IC-ENC Working together to assure navigational safety

S-100 Developments at IC-ENC

November 2023

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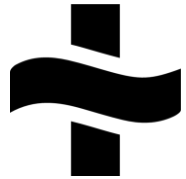
Agenda

1. **S-100 Developments**
   a) Progress on S-100 Services
   b) Conversion Readiness Service
   c) Product Development & Testing (PDT) Licence
   d) S100 Training
   e) Look ahead for the next six months



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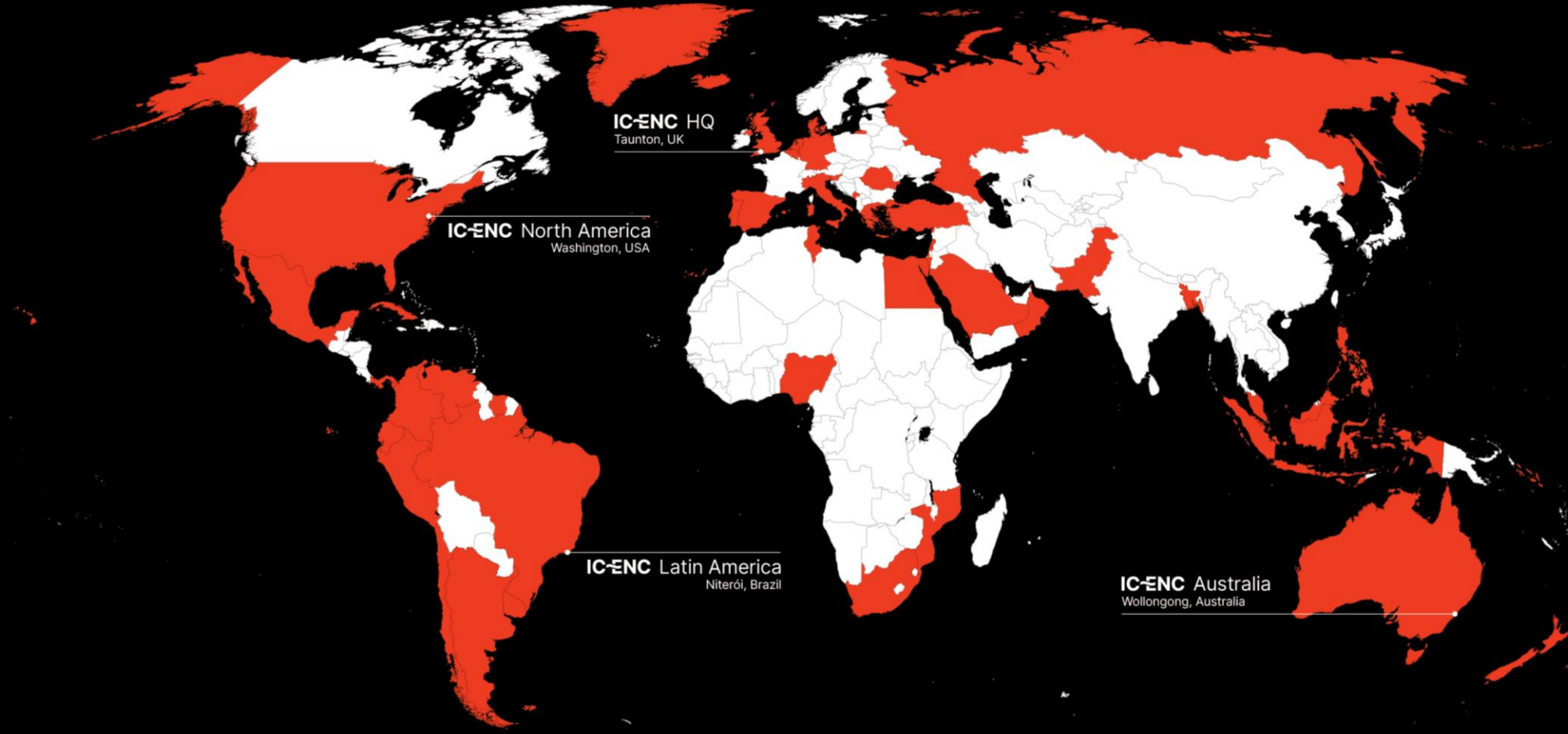
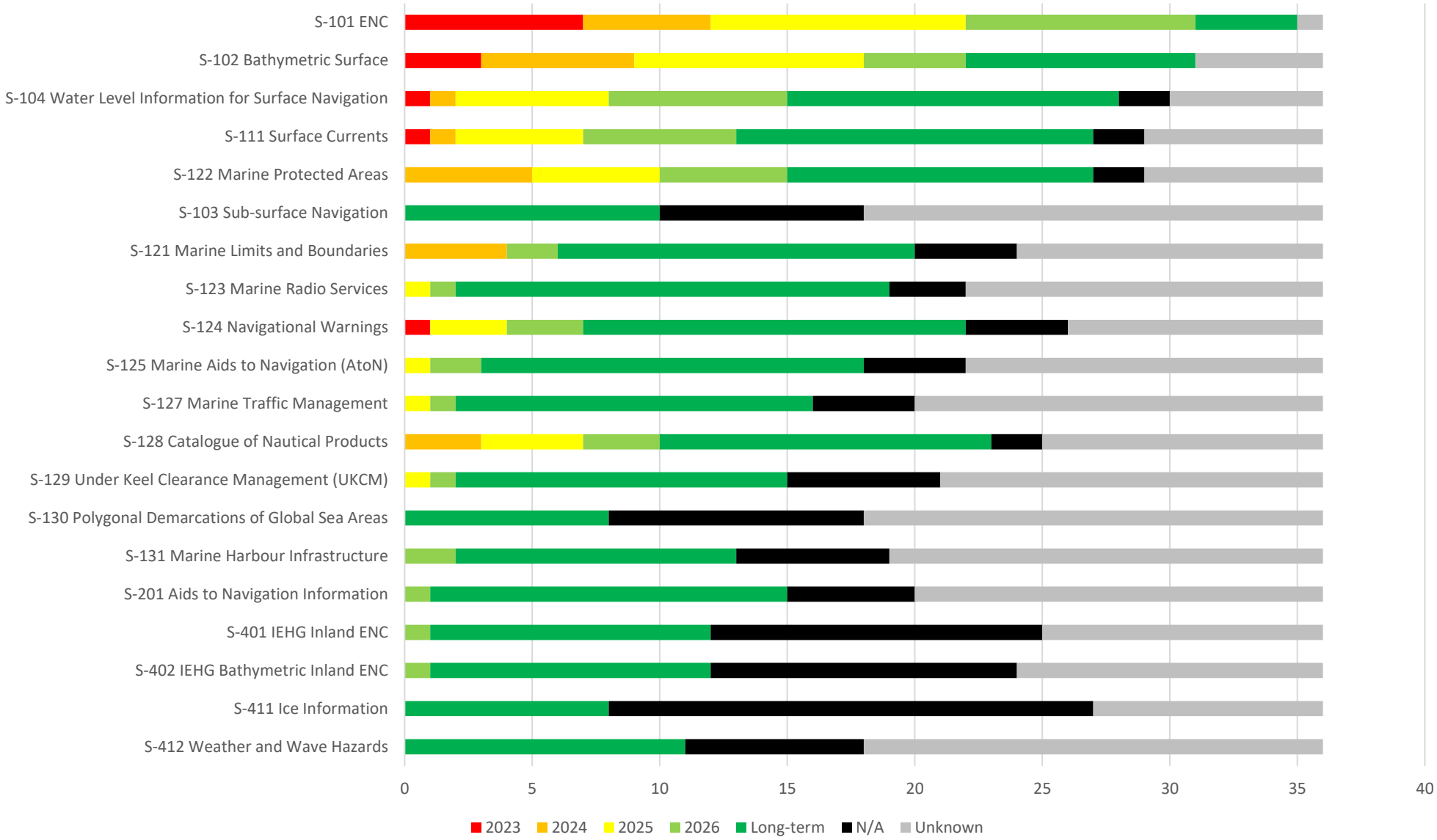
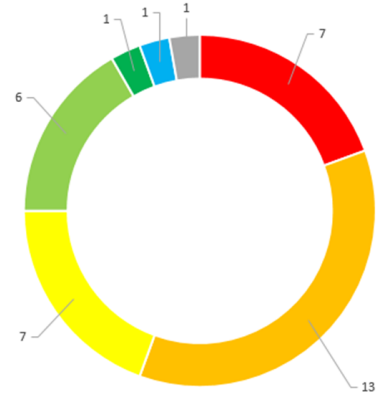


