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Towards a Sustainable Future via Joint Industrial Efforts

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DNV – Global leader in energy transition and innovation via Joint Industrial Projects

Example: Floating offshore wind substation

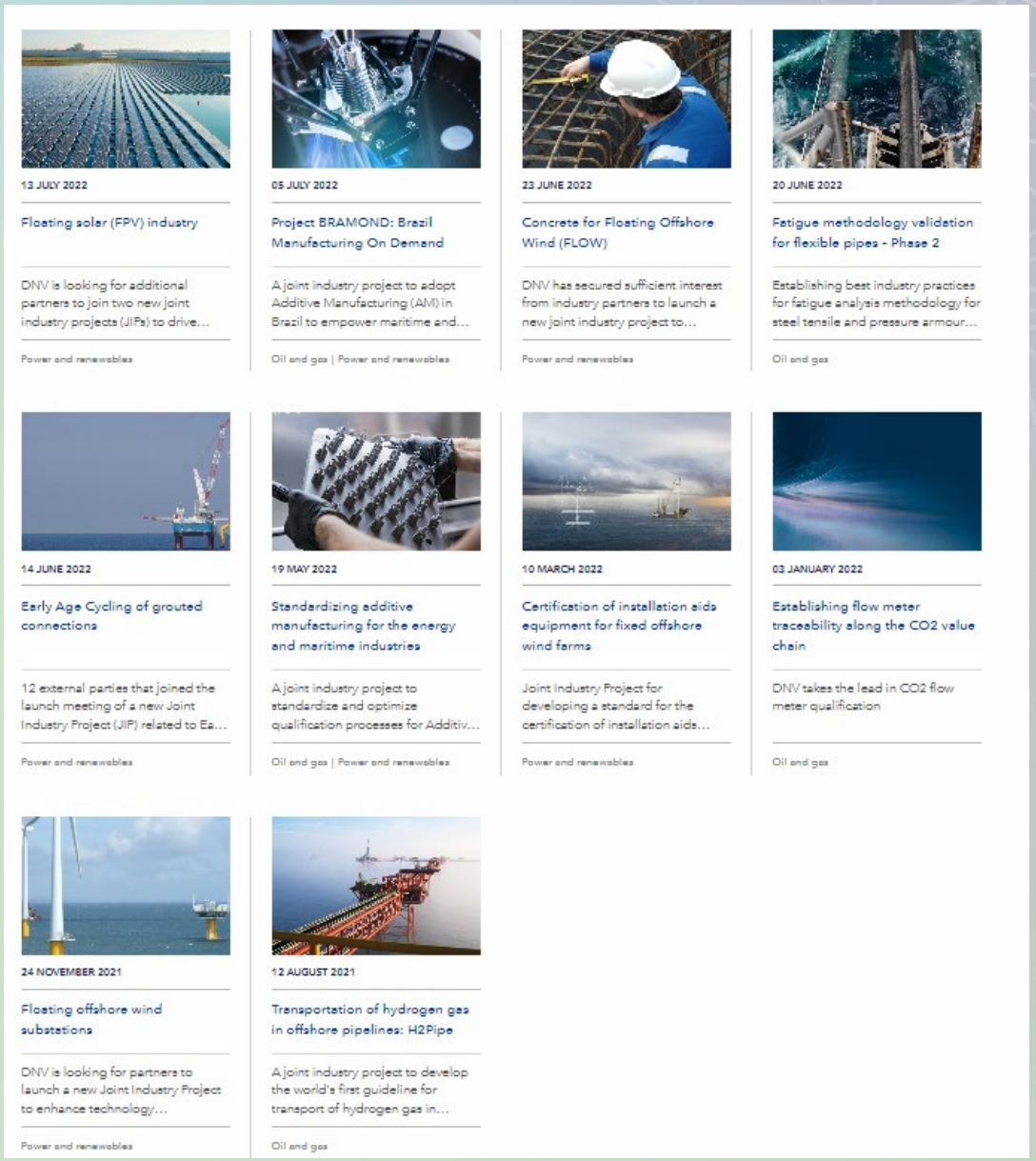
Participants: 25 contributors including: TenneT, Statnett, Hitachi Power Grids, Siemens Energy, …

