Maritime & Coastguard Agency

Oil Spill Modelling

Safer Lives, Safer Ships, Cleaner Seas

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- Introduction to Modelling
- Limitations and Uncertainty
- OILMAP
- Application and Case Studies

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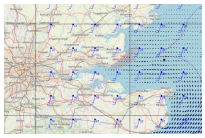
Oil Spill Models



- Inputs:
  - Hydrodynamic data (surface currents, speed and direction)
  - Wind data (speed and direction)
  - Oil type
  - Temperature (air and sea)

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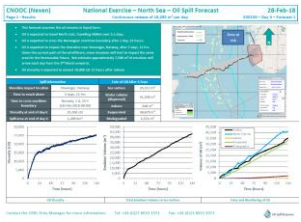
Oil Spill Models

- Outputs:
  - Trajectory
  - Behaviour



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Oil Spill Models

Types of models:

- Stochastic (probability of impacts)
- Deterministic (oil trajectory over time)
- Oil weathering (weathering over time)
- Hind-cast (identification of spill sources)

Caution:

Output quality is highly dependent of data quality
In a spill situation, modelling results must be validated by field observations

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Other Models

- SARIS
- Chemmap
- Atmospheric models – MET Office
- http://mariner-project.eu/

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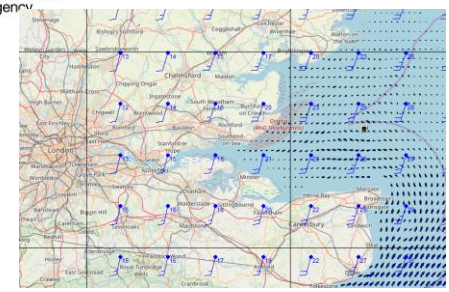
Limitations



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Sources of Uncertainty

- Wind forecasts
- Current forecasts
- Oil type and quantity
- Oil observations
  - The level of uncertainty will give different levels of confidence in the outputs

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OILMAP

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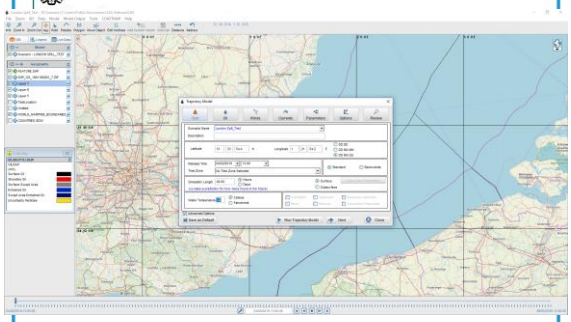

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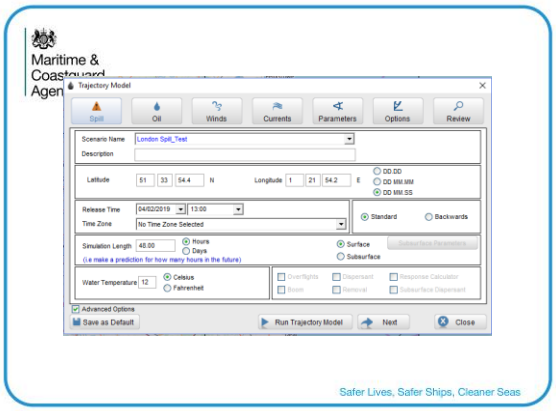

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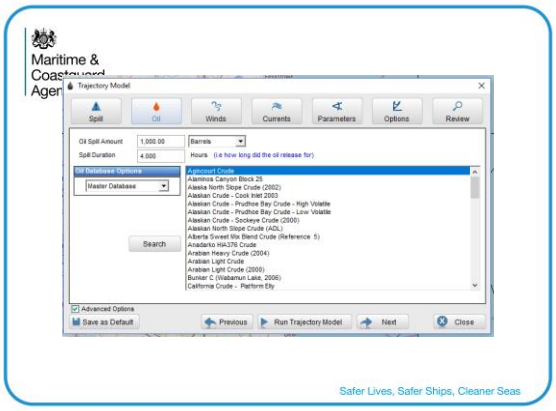

