Method 2 & 3 Process Viability

Objective

This short paper focuses specifically on the viability of the following end-to-end processes in isolation from the wider wind farm business case:

- Method 2 – Constrained electricity to hydrogen to electricity
- Method 3 – Constrained electricity to hydrogen

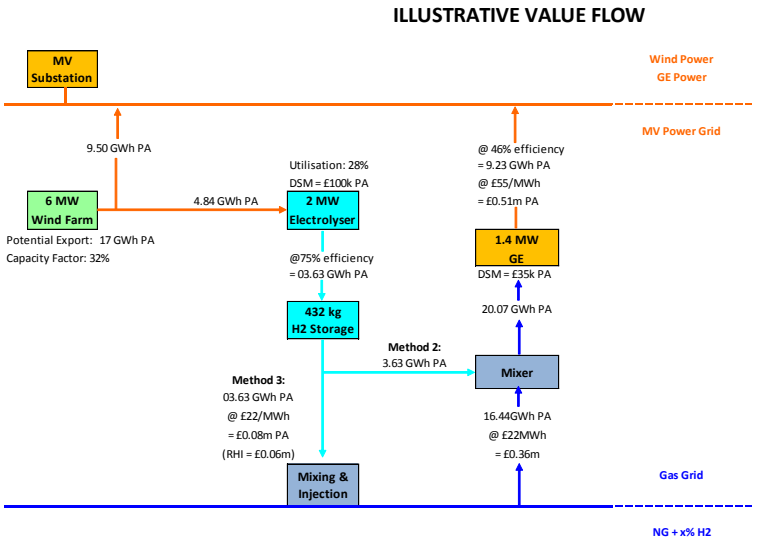
Findings

- The modelling demonstrates that the model returns increase with electrolyser size (and utilisation)
- The modelling demonstrates that Method 2 is viable with gas prices at the DECC Low Case and Mid Case levels but non-viable at the high case level given the reduced Spark Spread
- Despite essentially using 'free' constrained electricity, due to low equipment utilisations and the inherent low efficiency of the energy value chain, Method 3 has more challenging viability
- However, with a larger electrolyser, the fixed gas injection cost is spread across a greater volume of injected gas and hence Method 3 becomes viable under a number of scenarios
- The table below demonstrates the payback years for each scenario. The red figures denote where the payback for that Method and scenario is lower than that for the alternative Method

	Breakeven Year				
Electrolyser Size:	1MW	2MW	3MW	4MW	6MW
Electrolyser Utilisation:	23%	28%	24%	22%	32%
METHOD 2					
DECC Mid Case Gas Price (£22/MWh)	19	16	15	15	>20
DECC Mid Case Gas Price & Thrash* Electrolyser	16	12	11	10	>20
DECC Low Case Gas Price (£14/MWh)	9	10	10	11	>20
DECC High Case Gas Price (£35/MWh)	>20	>20	>20	>20	>20
DECC High Case Gas Price & Thrash* Electrolyser	>20	>20	>20	>20	>20
METHOD 3					
DECC Mid Case Gas Price (£22/MWh)	>20	>20	20	19	14
DECC Mid Case Gas Price & Thrash* Electrolyser	>20	15	13	12	9
DECC High Case Gas Price (£35/MWh)	>20	16	15	15	10
DECC High Case Gas Price & Thrash* Electrolyser	>20	11	10	9	7
DECC Mid Case Gas Price & H_2 RHI	>20	15	14	14	10
DECC High Case Gas Price & H_2 RHI	>20	12	12	11	8
DECC High Case Gas Price & H_2 RHI & Thrash* Electrolyser	17	9	8	7	5
DECC Mid Case Gas Price & GDNO funded inject	18	14	14	15	12
DECC High Case Gas Price & GDNO funded inject	13	13	13	13	13

* Thrashing the electrolyser entails running it at double capacity for short periods to cope with generation peaks

More detail of the above scenarios can be found in the document below including detailed cash flow modelling and value flow diagrams, such as the example below.



KEY ASSUMPTIONS	
Wind (MW):	6
PV (MW):	0
ELY (MW):	2
Wind Connection (MW):	2
Gas Engine (MW):	1.4
Gas Price (£/MWh)	22
Electricity Price (£/MWh)	55
Annual Energy Inflation	N/A

SIMPLE CASHFLOW/PAYBACK

	Standard Operation			Thrash Electrolyser		
	Method 2	Method 3	M3+RHI	Method 2	Method 3	M3+RHI
Income* (£m PA)	**0.643**	**0.180**	**0.244**	**0.643**	**0.180**	**0.244**
DSM	0.135	0.100	0.100	0.135	0.100	0.100
Generation	0.508	0.080	0.144	0.508	0.080	0.144
Opex (£m PA)	**0.480**	**0.069**	**0.069**	**0.480**	**0.069**	**0.069**
ELY O&M	0.041	0.041	0.041	0.041	0.041	0.041
Gas Bought	0.362	N/A	N/A	0.362	N/A	N/A
GI O&M	N/A	0.028	0.028	N/A	0.028	0.028
GE O&M	0.077	N/A	N/A	0.077	N/A	N/A
Gross Cashflow (£m PA	0.163	0.111	0.175	0.163	0.111	0.175
Capex	2.64	2.4	2.4	1.84	1.6	1.6
Simple Payback	16	22	14	11	14	9

* Excludes energy price inflation

Note:

To produce this paper the following amendments have been made to the financial model:

- All wind farm costs and revenues have been stripped out to focus purely on energy conversion
- An incremental control system cost has been assumed, given there will need to be a constraint scheme operating for the wind farm, hence this will part-fund the overall control system
- The accuracy of the O&M costs has been improved based on new data
- Given all calculations have been undertaken based on£/MWh rather than gas volume/CV or any other measure, we have assumed that the price obtained for injected hydrogen (£/MWh) is the same as £/MWh for natural gas, as both are measures of energy delivered rather than of volume or CV
- For each Method, a number of scenarios have been modelled based on varying electrolyser sizes. The unconstrained wind connection has been varied for each in order to try and keep electrolyser utilisation relatively consistent and hence aid comparison
- The exception to the above is the 6MW electrolyser scenario, which has been modelled with no firm connection to demonstrate an off grid Method 3 solution
- For Method 3, the assumed 7.3p RHI H_2 tariff has been reduced to reflect the lost FIT (the energy equivalent for this has been uplifted to counter the 75% electrolyser efficiency)

The financial results represented in this paper are understated in a number of key respects:

- All benefits accrued to the constraint scheme are ignored
- The wind farm output is based on historic half-hourly data uplifted to reflect the increased capacity factor of the new wind farm. As this is done via a simple uplift rather than taking into account the profile of the power curve, peak generation is overstated (albeit not total generation) hence generation curtailment is also overstated
- The Gas Engine O&M quote used has not been through vigorous challenge/competitive tender and hence is likely to reduce, impacting Method 2 payback
- The control system costs are modelled on a bespoke basis rather than socialised across installations

METHOD 2 – GAS ENGINE

SCENARIO 1 – 1MW ELECTROLYSER, 3MW UNCONSTRAINED WIND

Base Case Assumptions	
Wind (MW):	6
PV (MW):	0
ELY (MW):	1
Wind Connection (MW):	3
Gas Engine (MW):	1.4
Energy price rise PA:	0.5%
Gas Price (£/MW):	22
Electricity Price (£/MW):	55
Electrolyser Utilisation (%)	23%

Method 2 - Calculation Description

Energy Consumed by the electrolyser is calculated using half hourly profile wind and PV generation data.

Energy generated up to 1 MW over the wind farm firm level is calculated for each half hour of the year. This results in electrolyser energy consumption of: 2004 MWh PA using the scenario parameters shown. At an electrolyser efficiency of 75%, this represents: 1,503 MWh PA gas energy output.

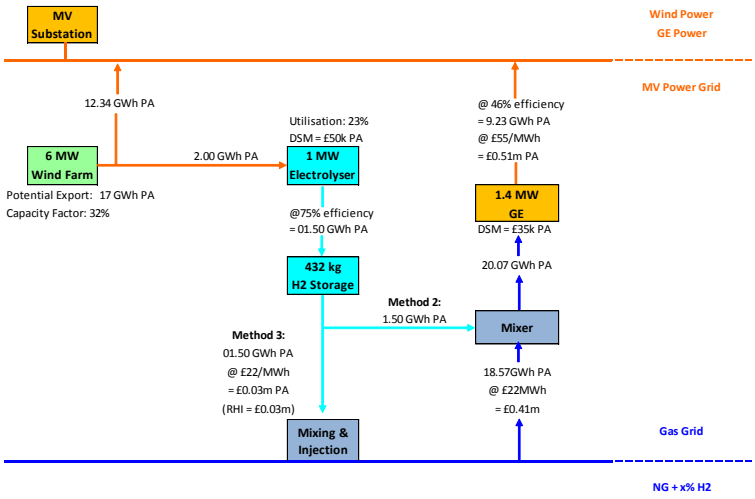
Potential gas engine generation output is calculated based on spare network capacity after Wind and PV. generation. The gas required to generate this is used by uplifting this spare MWh PA capacity to reflect the 46% gas engine efficiency (i.e. Ignores heat). Electrolyser gas output is deducted and the remainder turned to £M using DECC gas price scenarios. This gives a PA supplemental gas price of £408,443 The gas engine revenue is calculated by multiplying the gas engine energy output by 55 MWh electricity price. This gives £507,735 per annum revenue. In addition there are DSM/Footroom revenues of: 0.09 £m PA.

Key Costs					
Electrolyser	**Value**	**Units**	**Gas Engine**	**Value**	**Units**
Initial Cost	0.80	m£	Initial Cost	0.84	m£
Incremental Control System	0.20	m£	Operating Cost	0.077	m£ PA
Operating Cost	0.03	m£ PA	Natural Gas required to exploit capacity	18,566	MWh PA
Output after efficiency loss	1,503	MWh PA	Gas Bought (at Mid Case Gas Price)	0.41	m£ PA
DSM/Footroom Revenue	0.09	m£ PA	Generation Output	0.51	m£ PA

Financial Summary

	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DECC Mid Case Gas Price (£22/MWh)	Income (m£)	0.00	0.60	0.60	0.60	0.60	0.61	0.61	0.61	0.62	0.62	0.62	0.63	0.63	0.63	0.64	0.64	0.64	0.65	0.65	0.65
	Capex (m£)	1.84																			
	Opex (m£)	0.00	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51
	Annual Cashflow	-1.84	0.08	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.11	0.11	0.11	0.12	0.12	0.12	0.13	0.13	0.13	0.13	0.14
	Cummulative Cashflow	-1.84	-1.76	-1.67	-1.58	-1.49	-1.40	-1.30	-1.20	-1.10	-0.99	-0.88	-0.77	-0.65	-0.53	-0.41	-0.29	-0.16	-0.03	0.11	0.25
Mid Case and Thrash Electrolyser	Income (m£)	0.00	0.596	0.60	0.60	0.60	0.61	0.61	0.61	0.62	0.62	0.62	0.63	0.63	0.63	0.64	0.64	0.64	0.65	0.65	0.65
	Capex (m£)	1.44																			
	Opex (m£)	0.00	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51
	Annual Cashflow	-1.44	0.08	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.11	0.11	0.11	0.12	0.12	0.12	0.13	0.13	0.13	0.13	0.14
	Cummulative Cashflow	-1.44	-1.36	-1.27	-1.18	-1.09	-1.00	-0.90	-0.80	-0.70	-0.59	-0.48	-0.37	-0.25	-0.13	-0.01	0.11	0.24	0.37	0.51	0.65
DECC Low Case Gas Price (£14/MWh)	Income (m£)	0.00	0.60	0.60	0.60	0.60	0.61	0.61	0.61	0.62	0.62	0.62	0.63	0.63	0.63	0.64	0.64	0.64	0.65	0.65	0.65
	Capex (m£)	1.84																			
	Opex (m£)	0.00	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
	Annual Cashflow	-1.84	0.23	0.23	0.24	0.24	0.24	0.25	0.25	0.25	0.26	0.26	0.26	0.26	0.27	0.27	0.27	0.28	0.28	0.28	0.29
	Cummulative Cashflow	-1.84	-1.61	-1.38	-1.14	-0.90	-0.66	-0.41	-0.16	0.09	0.35	0.60	0.86	1.13	1.40	1.67	1.94	2.22	2.50	2.78	3.07
DECC High Case Gas Price (£35/MWh)	Income (m£)	0.00	0.60	0.60	0.60	0.60	0.61	0.61	0.61	0.62	0.62	0.62	0.63	0.63	0.63	0.64	0.64	0.64	0.65	0.65	0.65
	Capex (m£)	1.84																			
	Opex (m£)	0.00	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
	Annual Cashflow	-1.84	-0.16	-0.16	-0.15	-0.15	-0.15	-0.14	-0.14	-0.14	-0.13	-0.13	-0.13	-0.13	-0.12	-0.12	-0.12	-0.11	-0.11	-0.11	-0.10
	Cummulative Cashflow	-1.84	-2.00	-2.16	-2.31	-2.46	-2.61	-2.75	-2.89	-3.03	-3.16	-3.30	-3.42	-3.55	-3.67	-3.79	-3.91	-4.02	-4.13	-4.24	-4.34
High Case Gas and Thrash Electrolyser	Income (m£)	0.00	0.60	0.60	0.60	0.60	0.61	0.61	0.61	0.62	0.62	0.62	0.63	0.63	0.63	0.64	0.64	0.64	0.65	0.65	0.65
	Capex (m£)	1.44																			
	Opex (m£)	0.00	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
	Annual Cashflow	-1.44	-0.16	-0.16	-0.15	-0.15	-0.15	-0.14	-0.14	-0.14	-0.13	-0.13	-0.13	-0.13	-0.12	-0.12	-0.12	-0.11	-0.11	-0.11	-0.10
	Cummulative Cashflow	-1.44	-1.60	-1.76	-1.91	-2.06	-2.21	-2.35	-2.49	-2.63	-2.76	-2.90	-3.02	-3.15	-3.27	-3.39	-3.51	-3.62	-3.73	-3.84	-3.94

ILLUSTRATIVE VALUE FLOW



KEY ASSUMPTIONS	
Wind (MW):	6
PV (MW):	0
ELY (MW):	1
Wind Connection (MW):	3
Gas Engine (MW):	1.4
Gas Price (£/MWh)	22
Electricity Price (£/MWh)	55
Annual Energy Inflation	N/A

SIMPLE CASHFLOW/PAYBACK						
	Standard Operation			Thrash Electrolyser		
	Method 2	Method 3	M3+RHI	Method 2	Method 3	M3+RHI
Income* (£m PA)	**0.593**	**0.083**	**0.110**	**0.593**	**0.083**	**0.110**
DSM	0.085	0.050	0.050	0.085	0.050	0.050
Generation	0.508	0.033	0.060	0.508	0.033	0.060
Opex (£m PA)	**0.513**	**0.056**	**0.056**	**0.513**	**0.056**	**0.056**
ELY O&M	0.028	0.028	0.028	0.028	0.028	0.028
Gas Bought	0.408	N/A	N/A	0.408	N/A	N/A
GI O&M	N/A	0.028	0.028	N/A	0.028	0.028
GE O&M	0.077	N/A	N/A	0.077	N/A	N/A
Gross Cashflow (£m PA	0.079	0.027	0.054	0.079	0.027	0.054
Capex	1.84	1.6	1.6	1.44	1.2	1.2
Simple Payback	23	59	30	18	44	22

* Excludes energy price inflation

METHOD 2 – GAS ENGINE

SCENARIO 2 – 2MW ELECTROLYSER, 2MW UNCONSTRAINED WIND

Base Case Assumptions	
Wind (MW):	6
PV (MW):	0
ELY (MW):	2
Wind Connection (MW):	2
Gas Engine (MW):	1.4
Energy price rise PA:	0.5%
Gas Price (£/MW):	22
Electricity Price (£/MW):	55
Electrolyser Utilisation (%)	28%

Method 2 - Calculation Description

Energy Consumed by the electrolyser is calculated using half hourly profile wind and PV generation data.

