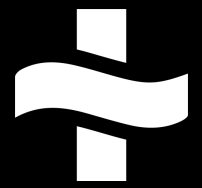
IC-ENC Working together to assure navigational safety

IC-ENC to MACHC, December 2023

Leendert Dorst, IC-ENC Vice Chair

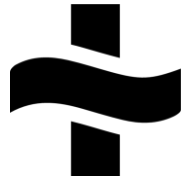
James Harper, IC-ENC General Manager



IC-ENC

Agenda

1. IC-ENC Overview
2. ENC Services
3. Distribution and Assurance
4. S-100 Services
5. IC-ENC Training & Support



IC-ENC Working together to assure navigational safety

IC-ENC Overview

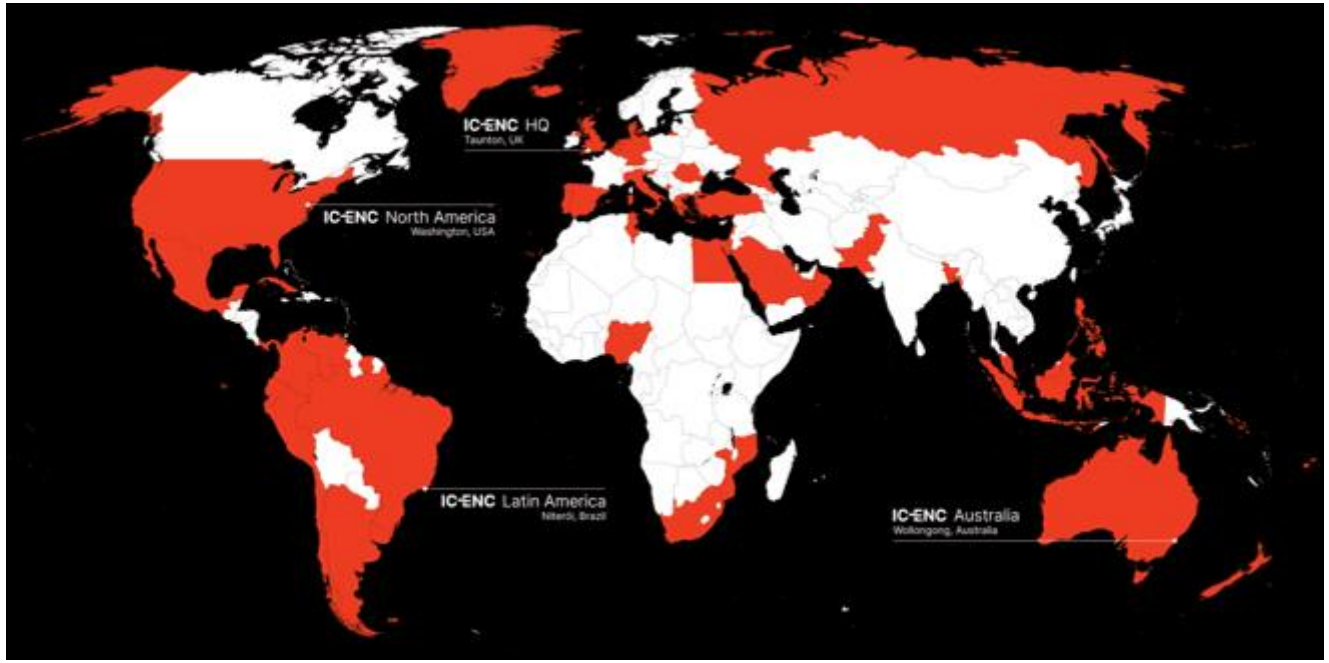
IC-ENC

Introduction

- IC-ENC is a Regional ENC Coordinating Centre (RENC) which conducts the validation and distribution of ENC data for 50 Member HOs

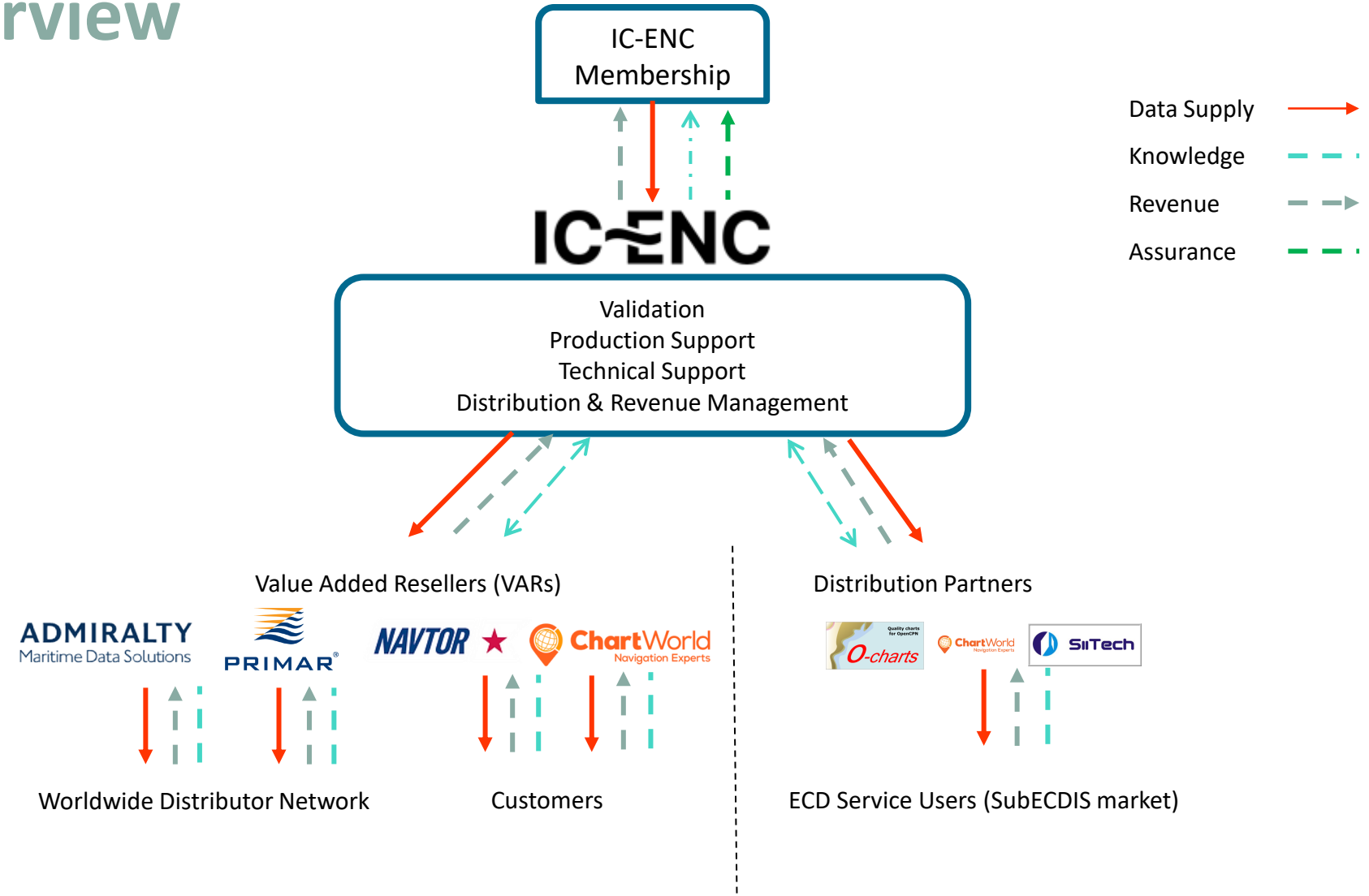
- IC-ENC was formed in 2002 with six Members, and has grown significantly over the years.

