

R&D Need Prioritization Spreadsheet			GHG Criteria					Sustainability Criteria					Combined			
I.D.	R&D Need	Type of R&D	Timing	GHG Impact	Forecasting	Score	Rank GHG	Economic	Environment	Security	Score	Rank Sust	Variance	Rank Var	Score	Rank OA
A1.1	Impacts of Intentionally Producing Sand	Theory Development	8	8	1	17	11	1	6	1	8	1	-9	15	25	4
A1.4	Water Influx	Investigation	3	5	5	13	2	2	4	3	9	2	-4	29	22	2
B1.3	Transportation - Pipeline Gathering Systems	Motivation	5	4	6	15	8	5	1	3	9	3	-6	22	24	3
A1.2	Geomechanics in the Reservoir	Theory Development	8	8	3	19	12	2	6	1	9	4	-10	10	28	7
A1.8	Low Cost Routine Monitoring	Field Trials	8	10	9	27	28	5	4	2	11	5	-16	3	38	18
C3.4	Implementation to Realize Benefits	Motivation	10	9	10	29	30	3	5	3	11	6	-18	1	40	22
A2.1	Extend Low Energy Primary	Piloting	6	3	4	13	3	3	6	3	12	7	-1	40	25	5
B1.5	Fired Equipment Efficiencies	Field Trials	2	5	7	14	4	5	2	5	12	8	-2	36	26	6
B3.2	Assessment of Technologies in the Field	Field Trials	3	8	9	20	16	7	2	3	12	9	-8	19	32	10
A3.3	Coupled Geomechanics and Reservoir Simulation	Investigation	10	10	5	25	23	4	6	2	12	10	-13	6	37	16
B1.1	Collection and Utilization of Methane	Motivation	1	1	1	3	1	3	4	6	13	11	10	9	16	1
B2.1	Regional Water Management	Motivation	4	7	8	19	13	5	4	4	13	12	-6	23	32	11
A1.5	Sand Measurement in the Field	Field Trials	10	10	10	30	32	2	9	2	13	13	-17	2	43	26
A2.5	Follow-up Processes - Waterfloods and Chemicals	Piloting	6	4	6	16	9	4	6	4	14	14	-2	37	30	9
A2.3	Follow-up Processes - Solvents	Piloting	9	5	5	19	14	6	3	5	14	15	-5	25	33	12
B3.3	Support for Local SME and Industry Suppliers	Motivation	3	7	9	19	15	7	3	4	14	16	-5	26	33	13
B1.6	Development Planning	Motivation	7	9	9	25	24	6	3	5	14	17	-11	8	39	21
A3.4	Collaborative Data Analysis	Data Collection/Analysis	10	10	10	30	33	5	7	2	14	18	-16	4	44	27
B1.2	Transportation - Enhance Trucking Efficiency	Motivation	3	7	4	14	5	6	3	6	15	19	1	39	29	8
A3.5	Field Pilots - Reservoir	Motivation	8	8	7	23	21	5	6	4	15	20	-8	20	38	19
A3.2	Cost Effective Quality Reservoir Data Collection	Field Trials	10	10	5	25	25	3	10	3	16	21	-9	16	41	24
C1.1	Understanding Water Inflow	Field Trials	4	8	8	20	17	4	7	6	17	22	-3	34	37	17
A2.4	Follow-up Processes - Air Injection	Piloting	8	6	7	21	18	5	5	7	17	23	-4	30	38	20
B2.3	Surface Development - Flexibility and Footprints	Risk Management	9	9	9	27	29	9	1	7	17	24	-10	11	44	28
C3.1	Field Trials - Equipment/Methods	Field Trials	10	10	10	30	34	6	8	3	17	25	-13	7	47	30
A2.2	Follow-up Processes - CO2	Piloting	7	4	5	16	10	7	4	7	18	26	2	35	34	14
A3.1	Need for Data to Allow Simulation	Data Collection/Analysis	9	10	3	22	20	5	10	3	18	27	-4	31	40	23
A1.3	Foamy Oil Production	Investigation	2	4	8	14	6	6	10	4	20	28	6	21	34	15
A1.6	Reporting of Sand Production	Data Collection/Analysis	10	10	10	30	35	9	7	4	20	29	-10	12	50	33