Energy generated up to 2 MW over the wind farm firm level is calculated for each half hour of the year. This results in electrolyser energy consumption of: 4838 MWh PA using the scenario parameters shown. At an electrolyser efficiency of 75%, this represents: 3,628 MWh PA gas energy output.

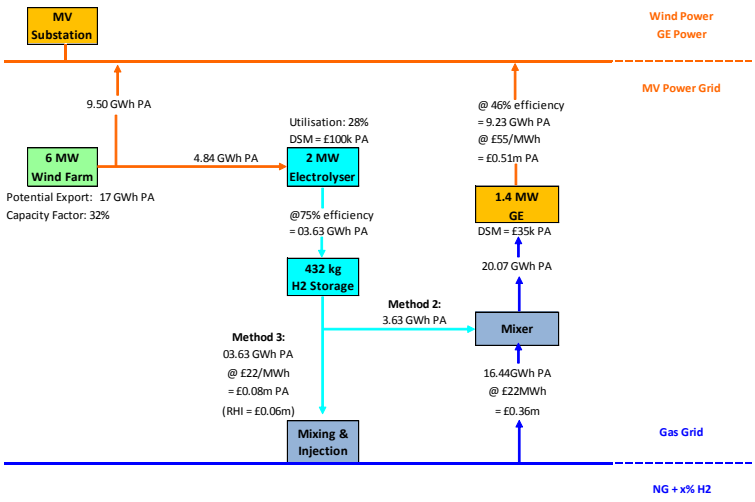
Potential gas engine generation output is calculated based on spare network capacity after Wind and PV. generation. The gas required to generate this is used by uplifting this spare MWh PA capacity to reflect the 46% gas engine efficiency (i.e. Ignores heat). Electrolyser gas output is deducted and the remainder turned to £M using DECC gas price scenarios. This gives a PA supplemental gas price of £361,688 The gas engine revenue is calculated by multiplying the gas engine energy output by 55 MWh electricity price. This gives £507,735 per annum revenue. In addition there are DSM/Footroom revenues of: 0.14 £m PA.

Key Costs					
Electrolyser	**Value**	**Units**	**Gas Engine**	**Value**	**Units**
Initial Cost	1.60	m£	Initial Cost	0.84	m£
Incremental Control System	0.20	m£	Operating Cost	0.077	m£ PA
Operating Cost	0.04	m£ PA	Natural Gas required to exploit capacity	16,440	MWh PA
Output after efficiency loss	3,628	MWh PA	Gas Bought (at Mid Case Gas Price)	0.36	m£ PA
DSM/Footroom Revenue	0.14	m£ PA	Generation Output	0.51	m£ PA

Financial Summary

	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DECC Mid Case Gas Price (£22/MWh)	Income (m£)	0.00	0.65	0.65	0.65	0.66	0.66	0.66	0.67	0.67	0.67	0.68	0.68	0.68	0.69	0.69	0.69	0.70	0.70	0.70	0.71
	Capex (m£)	2.64																			
	Opex (m£)	0.00	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48
	Annual Cashflow	-2.64	0.17	0.17	0.17	0.18	0.18	0.18	0.19	0.19	0.19	0.20	0.20	0.20	0.21	0.21	0.21	0.22	0.22	0.22	0.23
	Cummulative Cashflow	-2.64	-2.47	-2.30	-2.13	-1.96	-1.78	-1.59	-1.41	-1.22	-1.03	-0.83	-0.63	-0.43	-0.22	-0.01	0.20	0.42	0.64	0.86	1.09
Mid Case and Thrash Electrolyser	Income (m£)	0.00	0.646	0.65	0.65	0.66	0.66	0.66	0.67	0.67	0.67	0.68	0.68	0.68	0.69	0.69	0.69	0.70	0.70	0.70	0.71
	Capex (m£)	1.84																			
	Opex (m£)	0.00	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48
	Annual Cashflow	-1.84	0.17	0.17	0.17	0.18	0.18	0.18	0.19	0.19	0.19	0.20	0.20	0.20	0.21	0.21	0.21	0.22	0.22	0.22	0.23
	Cummulative Cashflow	-1.84	-1.67	-1.50	-1.33	-1.16	-0.98	-0.79	-0.61	-0.42	-0.23	-0.03	0.17	0.37	0.58	0.79	1.00	1.22	1.44	1.66	1.89
DECC Low Case Gas Price (£14/MWh)	Income (m£)	0.00	0.65	0.65	0.65	0.66	0.66	0.66	0.67	0.67	0.67	0.68	0.68	0.68	0.69	0.69	0.69	0.70	0.70	0.70	0.71
	Capex (m£)	2.64																			
	Opex (m£)	0.00	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
	Annual Cashflow	-2.64	0.30	0.30	0.30	0.31	0.31	0.31	0.32	0.32	0.32	0.33	0.33	0.33	0.34	0.34	0.34	0.35	0.35	0.35	0.36
	Cummulative Cashflow	-2.64	-2.34	-2.04	-1.74	-1.43	-1.12	-0.80	-0.49	-0.17	0.16	0.49	0.82	1.15	1.49	1.83	2.17	2.52	2.87	3.23	3.59
DECC High Case Gas Price (£35/MWh)	Income (m£)	0.00	0.65	0.65	0.65	0.66	0.66	0.66	0.67	0.67	0.67	0.68	0.68	0.68	0.69	0.69	0.69	0.70	0.70	0.70	0.71
	Capex (m£)	2.64																			
	Opex (m£)	0.00	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
	Annual Cashflow	-2.64	-0.05	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	-0.00	-0.00	0.00	0.01	0.01	0.01
	Cummulative Cashflow	-2.64	-2.69	-2.73	-2.77	-2.81	-2.84	-2.88	-2.90	-2.93	-2.95	-2.97	-2.98	-2.99	-3.00	-3.00	-3.01	-3.00	-3.00	-2.99	-2.97
High Case Gas and Thrash Electrolyser	Income (m£)	0.00	0.65	0.65	0.65	0.66	0.66	0.66	0.67	0.67	0.67	0.68	0.68	0.68	0.69	0.69	0.69	0.70	0.70	0.70	0.71
	Capex (m£)	1.84																			
	Opex (m£)	0.00	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
	Annual Cashflow	-1.84	-0.05	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	-0.00	-0.00	0.00	0.01	0.01	0.01
	Cummulative Cashflow	-1.84	-1.89	-1.93	-1.97	-2.01	-2.04	-2.08	-2.10	-2.13	-2.15	-2.17	-2.18	-2.19	-2.20	-2.20	-2.21	-2.20	-2.20	-2.19	-2.17

ILLUSTRATIVE VALUE FLOW



KEY ASSUMPTIONS	
Wind (MW):	6
PV (MW):	0
ELY (MW):	2
Wind Connection (MW):	2
Gas Engine (MW):	1.4
Gas Price (£/MWh)	22
Electricity Price (£/MWh)	55
Annual Energy Inflation	N/A

SIMPLE CASHFLOW/PAYBACK	Standard Operation			Thrash Electrolyser		
	Method 2	**Method 3**	**M3+RHI**	**Method 2**	**Method 3**	**M3+RHI**
Income* (£m PA)	**0.643**	**0.180**	**0.244**	**0.643**	**0.180**	**0.244**
DSM	0.135	0.100	0.100	0.135	0.100	0.100
Generation	0.508	0.080	0.144	0.508	0.080	0.144
Opex (£m PA)	**0.480**	**0.069**	**0.069**	**0.480**	**0.069**	**0.069**
ELY O&M	0.041	0.041	0.041	0.041	0.041	0.041
Gas Bought	0.362	N/A	N/A	0.362	N/A	N/A
GI O&M	N/A	0.028	0.028	N/A	0.028	0.028
GE O&M	0.077	N/A	N/A	0.077	N/A	N/A
Gross Cashflow (£m PA	0.163	0.111	0.175	0.163	0.111	0.175
Capex	2.64	2.4	2.4	1.84	1.6	1.6
Simple Payback	16	22	14	11	14	9

* Excludes energy price inflation

METHOD 2 – GAS ENGINE

SCENARIO 3 – 3MW ELECTROLYSER, 2MW UNCONSTRAINED WIND

Base Case Assumptions	
Wind (MW):	6
PV (MW):	0
ELY (MW):	3
Wind Connection (MW):	2
Gas Engine (MW):	1.4
Energy price rise PA:	0.5%
Gas Price (£/MW):	22
Electricity Price (£/MW):	55
Electrolyser Utilisation (%)	24%

Method 2 - Calculation Description

Energy Consumed by the electrolyser is calculated using half hourly profile wind and PV generation data.

Energy generated up to 3 MW over the wind farm firm level is calculated for each half hour of the year. This results in electrolyser energy consumption of: 6202 MWh PA using the scenario parameters shown. At an electrolyser efficiency of 75%, this represents: 4,651 MWh PA gas energy output.

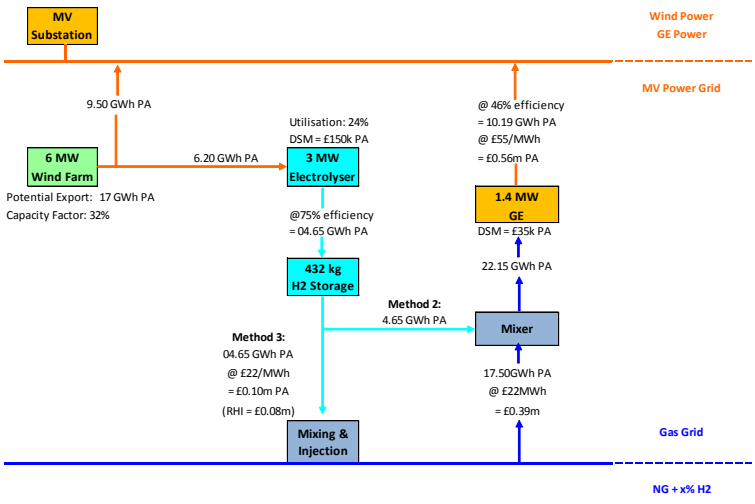
Potential gas engine generation output is calculated based on spare network capacity after Wind and PV. generation. The gas required to generate this is used by uplifting this spare MWh PA capacity to reflect the 46% gas engine efficiency (i.e. Ignores heat). Electrolyser gas output is deducted and the remainder turned to £M using DECC gas price scenarios. This gives a PA supplemental gas price of £385,010 The gas engine revenue is calculated by multiplying the gas engine energy output by 55 MWh electricity price. This gives £560,439 per annum revenue. In addition there are DSM/Footroom revenues of: 0.19 £m PA.

Key Costs					
Electrolyser	**Value**	**Units**	**Gas Engine**	**Value**	**Units**
Initial Cost	2.40	m£	Initial Cost	0.84	m£
Incremental Control System	0.20	m£	Operating Cost	0.077	m£ PA
Operating Cost	0.06	m£ PA	Natural Gas required to exploit capacity	17,500	MWh PA
Output after efficiency loss	4,651	MWh PA	Gas Bought (at Mid Case Gas Price)	0.39	m£ PA
DSM/Footroom Revenue	0.19	m£ PA	Generation Output	0.56	m£ PA

Financial Summary

	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DECC Mid Case Gas Price (£22/MWh)	Income (m£)	0.00	0.75	0.75	0.76	0.76	0.76	0.77	0.77	0.78	0.78	0.78	0.79	0.79	0.80	0.80	0.80	0.81	0.81	0.82	0.82
	Capex (m£)	3.44																			
	Opex (m£)	0.00	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52
	Annual Cashflow	-3.44	0.23	0.23	0.24	0.24	0.24	0.25	0.25	0.25	0.26	0.26	0.27	0.27	0.27	0.28	0.28	0.29	0.29	0.29	0.30
	Cummulative Cashflow	-3.44	-3.21	-2.98	-2.75	-2.51	-2.26	-2.02	-1.77	-1.51	-1.25	-0.99	-0.73	-0.46	-0.18	0.09	0.38	0.66	0.95	1.25	1.54
Mid Case and Thrash Electrolyser	Income (m£)	0.00	0.749	0.75	0.76	0.76	0.76	0.77	0.77	0.78	0.78	0.78	0.79	0.79	0.80	0.80	0.80	0.81	0.81	0.82	0.82
	Capex (m£)	2.24																			
	Opex (m£)	0.00	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52
	Annual Cashflow	-2.24	0.23	0.23	0.24	0.24	0.24	0.25	0.25	0.25	0.26	0.26	0.27	0.27	0.27	0.28	0.28	0.29	0.29	0.29	0.30
	Cummulative Cashflow	-2.24	-2.01	-1.78	-1.55	-1.31	-1.06	-0.82	-0.57	-0.31	-0.05	0.21	0.47	0.74	1.02	1.29	1.58	1.86	2.15	2.45	2.74
DECC Low Case Gas Price (£14/MWh)	Income (m£)	0.00	0.75	0.75	0.76	0.76	0.76	0.77	0.77	0.78	0.78	0.78	0.79	0.79	0.80	0.80	0.80	0.81	0.81	0.82	0.82
	Capex (m£)	3.44																			
	Opex (m£)	0.00	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
	Annual Cashflow	-3.44	0.37	0.37	0.38	0.38	0.38	0.39	0.39	0.39	0.40	0.40	0.41	0.41	0.41	0.42	0.42	0.43	0.43	0.43	0.44
	Cummulative Cashflow	-3.44	-3.07	-2.70	-2.33	-1.95	-1.56	-1.18	-0.79	-0.39	0.01	0.41	0.81	1.22	1.64	2.06	2.48	2.90	3.33	3.77	4.20
DECC High Case Gas Price (£35/MWh)	Income (m£)	0.00	0.75	0.75	0.76	0.76	0.76	0.77	0.77	0.78	0.78	0.78	0.79	0.79	0.80	0.80	0.80	0.81	0.81	0.82	0.82
	Capex (m£)	3.44																			
	Opex (m£)	0.00	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
	Annual Cashflow	-3.44	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.03	0.03	0.03	0.04	0.04	0.05	0.05	0.05	0.06	0.06	0.07	0.07
	Cummulative Cashflow	-3.44	-3.44	-3.44	-3.43	-3.42	-3.40	-3.38	-3.36	-3.33	-3.30	-3.27	-3.23	-3.19	-3.14	-3.09	-3.04	-2.98	-2.92	-2.85	-2.78
High Case Gas and Thrash Electrolyser	Income (m£)	0.00	0.75	0.75	0.76	0.76	0.76	0.77	0.77	0.78	0.78	0.78	0.79	0.79	0.80	0.80	0.80	0.81	0.81	0.82	0.82
	Capex (m£)	2.24																			
	Opex (m£)	0.00	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
	Annual Cashflow	-2.24	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.03	0.03	0.03	0.04	0.04	0.05	0.05	0.05	0.06	0.06	0.07	0.07
	Cummulative Cashflow	-2.24	-2.24	-2.24	-2.23	-2.22	-2.20	-2.18	-2.16	-2.13	-2.10	-2.07	-2.03	-1.99	-1.94	-1.89	-1.84	-1.78	-1.72	-1.65	-1.58