- IC-ENC has an HQ office in Taunton, UK, and three regional offices in Australia, Brazil and Washington



IC-ENC

Overview



IC-ENC

IC-ENC Chair Team

Burak Inan

Elected as **Chair** of IC-ENC in July 2023 and currently the Deputy Director of the Turkish Navy-Office of Navigation, Hydrography and Oceanography.

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Pia Dahl Højgaard

Vice Chair of IC-ENC and as of January 2016, she has held the position as Danish National Hydrographer and as such represents Denmark in the International Hydrography Organization (IHO) and related Regional Hydrographic Commissions.

Leendert Dorst

Vice Chair of IC-ENC, Leendert is the Deputy Hydrographer and Head of the Staff Group at the Royal Netherlands Navy. His work includes the coordination of IHO, EU and national government matters, with a focus on distribution aspects for nautical products and their source datasets.

Michael Andrew

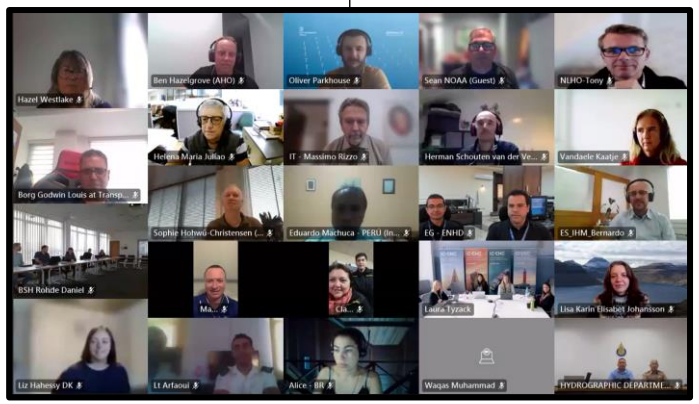
Vice Chair of IC-ENC and very experienced in all licensing matters for the Australian Hydrographic Office.

Governance

IC-ENC Steering Committee

Steering Committee

Strategy, Finance, Governance

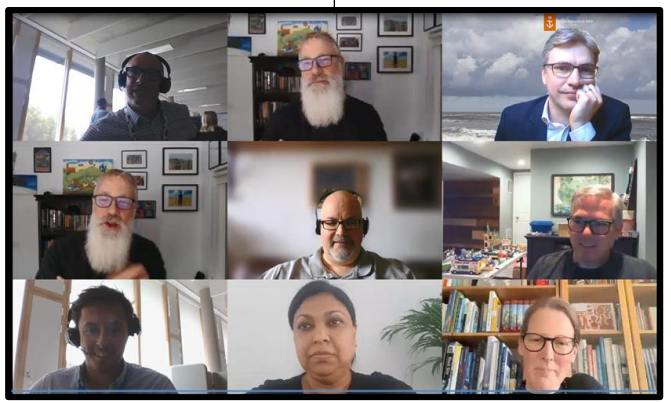


IC-ENC Technical Conference

International best practice across the Membership

IC-ENC Production Support Working Group

Training / learning and eLearning for IC-ENC members.



IC-ENC Distribution Working Group

Distribution and revenue management policies

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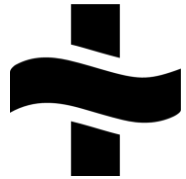
IC-ENC ENC Services

IC-ENC

IC-ENC ENC Validation Service

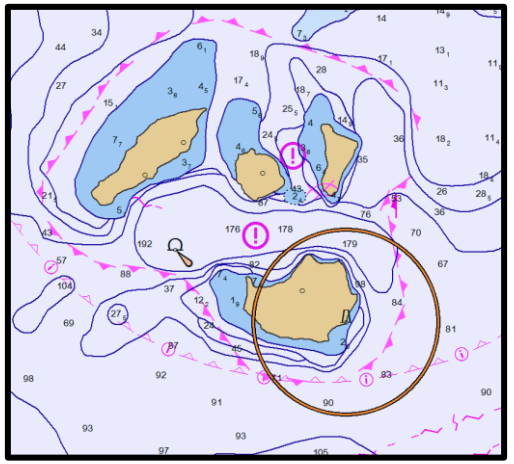
- IC-ENC conducts independent validations on data it receives
- Ensure conformance to S-57 and S-58 standards and IC-ENC Policy
- Provide guidance on improving the quality of the Global ENC Folio
- ECDIS Usability
- Validation Checks conducted by a range of validation tools
  - dKart Inspector
  - 7Cs ENC Analyzer
  - IC-ENC DMD
- IC-ENC Knowledgebase

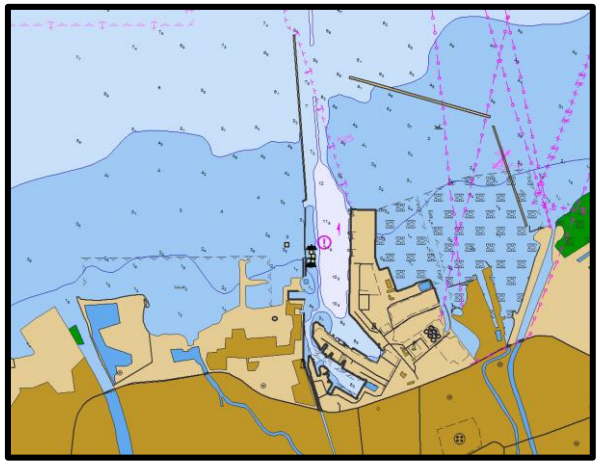


IC-ENC

2023 ENC Service Highlights

- Over 14,000 files released, including:
  - 1,460 New Cells, 3,600 New Editions and 8,500 updates
- IC-ENC Folio will reach 12,000 in January 2024.
- New Members Data Released
  - Lebanon and Saudi Arabia
- New 49th & 50th Members joined
  - Fiji & Indonesia





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IC-ENC Distribution & Assurance

IC-ENC

Our Value-Added Resellers

High quality companies appointed to deliver comprehensive end-user services.

