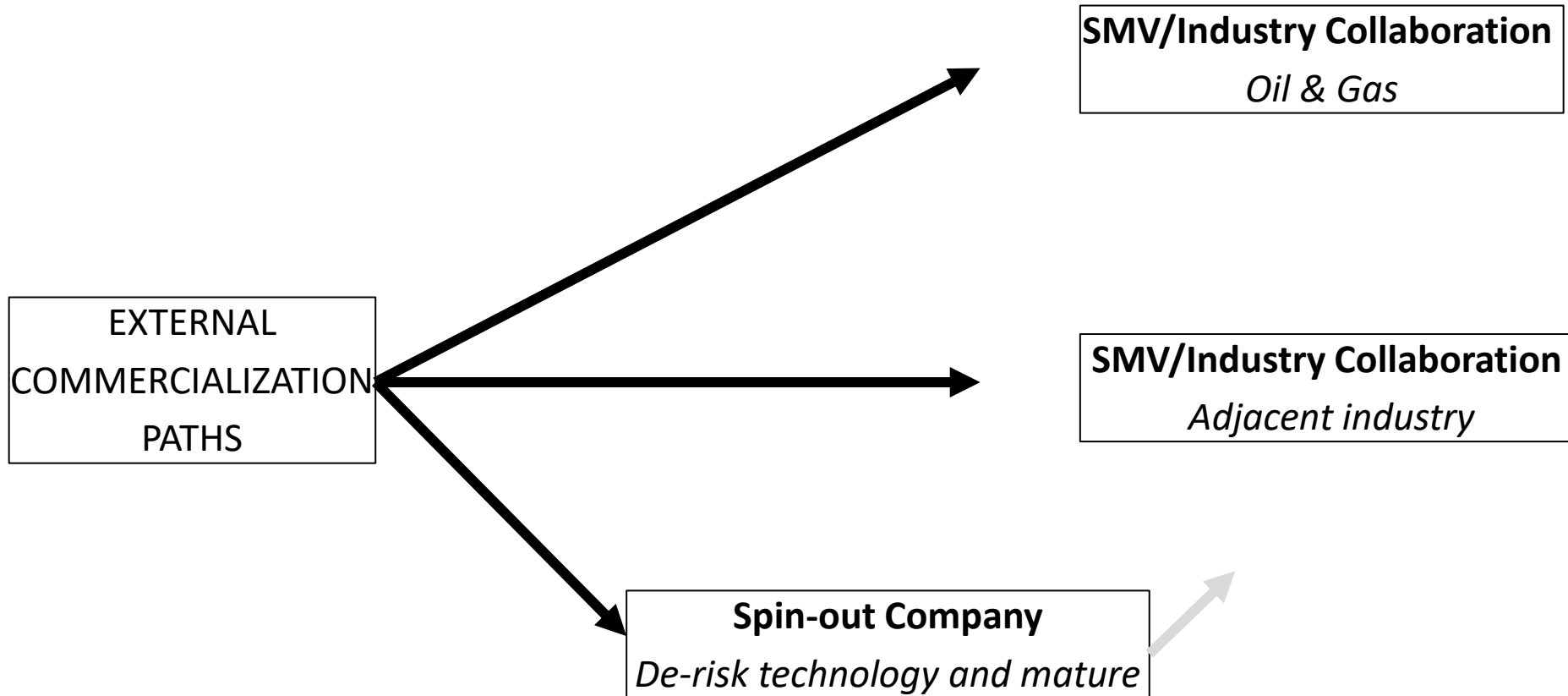
Long Term



* Source: Gross et al. 2018, How long does innovation and commercialisation in the energy sectors take? Energy Policy, Elsevier

