



SOREC

Decision Support Tool (DST)

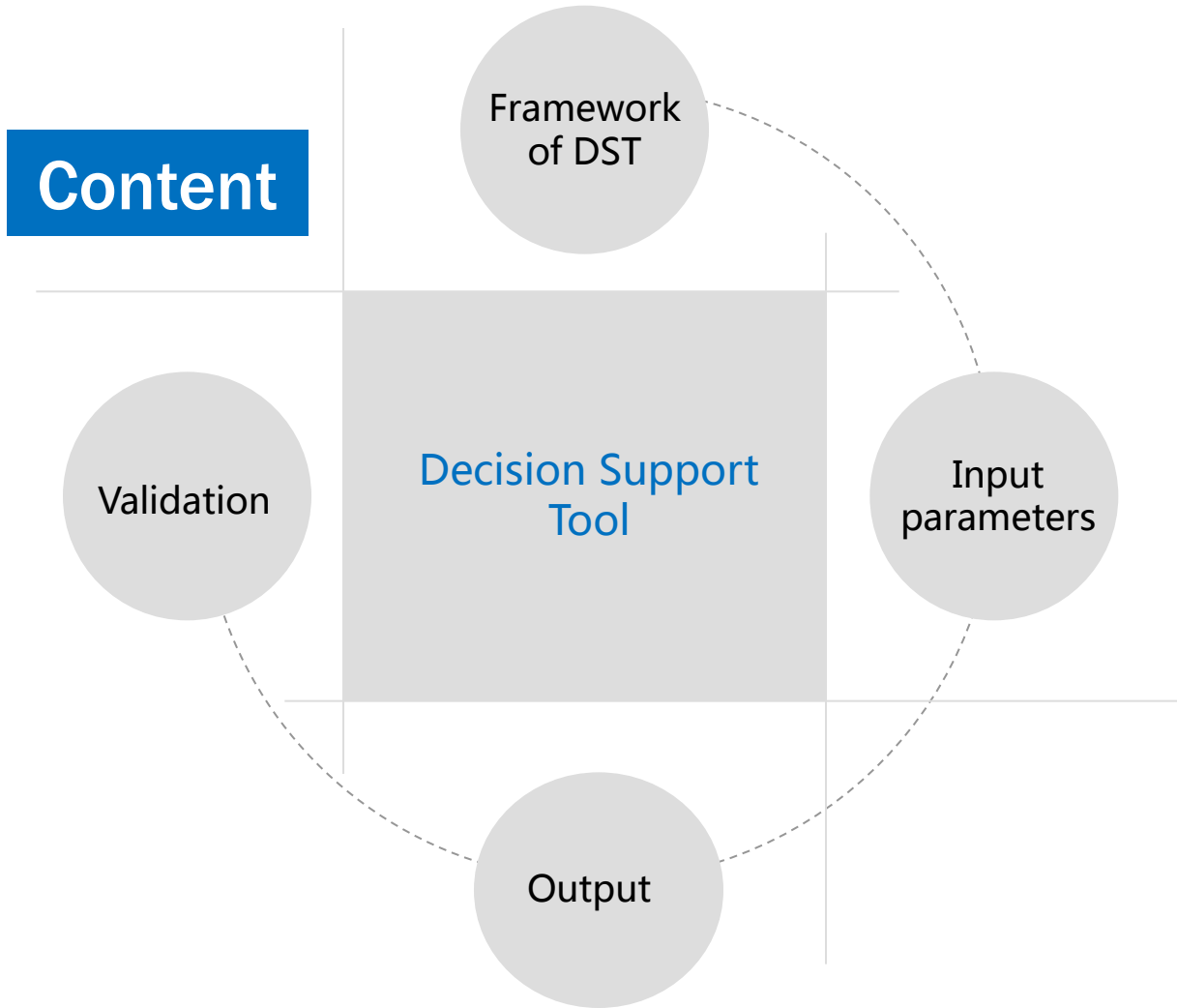
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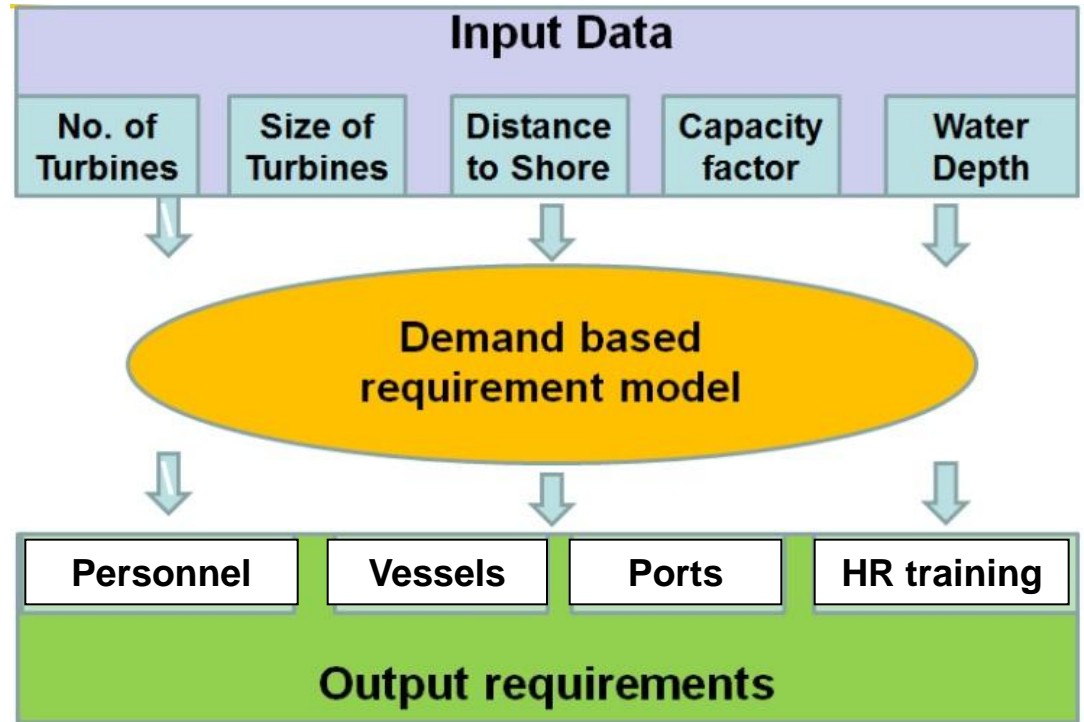
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Content



