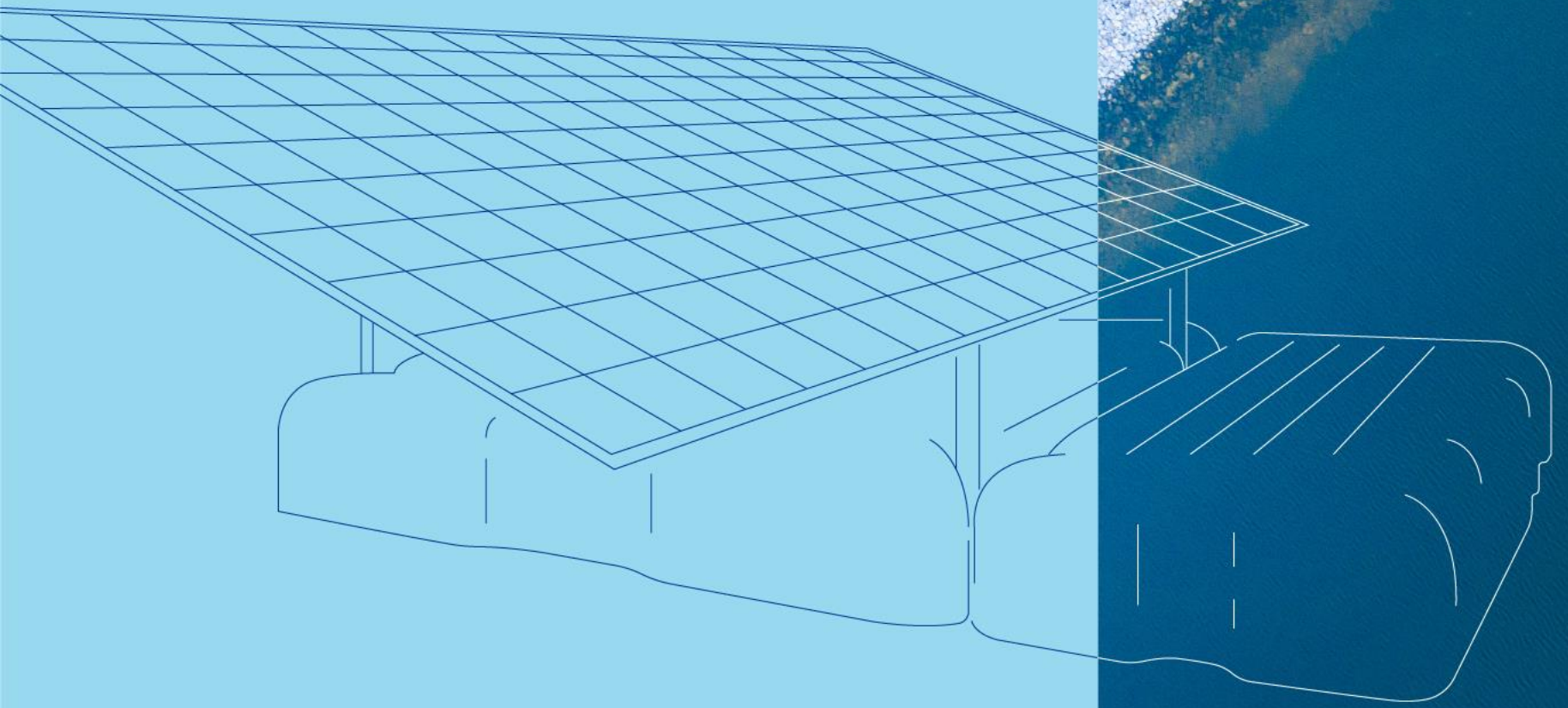
Best practices for inland FPV

Congres Zon op Water

Jasper Lemmens, 10 januari 2024



DNV - A global quality assurance and risk management company

12,000
employees

150+
years

100+
countries

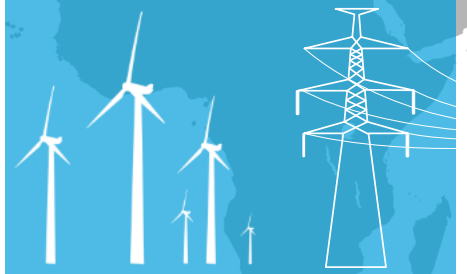
100,000+
customers

5% R&D
of annual revenue

MARITIME

OIL & GAS

ENERGY



BUSINESS ASSURANCE

DIGITAL SOLUTIONS

Technology & Research

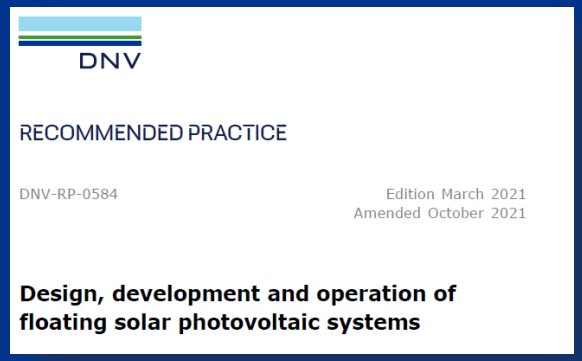
Global Shared Services

Jasper Lemmens

- Senior solar consultant
- Working at DNV since 2010
  - Background: Applied Physics MSc & Business Administration MSc
- Based in the Netherlands; DNV Global Practice Lead Floating Solar