ILLUSTRATIVE VALUE FLOW



KEY ASSUMPTIONS	
Wind (MW):	6
PV (MW):	0
ELY (MW):	3
Wind Connection (MW):	2
Gas Engine (MW):	1.4
Gas Price (£/MWh)	22
Electricity Price (£/MWh)	55
Annual Energy Inflation	N/A

SIMPLE CASHFLOW/PAYBACK	Standard Operation			Thrash Electrolyser		
	Method 2	**Method 3**	**M3+RHI**	**Method 2**	**Method 3**	**M3+RHI**
Income* (£m PA)	**0.745**	**0.252**	**0.335**	**0.745**	**0.252**	**0.335**
DSM	0.185	0.150	0.150	0.185	0.150	0.150
Generation	0.560	0.102	0.185	0.560	0.102	0.185
Opex (£m PA)	**0.522**	**0.088**	**0.088**	**0.522**	**0.088**	**0.088**
ELY O&M	0.060	0.060	0.060	0.060	0.060	0.060
Gas Bought	0.385	N/A	N/A	0.385	N/A	N/A
GI O&M	N/A	0.028	0.028	N/A	0.028	0.028
GE O&M	0.077	N/A	N/A	0.077	N/A	N/A
Gross Cashflow (£m PA	0.224	0.165	0.247	0.224	0.165	0.247
Capex	3.44	3.2	3.2	2.24	2	2
Simple Payback	15	19	13	10	12	8

* Excludes energy price inflation

METHOD 2 – GAS ENGINE

SCENARIO 4 – 4MW ELECTROLYSER, 2MW UNCONSTRAINED WIND

Base Case Assumptions	
Wind (MW):	6
PV (MW):	0
ELY (MW):	4
Wind Connection (MW):	2
Gas Engine (MW):	1.4
Energy price rise PA:	0.5%
Gas Price (£/MW):	22
Electricity Price (£/MW):	55
Electrolyser Utilisation (%)	22%

Method 2 - Calculation Description

Energy Consumed by the electrolyser is calculated using half hourly profile wind and PV generation data. Energy generated up to 4 MW over the wind farm firm level is calculated for each half hour of the year. This results in electrolyser energy consumption of: 7546 MWh PA using the scenario parameters shown. At an electrolyser efficiency of 75%, this represents: 5,660 MWh PA gas energy output.

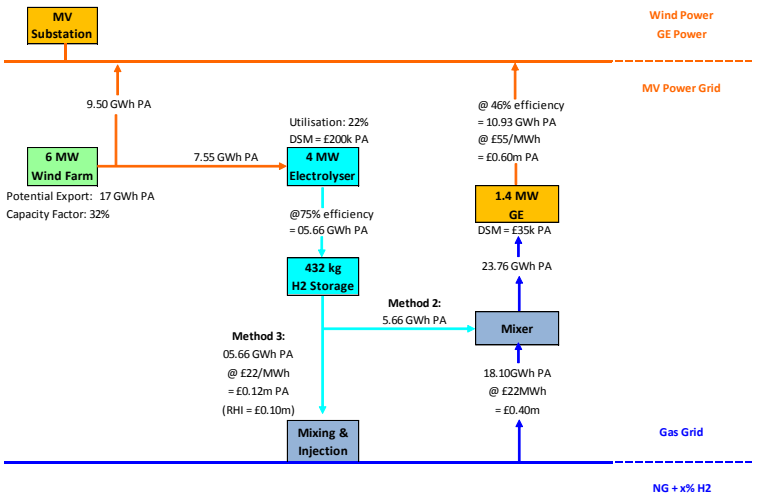
Potential gas engine generation output is calculated based on spare network capacity after Wind and PV. generation. The gas required to generate this is used by uplifting this spare MWh PA capacity to reflect the 46% gas engine efficiency (i.e. Ignores heat). Electrolyser gas output is deducted and the remainder turned to £M using DECC gas price scenarios. This gives a PA supplemental gas price of £398,207 The gas engine revenue is calculated by multiplying the gas engine energy output by 55 MWh electricity price. This gives £601,126 per annum revenue. In addition there are DSM/Footroom revenues of: 0.24 £m PA.

Key Costs					
Electrolyser	**Value**	**Units**	**Gas Engine**	**Value**	**Units**
Initial Cost	3.20	m£	Initial Cost	0.84	m£
Incremental Control System	0.20	m£	Operating Cost	0.077	m£ PA
Operating Cost	0.08	m£ PA	Natural Gas required to exploit capacity	18,100	MWh PA
Output after efficiency loss	5,660	MWh PA	Gas Bought (at Mid Case Gas Price)	0.40	m£ PA
DSM/Footroom Revenue	0.24	m£ PA	Generation Output	0.60	m£ PA

Financial Summary

	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DECC Mid Case Gas Price (£22/MWh)	Income (m£)	0.00	0.84	0.84	0.85	0.85	0.86	0.86	0.87	0.87	0.87	0.88	0.88	0.89	0.89	0.90	0.90	0.91	0.91	0.91	0.92
	Capex (m£)	4.24																			
	Opex (m£)	0.00	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
	Annual Cashflow	-4.24	0.29	0.29	0.30	0.30	0.30	0.31	0.31	0.32	0.32	0.33	0.33	0.33	0.34	0.34	0.35	0.35	0.36	0.36	0.37
	Cummulative Cashflow	-4.24	-3.95	-3.66	-3.37	-3.07	-2.76	-2.45	-2.14	-1.82	-1.50	-1.18	-0.85	-0.51	-0.17	0.17	0.52	0.87	1.23	1.59	1.95
Mid Case and Thrash Electrolyser	Income (m£)	0.00	0.840	0.84	0.85	0.85	0.86	0.86	0.87	0.87	0.87	0.88	0.88	0.89	0.89	0.90	0.90	0.91	0.91	0.91	0.92
	Capex (m£)	2.64																			
	Opex (m£)	0.00	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
	Annual Cashflow	-2.64	0.29	0.29	0.30	0.30	0.30	0.31	0.31	0.32	0.32	0.33	0.33	0.33	0.34	0.34	0.35	0.35	0.36	0.36	0.37
	Cummulative Cashflow	-2.64	-2.35	-2.06	-1.77	-1.47	-1.16	-0.85	-0.54	-0.22	0.10	0.42	0.75	1.09	1.43	1.77	2.12	2.47	2.83	3.19	3.55
DECC Low Case Gas Price (£14/MWh)	Income (m£)	0.00	0.84	0.84	0.85	0.85	0.86	0.86	0.87	0.87	0.87	0.88	0.88	0.89	0.89	0.90	0.90	0.91	0.91	0.91	0.92
	Capex (m£)	4.24																			
	Opex (m£)	0.00	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
	Annual Cashflow	-4.24	0.43	0.44	0.44	0.44	0.45	0.45	0.46	0.46	0.47	0.47	0.47	0.48	0.48	0.49	0.49	0.50	0.50	0.51	0.51
	Cummulative Cashflow	-4.24	-3.81	-3.37	-2.93	-2.49	-2.04	-1.59	-1.13	-0.67	-0.20	0.27	0.75	1.22	1.71	2.20	2.69	3.19	3.69	4.19	4.71
DECC High Case Gas Price (£35/MWh)	Income (m£)	0.00	0.84	0.84	0.85	0.85	0.86	0.86	0.87	0.87	0.87	0.88	0.88	0.89	0.89	0.90	0.90	0.91	0.91	0.91	0.92
	Capex (m£)	4.24																			
	Opex (m£)	0.00	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
	Annual Cashflow	-4.24	0.05	0.06	0.06	0.06	0.07	0.07	0.08	0.08	0.09	0.09	0.09	0.10	0.10	0.11	0.11	0.12	0.12	0.13	0.13
	Cummulative Cashflow	-4.24	-4.19	-4.13	-4.07	-4.01	-3.94	-3.87	-3.79	-3.71	-3.62	-3.53	-3.44	-3.34	-3.23	-3.12	-3.01	-2.90	-2.77	-2.65	-2.52
High Case Gas and Thrash Electrolyser	Income (m£)	0.00	0.84	0.84	0.85	0.85	0.86	0.86	0.87	0.87	0.87	0.88	0.88	0.89	0.89	0.90	0.90	0.91	0.91	0.91	0.92
	Capex (m£)	2.64																			
	Opex (m£)	0.00	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
	Annual Cashflow	-2.64	0.05	0.06	0.06	0.06	0.07	0.07	0.08	0.08	0.09	0.09	0.09	0.10	0.10	0.11	0.11	0.12	0.12	0.13	0.13
	Cummulative Cashflow	-2.64	-2.59	-2.53	-2.47	-2.41	-2.34	-2.27	-2.19	-2.11	-2.02	-1.93	-1.84	-1.74	-1.63	-1.52	-1.41	-1.30	-1.17	-1.05	-0.92

ILLUSTRATIVE VALUE FLOW



KEY ASSUMPTIONS	
Wind (MW):	6
PV (MW):	0
ELY (MW):	4
Wind Connection (MW):	2
Gas Engine (MW):	1.4
Gas Price (£/MWh)	22
Electricity Price (£/MWh)	55
Annual Energy Inflation	N/A

SIMPLE CASHFLOW/PAYBACK						
	Standard Operation			Thrash Electrolyser		
	Method 2	Method 3	M3+RHI	Method 2	Method 3	M3+RHI
Income* (£m PA)	**0.836**	**0.325**	**0.424**	**0.836**	**0.325**	**0.424**
DSM	0.235	0.200	0.200	0.235	0.200	0.200
Generation	0.601	0.125	0.224	0.601	0.125	0.224
Opex (£m PA)	**0.553**	**0.106**	**0.106**	**0.553**	**0.106**	**0.106**
ELY O&M	0.078	0.078	0.078	0.078	0.078	0.078
Gas Bought	0.398	N/A	N/A	0.398	N/A	N/A
GI O&M	N/A	0.028	0.028	N/A	0.028	0.028
GE O&M	0.077	N/A	N/A	0.077	N/A	N/A
Gross Cashflow (£m PA	0.283	0.219	0.318	0.283	0.219	0.318
Capex	4.24	4	4	2.64	2.4	2.4
Simple Payback	15	18	13	9	11	8

* Excludes energy price inflation

METHOD 2 – GAS ENGINE

SCENARIO 5 – 6MW ELECTROLYSER, 0MW UNCONSTRAINED WIND

Base Case Assumptions	
Wind (MW):	6
PV (MW):	0
ELY (MW):	6
Wind Connection (MW):	0
Gas Engine (MW):	1.4
Energy price rise PA:	0.5%
Gas Price (£/MW):	22
Electricity Price (£/MW):	55
Electrolyser Utilisation (%)	32%

Method 2 - Calculation Description

Energy Consumed by the electrolyser is calculated using half hourly profile wind and PV generation data.

Energy generated up to 6 MW over the wind farm firm level is calculated for each half hour of the year. This results in electrolyser energy consumption of: 17048 MWh PA using the scenario parameters shown. At an electrolyser efficiency of 75%, this represents: 12,786 MWh PA gas energy output.

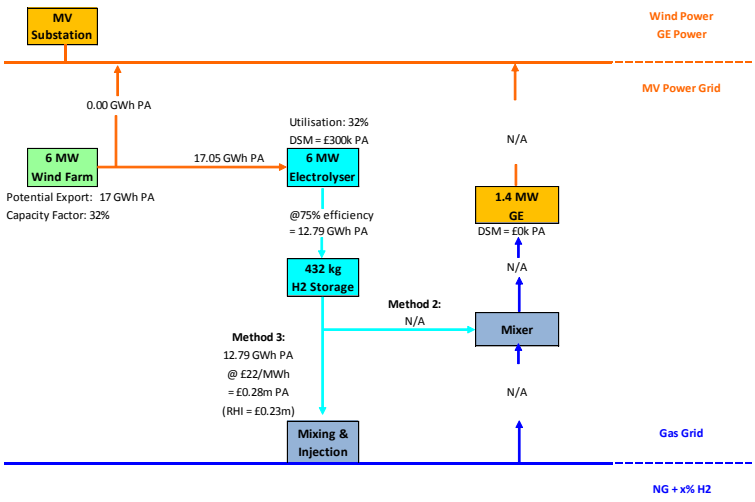
Potential gas engine generation output is calculated based on spare network capacity after Wind and PV. generation. The gas required to generate this is used by uplifting this spare MWh PA capacity to reflect the 46% gas engine efficiency (i.e. Ignores heat). Electrolyser gas output is deducted and the remainder turned to £M using DECC gas price scenarios. This gives a PA supplemental gas price of £241,425 The gas engine revenue is calculated by multiplying the gas engine energy output by 55 MWh electricity price. This gives £0 per annum revenue. In addition there are DSM/Footroom revenues of: 0.00 £m PA.