By doing so, our members avoid:
- The cost of developing and marketing their own services for global distribution
- Appointing and managing an extensive distributor network with the associated commercial and legal requirements
- The need for complex and expensive service delivery systems

ADMIRALTY
Maritime Data Solutions

PRIMAR®

NAVTOR

ChartWorld
Navigation Experts

IC-ENC

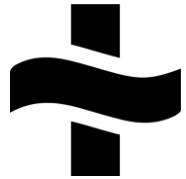
IC-ENC & PRIMAR

RENC

- IC-ENC and PRIMAR have an active “RENC Co-operation” program.
- Working conducted/achieved under this spirit of co-operation includes:
  - Joint RENC ENC licensing model
  - Arrangement for sharing data for QA purposes
  - Exchanging of technical knowledge re QA and S100 Standards developments

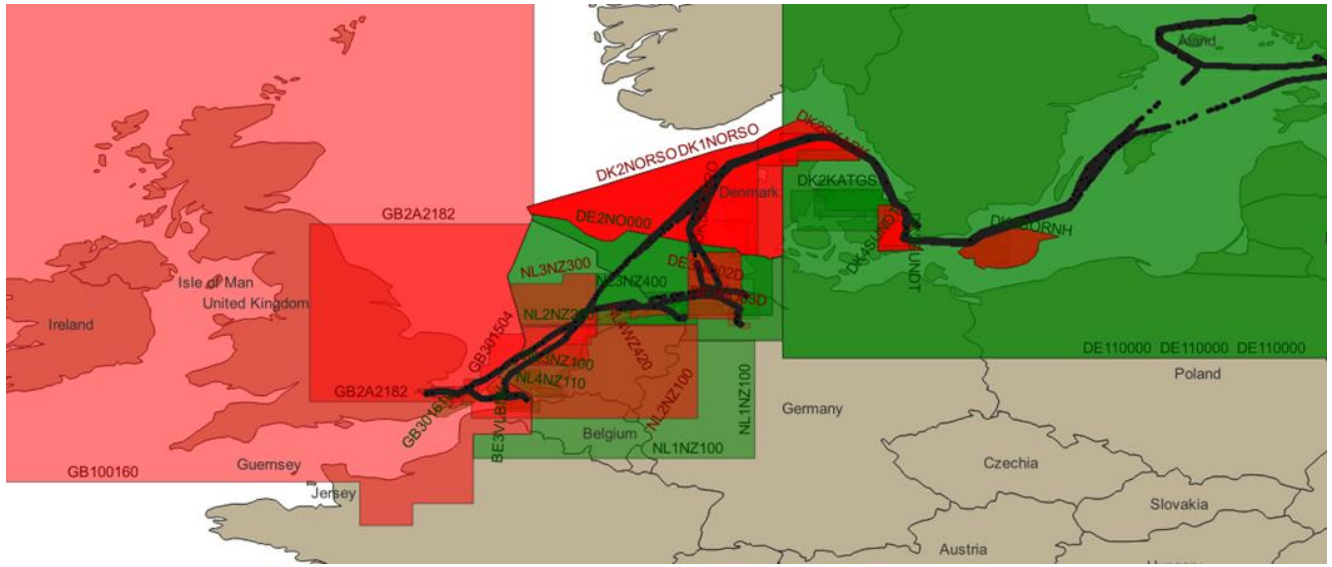
VAR

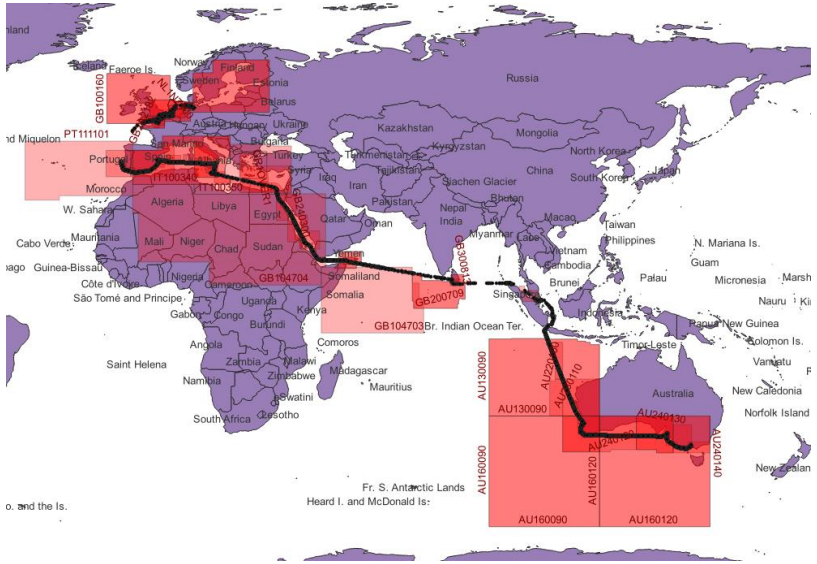
- PRIMAR is an IC-ENC appointed Value Added Reseller. **This means that all IC-ENC Members ENCs are available in the PRIMAR distribution service**.



IC-ENC Assurance Activity

- IC-ENC have developed a tool, combining four data feeds (AIS, shipping database, IC-ENC sales information, ENC catalogue) to identify sales reporting ‘discrepancies’. These are then investigated.



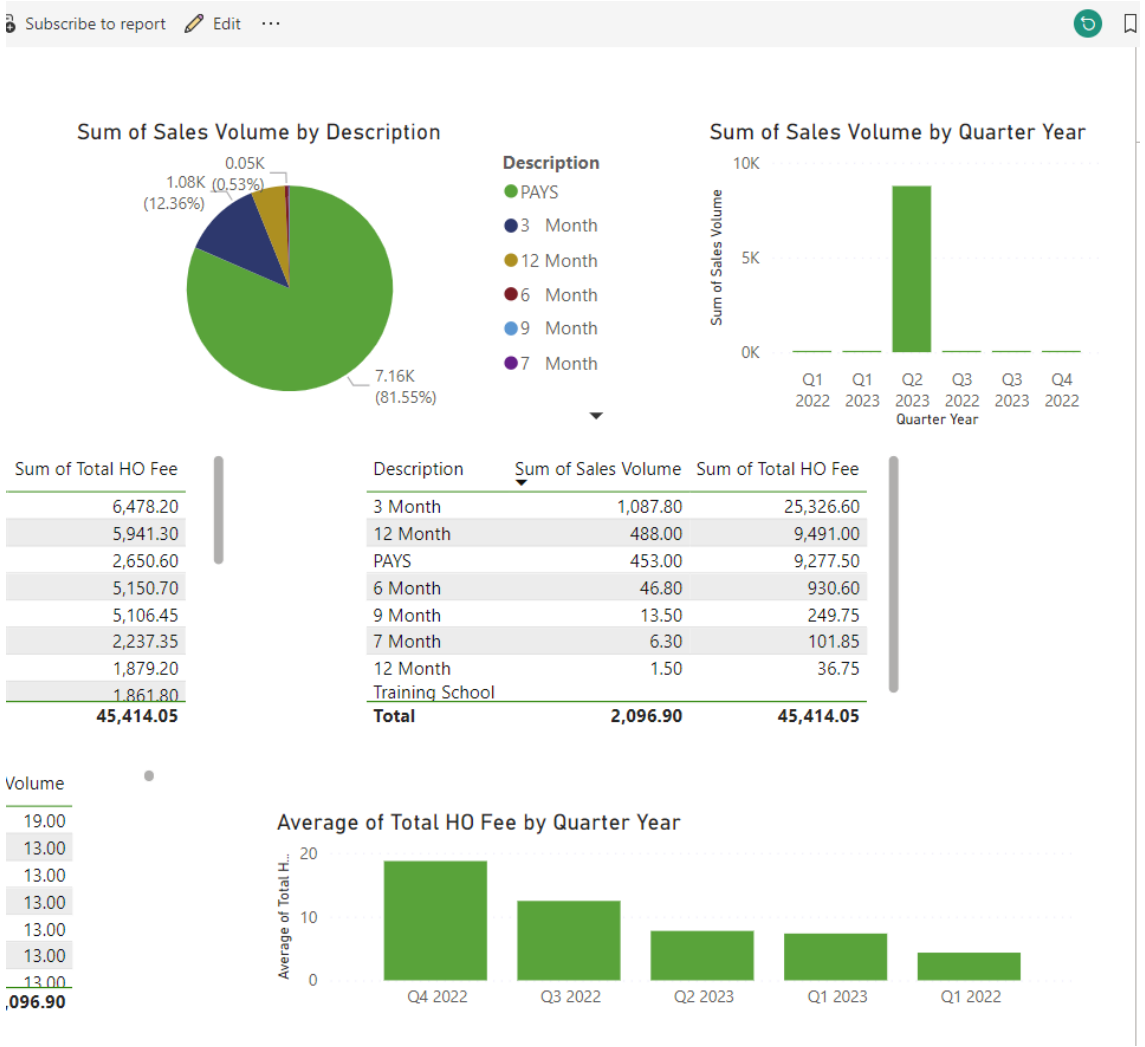


- Discrepancies include; late reporting, under reporting (systems failure), inaccurate reporting.
- Resolution/solution is dependent on the type of problem found via the root cause analysis.