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Framework of DTS



2

System inputs

Maintenance category

<i>Category</i>	<i>Annual frequency</i>	<i>Organise time (hour)</i>	<i>Repair time (hour)</i>	<i>Logistics time (hour)</i>	<i>Crew required (person)</i>
A1	1	3	4	0	3
A2	0.5	3	8	0	2
A3	0.1	3	8	0	3
A4	0.05	12	16	0	2
B1	5	6	8	0	3
B2	1.5	12	16	0	4
B3	0.18	24	32	168	6
B4	0.5	6	8	168	2
B5	3.1	6	8	48	3
B6	0.05	24	32	240	3

DataBase

Default

Change

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Screenshot of the system input data 2

Vessel

Type	Fixed cost (GBP/year)	Variable cost (GBP/hour)	Speed (miles/h)	Max Wave (m)	Order time (days)	Personnel space
Crew transfer vessels	1825000	30	12	2	12	12
Crane vessels	0	1364	10	2.5	20	14
Jack-up vessels	0	5454	25	2.5	30	21

Personnel

Type	Hourly pay (£)	Work shift (hours)	Work day (days/week)
Turbine technicians	90	8	5
Foundation technicians	70	8	5
Electrical technicians	70	8	5

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User inputs

- Turbine specification
- Balance of plant
- Location of offshore wind farm
- Sea state

Screenshot of the user input data

Decision Support System for Operations & Maintenance in Offshore Wind Farm

Offshore Wind Farm Information

Turbine

Turbine model

Areva M5000-116

Number of turbines

1

Turbine rated capacity 5.0 MW

Installed capacity 5 MW

Location

Distance to port 0 miles

Water depth 0 to 0 m

Balance of plant

Foundation type Gravity based

No. of substations 1

Export cable length 0 KM

Array cable length 0 KM

Sea state

Mean wave height (m)

1.0

Mean wind speed (m/s)