Key Costs					
Electrolyser	**Value**	**Units**	**Gas Engine**	**Value**	**Units**
Initial Cost	4.80	m£	Initial Cost	0.84	m£
Incremental Control System	0.20	m£	Operating Cost	0.077	m£ PA
Operating Cost	0.12	m£ PA	Natural Gas required to exploit capacity	10,974	MWh PA
Output after efficiency loss	12,786	MWh PA	Gas Bought (at Mid Case Gas Price)	0.24	m£ PA
DSM/Footroom Revenue	0.00	m£ PA	Generation Output	0.00	m£ PA

Financial Summary

	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DECC Mid Case Gas Price (£22/MWh)	Income (m£)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Capex (m£)	5.84																			
	Opex (m£)	0.00	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43
	Annual Cashflow	-5.84	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43
	Cummulative Cashflow	-5.84	-6.27	-6.71	-7.14	-7.57	-8.01	-8.44	-8.87	-9.31	-9.74	#####	-10.61	-11.04	-11.47	-11.91	-12.34	-12.77	-13.21	-13.64	-14.08
Mid Case and Thrash Electrolyser	Income (m£)	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Capex (m£)	3.44																			
	Opex (m£)	0.00	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43
	Annual Cashflow	-3.44	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43
	Cummulative Cashflow	-3.44	-3.87	-4.31	-4.74	-5.17	-5.61	-6.04	-6.47	-6.91	-7.34	-7.77	-8.21	-8.64	-9.07	-9.51	-9.94	-10.37	-10.81	-11.24	-11.68
DECC Low Case Gas Price (£14/MWh)	Income (m£)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Capex (m£)	5.84																			
	Opex (m£)	0.00	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
	Annual Cashflow	-5.84	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35
	Cummulative Cashflow	-5.84	-6.19	-6.53	-6.88	-7.22	-7.57	-7.91	-8.26	-8.61	-8.95	-9.30	-9.64	-9.99	-10.33	-10.68	-11.02	-11.37	-11.72	-12.06	-12.41
DECC High Case Gas Price (£35/MWh)	Income (m£)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Capex (m£)	5.84																			
	Opex (m£)	0.00	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58
	Annual Cashflow	-5.84	-0.58	-0.58	-0.58	-0.58	-0.58	-0.58	-0.58	-0.58	-0.58	-0.58	-0.58	-0.58	-0.58	-0.58	-0.58	-0.58	-0.58	-0.58	-0.58
	Cummulative Cashflow	-5.84	-6.42	-6.99	-7.57	-8.14	-8.72	-9.30	-9.87	-10.45	#####	#####	-12.18	-12.75	-13.33	-13.91	-14.48	-15.06	-15.63	-16.21	-16.79
High Case Gas and Thrash Electrolyser	Income (m£)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Capex (m£)	3.44																			
	Opex (m£)	0.00	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58
	Annual Cashflow	-3.44	-0.58	-0.58	-0.58	-0.58	-0.58	-0.58	-0.58	-0.58	-0.58	-0.58	-0.58	-0.58	-0.58	-0.58	-0.58	-0.58	-0.58	-0.58	-0.58
	Cummulative Cashflow	-3.44	-4.02	-4.59	-5.17	-5.74	-6.32	-6.90	-7.47	-8.05	-8.62	-9.20	-9.78	-10.35	-10.93	-11.51	-12.08	-12.66	-13.23	-13.81	-14.39

ILLUSTRATIVE VALUE FLOW



KEY ASSUMPTIONS	
Wind (MW):	6
PV (MW):	0
ELY (MW):	6
Wind Connection (MW):	0
Gas Engine (MW):	1.4
Gas Price (£/MWh)	22
Electricity Price (£/MWh)	55
Annual Energy Inflation	N/A

SIMPLE CASHFLOW/PAYBACK						
	Standard Operation			Thrash Electrolyser		
	Method 2	Method 3	M3+RHI	Method 2	Method 3	M3+RHI
Income* (£m PA)	**0.000**	**0.581**	**0.807**	**0.000**	**0.581**	**0.807**
DSM	0.000	0.300	0.300	0.000	0.300	0.300
Generation	0.000	0.281	0.507	0.000	0.281	0.507
Opex (£m PA)	**0.433**	**0.143**	**0.143**	**0.433**	**0.143**	**0.143**
ELY O&M	0.115	0.115	0.115	0.115	0.115	0.115
Gas Bought	0.241	N/A	N/A	0.241	N/A	N/A
GI O&M	N/A	0.028	0.028	N/A	0.028	0.028
GE O&M	0.077	N/A	N/A	0.077	N/A	N/A
Gross Cashflow (£m PA	-0.433	0.438	0.664	-0.433	0.438	0.664
Capex	5.84	5.6	5.6	3.44	3.2	3.2
Simple Payback	N/A	13	8	N/A	7	5

* Excludes energy price inflation

METHOD 3 – GAS INJECT

SCENARIO 1 – 1MW ELECTROLYSER, 3MW UNCONSTRAINED WIND

Base Case Assumptions	
Wind (MW):	6
PV (MW):	0
ELY (MW):	1
Wind Connection (MW):	3
Energy price rise PA:	0.5%
Electrolyser Utilisation (%):	23%

Method 3 - Calculation Description

Energy Consumed by the electrolyser is calculated using half hourly profile wind and PV generation data.

Energy generated up to 1 MW over the wind farm firm level is calculated for each half hour of the year. This results in electrolyser energy consumption of 2004 MWh PA using the base case assumptions shown. At an electrolyser efficiency of 75%, this represents: 1,503 MWh PA gas energy output.

The key cost and scenario parameters below are then used to calculate the Income, Capex and Opex of each option. Income includes the value of gas injected coupled with electrolyser DSM revenues of 0.05 m£ PA.

Key Costs					
Electrolyser	**Value**	**Units**	**Gas Inject**	**Value**	**Units**
Initial Cost	0.80	m£	Initial Cost	0.60	m£
Incremental Control System	0.20	m£	Operating Cost	0.03	m£ PA
Operating Cost	0.03	m£ PA	H2 Produced	38,146	Kg PA
Output after efficiency loss	1,503	MWh PA	Value of Gas Injected (Mid Case)	0.03	m£ PA
DSM Revenue	0.05	m£ PA	Value of H2 Compressed*	1.71	£m PA

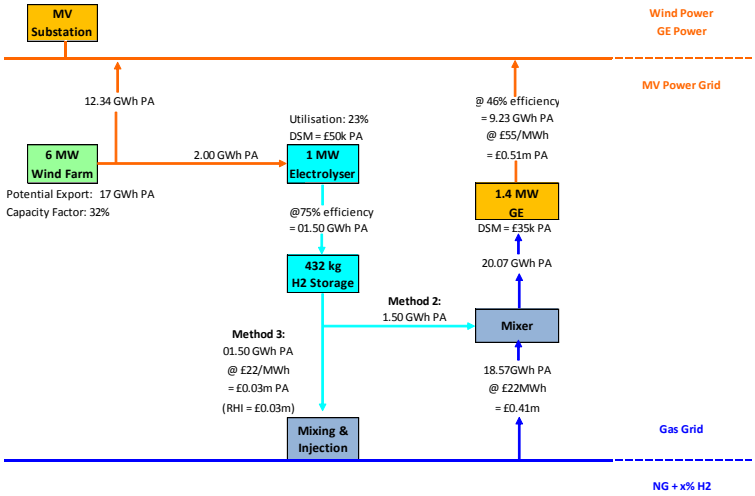
* $70/Kg using BOC 2012 prices

Financial Summary

	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DECC Mid Case Gas Price (£22/MWh)	Income (m£)	0.00	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
	Capex (m£)	1.60																			
	Opex (m£)	0.00	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
	Annual Cashflow	-1.60	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04
	Cummulative Cashflow	-1.60	-1.57	-1.54	-1.52	-1.49	-1.46	-1.43	-1.40	-1.37	-1.34	-1.31	-1.27	-1.24	-1.21	-1.18	-1.14	-1.11	-1.07	-1.04	-1.00
DECC Mid Case Price & Thrash Electrolyser	Income (m£)	0.00	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
	Capex (m£)	1.20																			
	Opex (m£)	0.00	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
	Annual Cashflow	-1.20	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04
	Cummulative Cashflow	-1.20	-1.17	-1.14	-1.12	-1.09	-1.06	-1.03	-1.00	-0.97	-0.94	-0.91	-0.87	-0.84	-0.81	-0.78	-0.74	-0.71	-0.67	-0.64	-0.60
DECC High Case Gas Price (£35/MWh)	Income (m£)	0.00	0.10	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
	Capex (m£)	1.60																			
	Opex (m£)	0.00	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
	Annual Cashflow	-1.60	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06
	Cummulative Cashflow	-1.60	-1.55	-1.51	-1.46	-1.41	-1.36	-1.31	-1.26	-1.21	-1.16	-1.11	-1.05	-1.00	-0.95	-0.89	-0.84	-0.78	-0.73	-0.67	-0.61
DECC High Case Price & Thrash Electrolyser	Income (m£)	0.00	0.10	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
	Capex (m£)	1.20																			
	Opex (m£)	0.00	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
	Annual Cashflow	-1.20	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06
	Cummulative Cashflow	-1.20	-1.15	-1.11	-1.06	-1.01	-0.96	-0.91	-0.86	-0.81	-0.76	-0.71	-0.65	-0.60	-0.55	-0.49	-0.44	-0.38	-0.33	-0.27	-0.21
Mid Case Gas & 7.3p H2 RHI (reduced FIT)	Income (m£)	0.00	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
	Capex (m£)	1.60																			
	Opex (m£)	0.00	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
	Annual Cashflow	-1.60	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
	Cummulative Cashflow	-1.60	-1.55	-1.49	-1.44	-1.38	-1.32	-1.27	-1.21	-1.15	-1.09	-1.03	-0.97	-0.91	-0.85	-0.79	-0.73	-0.67	-0.60	-0.54	-0.47
High Case Gas & 7.3p H2 RHI (reduced FIT)	Income (m£)	0.00	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
	Capex (m£)	1.60																			
	Opex (m£)	0.00	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
	Annual Cashflow	-1.60	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.09
	Cummulative Cashflow	-1.60	-1.53	-1.45	-1.38	-1.30	-1.22	-1.15	-1.07	-0.99	-0.91	-0.83	-0.75	-0.67	-0.59	-0.51	-0.42	-0.34	-0.25	-0.17	-0.08
High Case Gas & 7.3p H2 RHI (reduced FIT) & Thrash ELY	Income (m£)	0.00	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
	Capex (m£)	1.20																			
	Opex (m£)	0.00	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
	Annual Cashflow	-1.20	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.09
	Cummulative Cashflow	-1.20	-1.13	-1.05	-0.98	-0.90	-0.82	-0.75	-0.67	-0.59	-0.51	-0.43	-0.35	-0.27	-0.19	-0.11	-0.02	0.06	0.15	0.23	0.32
Mid Case Gas Price & GDNO funded inject	Income (m£)	0.00	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
	Capex (m£)	1.00																			
	Opex (m£)	0.00	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	Annual Cashflow	-1.00	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
	Cummulative Cashflow	-1.00	-0.94	-0.89	-0.83	-0.78	-0.72	-0.66	-0.60	-0.54	-0.49	-0.43	-0.37	-0.31	-0.25	-0.18	-0.12	-0.06	0.00	0.06	0.13
High Case Gas Price & GDNO funded inject	Income (m£)	0.00	0.10	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
	Capex (m£)	2.60																			
	Opex (m£)	0.00	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Annual Cashflow	-2.60	0.21	0.21	0.21	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.24	0.24
	Cummulative Cashflow	-2.60	-2.39	-2.17	-1.96	-1.74	-1.53	-1.31	-1.09	-0.87	-0.64	-0.42	-0.19	0.03	0.26	0.49	0.72	0.95	1.19	1.42	1.66
Sold at Compressed H2 Prices	Income (m£)	0.00	1.77	1.78	1.79	1.80	1.81	1.82	1.82	1.83	1.84	1.85	1.86	1.87	1.88	1.89	1.90	1.91	1.92	1.93	1.94
	Capex (m£)	1.60																			
	Opex (m£)	0.00	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
	Annual Cashflow	-1.60	1.71	1.72	1.73	1.74	1.75	1.76	1.77	1.78	1.79	1.80	1.81	1.81	1.82	1.83	1.84	1.85	1.86	1.87	1.88
	Cummulative Cashflow	-1.60	0.11	1.84	3.57	5.31	7.06	8.82	10.59	12.37	14.15	15.95	17.75	19.57	21.39	23.22	25.07	26.92	28.78	30.65	32.53

DECC Mid Case Gas Price

ILLUSTRATIVE VALUE FLOW



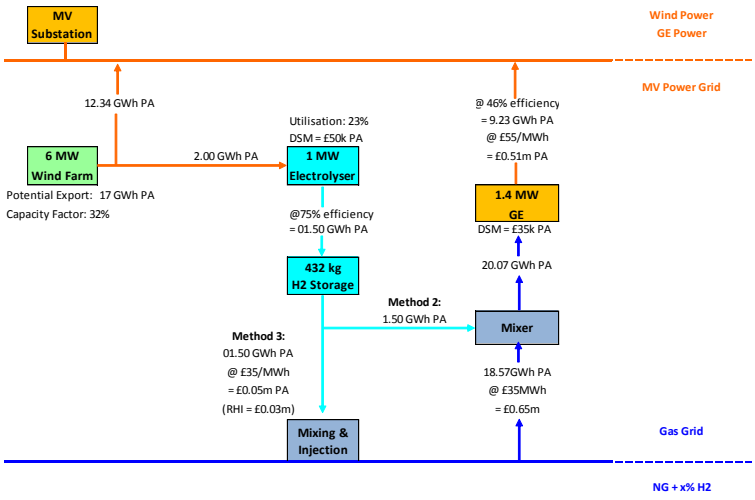
KEY ASSUMPTIONS	
Wind (MW):	6
PV (MW):	0
ELY (MW):	1
Wind Connection (MW):	3
Gas Engine (MW):	1.4
Gas Price (£/MWh)	22
Electricity Price (£/MWh)	55
Annual Energy Inflation	N/A

SIMPLE CASHFLOW/PAYBACK	Standard Operation			Thrash Electrolyser		
	Method 2	Method 3	M3+RHI	Method 2	Method 3	M3+RHI
Income* (£m PA)	**0.593**	**0.083**	**0.110**	**0.593**	**0.083**	**0.110**
DSM	0.085	0.050	0.050	0.085	0.050	0.050
Generation	0.508	0.033	0.060	0.508	0.033	0.060
Opex (£m PA)	**0.513**	**0.056**	**0.056**	**0.513**	**0.056**	**0.056**
ELY O&M	0.028	0.028	0.028	0.028	0.028	0.028
Gas Bought	0.408	N/A	N/A	0.408	N/A	N/A
GI O&M	N/A	0.028	0.028	N/A	0.028	0.028
GE O&M	0.077	N/A	N/A	0.077	N/A	N/A
Gross Cashflow (£m PA	0.079	0.027	0.054	0.079	0.027	0.054
Capex	1.84	1.6	1.6	1.44	1.2	1.2
Simple Payback	23	59	30	18	44	22

