Harvesting tidal energy from a storm surge barrier

Environmental monitoring of turbines in the Oosterschelde

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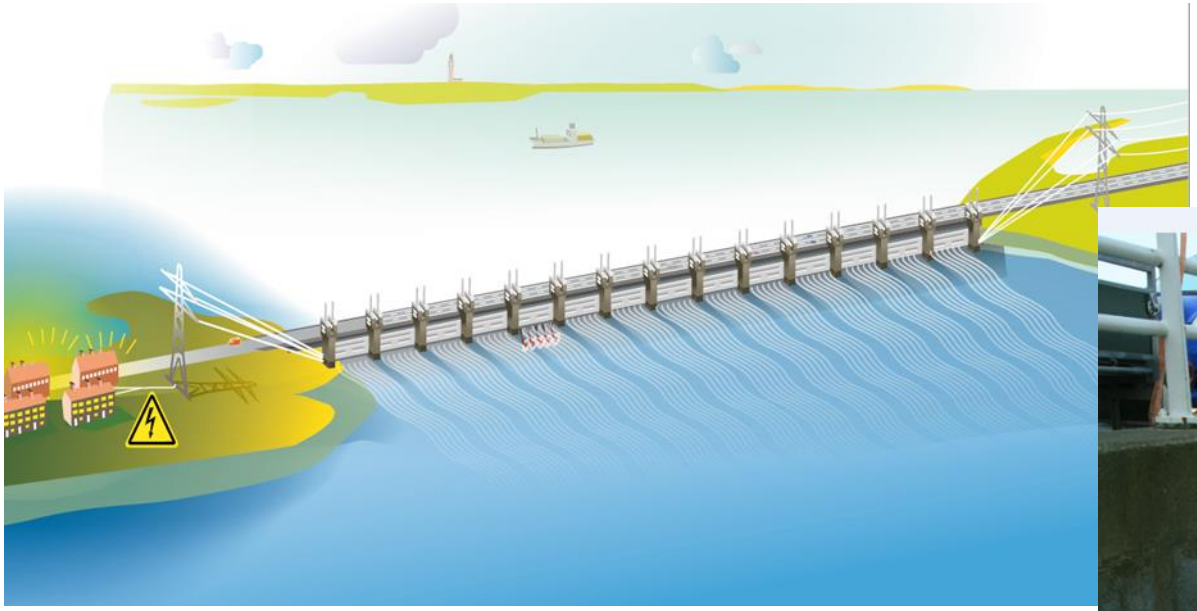