Context: Members' S-1XX Production Plans



S-57 to S-101 conversion timeframes



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S-100 Services - Progress

- Initial end-to-end services for S-101, S-102, S-104 and S-111 have been developed and built into the IC-ENC workflow tool
  - S-101 – based on current S-57 service, but with S-101 enhancements. Supports S-100 Ed 5.0.0 datasets
  - S-102 – automated where possible, supports S-100 Ed 5.0.0 datasets
  - S-104 & S-111 – automated process due to expected high cadence (e.g. every 6hrs)
- S-122 – in scope, but remains outside of IC-ENC workflow tool, processed through manual examination
- S-128 generation capability – generated by the IC-ENC workflow tool for each release
- S-100 Knowledgebase is now available to Members
  - Contains IC-ENC S-1XX ingest & registration checks
  - Will include S-100 Validation checks once published
- Currently implementing the Exchange Set Service tool for the generation of S-100 exchange sets and digital signing (expected by end of 2023)

IC-ENC's First generation S-1XX services:

S-101 - Electronic Navigational Chart (ENC)

S-102 - Bathymetric Surface Product

S-104 - Water Level Information for Surface Navigation

S-111 - Surface Currents

S-122 - Marine Protected Areas

S-128 – Catalogue of Nautical Products

The S-100 landscape/Challenges:

- S-1XX Product Specifications are still at different levels of maturity
- No published S-100 Validation checks yet which limits validation software tool development
- More test datasets are key to support development and testing phase (see PDT slides)

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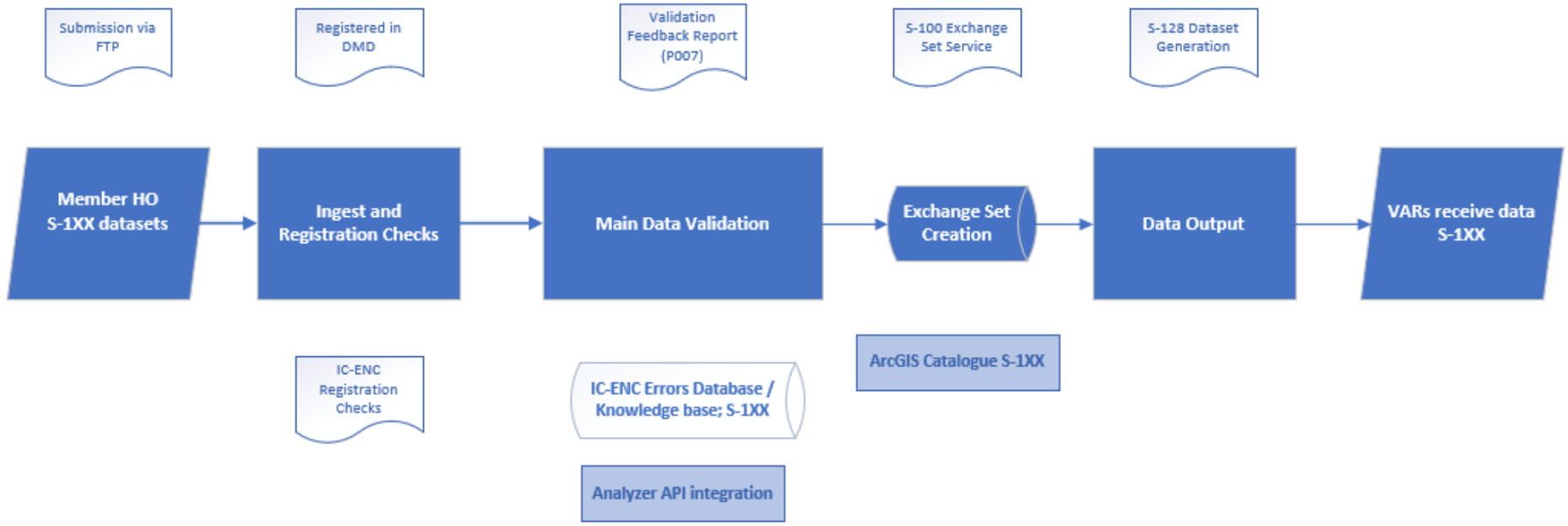
S-1XX Services - Process Flow Diagram

S-1XX Services

(S-101, S-102, S-104, S-111)



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Conversion Readiness Service

- The goal of the Conversion Readiness Service is to support members with the preparation of their S-57 ENCs for conversion to S-101

- This service is an extension of the S-57 Validation Service (Work Plan items 2g & 2h)

- Components of the service:
  a) Conversion Readiness Checks
  b) S-57 to S-101 conversion assessments
  c) S-101 trial data assessments
  d) S-100 validation tool testing
  e) ENC global query capability
  f) IC-ENC Knowledgebase
  g) Technical Conference

Theme	Theme	Activity ref	Theme owner	Activity Owner	Headline / Detailed activity	2023 comments - activities
2	S57 ENC Validation Service	g	Data Manager	S-100 Support Officer	CONVERSION READINESS SERVICE - Provision of Conversion Readiness Checks for effective conversion to S-101	Develop the S-57 Validation service so that it is identifying actions Members can take on their S-57 ENCs in order to prepare for effective conversion to S-101. A complete set of custom checks (aligned to S-101 PS 1.1.0, S-101 DCEG 1.1.0, S-65 Annex B 1.1.0) to be developed and in place by end of Q1/2023 (as per discussion at TC22_5). This set of checks will be reviewed at each iteration of the standards, with S-101 PS 2.0.0 due
2	S57 ENC Validation Service	h	Data Manager	S-100 Manager	ENC QUERY CAPABILITY To support Conversion Readiness Service	Query all IC-ENC ENC data to provide Members a high-level conversion readiness report (continuous improvement item). This will also inform the conversion readiness checks.