- Three FPV projects:

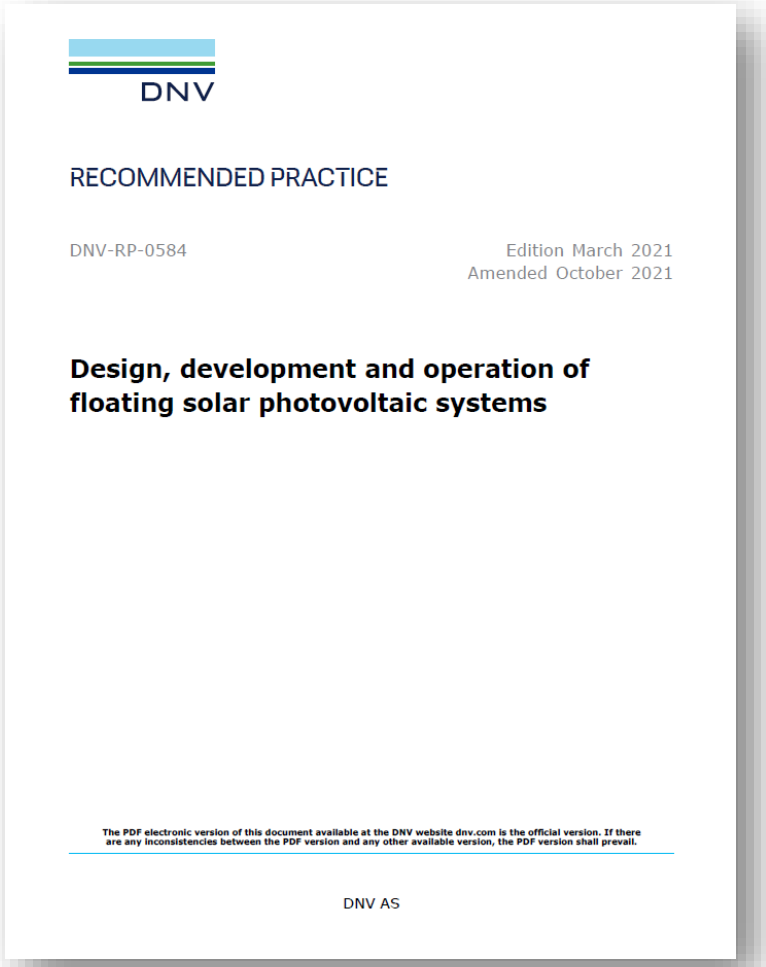
Technical due diligence
Zonnepark Lingewaard

Technical due diligence
Sekdoorn the Netherlands



DNV Joint Industry Project for
FPV Recommended Practice

Best practices are in DNV's Recommended Practice


DNV

RECOMMENDED PRACTICE

DNV-RP-0584

Edition March 2021
Amended October 2021

Design, development and operation of floating solar photovoltaic systems

The PDF electronic version of this document available at the DNV website dnv.com is the official version. If there are any inconsistencies between the PDF version and any other available version, the PDF version shall prevail.