Pharmaceutical industry – 15-17 years

Three Paths



Commercialization Steps



Ministry of Environment
of Denmark
Environmental
Protection Agency

Additives and Fuels Solutions

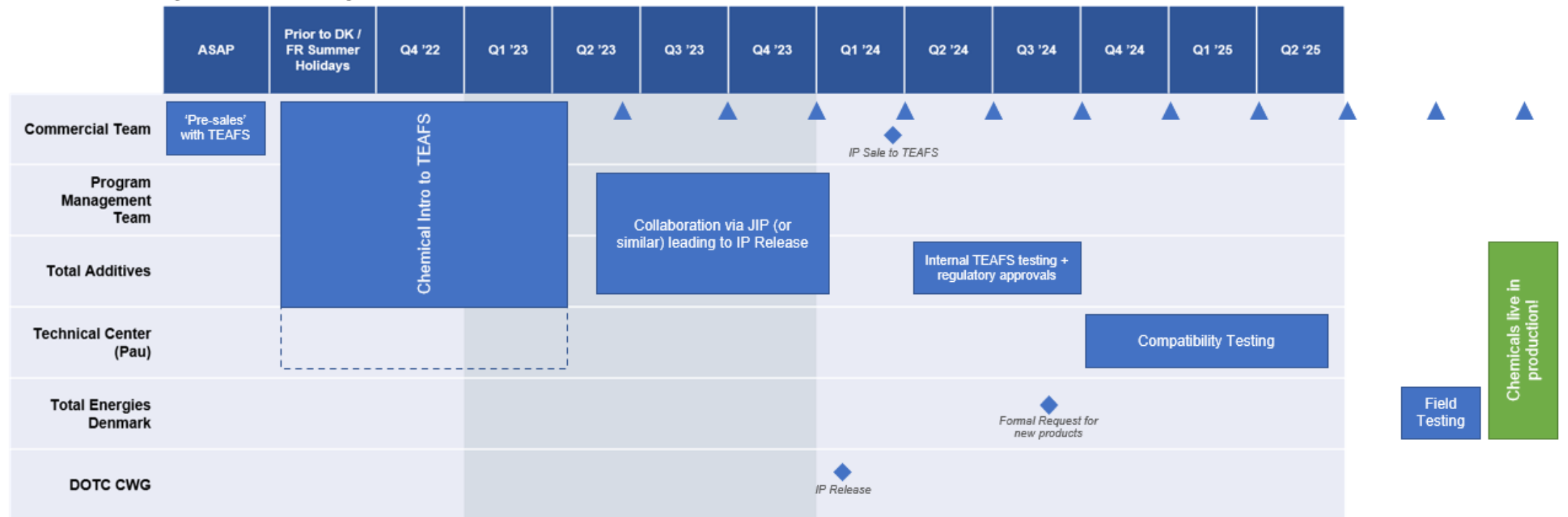


Green H2S Scavenger

Work Package	Task	Estimated time (weeks)	Planned completion date	Actual completion date
IP	Notice of invention draft	4	-	02-03-2022
	Novelty search	12	-	04-05-2022
	Determination of inventors	6	-	27-07-2022
	Patent application	12	15-03-2023	
	Inform DUC of NOI	1	24-01-2023	
	1st right of refusal invoked/relinquished	4		
	Negotiate IP rights	12		
Research	Application Workshop	1	27-09-2022	
	Stage gate 2	1	15-11-2022	
	Application Workshop	1	01-09-2023	
	Stage gate 3	1	01-10-2023	
Chemical Validation	Send chemical sample to TEAFS & TE Pau	1		
	Validate functionality	6		
	Validate EIF score	6		
Regulatory	EIF, ecotoxicity tests	6	01-11-2022	
	MSDS	1	08-12-2022	
	Certification and regulatory approval	6		
	Danish Governmental approvals	12		
Production	Synthesize industrial process	3		
Field trials	Reservoir fluid compatability testing	12		
	Steel compatability testing	12		
	Topside compatability testing	12		
	Refinery compaitibility testing	12		
	Full scale trial	3		

Timetable

Illustrative implementation plan



▲ Quarterly updates across Total Energies 'chemical network'; organized by Commercialization Team, but led by Programme Managers

Chemicals live in production!

Challenges



IP ownership



Internal industry chemistry validation

Does the chemistry work?

Does it mess up downstream process?



Production facilities



Pilot test