A1.7	What Should be Monitored?	Investigation	10	10	10	30	36	8	7	5	20	30	-10	13	50	34
C3.2	Shared Funding	Motivation	10	10	10	30	37	6	10	4	20	31	-10	14	50	35
B1.4	Sand Separation	Field Trials	6	10	10	26	26	7	5	9	21	32	-5	27	47	31
C2.3	Adapting to Potential Recovery Methods	Risk Management	10	10	10	30	38	5	9	7	21	33	-9	17	51	36
C3.3	Data Sharing	Data Collection/Analysis	10	10	10	30	39	7	8	6	21	34	-9	18	51	37
C1.2	Designing Robust Wells	Risk Management	10	9	10	29	31	9	6	8	23	35	-6	24	52	39
B3.1	Definition of Problems	Investigation	3	9	9	21	19	8	8	8	24	36	3	33	45	29
C1.3	Controlling Inflow	Field Trials	6	8	9	23	22	7	8	9	24	37	1	38	47	32
B2.2	Water Treatment and Purification	Risk Management	8	8	10	26	27	9	7	9	25	38	-1	41	51	38
C2.1	Tools for Flexible, Controlled Drilling	Field Trials	10	10	10	30	40	7	9	9	25	39	-5	28	55	40
C2.2	Inflow Enhancement - Near Well and Wellbore	Field Trials	10	10	10	30	41	8	9	9	26	40	-4	32	56	41
A1.9	Potential GHG Impacts	Data Collection/Analysis	5	5	4	14	7	10	8	9	27	41	13	5	41	25

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I.D.	R&D Need	Type of R&D	Timing	GHG Impact	Forecasting	Score	Rank GHG	Economic	Environment	Security	Score	Rank Sust	Variance	Rank Var	Score	Rank OA
C3.4	Implementation to Realize Benefits	Motivation	10	9	10	29	30	3	5	3	11	6	-18	1	40	22
A1.5	Sand Measurement in the Field	Field Trials	10	10	10	30	32	2	9	2	13	13	-17	2	43	26
A1.8	Low Cost Routine Monitoring	Field Trials	8	10	9	27	28	5	4	2	11	5	-16	3	38	18
A3.4	Collaborative Data Analysis	Data Collection/Analysis	10	10	10	30	33	5	7	2	14	18	-16	4	44	27
A1.9	Potential GHG Impacts	Data Collection/Analysis	5	5	4	14	7	10	8	9	27	41	13	5	41	25
A3.3	Coupled Geomechanics and Reservoir Simulation	Investigation	10	10	5	25	23	4	6	2	12	10	-13	6	37	16
C3.1	Field Trials - Equipment/Methods	Field Trials	10	10	10	30	34	6	8	3	17	25	-13	7	47	30
B1.6	Development Planning	Motivation	7	9	9	25	24	6	3	5	14	17	-11	8	39	21
B1.1	Collection and Utilization of Methane	Motivation	1	1	1	3	1	3	4	6	13	11	10	9	16	1
A1.2	Geomechanics in the Reservoir	Theory Development	8	8	3	19	12	2	6	1	9	4	-10	10	28	7
B2.3	Surface Development - Flexibility and Footprints	Risk Management	9	9	9	27	29	9	1	7	17	24	-10	11	44	28
A1.6	Reporting of Sand Production	Data Collection/Analysis	10	10	10	30	35	9	7	4	20	29	-10	12	50	33
A1.7	What Should be Monitored?	Investigation	10	10	10	30	36	8	7	5	20	30	-10	13	50	34
C3.2	Shared Funding	Motivation	10	10	10	30	37	6	10	4	20	31	-10	14	50	35
A1.1	Impacts of Intentionally Producing Sand	Theory Development	8	8	1	17	11	1	6	1	8	1	-9	15	25	4
A3.2	Cost Effective Quality Reservoir Data Collection	Field Trials	10	10	5	25	25	3	10	3	16	21	-9	16	41	24
C2.3	Adapting to Potential Recovery Methods	Risk Management	10	10	10	30	38	5	9	7	21	33	-9	17	51	36