DNV AS

[DNV-RP-0584 Design, development and operation of floating solar photovoltaic systems]

Topics covered in DNV-RP-0584:

- Environmental and site conditions
- Energy yield analysis
- General design considerations
- Floats
- Anchoring and mooring
- Permitting and environmental impact
- Electrical layout and components
- Installation and operation and maintenance
- Decommissioning
- Health and safety
- Levelised cost of electricity

DNV

Lessons learned when not using best practices

Drijvend zonnepark in Reuver loopt forse schade op, waarschijnlijk door de storm: 'Dit zagen we echt niet aankomen'

DNV

RECOMMENDED PRACTICE

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9.2.3 Anchoring and mooring

During the installation phase it may be necessary to use a temporary or intermediate mooring system for a short period of time before the final mooring arrangement is hooked up. The temporary mooring system and all its components shall normally be designed as per requirements for weather restricted operations if the criteria for such operations are met. See DNV-ST-N001 [2.6] for further guidance.

Lessons learned when not using best practices

DNV-RP-0584: Geotechnical investigations shall be investigated for correct anchor design

2.12 Ground conditions

For design of station-keeping systems and their components, such as anchors and mooring lines, a range of ground conditions should be defined. For each particular site-specific FPV project, the design of these station-keeping systems and their components shall be qualified for application in the actual site conditions.

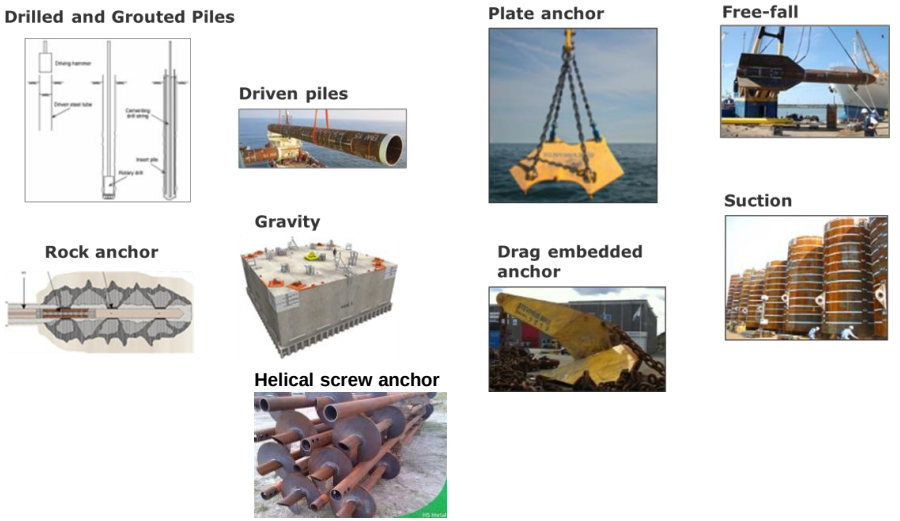
The surface and subsurface soil conditions at and near the site of proposed works shall be assessed by conducting geological studies, geophysical surveys and geotechnical investigations. The studies should include an assessment of the characteristics of rock or soil formations, which can be retained by structures or provide their foundations.

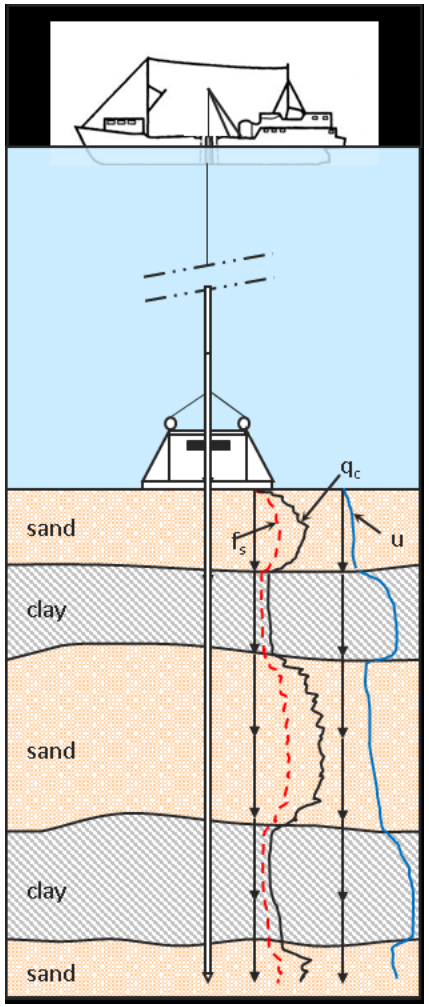
Recent DNV observation:

No soil investigation was conducted.