* Excludes energy price inflation

DECC High Case Gas Price

ILLUSTRATIVE VALUE FLOW



KEY ASSUMPTIONS	
Wind (MW):	6
PV (MW):	0
ELY (MW):	1
Wind Connection (MW):	3
Gas Engine (MW):	1.4
Gas Price (£/MWh)	35
Electricity Price (£/MWh)	55
Annual Energy Inflation	N/A

SIMPLE CASHFLOW/PAYBACK	Standard Operation			Thrash Electrolyser		
	Method 2	Method 3	M3+RHI	Method 2	Method 3	M3+RHI
Income* (£m PA)	**0.593**	**0.103**	**0.129**	**0.593**	**0.103**	**0.129**
DSM	0.085	0.050	0.050	0.085	0.050	0.050
Generation	0.508	0.053	0.079	0.508	0.053	0.079
Opex (£m PA)	**0.513**	**0.056**	**0.056**	**0.513**	**0.056**	**0.056**
ELY O&M	0.028	0.028	0.028	0.028	0.028	0.028
Gas Bought	0.408	N/A	N/A	0.408	N/A	N/A
GI O&M	N/A	0.028	0.028	N/A	0.028	0.028
GE O&M	0.077	N/A	N/A	0.077	N/A	N/A
Gross Cashflow (£m PA	0.079	0.047	0.073	0.079	0.047	0.073
Capex	1.84	1.6	1.6	1.44	1.2	1.2
Simple Payback	23	34	22	18	26	16

* Excludes energy price inflation

METHOD 3 – GAS INJECT

SCENARIO 2 – 2MW ELECTROLYSER, 2MW UNCONSTRAINED WIND

Base Case Assumptions	
Wind (MW):	6
PV (MW):	0
ELY (MW):	2
Wind Connection (MW):	2
Energy price rise PA:	0.5%
Electrolyser Utilisation (%):	28%

Method 3 - Calculation Description

Energy Consumed by the electrolyser is calculated using half hourly profile wind and PV generation data.

Energy generated up to 2 MW over the wind farm firm level is calculated for each half hour of the year. This results in electrolyser energy consumption of 4838 MWh PA using the base case assumptions shown. At an electrolyser efficiency of 75%, this represents: 3,628 MWh PA gas energy output.

The key cost and scenario parameters below are then used to calculate the Income, Capex and Opex of each option. Income includes the value of gas injected coupled with electrolyser DSM revenues of 0.10 m£ PA.

Key Costs					
Electrolyser	**Value**	**Units**	**Gas Inject**	**Value**	**Units**
Initial Cost	1.60	m£	Initial Cost	0.60	m£
Incremental Control System	0.20	m£	Operating Cost	0.03	m£ PA
Operating Cost	0.04	m£ PA	H2 Produced	92,087	Kg PA
Output after efficiency loss	3,628	MWh PA	Value of Gas Injected (Mid Case)	0.08	m£ PA
DSM Revenue	0.10	m£ PA	Value of H2 Compressed*	4.13	£m PA

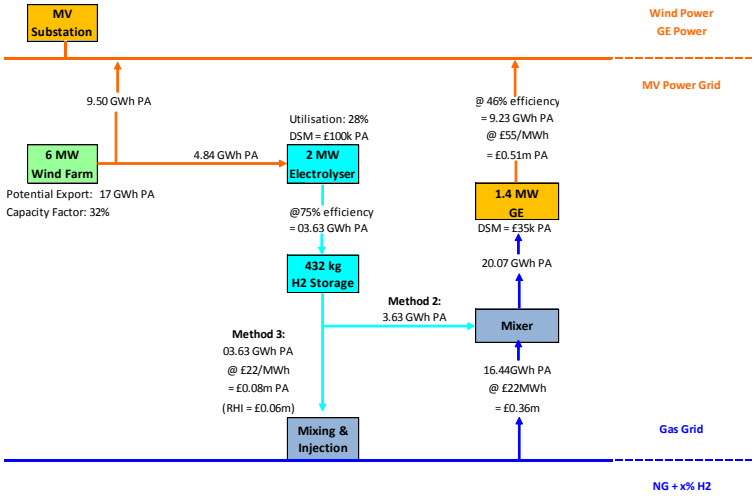
* $70/Kg using BOC 2012 prices

Financial Summary

	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DECC Mid Case Gas Price (£22/MWh)	Income (m£)	0.00	0.18	0.18	0.18	0.18	0.18	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.20	0.20	0.20
	Capex (m£)	2.40																			
	Opex (m£)	0.00	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
	Annual Cashflow	-2.40	0.11	0.11	0.11	0.11	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.13	0.13	0.13	0.13
	Cummulative Cashflow	-2.40	-2.29	-2.18	-2.06	-1.95	-1.83	-1.72	-1.60	-1.48	-1.36	-1.24	-1.12	-1.00	-0.88	-0.75	-0.63	-0.50	-0.37	-0.25	-0.12
DECC Mid Case Price & Thrash Electrolyser	Income (m£)	0.00	0.18	0.18	0.18	0.18	0.18	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.20	0.20	0.20
	Capex (m£)	1.60																			
	Opex (m£)	0.00	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
	Annual Cashflow	-1.60	0.11	0.11	0.11	0.11	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.13	0.13	0.13	0.13
	Cummulative Cashflow	-1.60	-1.49	-1.38	-1.26	-1.15	-1.03	-0.92	-0.80	-0.68	-0.56	-0.44	-0.32	-0.20	-0.08	0.05	0.17	0.30	0.43	0.55	0.68
DECC High Case Gas Price (£35/MWh)	Income (m£)	0.00	0.23	0.23	0.23	0.23	0.23	0.23	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.25	0.25	0.25	0.25
	Capex (m£)	2.40																			
	Opex (m£)	0.00	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
	Annual Cashflow	-2.40	0.16	0.16	0.16	0.16	0.16	0.16	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.18	0.18	0.18	0.18	0.18
	Cummulative Cashflow	-2.40	-2.24	-2.08	-1.92	-1.76	-1.59	-1.43	-1.26	-1.09	-0.93	-0.76	-0.59	-0.41	-0.24	-0.07	0.11	0.29	0.46	0.64	0.82
DECC High Case Price & Thrash Electrolyser	Income (m£)	0.00	0.23	0.23	0.23	0.23	0.23	0.23	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.25	0.25	0.25	0.25
	Capex (m£)	1.60																			
	Opex (m£)	0.00	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
	Annual Cashflow	-1.60	0.16	0.16	0.16	0.16	0.16	0.16	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.18	0.18	0.18	0.18	0.18
	Cummulative Cashflow	-1.60	-1.44	-1.28	-1.12	-0.96	-0.79	-0.63	-0.46	-0.29	-0.13	0.04	0.21	0.39	0.56	0.73	0.91	1.09	1.26	1.44	1.62
Mid Case Gas & 7.3p H2 RHI (reduced FIT)	Income (m£)	0.00	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.27	0.27	0.27
	Capex (m£)	2.40																			
	Opex (m£)	0.00	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
	Annual Cashflow	-2.40	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.20	0.20	0.20	0.20
	Cummulative Cashflow	-2.40	-2.22	-2.05	-1.87	-1.69	-1.51	-1.32	-1.14	-0.96	-0.77	-0.58	-0.39	-0.20	-0.01	0.18	0.37	0.57	0.77	0.96	1.16
High Case Gas & 7.3p H2 RHI (reduced FIT)	Income (m£)	0.00	0.29	0.29	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.31	0.31	0.31	0.31	0.31	0.31	0.32	0.32	0.32	0.32
	Capex (m£)	2.40																			
	Opex (m£)	0.00	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
	Annual Cashflow	-2.40	0.22	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.25	0.25	0.25	0.25
	Cummulative Cashflow	-2.40	-2.18	-1.95	-1.72	-1.50	-1.27	-1.04	-0.80	-0.57	-0.33	-0.10	0.14	0.38	0.62	0.87	1.11	1.36	1.60	1.85	2.10
High Case Gas & 7.3p H2 RHI (reduced FIT) & Thrash ELY	Income (m£)	0.00	0.29	0.29	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.31	0.31	0.31	0.31	0.31	0.31	0.32	0.32	0.32	0.32
	Capex (m£)	1.60																			
	Opex (m£)	0.00	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
	Annual Cashflow	-1.60	0.22	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.25	0.25	0.25	0.25
	Cummulative Cashflow	-1.60	-1.38	-1.15	-0.92	-0.70	-0.47	-0.24	-0.00	0.23	0.47	0.70	0.94	1.18	1.42	1.67	1.91	2.16	2.40	2.65	2.90
Mid Case Gas Price & GDNO funded inject	Income (m£)	0.00	0.18	0.18	0.18	0.18	0.18	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.20	0.20	0.20
	Capex (m£)	1.80																			
	Opex (m£)	0.00	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Annual Cashflow	-1.80	0.14	0.14	0.14	0.14	0.14	0.14	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.16	0.16
	Cummulative Cashflow	-1.80	-1.66	-1.52	-1.38	-1.24	-1.09	-0.95	-0.80	-0.66	-0.51	-0.36	-0.21	-0.06	0.09	0.24	0.39	0.55	0.70	0.86	1.01
High Case Gas Price & GDNO funded inject	Income (m£)	0.00	0.23	0.23	0.23	0.23	0.23	0.23	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.25	0.25	0.25	0.25
	Capex (m£)	2.60																			
	Opex (m£)	0.00	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Annual Cashflow	-2.60	0.21	0.21	0.21	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.24	0.24
	Cummulative Cashflow	-2.60	-2.39	-2.17	-1.96	-1.74	-1.53	-1.31	-1.09	-0.87	-0.64	-0.42	-0.19	0.03	0.26	0.49	0.72	0.95	1.19	1.42	1.66
Sold at Compressed H2 Prices	Income (m£)	0.00	4.25	4.27	4.30	4.32	4.34	4.36	4.38	4.40	4.43	4.45	4.47	4.49	4.52	4.54	4.56	4.58	4.61	4.63	4.65
	Capex (m£)	2.40																			
	Opex (m£)	0.00	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
	Annual Cashflow	-2.40	4.18	4.21	4.23	4.25	4.27	4.29	4.31	4.34	4.36	4.38	4.40	4.42	4.45	4.47	4.49	4.51	4.54	4.56	4.58
	Cummulative Cashflow	-2.40	1.78	5.99	10.22	14.47	18.74	23.03	27.34	31.68	36.03	40.41	44.81	49.24	53.69	58.15	62.65	67.16	71.70	76.26	80.84

DECC Mid Case Gas Price

ILLUSTRATIVE VALUE FLOW



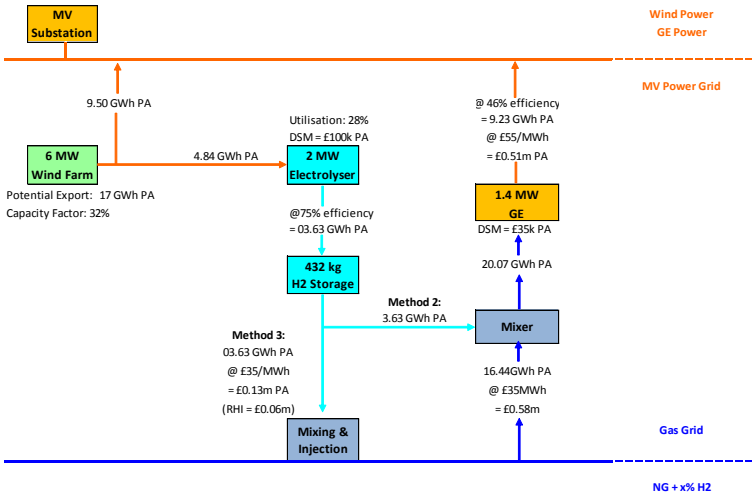
KEY ASSUMPTIONS	
Wind (MW):	6
PV (MW):	0
ELY (MW):	2
Wind Connection (MW):	2
Gas Engine (MW):	1.4
Gas Price (£/MWh)	22
Electricity Price (£/MWh)	55
Annual Energy Inflation	N/A

SIMPLE CASHFLOW/PAYBACK	Standard Operation			Thrash Electrolyser		
	Method 2	Method 3	M3+RHI	Method 2	Method 3	M3+RHI
Income* (£m PA)	**0.643**	**0.180**	**0.244**	**0.643**	**0.180**	**0.244**
DSM	0.135	0.100	0.100	0.135	0.100	0.100
Generation	0.508	0.080	0.144	0.508	0.080	0.144
Opex (£m PA)	**0.480**	**0.069**	**0.069**	**0.480**	**0.069**	**0.069**
ELY O&M	0.041	0.041	0.041	0.041	0.041	0.041
Gas Bought	0.362	N/A	N/A	0.362	N/A	N/A
GI O&M	N/A	0.028	0.028	N/A	0.028	0.028
GE O&M	0.077	N/A	N/A	0.077	N/A	N/A
Gross Cashflow (£m PA	0.163	0.111	0.175	0.163	0.111	0.175
Capex	2.64	2.4	2.4	1.84	1.6	1.6
Simple Payback	16	22	14	11	14	9

* Excludes energy price inflation

DECC High Case Gas Price

ILLUSTRATIVE VALUE FLOW



KEY ASSUMPTIONS	
Wind (MW):	6
PV (MW):	0
ELY (MW):	2
Wind Connection (MW):	2
Gas Engine (MW):	1.4
Gas Price (£/MWh)	35
Electricity Price (£/MWh)	55
Annual Energy Inflation	N/A

SIMPLE CASHFLOW/PAYBACK	Standard Operation			Thrash Electrolyser		
	Method 2	Method 3	M3+RHI	Method 2	Method 3	M3+RHI
Income* (£m PA)	**0.643**	**0.227**	**0.291**	**0.643**	**0.227**	**0.291**
DSM	0.135	0.100	0.100	0.135	0.100	0.100
Generation	0.508	0.127	0.191	0.508	0.127	0.191
Opex (£m PA)	**0.480**	**0.069**	**0.069**	**0.480**	**0.069**	**0.069**
ELY O&M	0.041	0.041	0.041	0.041	0.041	0.041
Gas Bought	0.362	N/A	N/A	0.362	N/A	N/A
GI O&M	N/A	0.028	0.028	N/A	0.028	0.028
GE O&M	0.077	N/A	N/A	0.077	N/A	N/A
Gross Cashflow (£m PA	0.163	0.158	0.222	0.163	0.158	0.222
Capex	2.64	2.4	2.4	1.84	1.6	1.6
Simple Payback	16	15	11	11	10	7

* Excludes energy price inflation

METHOD 3 – GAS INJECT

SCENARIO 3 – 3MW ELECTROLYSER, 2MW UNCONSTRAINED WIND

Base Case Assumptions	
Wind (MW):	6
PV (MW):	0
ELY (MW):	3
Wind Connection (MW):	2
Energy price rise PA:	0.5%
Electrolyser Utilisation (%):	24%

Method 3 - Calculation Description

Energy Consumed by the electrolyser is calculated using half hourly profile wind and PV generation data.