IC-ENC

IC-ENC Member Quarterly Sales Reports

All IC-ENC members receive detailed Quarterly Sales Reports, using PowerBI technology.



Features include:

- Underlying Data with 3-year sales history
- Sales by product/cell
- Sales by Subscription type
- Sales by Vessel
- Sales trends by Qtr
- Sales by VAR
- Average Selling Price by Qtr
- Sales by Service (ECDIS, ECD, OVPS etc)

IC-ENC

ECD Service Distribution

Whilst IC-ENC has historically focused on the distribution of ENCs used on an ECDIS, in 2021 we launched the Electronic Chart Data (ECD) Service.

Its purpose is to enhance safety of navigation in a nation's waters.

Appointed companies receive ENCs and use this to build their own services to vessels navigating electronically but not using an ECDIS.

The service continues to see more members joining with **22** live and **2** more set to be released ahead of 2024.

We currently have 3 appointed distribution partners and are in advanced stages of bringing on board 4 more

Quality charts for OpenCPN
O-charts

SiiTech

ChartWorld
Navigation Experts

Product Development & Testing Licence (PDT)

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

ADMIRALTY Maritime Data Solutions ChartWorld Navigation Experts NAVTOR PRIMAR®

- 5 PDT releases to date

CLEAR WATER FURUNO

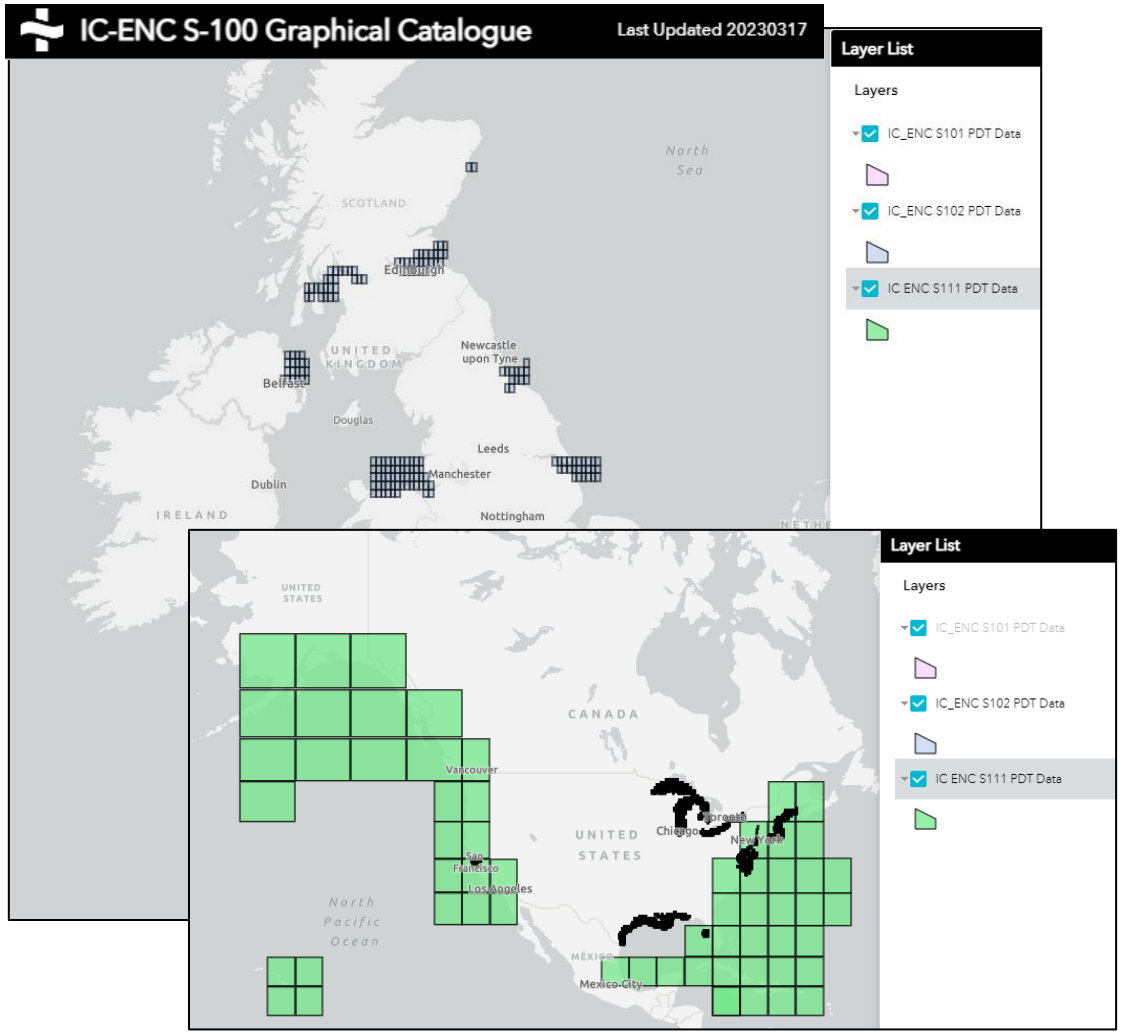
- 28 out of 50 Members have "opted in" so far – thank you!