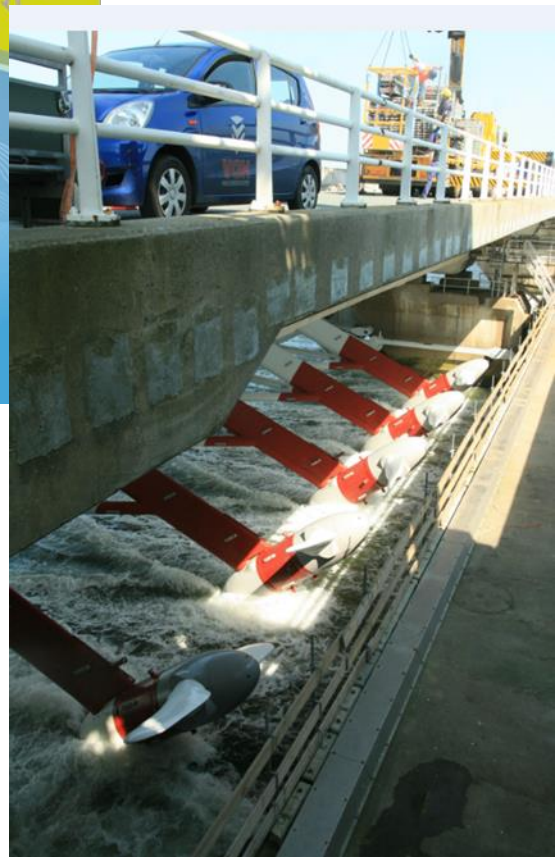
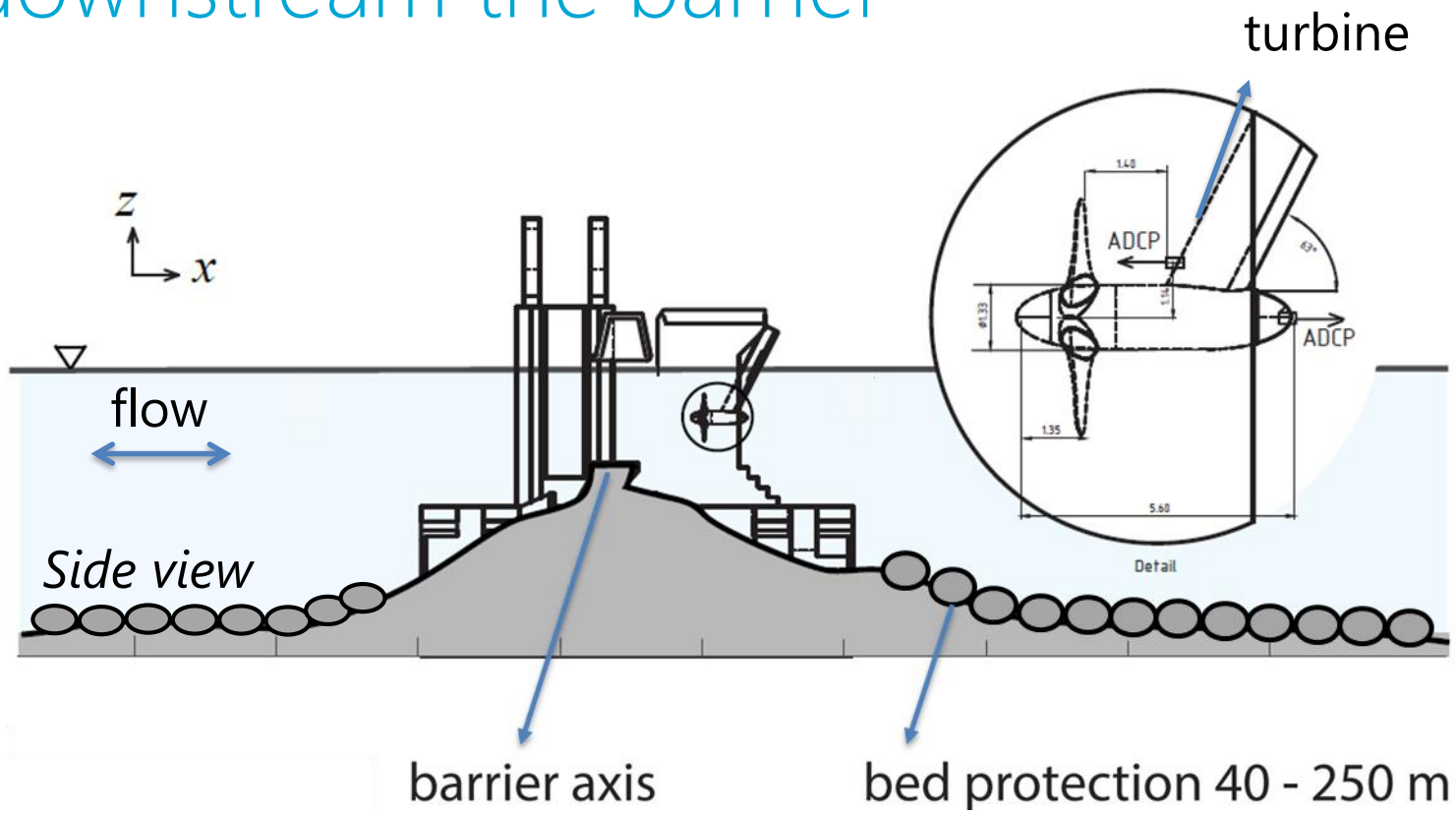
Barriers: an attractive location for harvesting renewable energy