Energy generated up to 3 MW over the wind farm firm level is calculated for each half hour of the year. This results in electrolyser energy consumption of 6202 MWh PA using the base case assumptions shown. At an electrolyser efficiency of 75%, this represents: 4,651 MWh PA gas energy output.

The key cost and scenario parameters below are then used to calculate the Income, Capex and Opex of each option. Income includes the value of gas injected coupled with electrolyser DSM revenues of 0.15 m£ PA.

Key Costs					
Electrolyser	**Value**	**Units**	**Gas Inject**	**Value**	**Units**
Initial Cost	2.40	m£	Initial Cost	0.60	m£
Incremental Control System	0.20	m£	Operating Cost	0.03	m£ PA
Operating Cost	0.06	m£ PA	H2 Produced	118,053	Kg PA
Output after efficiency loss	4,651	MWh PA	Value of Gas Injected (Mid Case)	0.10	m£ PA
DSM Revenue	0.15	m£ PA	Value of H2 Compressed*	5.30	£m PA

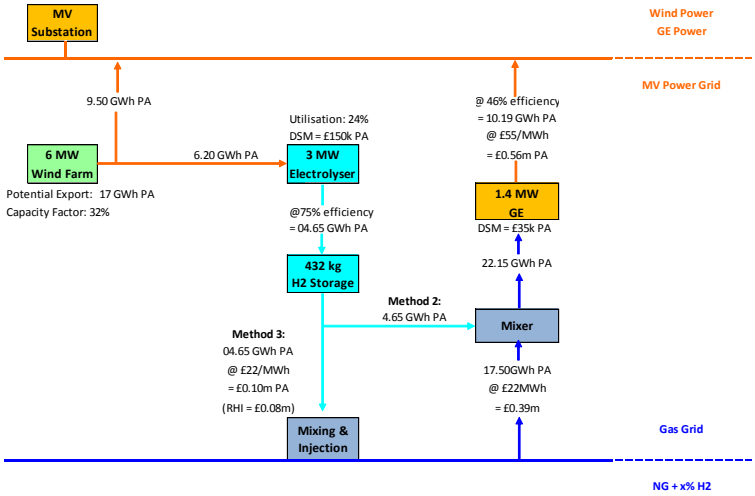
* $70/Kg using BOC 2012 prices

Financial Summary

	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DECC Mid Case Gas Price (£22/MWh)	Income (m£)	0.00	0.25	0.25	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.28	0.28
	Capex (m£)	3.20																			
	Opex (m£)	0.00	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
	Annual Cashflow	-3.20	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.19	0.19	0.19	0.19
	Cummulative Cashflow	-3.20	-3.03	-2.87	-2.70	-2.53	-2.36	-2.18	-2.01	-1.84	-1.66	-1.48	-1.30	-1.12	-0.94	-0.76	-0.57	-0.39	-0.20	-0.01	0.18
DECC Mid Case Price & Thrash Electrolyser	Income (m£)	0.00	0.25	0.25	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.28	0.28
	Capex (m£)	2.00																			
	Opex (m£)	0.00	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
	Annual Cashflow	-2.00	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.19	0.19	0.19	0.19
	Cummulative Cashflow	-2.00	-1.83	-1.67	-1.50	-1.33	-1.16	-0.98	-0.81	-0.64	-0.46	-0.28	-0.10	0.08	0.26	0.44	0.63	0.81	1.00	1.19	1.38
DECC High Case Gas Price (£35/MWh)	Income (m£)	0.00	0.31	0.32	0.32	0.32	0.32	0.32	0.32	0.33	0.33	0.33	0.33	0.33	0.33	0.34	0.34	0.34	0.34	0.34	0.34
	Capex (m£)	3.20																			
	Opex (m£)	0.00	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
	Annual Cashflow	-3.20	0.23	0.23	0.23	0.23	0.23	0.23	0.24	0.24	0.24	0.24	0.24	0.24	0.25	0.25	0.25	0.25	0.25	0.25	0.26
	Cummulative Cashflow	-3.20	-2.97	-2.74	-2.51	-2.28	-2.05	-1.82	-1.58	-1.34	-1.10	-0.86	-0.62	-0.37	-0.13	0.12	0.37	0.62	0.88	1.13	1.39
DECC High Case Price & Thrash Electrolyser	Income (m£)	0.00	0.31	0.32	0.32	0.32	0.32	0.32	0.32	0.33	0.33	0.33	0.33	0.33	0.33	0.34	0.34	0.34	0.34	0.34	0.34
	Capex (m£)	2.00																			
	Opex (m£)	0.00	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
	Annual Cashflow	-2.00	0.23	0.23	0.23	0.23	0.23	0.23	0.24	0.24	0.24	0.24	0.24	0.24	0.25	0.25	0.25	0.25	0.25	0.25	0.26
	Cummulative Cashflow	-2.00	-1.77	-1.54	-1.31	-1.08	-0.85	-0.62	-0.38	-0.14	0.10	0.34	0.58	0.83	1.07	1.32	1.57	1.82	2.08	2.33	2.59
Mid Case Gas & 7.3p H2 RHI (reduced FIT)	Income (m£)	0.00	0.34	0.34	0.34	0.34	0.34	0.34	0.35	0.35	0.35	0.35	0.35	0.36	0.36	0.36	0.36	0.36	0.36	0.37	0.37
	Capex (m£)	3.20																			
	Opex (m£)	0.00	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
	Annual Cashflow	-3.20	0.25	0.25	0.25	0.25	0.26	0.26	0.26	0.26	0.26	0.26	0.27	0.27	0.27	0.27	0.27	0.27	0.28	0.28	0.28
	Cummulative Cashflow	-3.20	-2.95	-2.70	-2.45	-2.20	-1.94	-1.68	-1.42	-1.16	-0.90	-0.64	-0.37	-0.10	0.17	0.44	0.71	0.99	1.26	1.54	1.82
High Case Gas & 7.3p H2 RHI (reduced FIT)	Income (m£)	0.00	0.40	0.40	0.40	0.40	0.40	0.41	0.41	0.41	0.41	0.42	0.42	0.42	0.42	0.42	0.43	0.43	0.43	0.43	0.43
	Capex (m£)	3.20																			
	Opex (m£)	0.00	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
	Annual Cashflow	-3.20	0.31	0.31	0.31	0.32	0.32	0.32	0.32	0.32	0.33	0.33	0.33	0.33	0.33	0.34	0.34	0.34	0.34	0.34	0.35
	Cummulative Cashflow	-3.20	-2.89	-2.58	-2.27	-1.95	-1.63	-1.31	-0.99	-0.67	-0.34	-0.02	0.31	0.65	0.98	1.32	1.65	1.99	2.34	2.68	3.03
High Case Gas & 7.3p H2 RHI (reduced FIT) & Thrash ELY	Income (m£)	0.00	0.40	0.40	0.40	0.40	0.40	0.41	0.41	0.41	0.41	0.42	0.42	0.42	0.42	0.42	0.43	0.43	0.43	0.43	0.43
	Capex (m£)	2.00																			
	Opex (m£)	0.00	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
	Annual Cashflow	-2.00	0.31	0.31	0.31	0.32	0.32	0.32	0.32	0.32	0.33	0.33	0.33	0.33	0.33	0.34	0.34	0.34	0.34	0.34	0.35
	Cummulative Cashflow	-2.00	-1.69	-1.38	-1.07	-0.75	-0.43	-0.11	0.21	0.53	0.86	1.18	1.51	1.85	2.18	2.52	2.85	3.19	3.54	3.88	4.23
Mid Case Gas Price & GDNO funded inject	Income (m£)	0.00	0.25	0.25	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.28	0.28
	Capex (m£)	2.60																			
	Opex (m£)	0.00	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
	Annual Cashflow	-2.60	0.19	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.22	0.22	0.22
	Cummulative Cashflow	-2.60	-2.41	-2.21	-2.01	-1.82	-1.62	-1.42	-1.21	-1.01	-0.81	-0.60	-0.39	-0.19	0.02	0.23	0.45	0.66	0.88	1.09	1.31
High Case Gas Price & GDNO funded inject	Income (m£)	0.00	0.31	0.32	0.32	0.32	0.32	0.32	0.32	0.33	0.33	0.33	0.33	0.33	0.33	0.34	0.34	0.34	0.34	0.34	0.34
	Capex (m£)	2.60																			
	Opex (m£)	0.00	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Annual Cashflow	-2.60	0.21	0.21	0.21	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.24	0.24
	Cummulative Cashflow	-2.60	-2.39	-2.17	-1.96	-1.74	-1.53	-1.31	-1.09	-0.87	-0.64	-0.42	-0.19	0.03	0.26	0.49	0.72	0.95	1.19	1.42	1.66
Sold at Compressed H2 Prices	Income (m£)	0.00	5.47	5.50	5.53	5.56	5.58	5.61	5.64	5.67	5.70	5.73	5.75	5.78	5.81	5.84	5.87	5.90	5.93	5.96	5.99
	Capex (m£)	3.20																			
	Opex (m£)	0.00	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
	Annual Cashflow	-3.20	5.39	5.41	5.44	5.47	5.50	5.53	5.55	5.58	5.61	5.64	5.67	5.70	5.72	5.75	5.78	5.81	5.84	5.87	5.90
	Cummulative Cashflow	-3.20	2.19	7.60	13.04	18.51	24.01	29.54	35.09	40.67	46.28	51.92	57.58	63.28	69.01	74.76	80.54	86.35	92.20	98.07	103.97

DECC Mid Case Gas Price

ILLUSTRATIVE VALUE FLOW



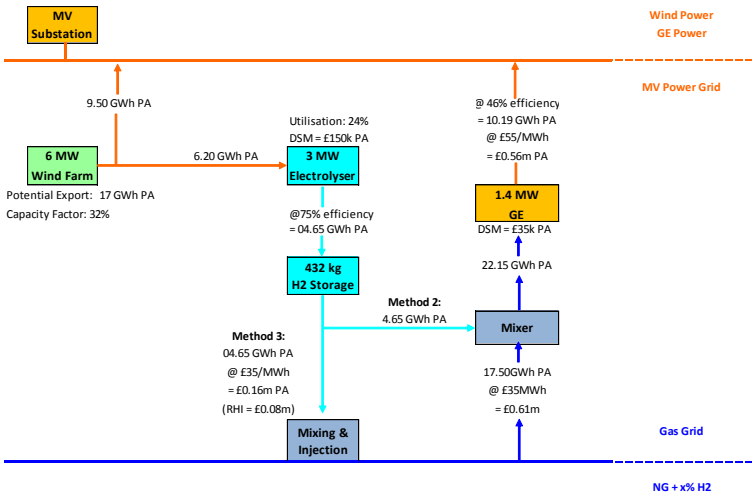
KEY ASSUMPTIONS	
Wind (MW):	6
PV (MW):	0
ELY (MW):	3
Wind Connection (MW):	2
Gas Engine (MW):	1.4
Gas Price (£/MWh)	22
Electricity Price (£/MWh)	55
Annual Energy Inflation	N/A

SIMPLE CASHFLOW/PAYBACK	Standard Operation			Thrash Electrolyser		
	Method 2	Method 3	M3+RHI	Method 2	Method 3	M3+RHI
Income* (£m PA)	**0.745**	**0.252**	**0.335**	**0.745**	**0.252**	**0.335**
DSM	0.185	0.150	0.150	0.185	0.150	0.150
Generation	0.560	0.102	0.185	0.560	0.102	0.185
Opex (£m PA)	**0.522**	**0.088**	**0.088**	**0.522**	**0.088**	**0.088**
ELY O&M	0.060	0.060	0.060	0.060	0.060	0.060
Gas Bought	0.385	N/A	N/A	0.385	N/A	N/A
GI O&M	N/A	0.028	0.028	N/A	0.028	0.028
GE O&M	0.077	N/A	N/A	0.077	N/A	N/A
Gross Cashflow (£m PA	0.224	0.165	0.247	0.224	0.165	0.247
Capex	3.44	3.2	3.2	2.24	2	2
Simple Payback	15	19	13	10	12	8

* Excludes energy price inflation

DECC High Case Gas Price

ILLUSTRATIVE VALUE FLOW



KEY ASSUMPTIONS	
Wind (MW):	6
PV (MW):	0
ELY (MW):	3
Wind Connection (MW):	2
Gas Engine (MW):	1.4
Gas Price (£/MWh)	35
Electricity Price (£/MWh)	55
Annual Energy Inflation	N/A

SIMPLE CASHFLOW/PAYBACK	Standard Operation			Thrash Electrolyser		
	Method 2	Method 3	M3+RHI	Method 2	Method 3	M3+RHI
Income* (£m PA)	**0.745**	**0.313**	**0.395**	**0.745**	**0.313**	**0.395**
DSM	0.185	0.150	0.150	0.185	0.150	0.150
Generation	0.560	0.163	0.245	0.560	0.163	0.245
Opex (£m PA)	**0.522**	**0.088**	**0.088**	**0.522**	**0.088**	**0.088**
ELY O&M	0.060	0.060	0.060	0.060	0.060	0.060
Gas Bought	0.385	N/A	N/A	0.385	N/A	N/A
GI O&M	N/A	0.028	0.028	N/A	0.028	0.028
GE O&M	0.077	N/A	N/A	0.077	N/A	N/A
Gross Cashflow (£m PA	0.224	0.225	0.307	0.224	0.225	0.307
Capex	3.44	3.2	3.2	2.24	2	2
Simple Payback	15	14	10	10	9	7

* Excludes energy price inflation

METHOD 3 – GAS INJECT

SCENARIO 4 – 4MW ELECTROLYSER, 2MW UNCONSTRAINED WIND

Base Case Assumptions	
Wind (MW):	6
PV (MW):	0
ELY (MW):	4
Wind Connection (MW):	2
Energy price rise PA:	0.5%
Electrolyser Utilisation (%):	22%

Method 3 - Calculation Description

Energy Consumed by the electrolyser is calculated using half hourly profile wind and PV generation data.