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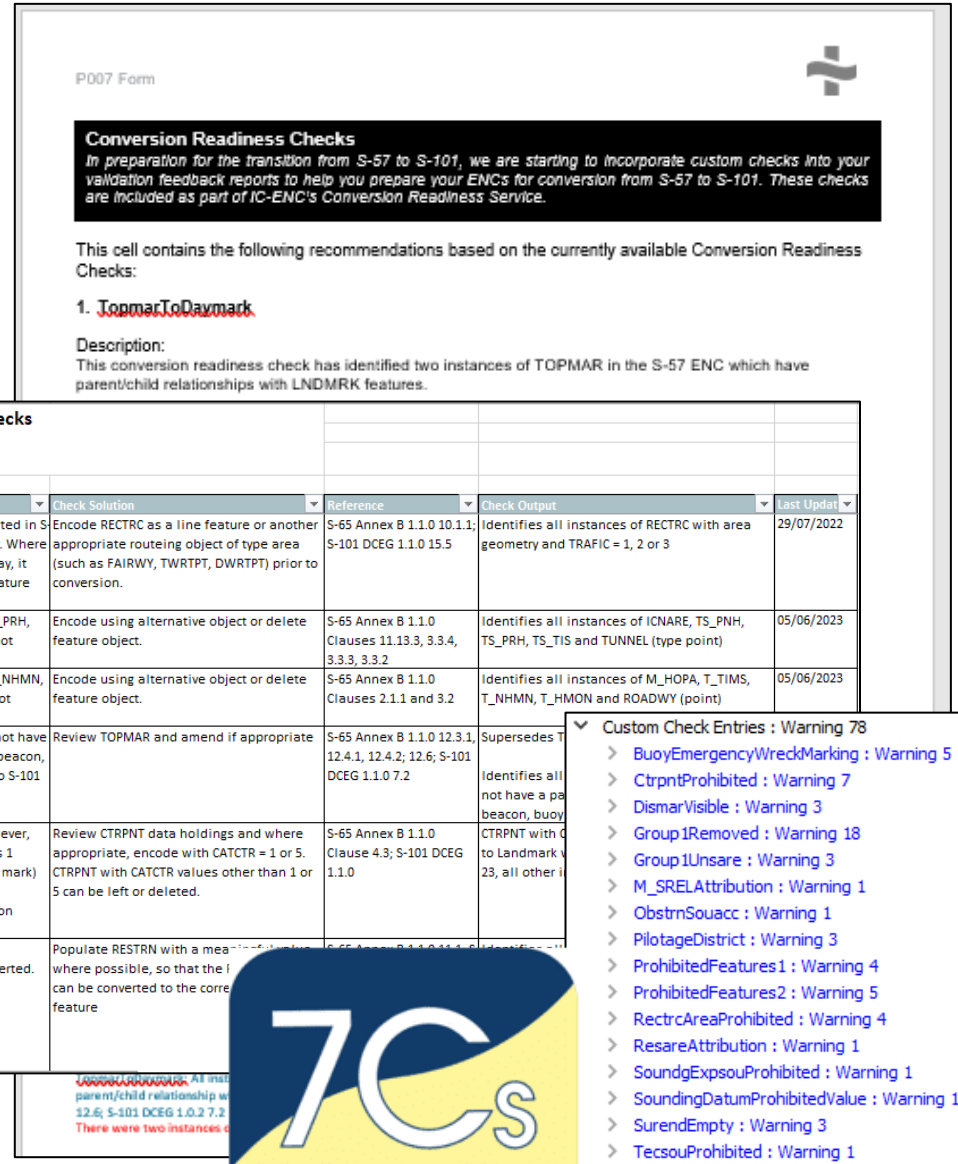
a) Conversion Readiness Checks

- A set of 21 checks identified from S-57 to S-101 Conversion Guidance (S-65 Annex B), S-101 1.1.0 & S-100 5.0.0
- Provide recommended action steps that members can take in their S-57 ENCs to prepare for conversion to S-101, i.e. “conversion ready ENCs”
- Recommended action is provided in the Validation Report for all base cell validations
- **Members can use the checks in their own 7Cs Analyzer and CARIS tools**
- Key resources for Members:
  - IC-ENC Knowledgebase
  - IC-ENC LMS


P007 Form

Conversion Readiness Checks

In preparation for the transition from S-57 to S-101, we are starting to incorporate custom checks into your validation feedback reports to help you prepare your ENCs for conversion from S-57 to S-101. These checks are included as part of IC-ENC's Conversion Readiness Service.

This cell contains the following recommendations based on the currently available Conversion Readiness Checks:

1. TopmarToDaymark

Description:
This conversion readiness check has identified two instances of TOPMAR in the S-57 ENC which have parent/child relationships with LNDMRK features.

IC-ENC **Conversion Readiness Checks**
Last updated: 05/06/2023
Built in 7Cs Analyzer 5.1.0.12

	Check ID	Check Message	Check Solution	Reference	Check Output	Last Updat
1	RectrcAreaProhibited	Area geometry for RECTRC is prohibited in S-101, except where TRAFIC = two-way. Where an area RECTRC has TRAFIC = two-way, it will be converted into new S-101 feature TwoWayRoutePart.	Encode RECTRC as a line feature or another appropriate routeing object of type area (such as FAIRWY, TWRTPT, DWRTPT) prior to conversion.	S-65 Annex B 1.1.0 10.1.1; S-101 DCEG 1.1.0 15.5	Identifies all instances of RECTRC with area geometry and TRAFIC = 1, 2 or 3	29/07/2022
2	ProhibitedFeatures1	Feature objects ICNARE, TS_PNH, TS_PRH, T_TIS and TUNNEL (type point) are not permitted in S-101.	Encode using alternative object or delete feature object.	S-65 Annex B 1.1.0 Clauses 11.13.3, 3.3.4, 3.3.3, 3.3.2	Identifies all instances of ICNARE, TS_PNH, TS_PRH, TS_TIS and TUNNEL (type point)	05/06/2023
3	ProhibitedFeatures2	Feature objects M_HOPA, T_TIMS, T_NHMN, T_HMON and ROADWY (point) are not permitted in S-101.	Encode using alternative object or delete feature object.	S-65 Annex B 1.1.0 Clauses 2.1.1 and 3.2	Identifies all instances of M_HOPA, T_TIMS, T_NHMN, T_HMON and ROADWY (point)	05/06/2023
4	TopmarToDaymark	All instances of TOPMAR which do not have a parent/child relationship with a beacon, buoy or LITFLT will be converted into S-101 feature Daymark.	Review TOPMAR and amend if appropriate	S-65 Annex B 1.1.0 12.3.1, 12.4.1, 12.4.2; 12.6; S-101 DCEG 1.1.0 7.2	Supersedes T… Identifies all… not have a pa… beacon, buoy…	
5	CtrpntProhibited	CTRPNT does not exist in S-101, however, CTRPNT features with CATCTR values 1 (triangulation mark) or 5 (boundary mark) will be converted to Landmark with categoryOfLandmark 22 (triangulation mark) or 23 (boundary mark).	Review CTRPNT data holdings and where appropriate, encode with CATCTR = 1 or 5. CTRPNT with CATCTR values other than 1 or 5 can be left or deleted.	S-65 Annex B 1.1.0 Clause 4.3; S-101 DCEG 1.1.0	CTRPNT with C… to Landmark v… 23, all other i…	
6	ResareAttribution	Where RESTRN is empty or set to 'unknown', RESARE may not be converted.	Populate RESTRN with a mea… where possible, so that the f… can be converted to the corre… feature			

Custom Check Entries : Warning 78
- BuoyEmergencyWreckMarking : Warning 5
- CtrpntProhibited : Warning 7
- DismarVisible : Warning 3
- Group1Removed : Warning 18
- Group1Unsare : Warning 3
- M_SRELAttribution : Warning 1
- ObstrnSouacc : Warning 1
- PilotageDistrict : Warning 3
- ProhibitedFeatures1 : Warning 4
- ProhibitedFeatures2 : Warning 5
- RectrcAreaProhibited : Warning 4
- ResareAttribution : Warning 1
- SoundgExpsouProhibited : Warning 1
- SoundingDatumProhibitedValue : Warning 1
- SurendEmpty : Warning 3
- TecsouProhibited : Warning 1
- TopmarToDaymark : Warning 5
- UwtrocSouacc : Warning 3
- VerticalDatumProhibitedValue : Warning 1
- VesselTrafficServiceArea : Warning 8