11

O&M options

Port based

Port with helicopters

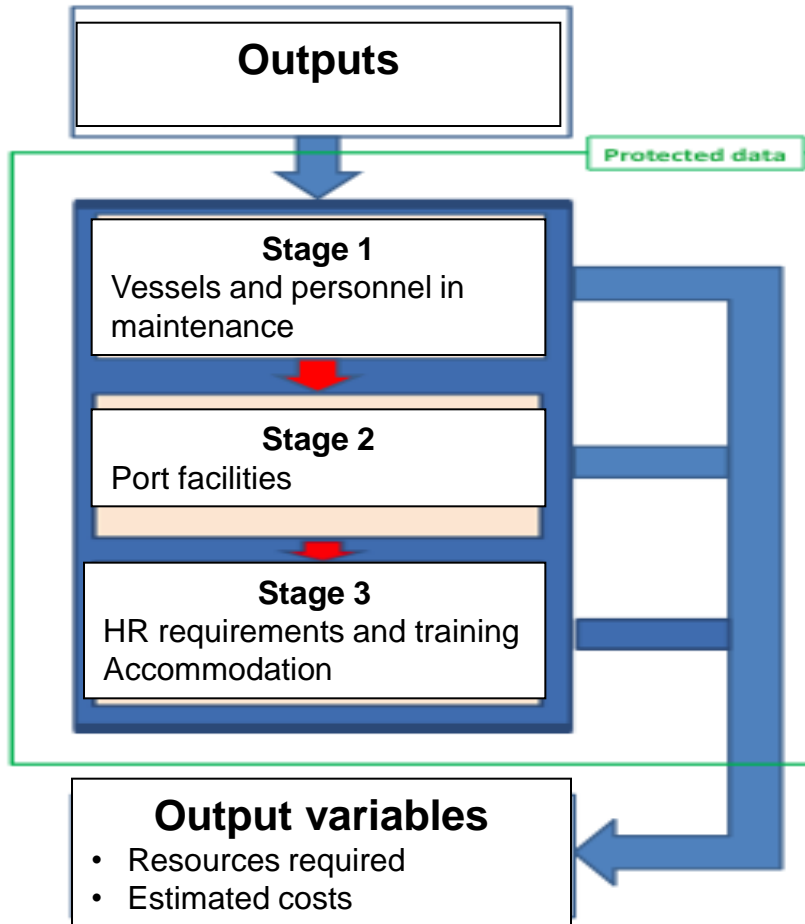
Offshore based

Exit

Default

System Input





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Outputs

Stage 1: Vessel and crew time

Stage One- Vessel and Personnel | Stage Two- Port | Stage Three- Training

Scheduled Maintenance

Maintenance category (preventive)	Frequency (turbine p.a.)	Vessel time requirement						Crew time requirement			
		CTVs	Crane vessels	Jack-up vessels	Helicopters	Mother ships	Daughter ships	Turbine	Foundation	Electrical	Offshore
Cat. A1: Repair/replacement of turbine (2000kg)	1	100	0	0	0	0	0	300	0	0	0
Cat. A2: Repair/replacement in substation	0.5	2	0	0	0	0	0	0	0	4	0
Cat. A3: Repair/replacement of foundation	0.1	10	0	0	0	0	0	0	30	0	0
Cat. A4: Repair/replacement of cables	0.05	6	0	0	0	0	0	0	0	12	0

Unscheduled Maintenance

Maintenance category (corrective)	Frequency (turbine p.a.)	Vessel time requirement						Crew time requirement			
		CTVs	Crane vessels	Jack-up vessels	Helicopters	Mother ships	daughter ships	Turbine	Foundation	Electrical	Offshore
Cat. B1: Small repair turbine	5	500	0	0	0	0	0	1500	0	0	0
Cat. B2: Replacement of small parts (<=2000kg)	1.5	0	150	0	0	0	0	600	0	0	0
Cat. B3: Replacement of large parts (>2000kg)	0.18	0	0	18	0	0	0	108	0	0	0
Cat. B4: Repair/replacement in substation	0.5	2	0	0	0	0	0	0	0	4	0
Cat. B5: Repair/replacement of foundation	3.1	310	0	0	0	0	0	0	930	0	0
Cat. B6: Repair/replacement of cables	0.05	6	0	0	0	0	0	0	0	18	0

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Maintenance cost estimate

costs

1.

Vessel cost:
fixed cost + variable cost

2.

Personnel cost:
Based on working hours / full-time annual salary

3.

Downtime cost:
Based on length of downtime



Estimated costs

Estimated Vessel Cost

<i>Vessel type</i>	<i>Working hours</i>										Sum	<i>The number required</i>	<i>Operation cost (£1000)</i>
	A1	A2	A3	A4	B1	B2	B3	B4	B5	B6			
Crew transfer vessels	1400	36	180	156	9000	0	0	36	5580	252	16640	14	1825499
Crane vessels	0	0	0	0	0	4200	0	0	0	0	4200	3	5728
Jack-up vessels	0	0	0	0	0	0	662	0	0	0	662	1	3610
Helicopters	0	0	0	0	0	0	0	0	0	0	0	0	0
Mother ships	0	0	0	0	0	0	0	0	0	0	0	0	0
Daughter ships	0	0	0	0	0	0	0	0	0	0	0	0	0
												Vessel cost	1834837

Estimated Personnel Cost

<i>Personnel type</i>	<i>Working hours</i>										Sum	<i>The number required</i>	<i>Operation cost (£1000)</i>
	A1	A2	A3	A4	B1	B2	B3	B4	B5	B6			
Turbine technicians	4200	0	0	0	27000	16800	3974	0	0	0	51974	44	4677
Foundation technicians	0	0	540	0	0	0	0	0	16740	0	17280	15	1209
Electrical technicians	0	72	0	312	0	0	0	72	0	756	1212	2	9
Turbine technicians (offshore)	0	0	0	0	0	0	0	0	0	0	0	0	0
												Personnel cost	5895

Estimated Revenue Loss

	A1	A2	A3	A4	B1	B2	B3	B4	B5	B6	Sum
<i>Breakdown hours</i>	3600	96	480	5049	28500	15300	12204	1122	62310	46053	174714
<i>Revenue loss (£1000)</i>	3060	81	408	4291	24225	13005	10373	953	52963	39145	148506

Total cost

£ 1989238 ,000

Exit



Online survey

35 respondents: *July – October 2014*

Site visits for in-depth interview

Ramsgate port: *7th October 2014*

E.On: *14th October 2014*

Newhaven port: *15th December 2014 (appointed)*



Welcome to comments

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