Purpose:

Identify gaps with regards to offshore floating substation and the development and efforts required to close the gap

Deliverables:

Report on key technologies to future substation development



Pathway to Net Zero Emissions: Best Practices in Sustainability for High Voltage Power Transformers

- Massive, early action is needed to have any chance of reaching 1.5°C where time is the most critical constraint
- To reach 1.5°C leading regions and sectors have to go much further and faster reaching net zero well before 2050
- Pathway to net zero is technically and politically feasible but only with strong policy implementation
- Renewable electricity, hydrogen and bioenergy are essential, but insufficient carbon capture and removal play a critical role
- Best practices in sustainability are needed for High Voltage Power Transformers

List of Participants

PARTICIPANTS (19)

- Amprion TSO
- Electrical Oil Services
- Elia group
- Ergon
- Essexwire
- Hitachi Energy
- HSP/Trench Group
- JFE steel corporation
- M&I Materials (Midel)
- Metal One
- Nippon
- Nynas
- Ormazabal
- R&S Group
- SGB-SMIT Group
- Siemens Energy
- TenneT TSO
- Thyssen Krupp Electrical Steel

OBSERVERS (2)

- T&D Europe
- ENTSO-E

Our Journey on JIP

Kick-off in July 2023

First workshops in September and October 2023

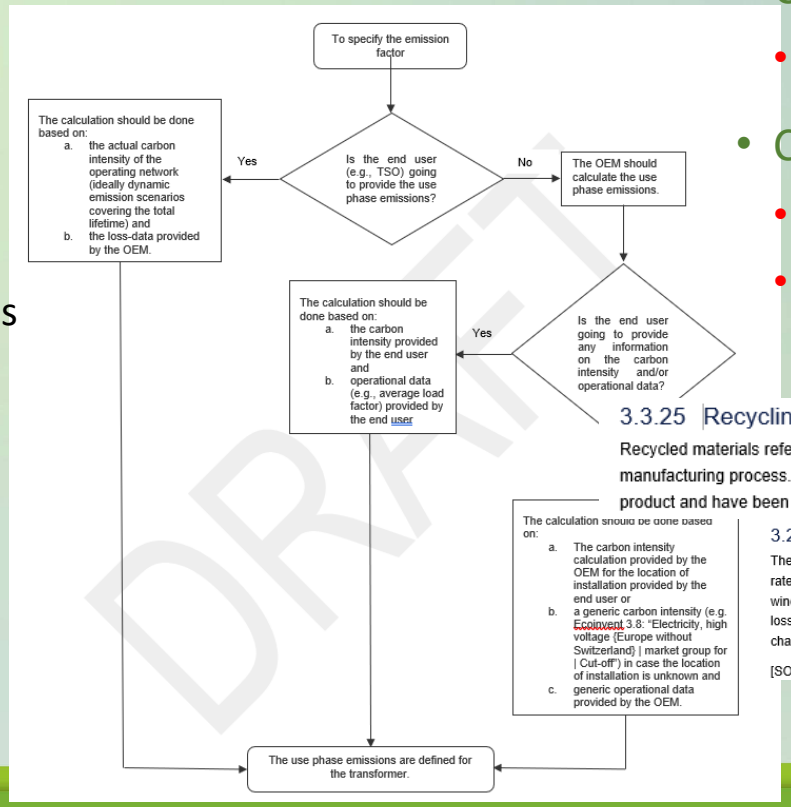
Second workshops in December 2023

Technical discussions on several controversial topics

Submission of the Draft Recommended Practice in April 2024

Scope of work & Achievement

- Terminology, definitions and normative references
  - The relation of the recommended practice with ISO and IEC
- Product category rules
  - The functional unit
  - The reference service life
  - Cut-off criteria
  - The use scenario and boundaries
  - Allocation method for circularities



- Material Circularity – Formulas Agreed
  - Impacts relating to input primary materials
  - Impacts relating to input secondary materials
- Use scenario – Energy Loss
  - Flowchart agreed
- Cut-off Criteria
  - 95% of the environmental impact is reported.
  - 95% of the total mass is covered.