During the anchor pull-out test just before construction the anchors showed to be not strong enough,

→ months of project delay!

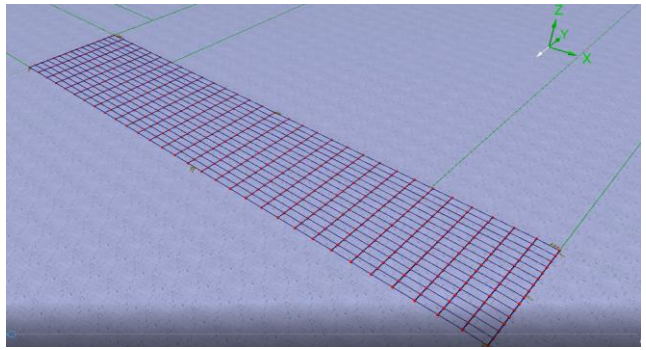


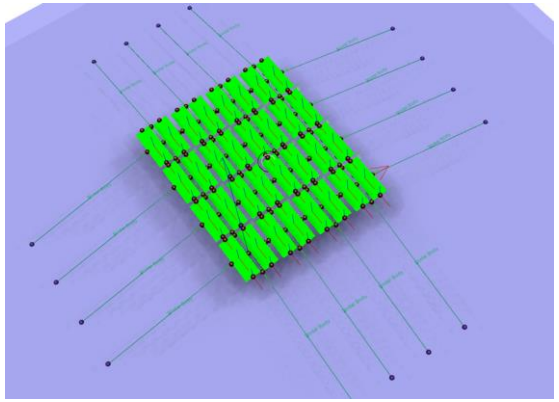


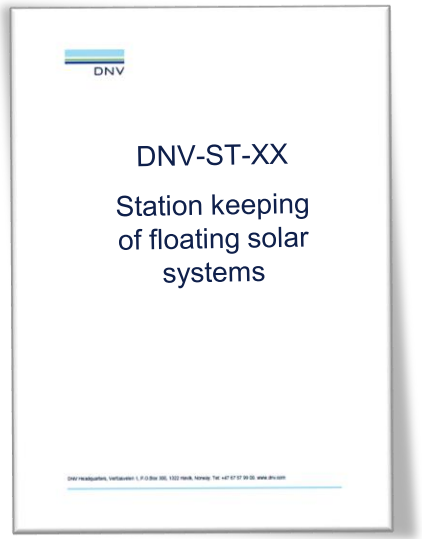
Outlook 2024 – Two standards for floating solar

Mooring

Design methodologies
Design analyses
Safety factors for design

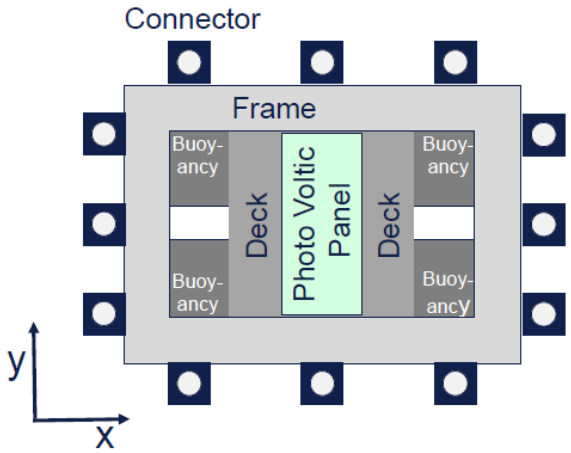


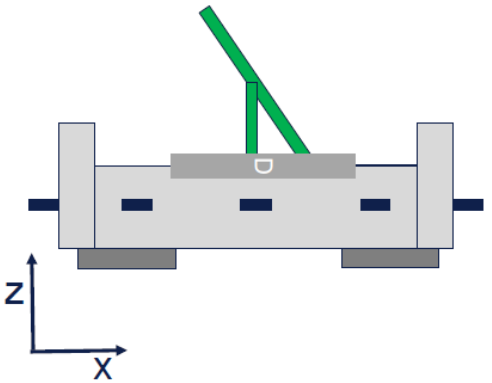




Floats

Design & analysis tools
Design checks
Operational & quality assurance





Thank you for your attention!

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