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, TR, 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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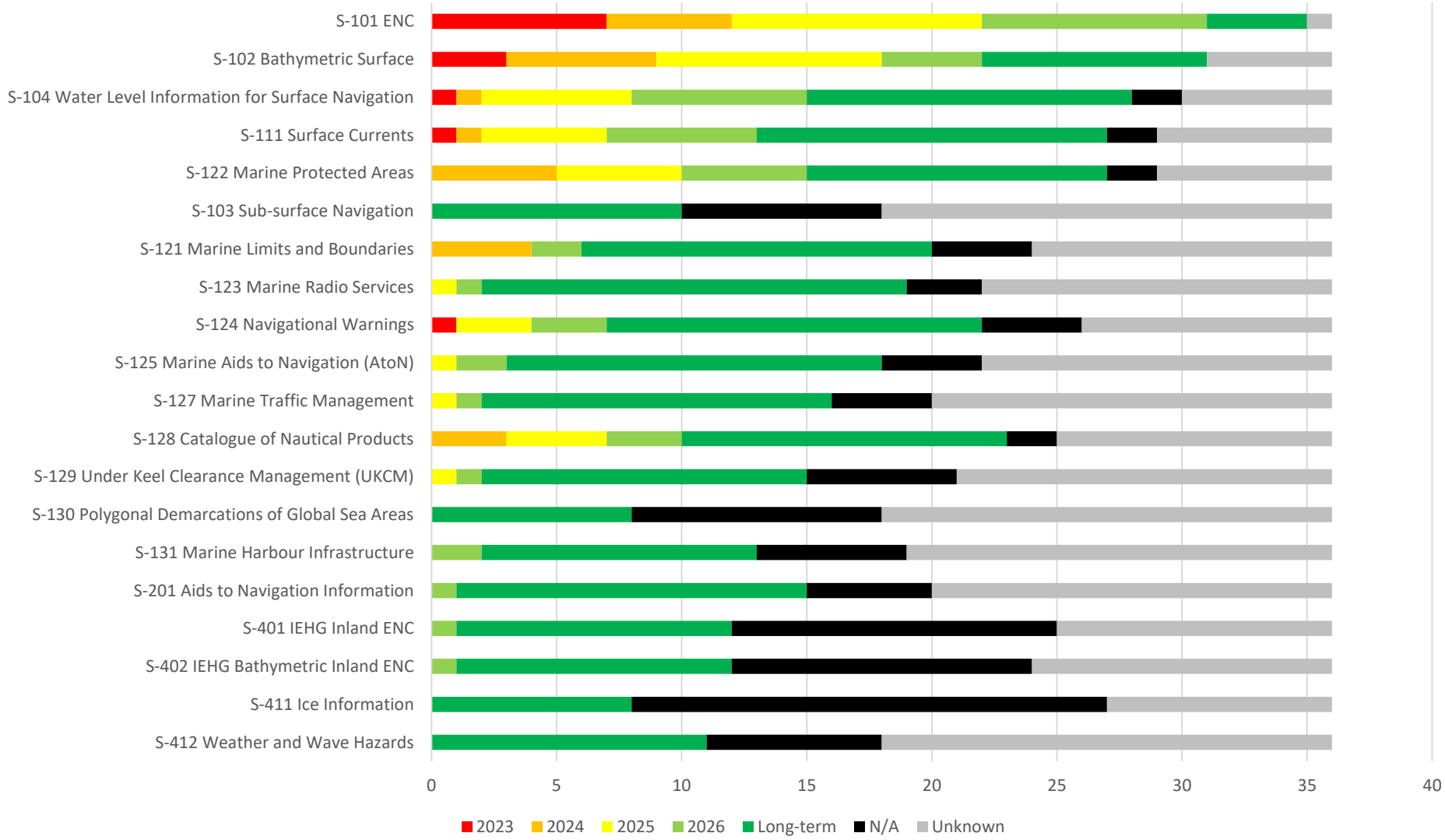
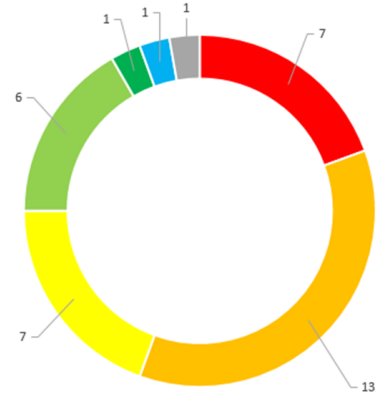
IC-ENC S100 Services

IC-ENC

Context: Members' S-1XX Production Plans



S-57 to S-101 conversion timeframes



IC-ENC

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
  - 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

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)

IC-ENC

S57-S101 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)

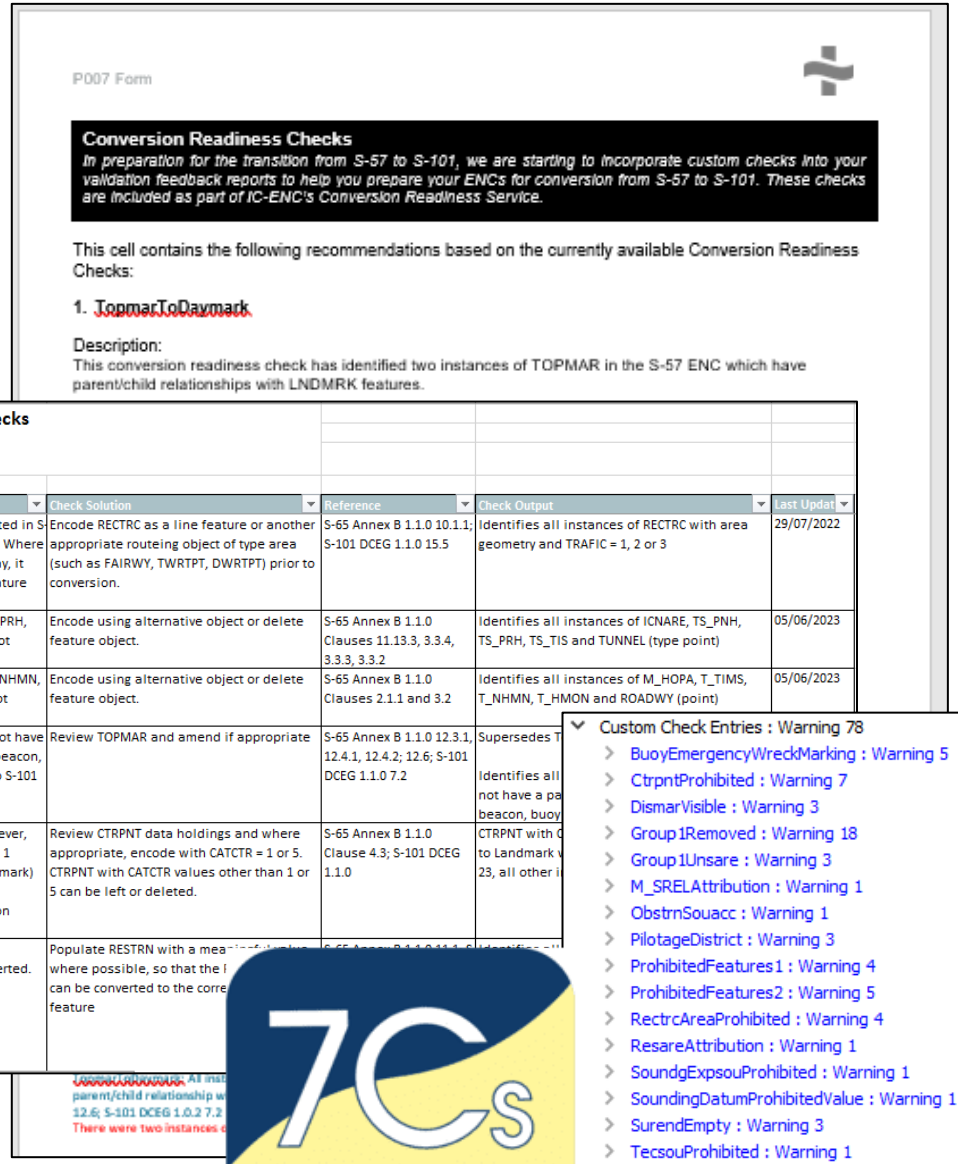
- Components of the service:
  a) Conversion Readiness Checks
  b) S-57 to S-101 conversion assessments
  c) S-101 trial data assessments
  d) S-100 validation tool testing
  e) ENC global query capability
  f) IC-ENC Knowledgebase
  g) Technical Conference

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.