- Mounting and grid connection
- Constriction of the flow

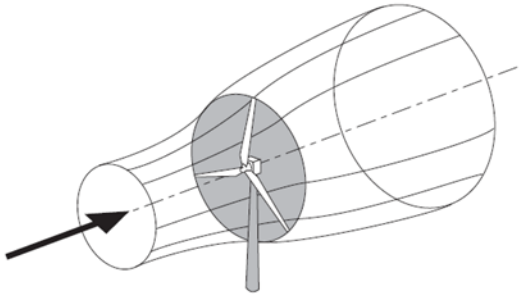
Flow accelerates and expands downstream the barrier

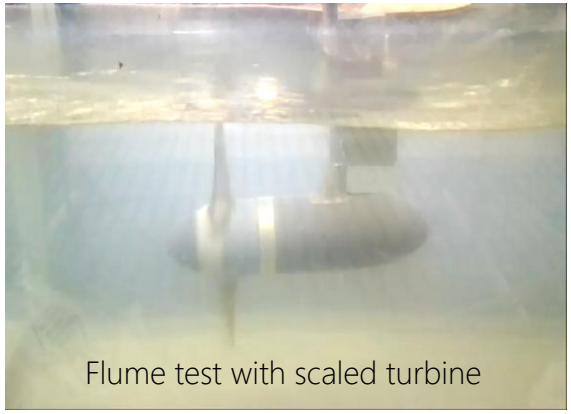


- Influences the hydraulic load on the structure and morphology of the basin

Need for a design tool to quantify electricity output and environmental impact


Turbines in the Storm Surge barrier


Disk representation of a turbine


Flume test with scaled turbine

Monitoring at field scale

Modelling using theory

Verificating at laboratory scale

To assess changes in:

- The stability of the bed protection of the barrier
- Basin morphology

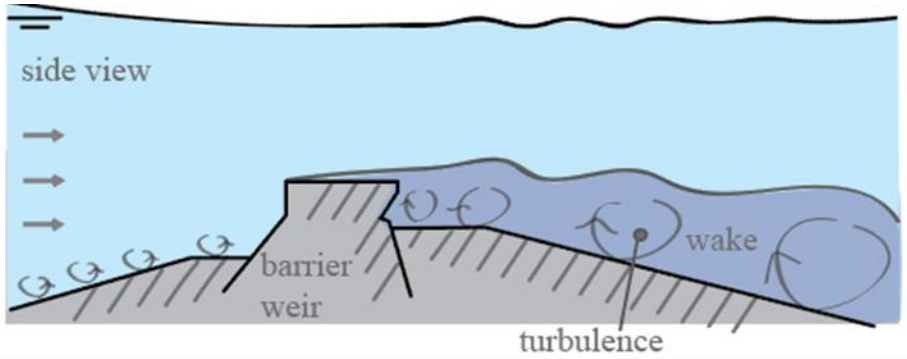
Monitoring of first-build turbine array

- First turbines in a barrier
  - The installed capacity is 1.2 MW
  - 1100 average Dutch households (of 3000 kWh/y)

5 turbines of Tocardo Solutions BV

New model should add turbine and barrier drag

- Combined resistance is less than summing of the individual resistances



Flow past a barrier

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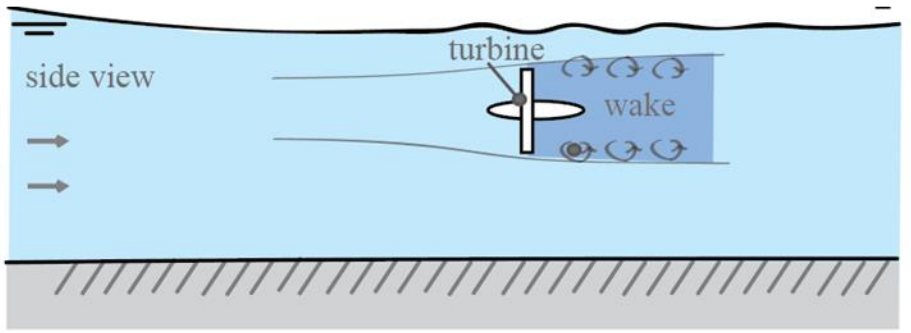