Energy generated up to 4 MW over the wind farm firm level is calculated for each half hour of the year. This results in electrolyser energy consumption of 7546 MWh PA using the base case assumptions shown. At an electrolyser efficiency of 75%, this represents: 5,660 MWh PA gas energy output.

The key cost and scenario parameters below are then used to calculate the Income, Capex and Opex of each option. Income includes the value of gas injected coupled with electrolyser DSM revenues of 0.20 m£ PA.

Key Costs					
Electrolyser	**Value**	**Units**	**Gas Inject**	**Value**	**Units**
Initial Cost	3.20	m£	Initial Cost	0.60	m£
Incremental Control System	0.20	m£	Operating Cost	0.03	m£ PA
Operating Cost	0.08	m£ PA	H2 Produced	143,644	Kg PA
Output after efficiency loss	5,660	MWh PA	Value of Gas Injected (Mid Case)	0.12	m£ PA
DSM Revenue	0.20	m£ PA	Value of H2 Compressed*	6.45	£m PA

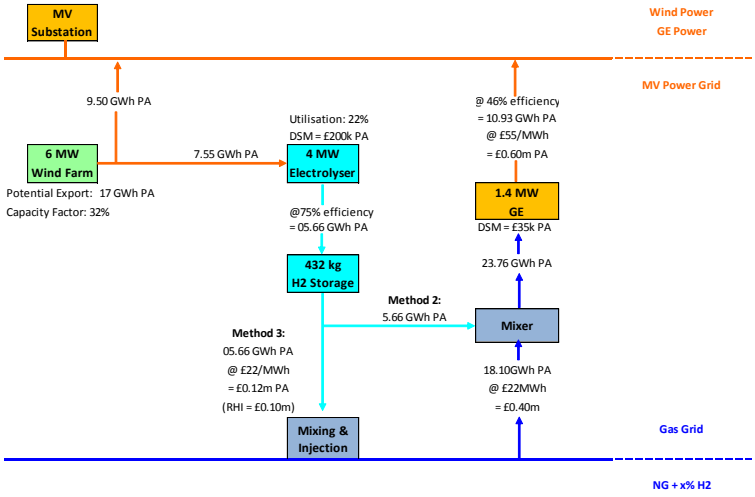
* $70/Kg using BOC 2012 prices

Financial Summary

	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	Income (m£)	0.00	0.33	0.33	0.33	0.33	0.33	0.33	0.34	0.34	0.34	0.34	0.34	0.34	0.35	0.35	0.35	0.35	0.35	0.35	0.36
DECC Mid Case Gas Price (£22/MWh)	Capex (m£)	4.00																			
	Opex (m£)	0.00	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
	Annual Cashflow	-4.00	0.22	0.22	0.22	0.23	0.23	0.23	0.23	0.23	0.23	0.24	0.24	0.24	0.24	0.24	0.24	0.25	0.25	0.25	0.25
	Cummulative Cashflow	-4.00	-3.78	-3.56	-3.33	-3.11	-2.88	-2.65	-2.42	-2.19	-1.96	-1.72	-1.49	-1.25	-1.01	-0.77	-0.52	-0.28	-0.03	0.22	0.47
	Income (m£)	0.00	0.33	0.33	0.33	0.33	0.33	0.33	0.34	0.34	0.34	0.34	0.34	0.34	0.35	0.35	0.35	0.35	0.35	0.35	0.36
DECC Mid Case Price & Thrash Electrolyser	Capex (m£)	2.40																			
	Opex (m£)	0.00	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
	Annual Cashflow	-2.40	0.22	0.22	0.22	0.23	0.23	0.23	0.23	0.23	0.23	0.24	0.24	0.24	0.24	0.24	0.24	0.25	0.25	0.25	0.25
	Cummulative Cashflow	-2.40	-2.18	-1.96	-1.73	-1.51	-1.28	-1.05	-0.82	-0.59	-0.36	-0.12	0.11	0.35	0.59	0.83	1.08	1.32	1.57	1.82	2.07
	Income (m£)	0.00	0.40	0.40	0.40	0.41	0.41	0.41	0.41	0.41	0.42	0.42	0.42	0.42	0.42	0.43	0.43	0.43	0.43	0.44	0.44
DECC High Case Gas Price (£35/MWh)	Capex (m£)	4.00																			
	Opex (m£)	0.00	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
	Annual Cashflow	-4.00	0.29	0.30	0.30	0.30	0.30	0.30	0.31	0.31	0.31	0.31	0.31	0.32	0.32	0.32	0.32	0.33	0.33	0.33	0.33
	Cummulative Cashflow	-4.00	-3.71	-3.41	-3.11	-2.81	-2.51	-2.21	-1.90	-1.59	-1.28	-0.97	-0.65	-0.34	-0.02	0.30	0.63	0.95	1.28	1.61	1.94
	Income (m£)	0.00	0.40	0.40	0.40	0.41	0.41	0.41	0.41	0.41	0.42	0.42	0.42	0.42	0.42	0.43	0.43	0.43	0.43	0.44	0.44
DECC High Case Price & Thrash Electrolyser	Capex (m£)	2.40																			
	Opex (m£)	0.00	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
	Annual Cashflow	-2.40	0.29	0.30	0.30	0.30	0.30	0.30	0.31	0.31	0.31	0.31	0.31	0.32	0.32	0.32	0.32	0.33	0.33	0.33	0.33
	Cummulative Cashflow	-2.40	-2.11	-1.81	-1.51	-1.21	-0.91	-0.61	-0.30	0.01	0.32	0.63	0.95	1.26	1.58	1.90	2.23	2.55	2.88	3.21	3.54
	Income (m£)	0.00	0.43	0.43	0.43	0.43	0.44	0.44	0.44	0.44	0.44	0.45	0.45	0.45	0.45	0.46	0.46	0.46	0.46	0.46	0.47
Mid Case Gas & 7.3p H2 RHI (reduced FIT)	Capex (m£)	4.00																			
	Opex (m£)	0.00	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
	Annual Cashflow	-4.00	0.32	0.32	0.32	0.33	0.33	0.33	0.33	0.34	0.34	0.34	0.34	0.34	0.35	0.35	0.35	0.35	0.36	0.36	0.36
	Cummulative Cashflow	-4.00	-3.68	-3.36	-3.03	-2.70	-2.38	-2.04	-1.71	-1.37	-1.04	-0.70	-0.35	-0.01	0.34	0.69	1.04	1.39	1.75	2.11	2.47
	Income (m£)	0.00	0.50	0.50	0.51	0.51	0.51	0.51	0.52	0.52	0.52	0.52	0.53	0.53	0.53	0.53	0.54	0.54	0.54	0.54	0.55
High Case Gas & 7.3p H2 RHI (reduced FIT)	Capex (m£)	4.00																			
	Opex (m£)	0.00	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
	Annual Cashflow	-4.00	0.39	0.40	0.40	0.40	0.40	0.41	0.41	0.41	0.41	0.42	0.42	0.42	0.43	0.43	0.43	0.43	0.44	0.44	0.44
	Cummulative Cashflow	-4.00	-3.61	-3.21	-2.81	-2.41	-2.00	-1.59	-1.19	-0.77	-0.36	0.06	0.48	0.90	1.33	1.76	2.19	2.62	3.06	3.50	3.94
	Income (m£)	0.00	0.50	0.50	0.51	0.51	0.51	0.51	0.52	0.52	0.52	0.52	0.53	0.53	0.53	0.53	0.54	0.54	0.54	0.54	0.55
High Case Gas & 7.3p H2 RHI (reduced FIT) & Thrash ELY	Capex (m£)	2.40																			
	Opex (m£)	0.00	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
	Annual Cashflow	-2.40	0.39	0.40	0.40	0.40	0.40	0.41	0.41	0.41	0.41	0.42	0.42	0.42	0.43	0.43	0.43	0.43	0.44	0.44	0.44
	Cummulative Cashflow	-2.40	-2.01	-1.61	-1.21	-0.81	-0.40	0.01	0.41	0.83	1.24	1.66	2.08	2.50	2.93	3.36	3.79	4.22	4.66	5.10	5.54
	Income (m£)	0.00	0.33	0.33	0.33	0.33	0.33	0.33	0.34	0.34	0.34	0.34	0.34	0.34	0.35	0.35	0.35	0.35	0.35	0.35	0.36
Mid Case Gas Price & GDNO funded inject	Capex (m£)	3.40																			
	Opex (m£)	0.00	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
	Annual Cashflow	-3.40	0.25	0.25	0.25	0.25	0.25	0.26	0.26	0.26	0.26	0.26	0.26	0.27	0.27	0.27	0.27	0.27	0.28	0.28	0.28
	Cummulative Cashflow	-3.40	-3.15	-2.90	-2.65	-2.40	-2.14	-1.89	-1.63	-1.37	-1.11	-0.84	-0.58	-0.31	-0.04	0.23	0.50	0.77	1.05	1.32	1.60
	Income (m£)	0.00	0.40	0.40	0.40	0.41	0.41	0.41	0.41	0.41	0.42	0.42	0.42	0.42	0.42	0.43	0.43	0.43	0.43	0.44	0.44
High Case Gas Price & GDNO funded inject	Capex (m£)	2.60																			
	Opex (m£)	0.00	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Annual Cashflow	-2.60	0.21	0.21	0.21	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.24	0.24
	Cummulative Cashflow	-2.60	-2.39	-2.17	-1.96	-1.74	-1.53	-1.31	-1.09	-0.87	-0.64	-0.42	-0.19	0.03	0.26	0.49	0.72	0.95	1.19	1.42	1.66
	Income (m£)	0.00	6.68	6.71	6.75	6.78	6.81	6.85	6.88	6.92	6.95	6.99	7.02	7.06	7.09	7.13	7.16	7.20	7.23	7.27	7.31
Sold at Compressed H2 Prices	Capex (m£)	4.00																			
	Opex (m£)	0.00	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
	Annual Cashflow	-4.00	6.57	6.61	6.64	6.67	6.71	6.74	6.78	6.81	6.84	6.88	6.91	6.95	6.98	7.02	7.06	7.09	7.13	7.16	7.20
	Cummulative Cashflow	-4.00	2.57	9.18	15.82	22.49	29.20	35.94	42.72	49.53	56.37	63.25	70.17	77.11	84.10	91.12	98.18	105.27	112.39	119.56	126.76

DECC Mid Case Gas Price

ILLUSTRATIVE VALUE FLOW



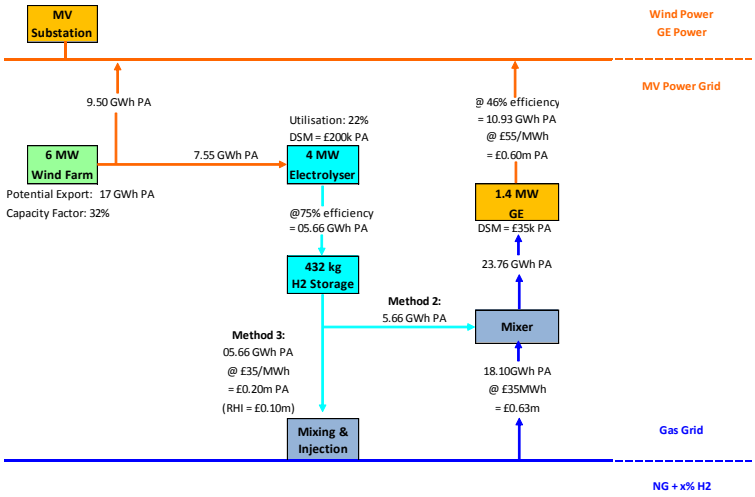
KEY ASSUMPTIONS	
Wind (MW):	6
PV (MW):	0
ELY (MW):	4
Wind Connection (MW):	2
Gas Engine (MW):	1.4
Gas Price (£/MWh)	22
Electricity Price (£/MWh)	55
Annual Energy Inflation	N/A

SIMPLE CASHFLOW/PAYBACK	Standard Operation			Thrash Electrolyser		
	Method 2	Method 3	M3+RHI	Method 2	Method 3	M3+RHI
Income* (£m PA)	**0.836**	**0.325**	**0.424**	**0.836**	**0.325**	**0.424**
DSM	0.235	0.200	0.200	0.235	0.200	0.200
Generation	0.601	0.125	0.224	0.601	0.125	0.224
Opex (£m PA)	**0.553**	**0.106**	**0.106**	**0.553**	**0.106**	**0.106**
ELY O&M	0.078	0.078	0.078	0.078	0.078	0.078
Gas Bought	0.398	N/A	N/A	0.398	N/A	N/A
GI O&M	N/A	0.028	0.028	N/A	0.028	0.028
GE O&M	0.077	N/A	N/A	0.077	N/A	N/A
Gross Cashflow (£m PA	0.283	0.219	0.318	0.283	0.219	0.318
Capex	4.24	4	4	2.64	2.4	2.4
Simple Payback	15	18	13	9	11	8

* Excludes energy price inflation

DECC High Case Gas Price

ILLUSTRATIVE VALUE FLOW



KEY ASSUMPTIONS	
Wind (MW):	6
PV (MW):	0
ELY (MW):	4
Wind Connection (MW):	2
Gas Engine (MW):	1.4
Gas Price (£/MWh)	35
Electricity Price (£/MWh)	55
Annual Energy Inflation	N/A

SIMPLE CASHFLOW/PAYBACK	Standard Operation			Thrash Electrolyser		
	Method 2	Method 3	M3+RHI	Method 2	Method 3	M3+RHI
Income* (£m PA)	**0.836**	**0.398**	**0.498**	**0.836**	**0.398**	**0.498**
DSM	0.235	0.200	0.200	0.235	0.200	0.200
Generation	0.601	0.198	0.298	0.601	0.198	0.298
Opex (£m PA)	**0.553**	**0.106**	**0.106**	**0.553**	**0.106**	**0.106**
ELY O&M	0.078	0.078	0.078	0.078	0.078	0.078
Gas Bought	0.398	N/A	N/A	0.398	N/A	N/A
GI O&M	N/A	0.028	0.028	N/A	0.028	0.028
GE O&M	0.077	N/A	N/A	0.077	N/A	N/A
Gross Cashflow (£m PA	0.283	0.292	0.392	0.283	0.292	0.392
Capex	4.24	4	4	2.64	2.4	2.4
Simple Payback	15	14	10	9	8	6

* Excludes energy price inflation

METHOD 3 – GAS INJECT

SCENARIO 5 – 6MW ELECTROLYSER, 0MW UNCONSTRAINED WIND

Base Case Assumptions	
Wind (MW):	**6**
PV (MW):	**0**
ELY (MW):	**6**
Wind Connection (MW):	**0**
Energy price rise PA:	**0.5%**
Electrolyser Utilisation (%):	**32%**

Method 3 - Calculation Description

Energy Consumed by the electrolyser is calculated using half hourly profile wind and PV generation data.