7Cs SevenCs

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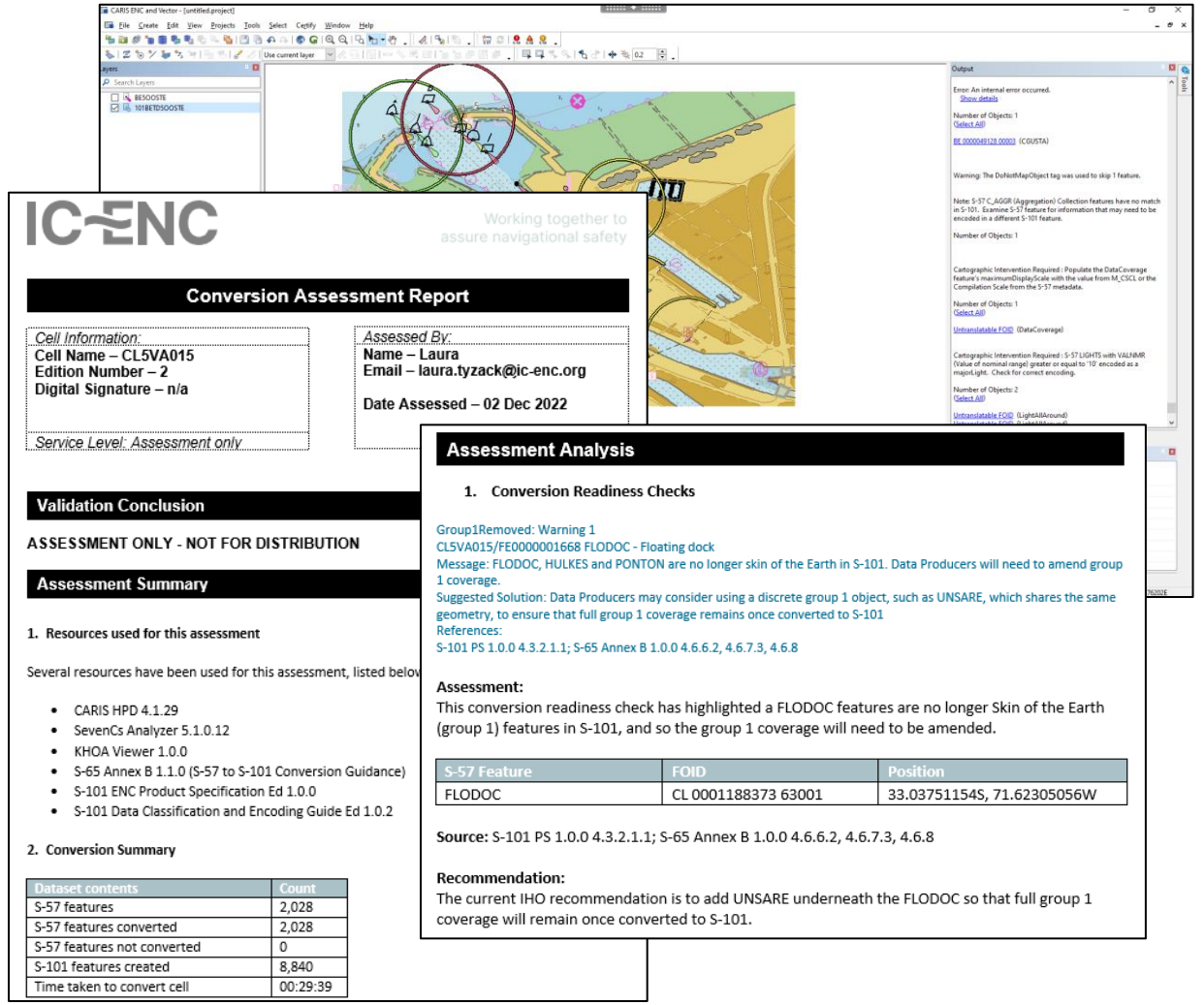
b) S-57 to S-101 conversion assessment

- We provide conversion assessment of Members' S-57 ENCs (sample size agreed with Member)

- This includes:
  - Assessment against the Conversion Readiness Checks
  - Converting from S-57 to S-101 using CARIS HPD
  - Assessment report for each ENC with findings/recommended action to take

- S-101 to S-57 assessments will be offered once the S-101 to S-57 Conversion Guidance has been drafted (S-65 Annex C)



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Conversion Assessment Report

Cell Information:
Cell Name – CL5VA015
Edition Number – 2
Digital Signature – n/a

Assessed By:
Name – Laura
Email – laura.tyzack@ic-enc.org

Date Assessed – 02 Dec 2022

Service Level: Assessment only

Validation Conclusion

ASSESSMENT ONLY - NOT FOR DISTRIBUTION

Assessment Summary

1. Resources used for this assessment

Several resources have been used for this assessment, listed belov

- CARIS HPD 4.1.29
- SevenCs Analyzer 5.1.0.12
- KHOA Viewer 1.0.0
- S-65 Annex B 1.1.0 (S-57 to S-101 Conversion Guidance)
- S-101 ENC Product Specification Ed 1.0.0
- S-101 Data Classification and Encoding Guide Ed 1.0.2

2. Conversion Summary

Dataset contents	Count
S-57 features	2,028
S-57 features converted	2,028
S-57 features not converted	0
S-101 features created	8,840
Time taken to convert cell	00:29:39

Assessment Analysis

1. Conversion Readiness Checks

Group1Removed: Warning 1
CL5VA015/FE0000001668 FLODOC - Floating dock
Message: FLODOC, HULKES and PONTON are no longer skin of the Earth in S-101. Data Producers will need to amend group 1 coverage.
Suggested Solution: Data Producers may consider using a discrete group 1 object, such as UNSARE, which shares the same geometry, to ensure that full group 1 coverage remains once converted to S-101
References:
S-101 PS 1.0.0 4.3.2.1.1; S-65 Annex B 1.0.0 4.6.6.2, 4.6.7.3, 4.6.8

Assessment:
This conversion readiness check has highlighted a FLODOC features are no longer Skin of the Earth (group 1) features in S-101, and so the group 1 coverage will need to be amended.

S-57 Feature	FOID	Position
FLODOC	CL 0001188373 63001	33.03751154S, 71.62305056W

Source: S-101 PS 1.0.0 4.3.2.1.1; S-65 Annex B 1.0.0 4.6.6.2, 4.6.7.3, 4.6.8

Recommendation:
The current IHO recommendation is to add UNSARE underneath the FLODOC so that full group 1 coverage will remain once converted to S-101.