Flow past a turbine

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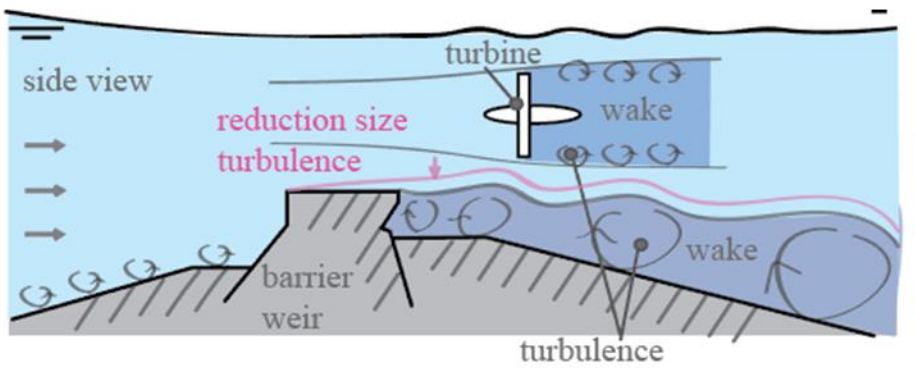
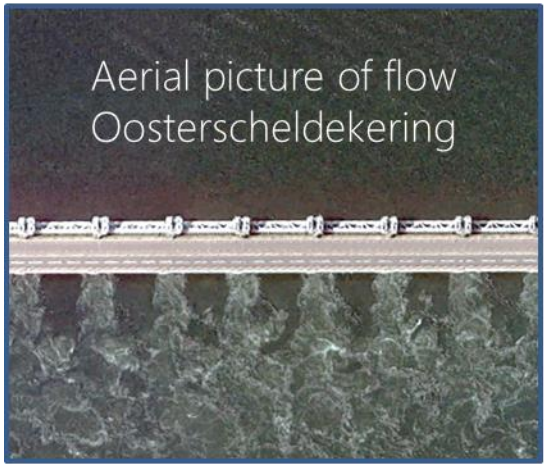
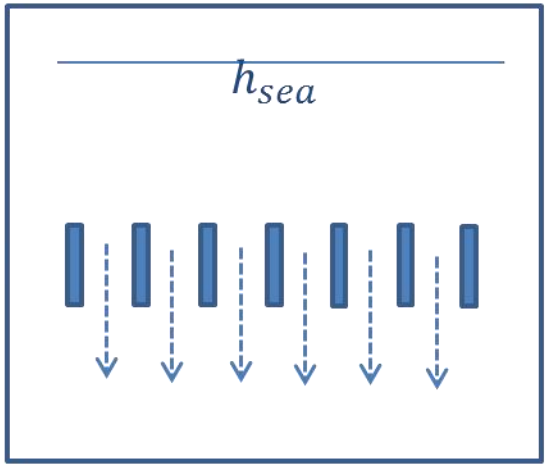


Flow past a barrier with turbine

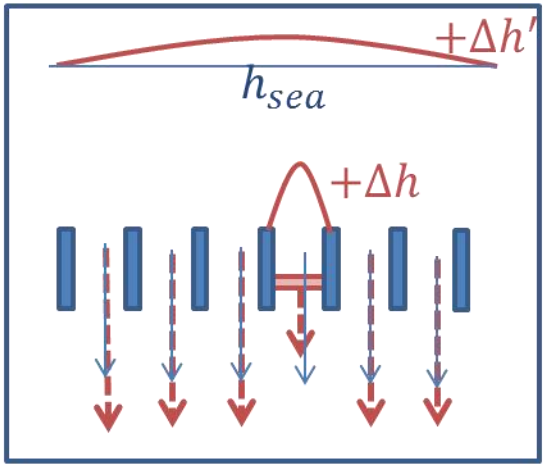
Gates of a barrier "communicate"

- Barrier has 62 gates, 1 with turbines
- Drag increases over 1 gate → flow bypasses to others





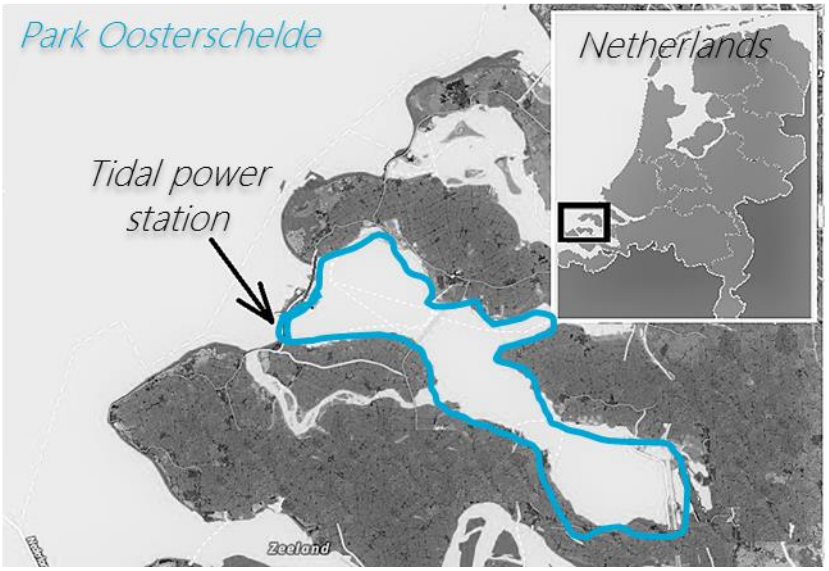
Normal flow (schematic)



Flow with turbines

Team of scientists in ‘Oosterschelde Tidal Power’ investigates environmental concerns

- We investigated ecological, morphological and hydrodynamic changes over the past two year
- Funded by the Netherlands Organisation for scientific research (NWO project 869.15.008), engineering consultancies, and European Regional Development Fund.



Thank you for your attention

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