C3.3	Data Sharing	Data Collection/Analysis	10	10	10	30	39	7	8	6	21	34	-9	18	51	37
B3.2	Assessment of Technologies in the Field	Field Trials	3	8	9	20	16	7	2	3	12	9	-8	19	32	10
A3.5	Field Pilots - Reservoir	Motivation	8	8	7	23	21	5	6	4	15	20	-8	20	38	19
A1.3	Foamy Oil Production	Investigation	2	4	8	14	6	6	10	4	20	28	6	21	34	15
B1.3	Transportation - Pipeline Gathering Systems	Motivation	5	4	6	15	8	5	1	3	9	3	-6	22	24	3
B2.1	Regional Water Management	Motivation	4	7	8	19	13	5	4	4	13	12	-6	23	32	11
C1.2	Designing Robust Wells	Risk Management	10	9	10	29	31	9	6	8	23	35	-6	24	52	39
A2.3	Follow-up Processes - Solvents	Piloting	9	5	5	19	14	6	3	5	14	15	-5	25	33	12
B3.3	Support for Local SME and Industry Suppliers	Motivation	3	7	9	19	15	7	3	4	14	16	-5	26	33	13
B1.4	Sand Separation	Field Trials	6	10	10	26	26	7	5	9	21	32	-5	27	47	31
C2.1	Tools for Flexible, Controlled Drilling	Field Trials	10	10	10	30	40	7	9	9	25	39	-5	28	55	40
A1.4	Water Influx	Investigation	3	5	5	13	2	2	4	3	9	2	-4	29	22	2
A2.4	Follow-up Processes - Air Injection	Piloting	8	6	7	21	18	5	5	7	17	23	-4	30	38	20
A3.1	Need for Data to Allow Simulation	Data Collection/Analysis	9	10	3	22	20	5	10	3	18	27	-4	31	40	23
C2.2	Inflow Enhancement - Near Well and Wellbore	Field Trials	10	10	10	30	41	8	9	9	26	40	-4	32	56	41
B3.1	Definition of Problems	Investigation	3	9	9	21	19	8	8	8	24	36	3	33	45	29
C1.1	Understanding Water Inflow	Field Trials	4	8	8	20	17	4	7	6	17	22	-3	34	37	17
A2.2	Follow-up Processes - CO2	Piloting	7	4	5	16	10	7	4	7	18	26	2	35	34	14
B1.5	Fired Equipment Efficiencies	Field Trials	2	5	7	14	4	5	2	5	12	8	-2	36	26	6
A2.5	Follow-up Processes - Waterfloods and Chemicals	Piloting	6	4	6	16	9	4	6	4	14	14	-2	37	30	9
C1.3	Controlling Inflow	Field Trials	6	8	9	23	22	7	8	9	24	37	1	38	47	32
B1.2	Transportation - Enhance Trucking Efficiency	Motivation	3	7	4	14	5	6	3	6	15	19	1	39	29	8
A2.1	Extend Low Energy Primary	Piloting	6	3	4	13	3	3	6	3	12	7	-1	40	25	5
B2.2	Water Treatment and Purification	Risk Management	8	8	10	26	27	9	7	9	25	38	-1	41	51	38

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B1.1	Collection and Utilization of Methane	Motivation	1	1	1	3	1	3	4	6	13	11	10	9	16	1
A1.4	Water Influx	Investigation	3	5	5	13	2	2	4	3	9	2	-4	29	22	2
B1.3	Transportation - Pipeline Gathering Systems	Motivation	5	4	6	15	8	5	1	3	9	3	-6	22	24	3
A1.1	Impacts of Intentionally Producing Sand	Theory Development	8	8	1	17	11	1	6	1	8	1	-9	15	25	4
A2.1	Extend Low Energy Primary	Piloting	6	3	4	13	3	3	6	3	12	7	-1	40	25	5
B1.5	Fired Equipment Efficiencies	Field Trials	2	5	7	14	4	5	2	5	12	8	-2	36	26	6
A1.2	Geomechanics in the Reservoir	Theory Development	8	8	3	19	12	2	6	1	9	4	-10	10	28	7
B1.2	Transportation - Enhance Trucking Efficiency	Motivation	3	7	4	14	5	6	3	6	15	19	1	39	29	8
A2.5	Follow-up Processes - Waterfloods and Chemicals	Piloting	6	4	6	16	9	4	6	4	14	14	-2	37	30	9