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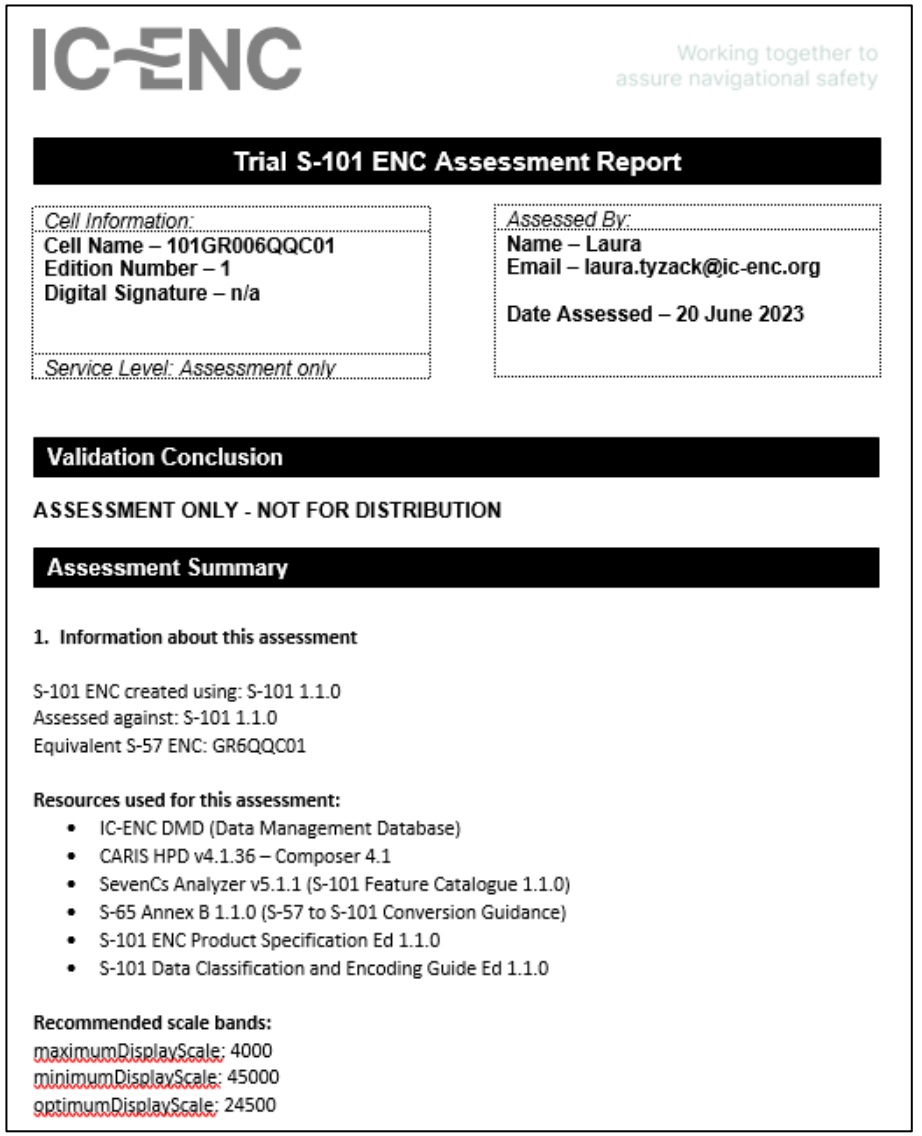
c) S-101 trial data assessment

- We assess S-101 trial datasets for Members who have produced them

- The assessment includes:
  - Register in the DMD & assess against DMD S-101 registration checks
  - Run 7Cs Analyzer validation checks
  - Load into CARIS
  - Load into S-100 Viewer tools
  - Assessment report for each ENC with findings/recommended action to take



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Trial S-101 ENC Assessment Report

Cell Information:
Cell Name – 101GR006QQC01
Edition Number – 1
Digital Signature – n/a

Service Level: Assessment only

Assessed By:
Name – Laura
Email – laura.tyzack@ic-enc.org

Date Assessed – 20 June 2023

Validation Conclusion

ASSESSMENT ONLY - NOT FOR DISTRIBUTION

Assessment Summary

1. Information about this assessment

S-101 ENC created using: S-101 1.1.0
Assessed against: S-101 1.1.0
Equivalent S-57 ENC: GR6QQC01

Resources used for this assessment:

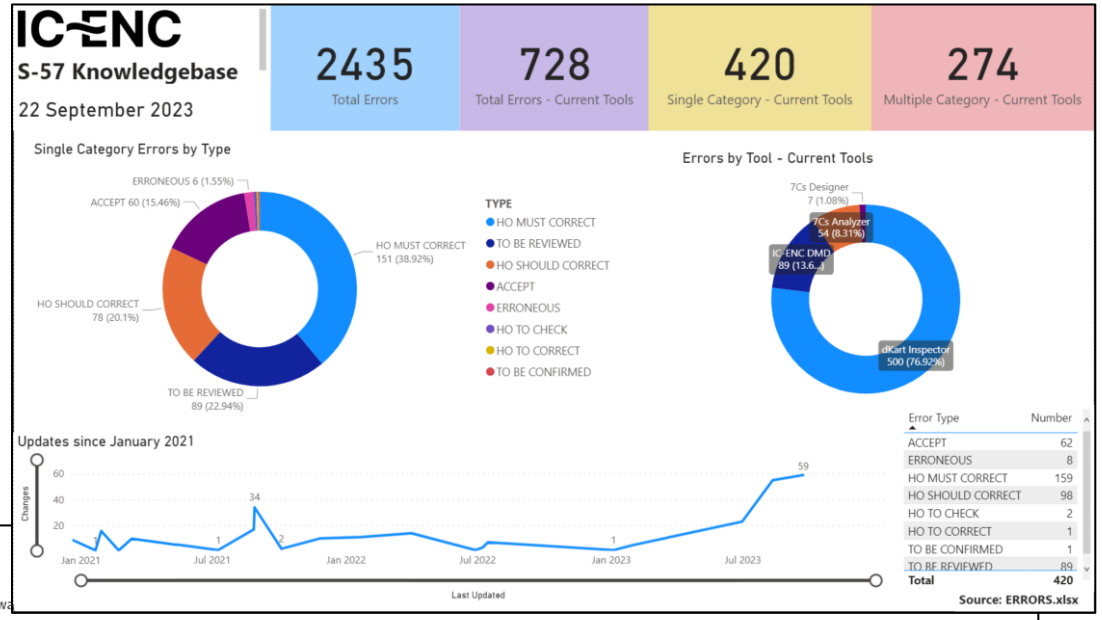
- IC-ENC DMD (Data Management Database)
- CARIS HPD v4.1.36 – Composer 4.1
- SevenCs Analyzer v5.1.1 (S-101 Feature Catalogue 1.1.0)
- S-65 Annex B 1.1.0 (S-57 to S-101 Conversion Guidance)
- S-101 ENC Product Specification Ed 1.1.0
- S-101 Data Classification and Encoding Guide Ed 1.1.0

Recommended scale bands:
maximumDisplayScale: 4000
minimumDisplayScale: 45000
optimumDisplayScale: 24500

e) IC-ENC Knowledgebase

- **S-57 Knowledgebase**
  - 7Cs Analyzer & Designer errors
  - dKart Inspector errors
  - DMD errors
  - IC-ENC custom checks
  - ECDIS errors
  - Conversion Readiness Checks

- **New S-100 Knowledgebase**
  - IC-ENC S-1XX Ingest & Registration Checks
  - IHO S-100 Validation Checks will be added once published
  - 7Cs Analyzer & dKart Inspector errors will be added once developed