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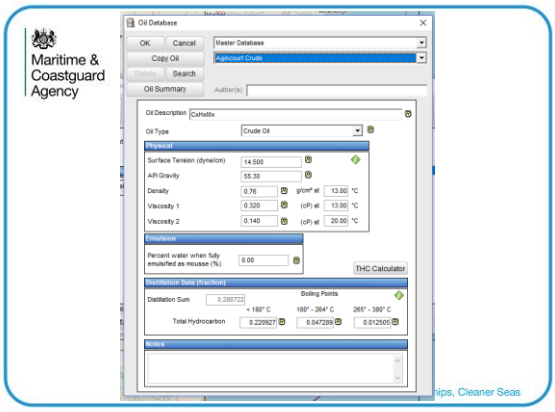
Maritime & Coastguard Agency
Oil Database
OK
Cancel
Copy Oil
Delete
Search
Oil Summary
Master Database
Agincourt Crude
Author(s)
Oil Description
Oil Type
Crude Oil
Physical
Surface Tension (dyne/cm)
API Gravity
Density
Viscosity 1
Viscosity 2
Emulsion
Percent water when fully emulsified as mousse (%)
THC Calculator
Distillation Data (fraction)
Distillation Sum
Boiling Points
Total Hydrocarbon
Notes
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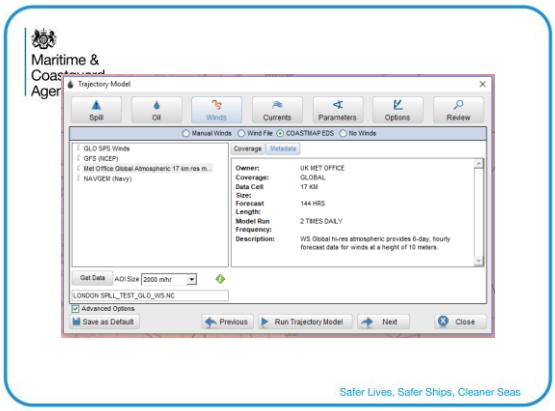
Maritime &
Trajectory Model
Spill
Oil
Winds
Currents
Parameters
Options
Review
Manual Winds
Wind File
COASTMAP EDS
No Winds
GLO SPS Winds
GFS (NCEP)
Met Office Global Atmospheric 17 km res m...
NAVGEM (Navy)
Coverage
Metadata
Owner: UK MET OFFICE
Coverage: GLOBAL
Data Cell Size: 17 KM
Forecast Length: 144 HRS
Model Run Frequency: 2 TIMES DAILY
Description: WS Global hi-res atmospheric provides 6-day, hourly forecast data for winds at a height of 10 meters.
Get Data
AOI Size 2000 m/hr
LONDON SPILL_TEST_GLO_WS.NC
Advanced Options
Save as Default
Previous
Run Trajectory Model
Next
Close
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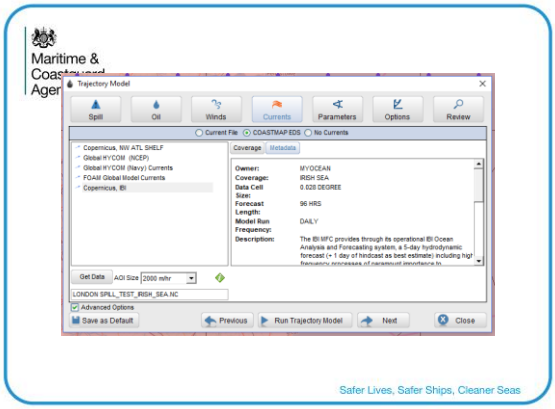
Maritime &
Trajectory Model
Spill
Oil
Winds
Currents
Parameters
Options
Review
Current File
COASTMAP EDS
No Currents
Copernicus, NW ATL SHELF
Global HYCOM (NCEP)
Global HYCOM (Navy) Currents
FOAM Global Model Currents
Copernicus, IBI
Coverage
Metadata
Owner: MYOCEAN
Coverage: IRISH SEA
Data Cell Size: 0.028 DEGREE
Forecast Length: 96 HRS
Model Run Frequency: DAILY
Description: The IBI MFC provides through its operational IBI Ocean Analysis and Forecasting system, a 5-day hydrodynamic forecast (+ 1 day of hindcast as best estimate) including high
Get Data
AOI Size 2000 m/hr
LONDON SPILL_TEST_IRISH_SEA.NC
Advanced Options
Save as Default
Previous
Run Trajectory Model
Next
Close
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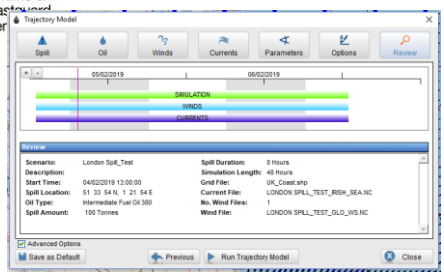