3.3.25 Recycling

Recycled materials refer to materials that have been recovered or diverted from the waste stream for reuse in the manufacturing process. These materials have completed their intended lifecycle as a consumer or post-industrial product and have been collected, processed, and reconditioned for use in the creation of new products.

3.2.12 Load losses

The absorbed active power at a rated frequency and reference temperature associated with a pair of windings when rated current (tapping current) is flowing through the line terminals of one of the windings and the terminals of the other winding are short circuited. Further windings, if existing, are open-circuited. The load losses are primarily caused by losses in the coil. The losses are proportional to the load of the transformer to the power squared. The load profile can change hourly and during the lifetime of the transformer. The losses are expressed in kW.

[SOURCE: Adapted from IEC 60076-1:2011]

Scope of work & Achievement

- Communication mechanism & data quality
  - Life cycle inventory and life cycle impact assessment
  - Data gaps
  - Example of LCA analysis
  - Source of data and quality of data
- Verification requirement
  - Comparability
  - Compliance

Data shall be assessed according to EN 15804: A2:2019, 6.3.8.3 depending on the data quality assessment the practitioner shall:

- If the data is assessed to be poor or very poor for either time geography or technology, then one shall describe the reason for its quality level and for selecting the data set. Any data compensation or improvement attempts to improve data representativeness or compliance to EN 15804 shall also be described. The relevance of these data sets in terms of contribution to the core indicator results shall also be described.
- If the data is assessed to be fair for either time, geography, and technology, and has a contribution share larger than 30% for any core indicator, one shall also describe the reason for its quality level and for selecting the data set. The relevance of these data sets in terms of contribution to the core indicator results shall also be described.

- Gaps
  - Absence of suitable database entries
  - Limitations in transferring supplier provided information
  - Various existing approaches, OEMs heavily rely on available databases
- Requirement
  - Functional unit
  - Data quality
  - Inclusion and exclusion

5.7.5 Incentivization of primary data usage

TSOs, OEMs, and (sub-)suppliers should include mechanisms in their tender evaluations valuing the use of primary data with third party verified data. Incentivization will provide additional mechanisms to implement more accurate emissions reporting throughout the value chain. Furthermore, having third party verified data being incentivized throughout the value chain will enable better traceability throughout the value chain. Parties are free to develop incentivization schemes pushing the reporting of third-party verified primary data.

Table Environmental impact Indicators (EN 15804:2012+A2)

Core Impact category	Indicator	Unit	Weighting factor ECI[12]
Climate change – total	GWP-total	Kg CO_2eq.	0.116
Climate change – fossil	GWP-fossil	Kg CO_2eq.	0.116
Climate change – biogenic	GWP-biogenic	Kg CO_2eq.	0.116
Climate change – land use and land use change	GWP-luluc	Kg CO_2eq.	0.116
Ozone Depletion	ODP	Kg CFC 11 eq.	32
Acidification	AP	Mol H+ eq.	0.39
Eutrophication aquatic freshwater	EP-fw	Kg P eq.	1.96
Eutrophication aquatic marine	EP-m	Kg N eq.	3.28
Eutrophication terrestrial	EP-t	mol N eq.	0.36
Photochemical ozone formation	POCP	Kg NMVOC eq.	1.22
Depletion of abiotic resources – minerals and metals	ADP - m	Kg Sb eq.	0.3
Depletion of abiotic resources – fossil fuels	ADP – fossil	MJ, net caloric value	0.00033
Water use	WDP	M3 world eq. deprived	0.00506
Particulate Matter emissions	PM	Disease incidence	575838
Ionizing radiation, human health	IRP	kBq U235 eq.	0.049
Eco-toxicity (freshwater)	ETP-fw	CTUe	0.00013
Human toxicity, cancer	HTP-c	CTUh	1096368
Human toxicity, non-cancer effects	HTP-nc	CTUh	147588
Land use related impacts/ soil quality	SQP	dimensionless	0.000178

Note that climate change -total is a summation of the other three climate change impact categories, one therefore reports either total or the three subcategories.