S-100 Knowledgebase ★

Error Name	Softwa						
2008	IC-ENC DMD	V2.0	Error, 2008, The catalogue file \\ic-enc.org\DFS\Data_UAT\Private\DMD\ServiceWorkArea\S-101\T2023-01-23-09-59-07\S100_ROOT\catalog.xml contains lower-case characters which is not in line with S-102 product specification	HO MUST CORRECT / ACCEPT	The CATALOG.XML file is not upper case	HO MUST CORRECT: The catalogue file (including the extension) is not in upper case, or the	If the catalogue file name is not in upper case, or the reference to it in the H5 file is not in upper case, certain ECDIS (those that run on a UNIX/LINUX operating system) will not be able to load/display the dataset
2010	IC-ENC DMD	V2.0	Error, 2010, Invalid value in the identifier field of the CATALOG File. It should be unique but was encoded as [x]	ACCEPT	CATALOG.XML identifier is not unique	ACCEPT	
2011	IC-ENC DMD	V2.0	Error, 2011, File {0} was found in the exchange set but is not referenced in the CATALOG.XML file.	HO MUST CORRECT	No files other than those referenced in the CATALOG.XML can exist in the exchange set	HO MUST CORRECT: The HO should resubmit the exchange set, ensuring it contains the relevant S-102 file(s) and a CATALOG.XML file, and that the S-102 file(s) are referenced in the CATALOG.XML file	ECDIS and validation software may not be able to load/display the dataset
2014	IC-ENC DMD	V2.0	Exchange set contains multiple binary files. Check recorded CRC is correct	HO MUST CORRECT	Only a single ENC data file should be referenced by the CATALOG.031 file and included in the exchange set.	HO MUST CORRECT	
2015	IC-ENC DMD	V2.0	Error, 2015, The support file {0} is referenced by the data file {1} but could not be found in	HO MUST CORRECT	A support file is referenced by the dataset file but could not be found in the	HO MUST CORRECT	

Product Development & Testing Licence (PDT)

- Provides companies with access to IC-ENC Members' S-1XX datasets for innovation and testing purposes

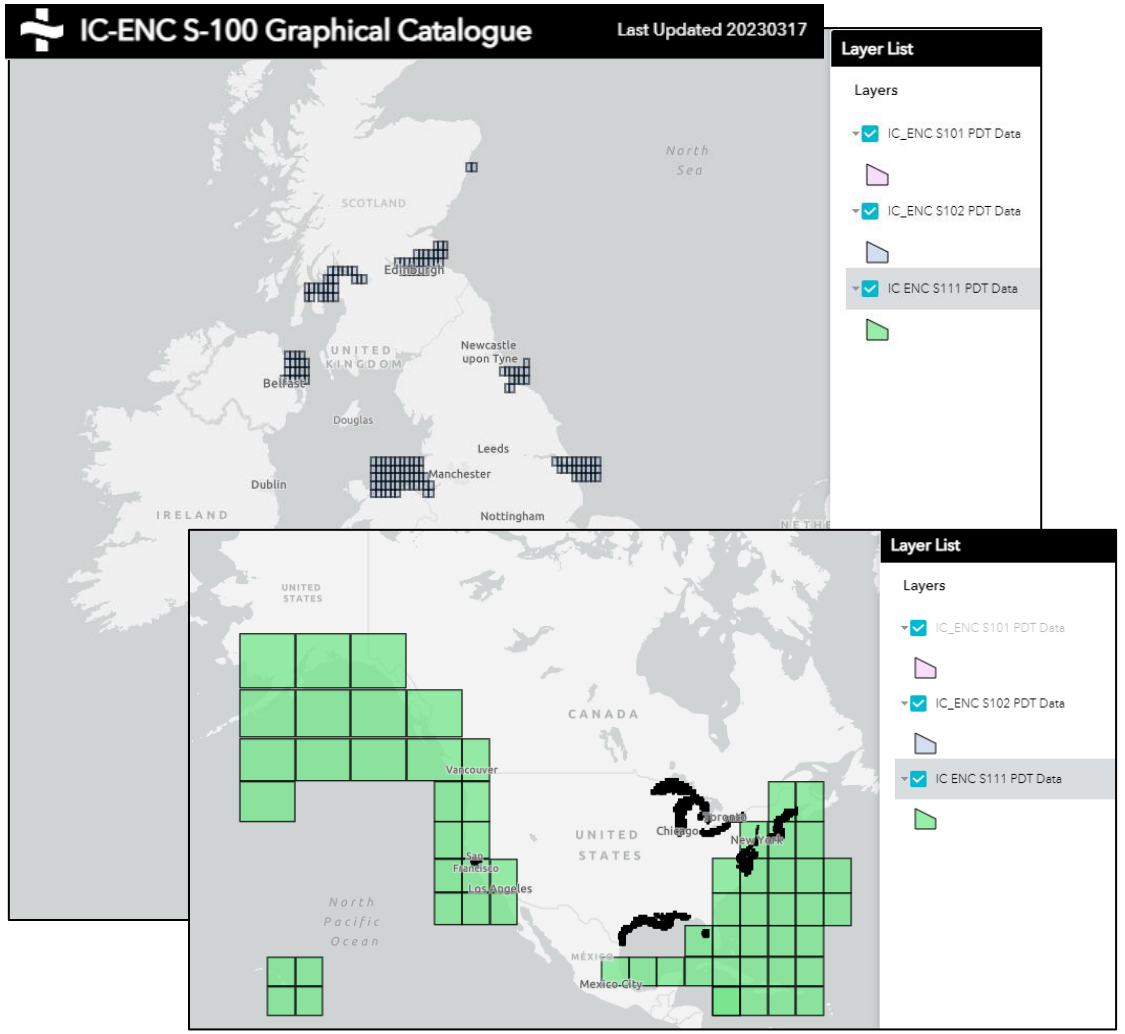
- 5 PDT releases to date

- 27 out of 50 Members have "opted in" so far – thank you!
  AU, BE, BD, BH, CU, DE, DK, EC, EG, ES, FO, GB, GR, IS, LB, MT, MY, NL, NZ, PCA, PH, PK, PT, RO, SR, US, ZA

- Recently extended to Members so they can access other Members' datasets for internal R&D purposes

Product Type	Datasets Released	Member
S-101	48	BE, ES, GB, GR, IT, NL
S-102	398	ES, GB, NL, US
S-104	18	NL, US
S-111	591	NL, US
S-122	3	NL
S-123	1	NL
S-128	3	IC-ENC, NL
Total	**1,062**	