Energy generated up to 6 MW over the wind farm firm level is calculated for each half hour of the year. This results in electrolyser energy consumption of 17048 MWh PA using the base case assumptions shown. At an electrolyser efficiency of 75%, this represents: 12,786 MWh PA gas energy output.

The key cost and scenario parameters below are then used to calculate the Income, Capex and Opex of each option. Income includes the value of gas injected coupled with electrolyser DSM revenues of 0.30 m£ PA.

Key Costs					
Electrolyser	**Value**	**Units**	**Gas Inject**	**Value**	**Units**
Initial Cost	4.80	m£	Initial Cost	0.60	m£
Incremental Control System	0.20	m£	Operating Cost	0.03	m£ PA
Operating Cost	0.12	m£ PA	H2 Produced	324,518	Kg PA
Output after efficiency loss	12,786	MWh PA	Value of Gas Injected (Mid Case)	0.45	m£ PA
DSM Revenue	0.30	m£ PA	Value of H2 Compressed*	14.56	£m PA

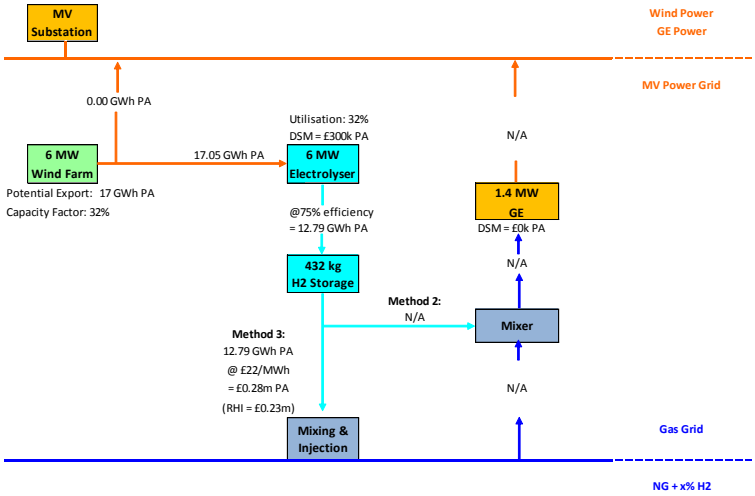
* $70/Kg using BOC 2012 prices

Financial Summary

	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DECC Mid Case Gas Price (£22/MWh)	Income (m£)	0.00	0.58	0.59	0.59	0.59	0.60	0.60	0.60	0.60	0.61	0.61	0.61	0.62	0.62	0.62	0.63	0.63	0.63	0.64	0.64
	Capex (m£)	5.60																			
	Opex (m£)	0.00	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
	Annual Cashflow	-5.60	0.44	0.44	0.45	0.45	0.45	0.46	0.46	0.46	0.46	0.47	0.47	0.47	0.48	0.48	0.48	0.49	0.49	0.49	0.50
	Cummulative Cashflow	-5.60	-5.16	-4.71	-4.27	-3.82	-3.36	-2.91	-2.45	-1.99	-1.52	-1.05	-0.58	-0.11	0.37	0.85	1.33	1.82	2.31	2.80	3.30
DECC Mid Case Price & Thrash Electrolyser	Income (m£)	0.00	0.58	0.59	0.59	0.59	0.60	0.60	0.60	0.60	0.61	0.61	0.61	0.62	0.62	0.62	0.63	0.63	0.63	0.64	0.64
	Capex (m£)	3.20																			
	Opex (m£)	0.00	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
	Annual Cashflow	-3.20	0.44	0.44	0.45	0.45	0.45	0.46	0.46	0.46	0.46	0.47	0.47	0.47	0.48	0.48	0.48	0.49	0.49	0.49	0.50
	Cummulative Cashflow	-3.20	-2.76	-2.31	-1.87	-1.42	-0.96	-0.51	-0.05	0.41	0.88	1.35	1.82	2.29	2.77	3.25	3.73	4.22	4.71	5.20	5.70
DECC High Case Gas Price (£35/MWh)	Income (m£)	0.00	0.75	0.76	0.76	0.76	0.77	0.77	0.77	0.78	0.78	0.79	0.79	0.79	0.80	0.80	0.81	0.81	0.81	0.82	0.82
	Capex (m£)	5.60																			
	Opex (m£)	0.00	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
	Annual Cashflow	-5.60	0.61	0.61	0.62	0.62	0.62	0.63	0.63	0.63	0.64	0.64	0.65	0.65	0.65	0.66	0.66	0.67	0.67	0.67	0.68
	Cummulative Cashflow	-5.60	-4.99	-4.38	-3.76	-3.14	-2.52	-1.89	-1.26	-0.63	0.01	0.65	1.30	1.95	2.61	3.26	3.93	4.59	5.26	5.94	6.62
DECC High Case Price & Thrash Electrolyser	Income (m£)	0.00	0.75	0.76	0.76	0.76	0.77	0.77	0.77	0.78	0.78	0.79	0.79	0.79	0.80	0.80	0.81	0.81	0.81	0.82	0.82
	Capex (m£)	3.20																			
	Opex (m£)	0.00	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
	Annual Cashflow	-3.20	0.61	0.61	0.62	0.62	0.62	0.63	0.63	0.63	0.64	0.64	0.65	0.65	0.65	0.66	0.66	0.67	0.67	0.67	0.68
	Cummulative Cashflow	-3.20	-2.59	-1.98	-1.36	-0.74	-0.12	0.51	1.14	1.77	2.41	3.05	3.70	4.35	5.01	5.66	6.33	6.99	7.66	8.34	9.02
Mid Case Gas & 7.3p H2 RHI (reduced FIT)	Income (m£)	0.00	0.81	0.82	0.82	0.82	0.83	0.83	0.84	0.84	0.84	0.85	0.85	0.86	0.86	0.87	0.87	0.87	0.88	0.88	0.89
	Capex (m£)	5.60																			
	Opex (m£)	0.00	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
	Annual Cashflow	-5.60	0.67	0.67	0.68	0.68	0.68	0.69	0.69	0.70	0.70	0.71	0.71	0.71	0.72	0.72	0.73	0.73	0.74	0.74	0.74
	Cummulative Cashflow	-5.60	-4.93	-4.26	-3.58	-2.90	-2.22	-1.53	-0.84	-0.14	0.56	1.27	1.98	2.69	3.41	4.13	4.86	5.59	6.33	7.07	7.81
High Case Gas & 7.3p H2 RHI (reduced FIT)	Income (m£)	0.00	0.98	0.98	0.99	0.99	1.00	1.00	1.01	1.01	1.02	1.02	1.03	1.03	1.04	1.04	1.05	1.05	1.06	1.06	1.07
	Capex (m£)	5.60																			
	Opex (m£)	0.00	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
	Annual Cashflow	-5.60	0.84	0.84	0.85	0.85	0.85	0.86	0.86	0.87	0.88	0.88	0.89	0.89	0.90	0.90	0.91	0.91	0.92	0.92	0.93
	Cummulative Cashflow	-5.60	-4.76	-3.92	-3.08	-2.23	-1.37	-0.51	0.35	1.22	2.10	2.98	3.86	4.75	5.65	6.55	7.45	8.37	9.28	10.20	11.13
High Case Gas & 7.3p H2 RHI (reduced FIT) & Thrash ELY	Income (m£)	0.00	0.98	0.98	0.99	0.99	1.00	1.00	1.01	1.01	1.02	1.02	1.03	1.03	1.04	1.04	1.05	1.05	1.06	1.06	1.07
	Capex (m£)	3.20																			
	Opex (m£)	0.00	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
	Annual Cashflow	-3.20	0.84	0.84	0.85	0.85	0.85	0.86	0.86	0.87	0.88	0.88	0.89	0.89	0.90	0.90	0.91	0.91	0.92	0.92	0.93
	Cummulative Cashflow	-3.20	-2.36	-1.52	-0.68	0.17	1.03	1.89	2.75	3.62	4.50	5.38	6.26	7.15	8.05	8.95	9.85	10.77	11.68	12.60	13.53
Mid Case Gas Price & GDNO funded inject	Income (m£)	0.00	0.58	0.59	0.59	0.59	0.60	0.60	0.60	0.60	0.61	0.61	0.61	0.62	0.62	0.62	0.63	0.63	0.63	0.64	0.64
	Capex (m£)	5.00																			
	Opex (m£)	0.00	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
	Annual Cashflow	-5.00	0.47	0.47	0.48	0.48	0.48	0.48	0.49	0.49	0.49	0.50	0.50	0.50	0.51	0.51	0.51	0.51	0.52	0.52	0.52
	Cummulative Cashflow	-5.00	-4.53	-4.06	-3.58	-3.11	-2.62	-2.14	-1.65	-1.16	-0.67	-0.17	0.32	0.83	1.33	1.84	2.35	2.87	3.38	3.90	4.43
High Case Gas Price & GDNO funded inject	Income (m£)	0.00	0.75	0.76	0.76	0.76	0.77	0.77	0.77	0.78	0.78	0.79	0.79	0.79	0.80	0.80	0.81	0.81	0.81	0.82	0.82
	Capex (m£)	2.60																			
	Opex (m£)	0.00	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Annual Cashflow	-2.60	0.21	0.21	0.21	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.24	0.24
	Cummulative Cashflow	-2.60	-2.39	-2.17	-1.96	-1.74	-1.53	-1.31	-1.09	-0.87	-0.64	-0.42	-0.19	0.03	0.26	0.49	0.72	0.95	1.19	1.42	1.66
Sold at Compressed H2 Prices	Income (m£)	0.00	14.94	15.01	15.09	15.16	15.24	15.31	15.39	15.47	15.54	15.62	15.70	15.78	15.86	15.94	16.02	16.10	16.18	16.26	16.34
	Capex (m£)	5.60																			
	Opex (m£)	0.00	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
	Annual Cashflow	-5.60	14.79	14.87	14.94	15.02	15.09	15.17	15.25	15.32	15.40	15.48	15.56	15.64	15.71	15.79	15.87	15.95	16.03	16.11	16.20
	Cummulative Cashflow	-5.60	9.19	24.06	39.00	54.02	69.12	84.29	99.53	114.86	130.26	145.74	161.29	176.93	192.64	208.44	224.31	240.26	256.30	272.41	288.61

DECC Mid Case Gas Price

ILLUSTRATIVE VALUE FLOW



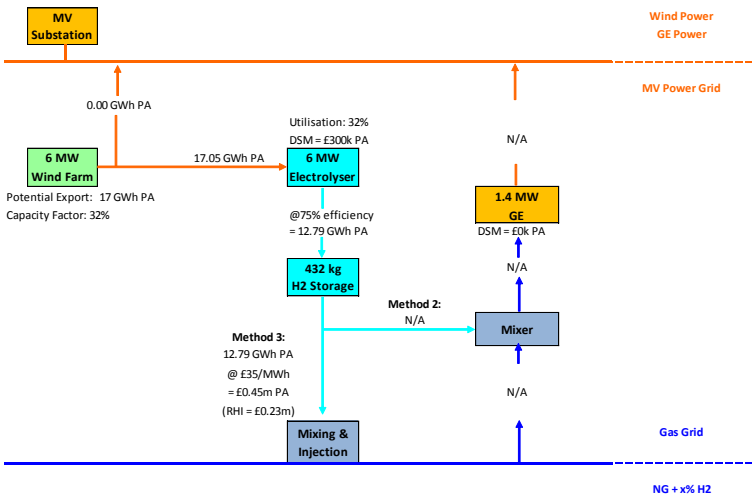
KEY ASSUMPTIONS	
Wind (MW):	6
PV (MW):	0
ELY (MW):	6
Wind Connection (MW):	0
Gas Engine (MW):	1.4
Gas Price (£/MWh)	22
Electricity Price (£/MWh)	55
Annual Energy Inflation	N/A

SIMPLE CASHFLOW/PAYBACK	Standard Operation			Thrash Electrolyser		
	Method 2	Method 3	M3+RHI	Method 2	Method 3	M3+RHI
Income* (£m PA)	**0.000**	**0.581**	**0.807**	**0.000**	**0.581**	**0.807**
DSM	0.000	0.300	0.300	0.000	0.300	0.300
Generation	0.000	0.281	0.507	0.000	0.281	0.507
Opex (£m PA)	**0.433**	**0.143**	**0.143**	**0.433**	**0.143**	**0.143**
ELY O&M	0.115	0.115	0.115	0.115	0.115	0.115
Gas Bought	0.241	N/A	N/A	0.241	N/A	N/A
GI O&M	N/A	0.028	0.028	N/A	0.028	0.028
GE O&M	0.077	N/A	N/A	0.077	N/A	N/A
Gross Cashflow (£m PA	-0.433	0.438	0.664	-0.433	0.438	0.664
Capex	5.84	5.6	5.6	3.44	3.2	3.2
Simple Payback	N/A	13	8	N/A	7	5

* Excludes energy price inflation

DECC High Case Gas Price

ILLUSTRATIVE VALUE FLOW



KEY ASSUMPTIONS	
Wind (MW):	6
PV (MW):	0
ELY (MW):	6
Wind Connection (MW):	0
Gas Engine (MW):	1.4
Gas Price (£/MWh)	35
Electricity Price (£/MWh)	55
Annual Energy Inflation	N/A

SIMPLE CASHFLOW/PAYBACK	Standard Operation			Thrash Electrolyser		
	Method 2	Method 3	M3+RHI	Method 2	Method 3	M3+RHI
Income* (£m PA)	**0.000**	**0.748**	**0.973**	**0.000**	**0.748**	**0.973**
DSM	0.000	0.300	0.300	0.000	0.300	0.300
Generation	0.000	0.448	0.673	0.000	0.448	0.673
Opex (£m PA)	**0.433**	**0.143**	**0.143**	**0.433**	**0.143**	**0.143**
ELY O&M	0.115	0.115	0.115	0.115	0.115	0.115
Gas Bought	0.241	N/A	N/A	0.241	N/A	N/A
GI O&M	N/A	0.028	0.028	N/A	0.028	0.028
GE O&M	0.077	N/A	N/A	0.077	N/A	N/A
Gross Cashflow (£m PA	-0.433	0.605	0.830	-0.433	0.605	0.830
Capex	5.84	5.6	5.6	3.44	3.2	3.2
Simple Payback	N/A	9	7	N/A	5	4

* Excludes energy price inflation