IC-ENC

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

TELEDYNE CARIS
Everywhereyoulook™

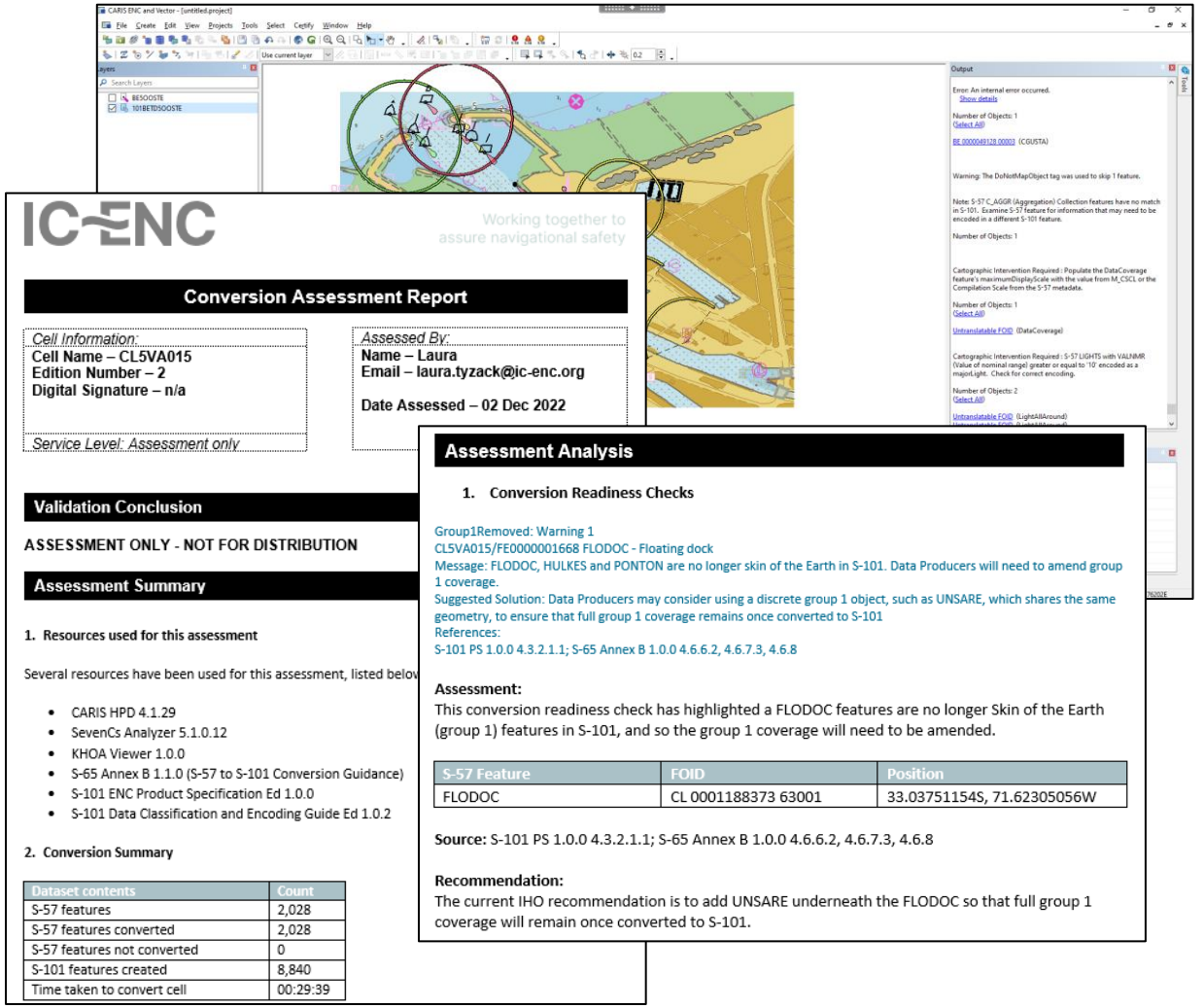
IC-ENC

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
  - Help to convert (sample) 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)



IC-ENC

Working together to assure navigational safety

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 below

- 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

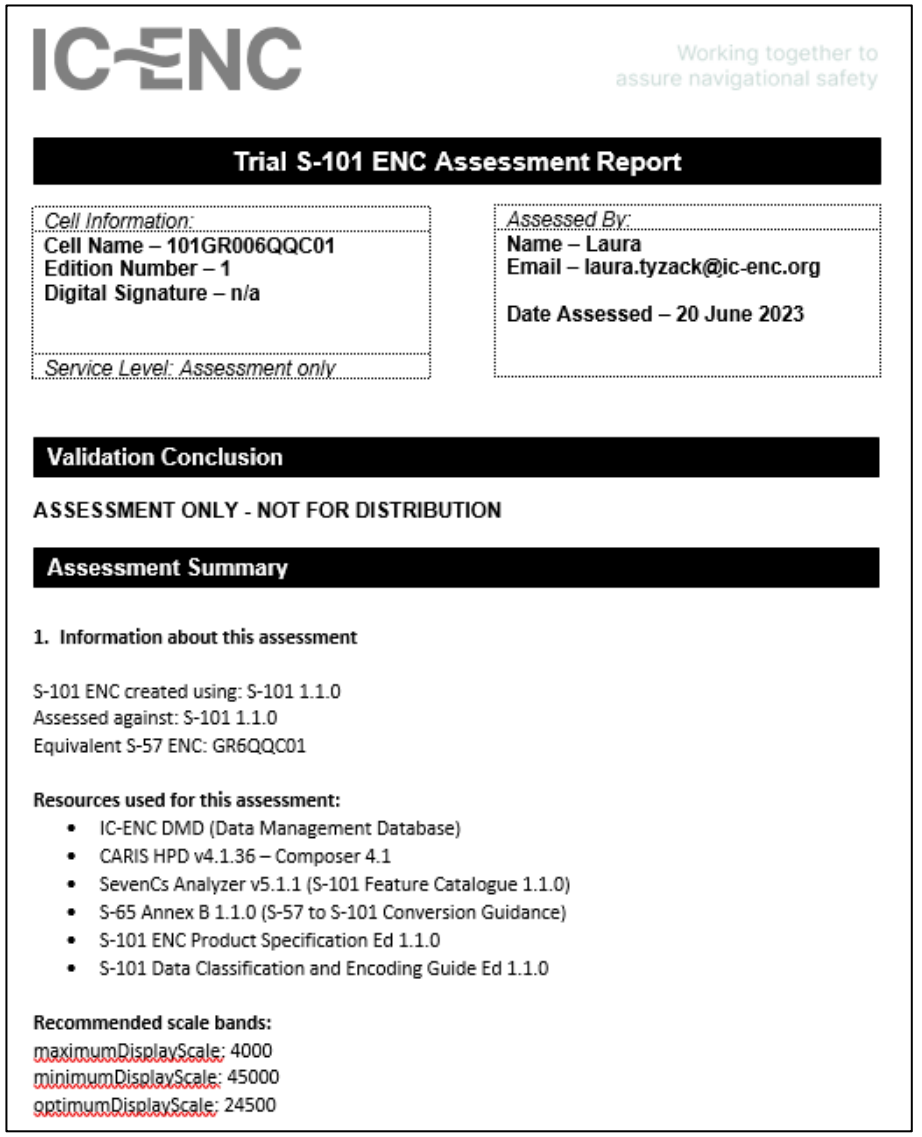
Recommendation:
The current IHO recommendation is to add UNSARE underneath the FLODOC so that full group 1 coverage will remain once converted to S-101.