S-1XX data released under PDT to date



S-10x data released under PDT shown in the IC-ENC S-100 Graphical Catalogue

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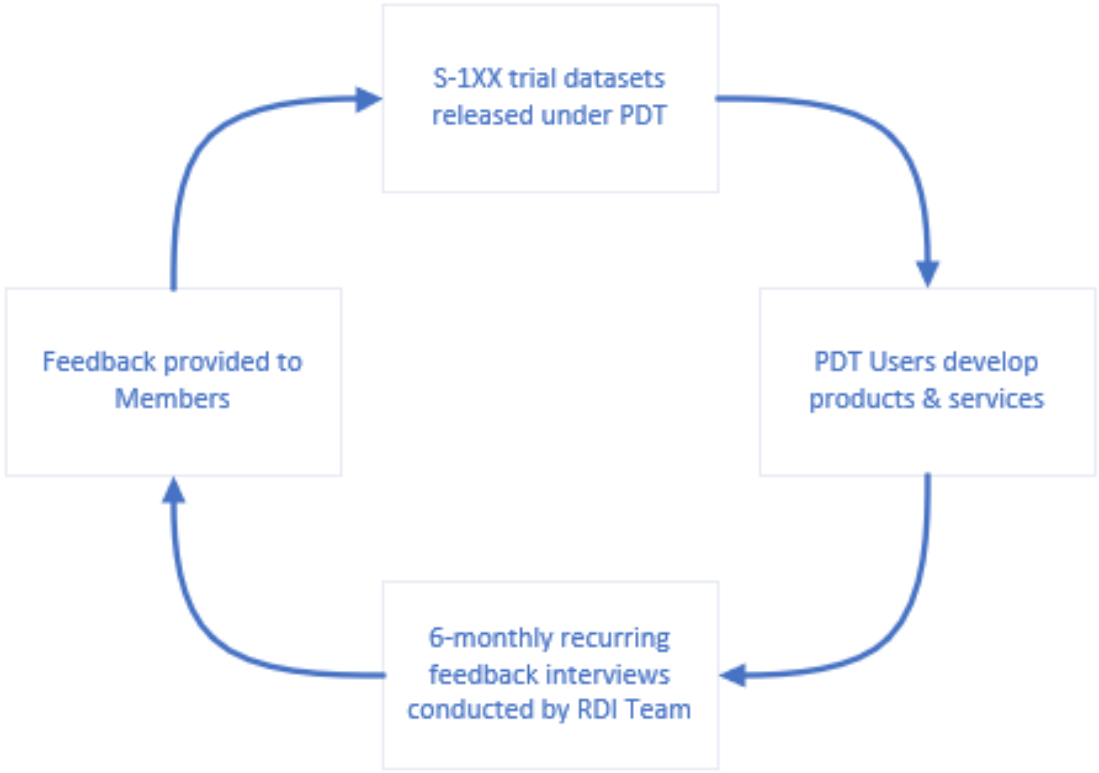
PDT Feedback Loop

- We have recently established a PDT Feedback Loop
- User Researchers interviewed PDT signatories to gain feedback on the S-1XX datasets released into the PDT scheme so far
- Comprehensive feedback received from three PDT user
- This has helped IC-ENC:
  - Understand how PDT Users are using the datasets
  - Gain feedback on the quality of the PDT service itself
  - Provide Members with technical feedback on their datasets
  - Provide feedback to relevant IHO Working Groups to support standards development
- Next round of feedback interviews planned for end of Q1 2024

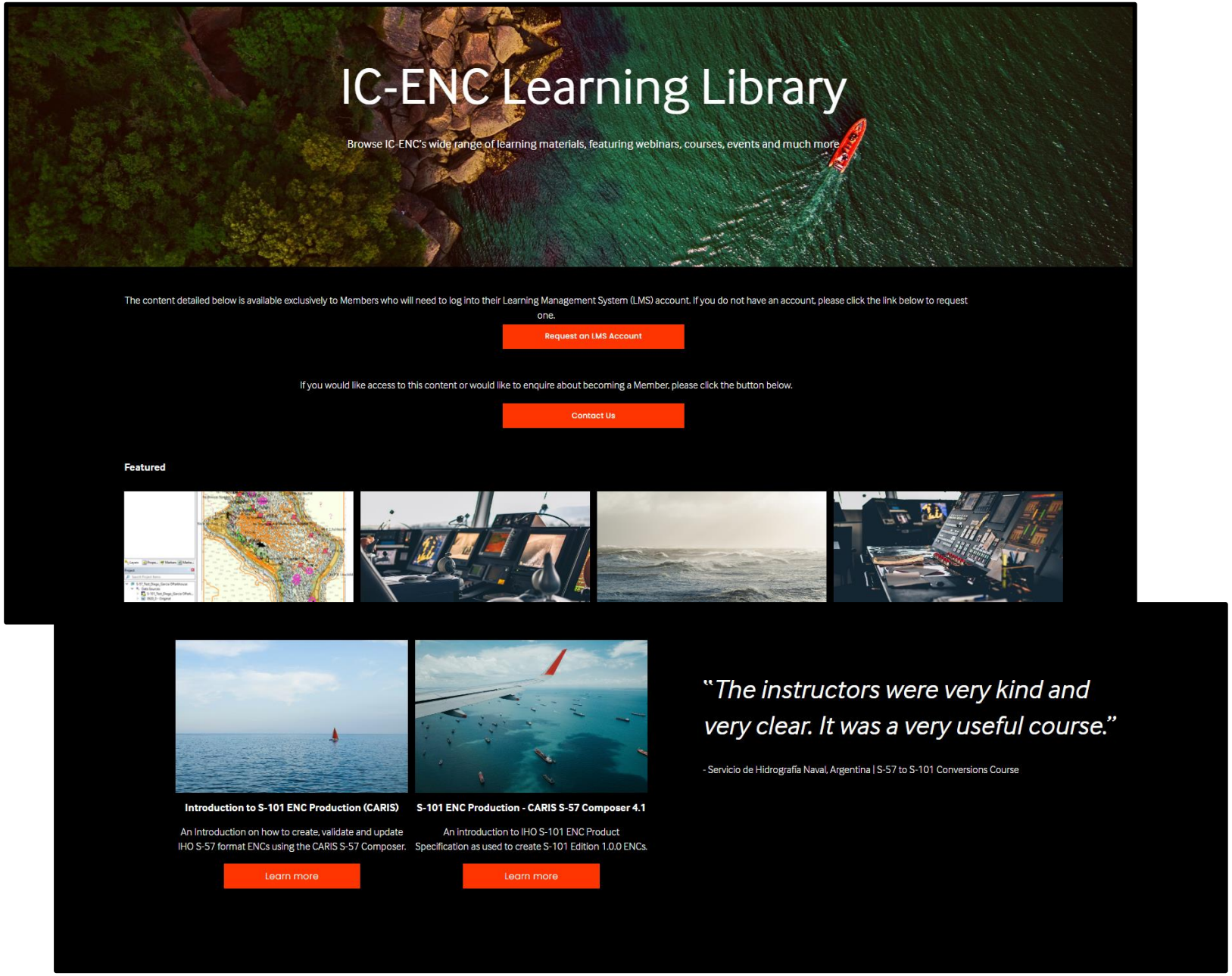


LMS Library Content

Our full LMS Library content can be viewed on our IC-ENC website via the following link [LMS Courses — IC-ENC]

Current content includes:

- IC-ENC Conversion Readiness Checks
- Sample Production of S-128 Datasets
- S-57 ENC Creation Guidance Booklet
- S-57 to S-101 Conversion (training recordings)
- Introduction to S-100 (training recordings)
- Industry Webinar (recordings)
- Technical Conference discussion recordings