Benefits of Value Chain Collaboration

Incentivizing Environmental Friendliness

- Encourages all stakeholders to adopt greener practices.
- Pressures value chain partners, beyond just those facing consumer scrutiny, to improve sustainability.

Increased Marketability

- Enhances the appeal of transformers and their subassemblies, basic, and raw materials.
- Drives positive public perception and supports market growth through sustainable practices.

Corporate Sustainability Reporting (CSR)

- Facilitates comprehensive and transparent CSR.
- Strengthens the company's commitment to sustainability and improves stakeholder confidence.

Challenges in Value Chain Collaboration

Data Acquisition and Quality

- Difficulty in obtaining and transferring accurate data.
- Challenges in ensuring data quality and compatibility across the value chain.

Navigating Uncertainty

- Addressing uncertainty related to future market changes.
- Developing guidelines and standards to manage and mitigate these uncertainties.

Strategic Guidance

- Providing value chain partners with guidelines on impact categories, boundaries, and cut-off criteria.
- Ensuring information and results are compatible both vertically within and across different value chains.

Designing Environmentally Friendly Products

Collaborative Design Efforts

- Promotes the creation of products designed for reuse.
- Encourages the integration of environmentally friendly materials and components.

Collective Innovation

- Harnesses the collective expertise of value chain partners to develop innovative, sustainable solutions.
- Ensures that sustainability is a core aspect of product design and development.

Next Steps

1. **Material Life Cycle Assessment (LCA)**
   - Evaluate the environmental impact of materials used in power transformers throughout their life cycle. Not all material has PCF documentation.
   - Inform material selection processes and drive improvements in environmental performance.
2. **Circularity: End-of-Life (EOL) Recyclability**
   - Assess the recyclability rate of materials in power transformers at end-of-life.
   - Analyze the potential for material reuse, recycling, and recovery to promote circularity.
   - Enhance sustainability by reducing waste and resource consumption in the transformer lifecycle.
3. **Credit Mechanisms and Double Counting**
   - Investigate mechanisms for assigning credit and preventing double counting in sustainability efforts.
   - Develop guidelines for transparent and equitable allocation of sustainability credits.

Next Steps

4. **Cost-Benefit Analysis of Green Efforts**
   - Conduct a comprehensive cost-benefit analysis of sustainability initiatives for all parties involved.
   - Identify opportunities for cost savings, revenue generation, and long-term sustainability benefits.
5. **Transformer Credit Mechanisms**
   - Examine how transformers can receive credit for sustainability efforts within regulatory frameworks.
   - Develop strategies to integrate sustainability criteria into credit systems and promote industry-wide adoption.
6. **Common Data Sharing Platform**
   - Explore the potential for a common data sharing platform to facilitate collaboration and data exchange among industry stakeholders.
   - Benefits: Enhance transparency, efficiency, and interoperability in data sharing processes.

Call for Action

- **Accelerated Progress:** Collaborative efforts in the JIP have led to faster advancements in sustainability goals.
- **High-Quality Solutions:** Collective expertise has resulted in innovative, effective sustainability solutions.
- **Enhanced Efficiency:** Collaboration has streamlined processes and maximized operational efficiency.
- **Stronger Impact:** Acting together has amplified our influence and inspired broader industry support.
- **Commitment to Excellence:** The success of the JIP showcases our shared dedication to sustainability excellence.

Sharing is Caring!