IC-ENC

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



IC-ENC

Working together to assure navigational safety

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

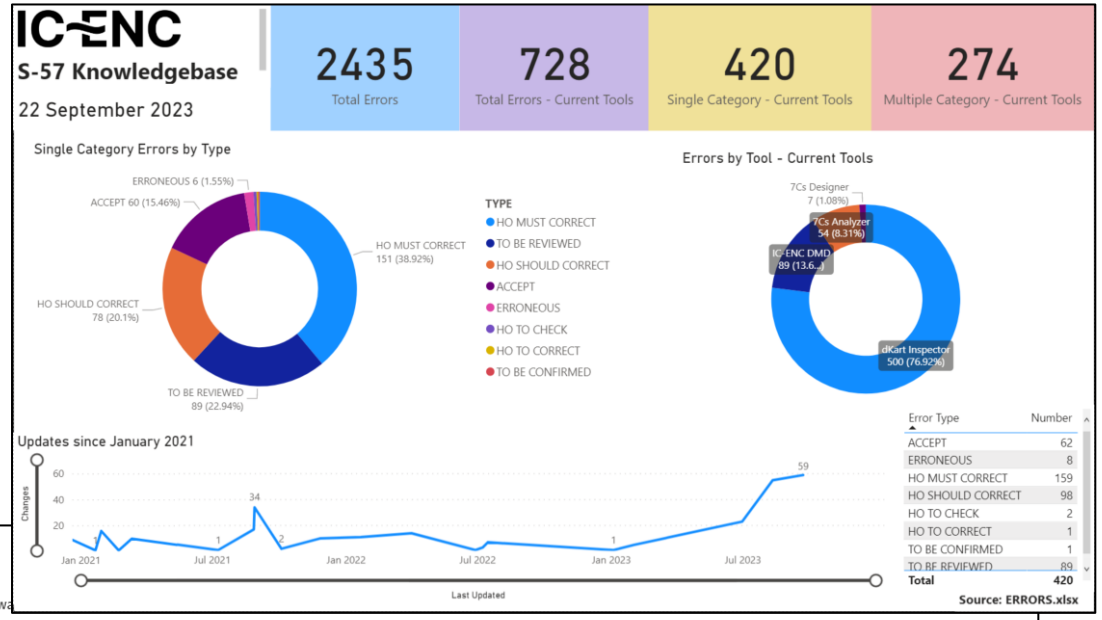
Recommended scale bands:
maximumDisplayScale: 4000
minimumDisplayScale: 45000
optimumDisplayScale: 24500