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Kuzma Minin

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Kuzma Minin

Credit: BBC News

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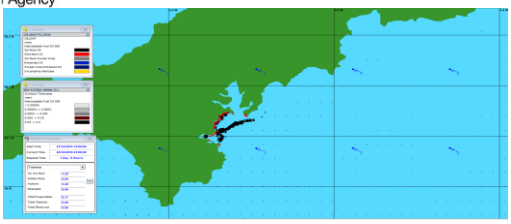
09:00 PM 24 December 18



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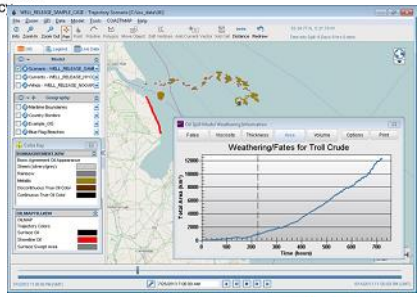
OILMAP



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Application and Case Studies

- Exercises
- Contingency planning and risk assessment
- Incident response

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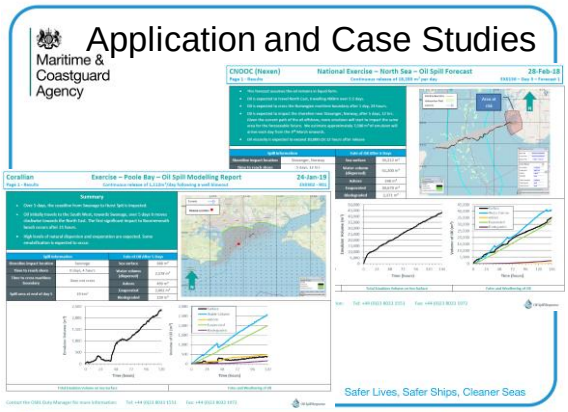
Application and Case Studies
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CNOOC (Nexen)
National Exercise – North Sea – Oil Spill Forecast
28-Feb-18
Corallian
Exercise – Poole Bay – Oil Spill Modelling Report
24-Jan-19
Summary
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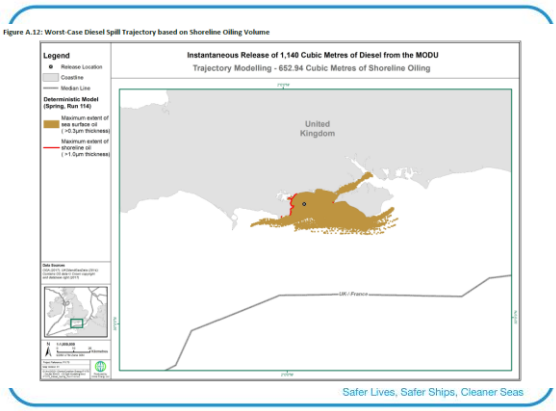
Figure A.12: Worst-Case Diesel Spill Trajectory based on Shoreline Oiling Volume
Legend
Release Location
Coastline
Median Line
Deterministic Model (Spring, Run 114)
Maximum extent of sea surface oil (>0.3µm thickness)
Maximum extent of shoreline oil (>1.0µm thickness)
Instantaneous Release of 1,140 Cubic Metres of Diesel from the MODU
Trajectory Modelling - 652.94 Cubic Metres of Shoreline Oiling
United Kingdom
UK / France
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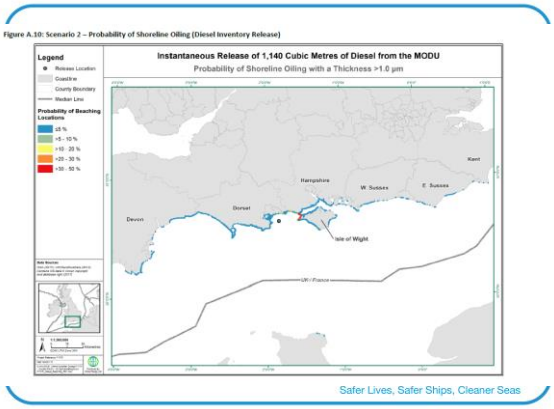
Figure A.10: Scenario 2 – Probability of Shoreline Oiling (Diesel Inventory Release)
Legend
Release Location
Coastline
County Boundary
Median Line
Probability of Beaching Locations
Instantaneous Release of 1,140 Cubic Metres of Diesel from the MODU
Probability of Shoreline Oiling with a Thickness >1.0 µm
Kent
Hampshire
W Sussex
E Sussex
Dorset
Devon
Isle of Wight
UK / France
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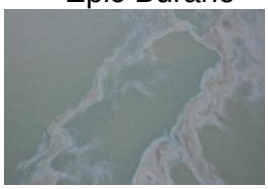
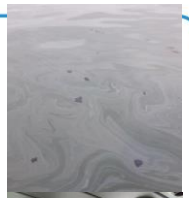
Epic Burano