B3.2	Assessment of Technologies in the Field	Field Trials	3	8	9	20	16	7	2	3	12	9	-8	19	32	10
B2.1	Regional Water Management	Motivation	4	7	8	19	13	5	4	4	13	12	-6	23	32	11
A2.3	Follow-up Processes - Solvents	Piloting	9	5	5	19	14	6	3	5	14	15	-5	25	33	12
B3.3	Support for Local SME and Industry Suppliers	Motivation	3	7	9	19	15	7	3	4	14	16	-5	26	33	13
A2.2	Follow-up Processes - CO2	Piloting	7	4	5	16	10	7	4	7	18	26	2	35	34	14
A1.3	Foamy Oil Production	Investigation	2	4	8	14	6	6	10	4	20	28	6	21	34	15
A3.3	Coupled Geomechanics and Reservoir Simulation	Investigation	10	10	5	25	23	4	6	2	12	10	-13	6	37	16
C1.1	Understanding Water Inflow	Field Trials	4	8	8	20	17	4	7	6	17	22	-3	34	37	17
A1.8	Low Cost Routine Monitoring	Field Trials	8	10	9	27	28	5	4	2	11	5	-16	3	38	18
A3.5	Field Pilots - Reservoir	Motivation	8	8	7	23	21	5	6	4	15	20	-8	20	38	19
A2.4	Follow-up Processes - Air Injection	Piloting	8	6	7	21	18	5	5	7	17	23	-4	30	38	20
B1.6	Development Planning	Motivation	7	9	9	25	24	6	3	5	14	17	-11	8	39	21
C3.4	Implementation to Realize Benefits	Motivation	10	9	10	29	30	3	5	3	11	6	-18	1	40	22
A3.1	Need for Data to Allow Simulation	Data Collection/Analysis	9	10	3	22	20	5	10	3	18	27	-4	31	40	23
A3.2	Cost Effective Quality Reservoir Data Collection	Field Trials	10	10	5	25	25	3	10	3	16	21	-9	16	41	24
A1.9	Potential GHG Impacts	Data Collection/Analysis	5	5	4	14	7	10	8	9	27	41	13	5	41	25
A1.5	Sand Measurement in the Field	Field Trials	10	10	10	30	32	2	9	2	13	13	-17	2	43	26
A3.4	Collaborative Data Analysis	Data Collection/Analysis	10	10	10	30	33	5	7	2	14	18	-16	4	44	27
B2.3	Surface Development - Flexibility and Footprints	Risk Management	9	9	9	27	29	9	1	7	17	24	-10	11	44	28
B3.1	Definition of Problems	Investigation	3	9	9	21	19	8	8	8	24	36	3	33	45	29
C3.1	Field Trials - Equipment/Methods	Field Trials	10	10	10	30	34	6	8	3	17	25	-13	7	47	30
B1.4	Sand Separation	Field Trials	6	10	10	26	26	7	5	9	21	32	-5	27	47	31
C1.3	Controlling Inflow	Field Trials	6	8	9	23	22	7	8	9	24	37	1	38	47	32
A1.6	Reporting of Sand Production	Data Collection/Analysis	10	10	10	30	35	9	7	4	20	29	-10	12	50	33
A1.7	What Should be Monitored?	Investigation	10	10	10	30	36	8	7	5	20	30	-10	13	50	34
C3.2	Shared Funding	Motivation	10	10	10	30	37	6	10	4	20	31	-10	14	50	35
C2.3	Adapting to Potential Recovery Methods	Risk Management	10	10	10	30	38	5	9	7	21	33	-9	17	51	36
C3.3	Data Sharing	Data Collection/Analysis	10	10	10	30	39	7	8	6	21	34	-9	18	51	37
B2.2	Water Treatment and Purification	Risk Management	8	8	10	26	27	9	7	9	25	38	-1	41	51	38
C1.2	Designing Robust Wells	Risk Management	10	9	10	29	31	9	6	8	23	35	-6	24	52	39
C2.1	Tools for Flexible, Controlled Drilling	Field Trials	10	10	10	30	40	7	9	9	25	39	-5	28	55	40
C2.2	Inflow Enhancement - Near Well and Wellbore	Field Trials	10	10	10	30	41	8	9	9	26	40	-4	32	56	41