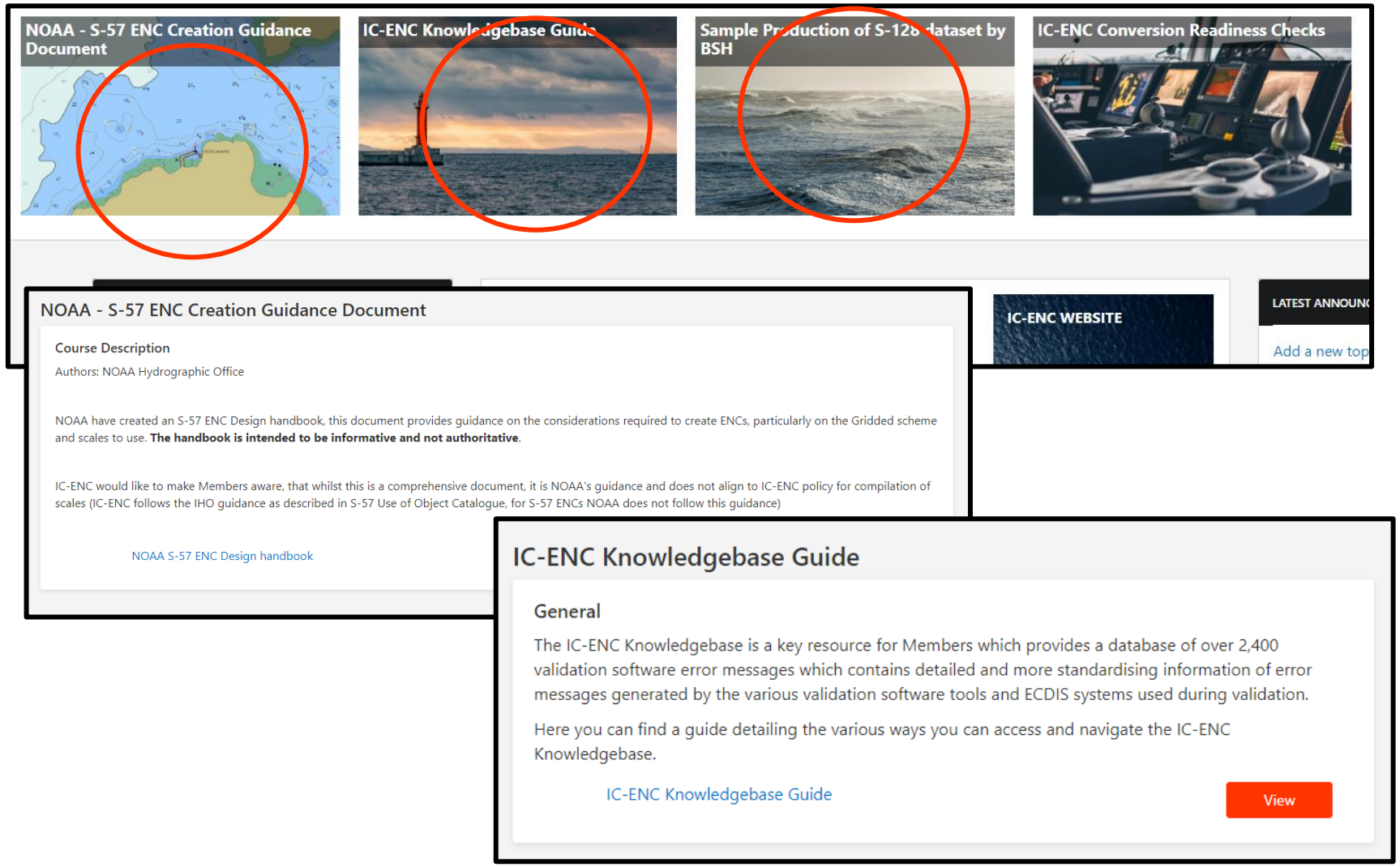


Member Material on the LMS

As part of Member collaboration and information sharing, Members can submit material to the LMS.

Examples of Submissions are:

- An S-57 ENC Creation Guidance document from NOAA
- A Sample Production of S-128 Datasets from BSH
- IC-ENC Knowledgebase Guide created by the EWH successful candidate Juliane Affonso



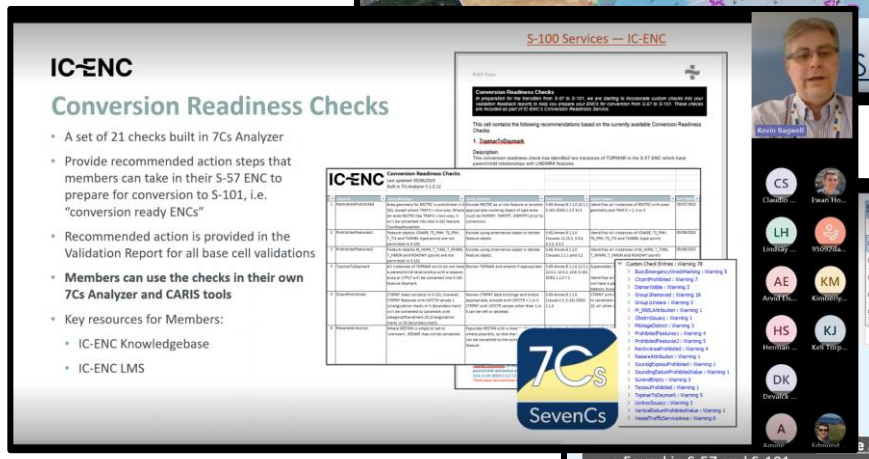
S-57 to S-101 Conversion Training

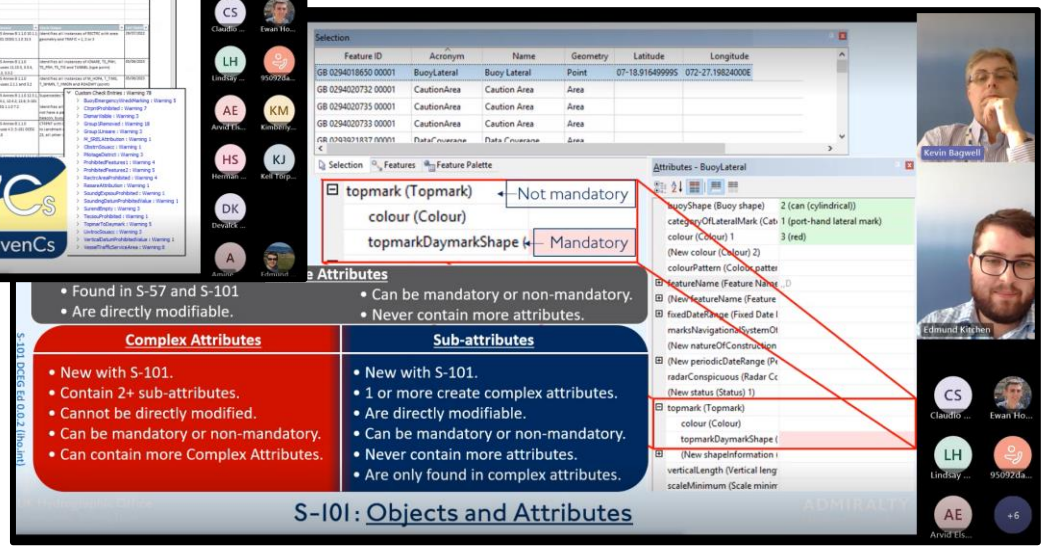
In partnership with UKHO International Training Team a S-57 to S-101 Conversion training course was delivered.

A total of 145 Members attended

‘conversion S-57 to S-101 was something complicated and not clear for me.

after attending that quick course , the conversion S-57 to S-101 in my opinion is something that can be reached by my HO office’





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Conversion Workshop

IC-ENC supported the IHO-Singapore Innovation Lab Conversion workshop by part funding this important initiative.

24 delegates attended and 19 of those were IC-ENC Members.

Feedback and lessons learnt will be shared at our Tech Conference in March 2024, where, IC-ENC Members will present

IC-ENC are working with Industry to host regional conversion workshops throughout 2024

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Look ahead for next 6 months

- Continue development of S-100 Services
- Increase S-1XX datasets released under the PDT Licence
- Conduct first S-101 and S-102 trials with Members
  - S-101 – Netherlands (Jan 2024)
  - S-102 – Argentina (Q1 2024)
- Regional Training
- Deliver hybrid Technical Conference (TC24_1) in March 2024
  - Members' conversion experiences from IHO Singapore Lab Conversion Workshop (Nov 2023)
  - S-101 developments
  - S-100 Services progress
  - Members' S-1XX production experiences
  - Industry updates