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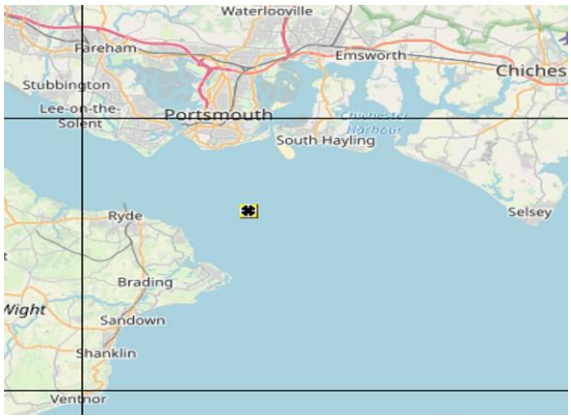

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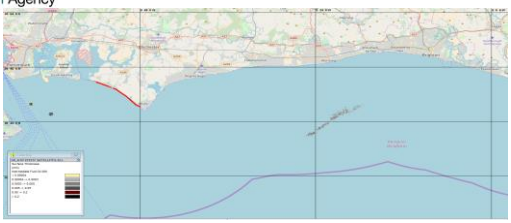
10:50 PM 22 December 17



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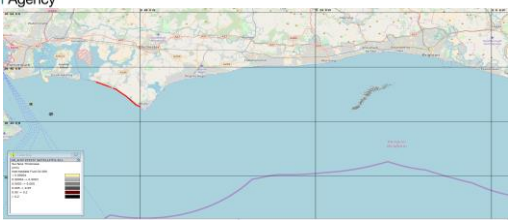
01:50 AM 23 December 17



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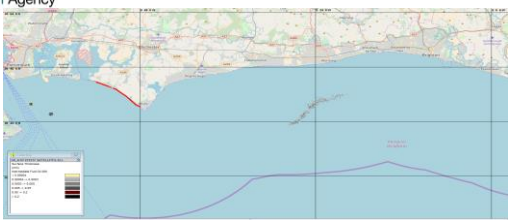

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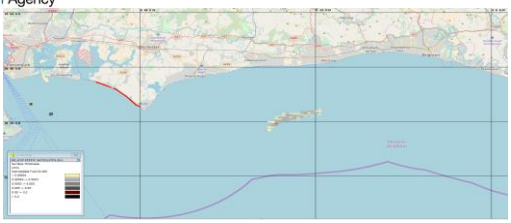

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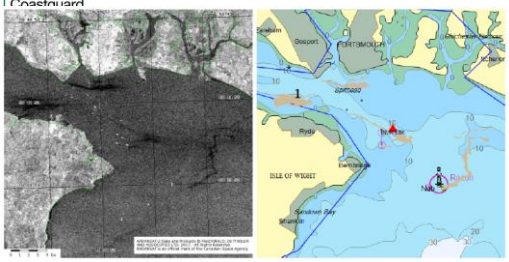

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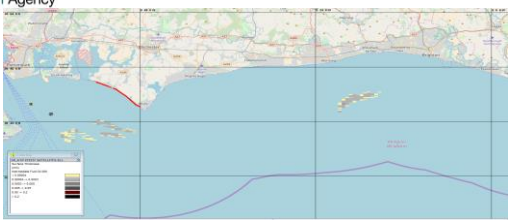

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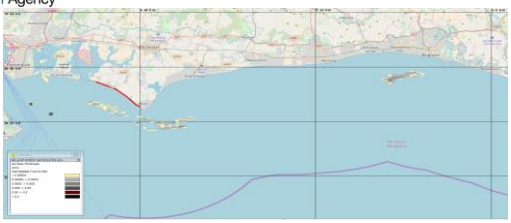

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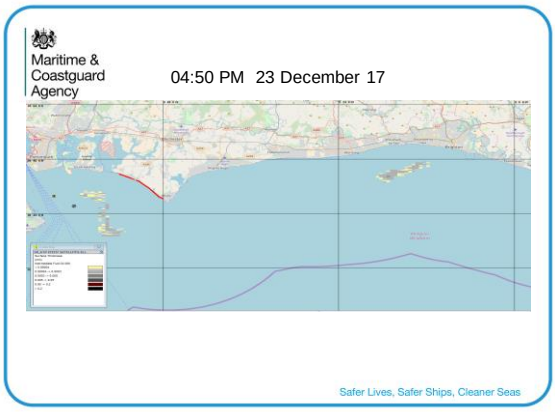
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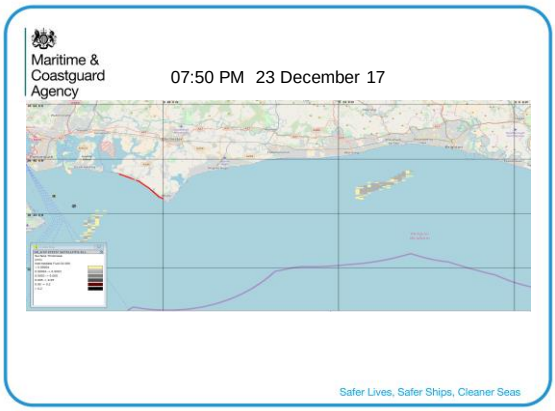
Maritime &
Coastguard
Agency
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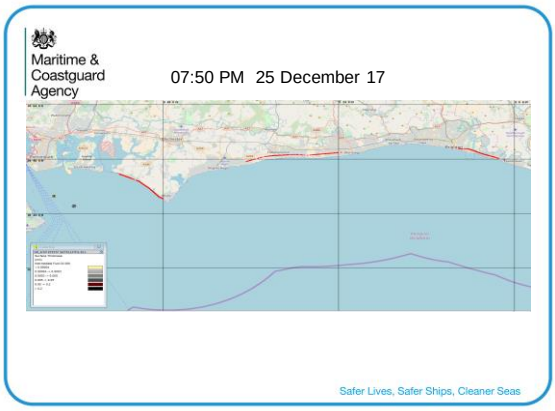
Maritime &
Coastguard
Agency
07:50 PM 25 December 17
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Epic Burano

- 45 x 15kg bags, mostly debris
- Local Authorities involved from Southampton & Isle of Wight up to East Sussex

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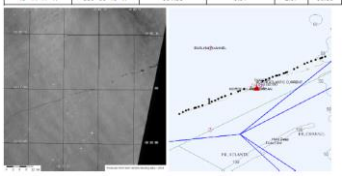
Application and Case Studies

Centre Position		SAR Wind at Center		Area	Length
Latitude	Longitude	Direction (From)	Speed (m/s)	(nm²)	(nm)
49° 44' 17" N	003° 39' 19" W	331.00	8.34	2.87	38.03



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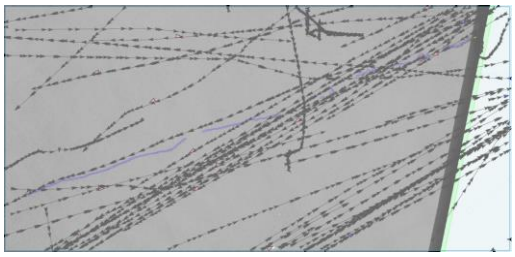
Application and Case Studies



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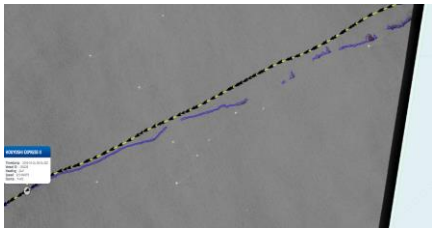
Application and Case Studies



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06:00 AM 21 December 18

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Thank you for your time, any questions??

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