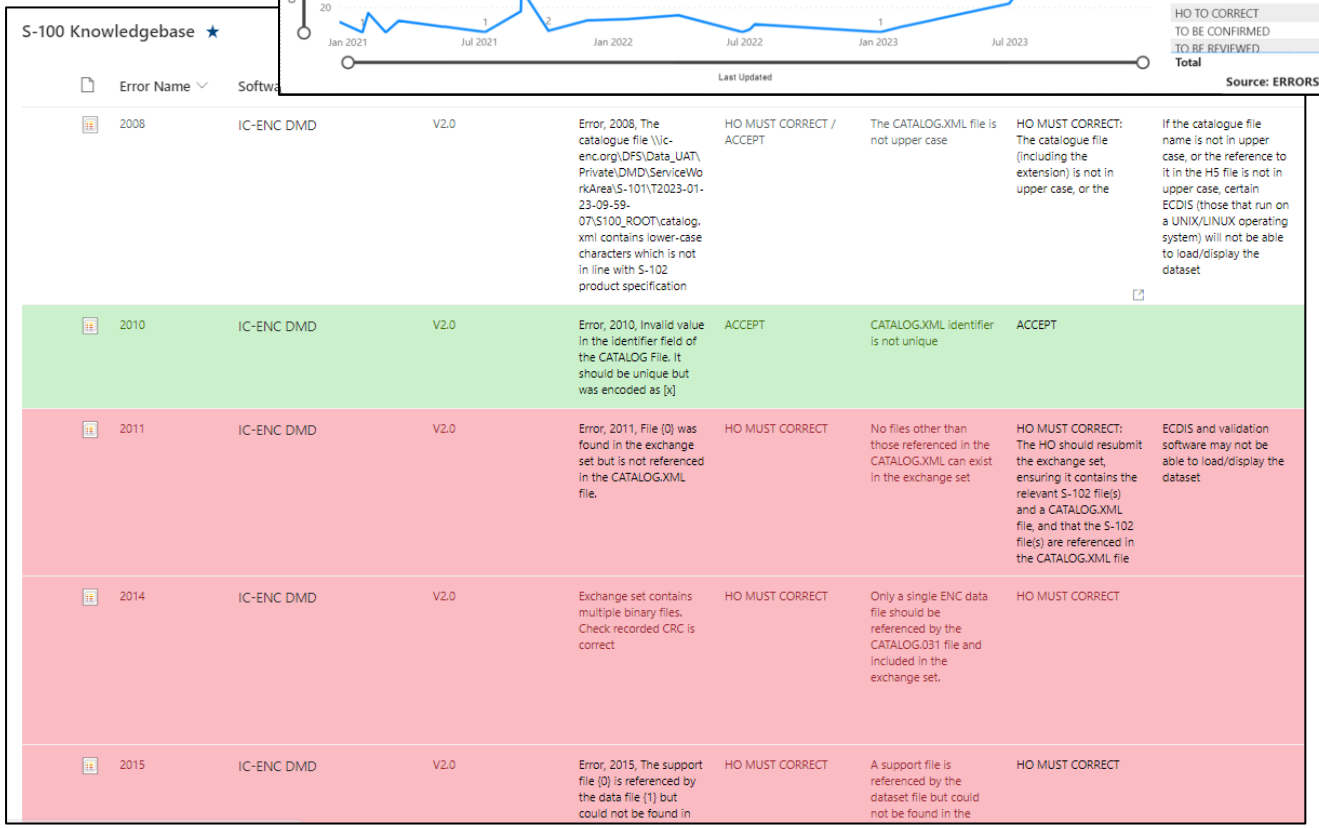
IC-ENC

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





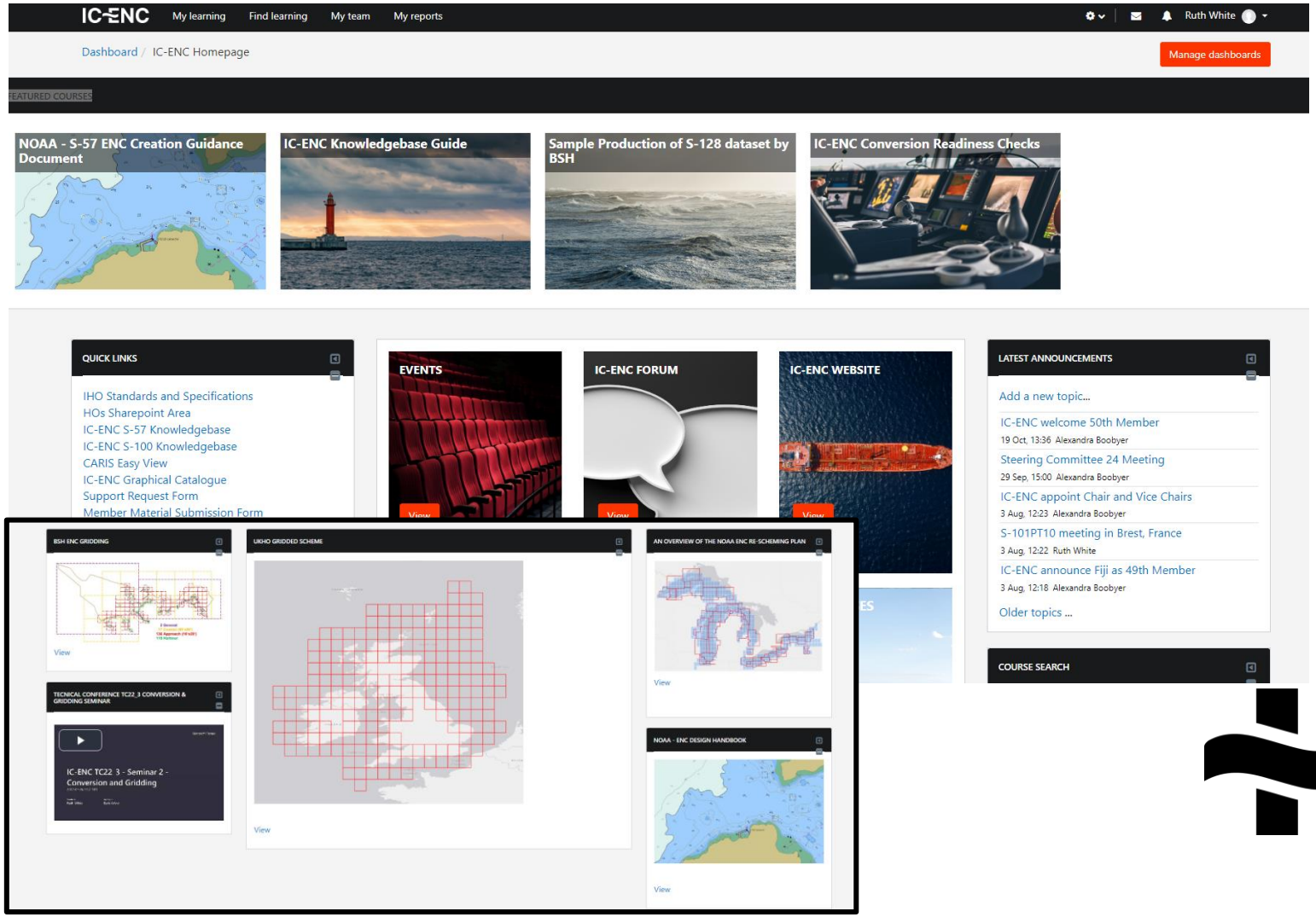
IC-ENC Working together to assure navigational safety

IC-ENC Training & Support

IC-ENC

Learning Management System (LMS)

- IC-ENC established a Learning Management System (LMS) in 2021
- The LMS has been going from strength to strength with Member sign ups and contributions.
- The LMS provides Members with a rich resource of learning and an opportunity to correspond with each other via the IC-ENC forum.

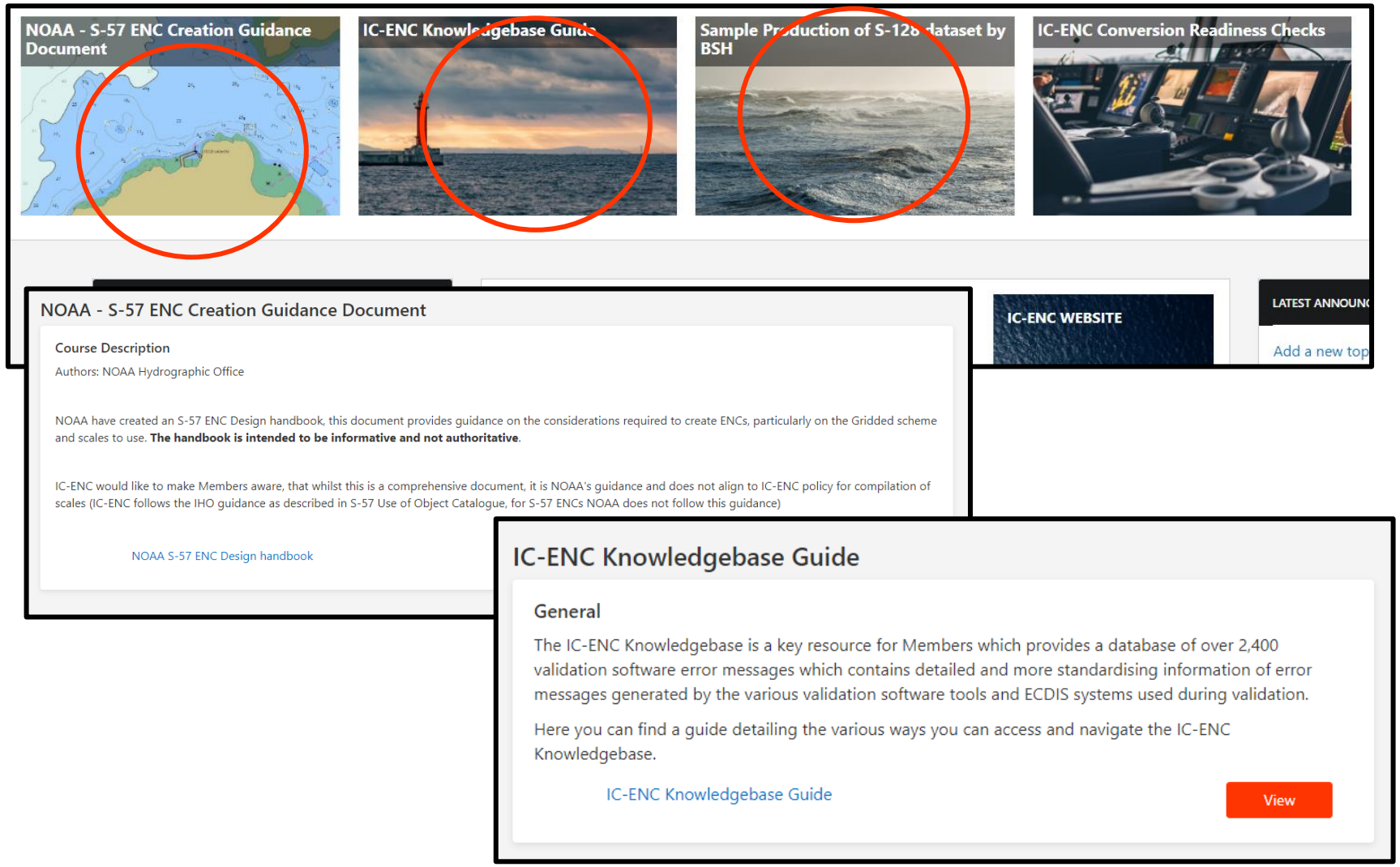


Member Material on the LMS

- 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 Empowering Women in Hydrography successful candidate Juliane Affonso (Brazil)



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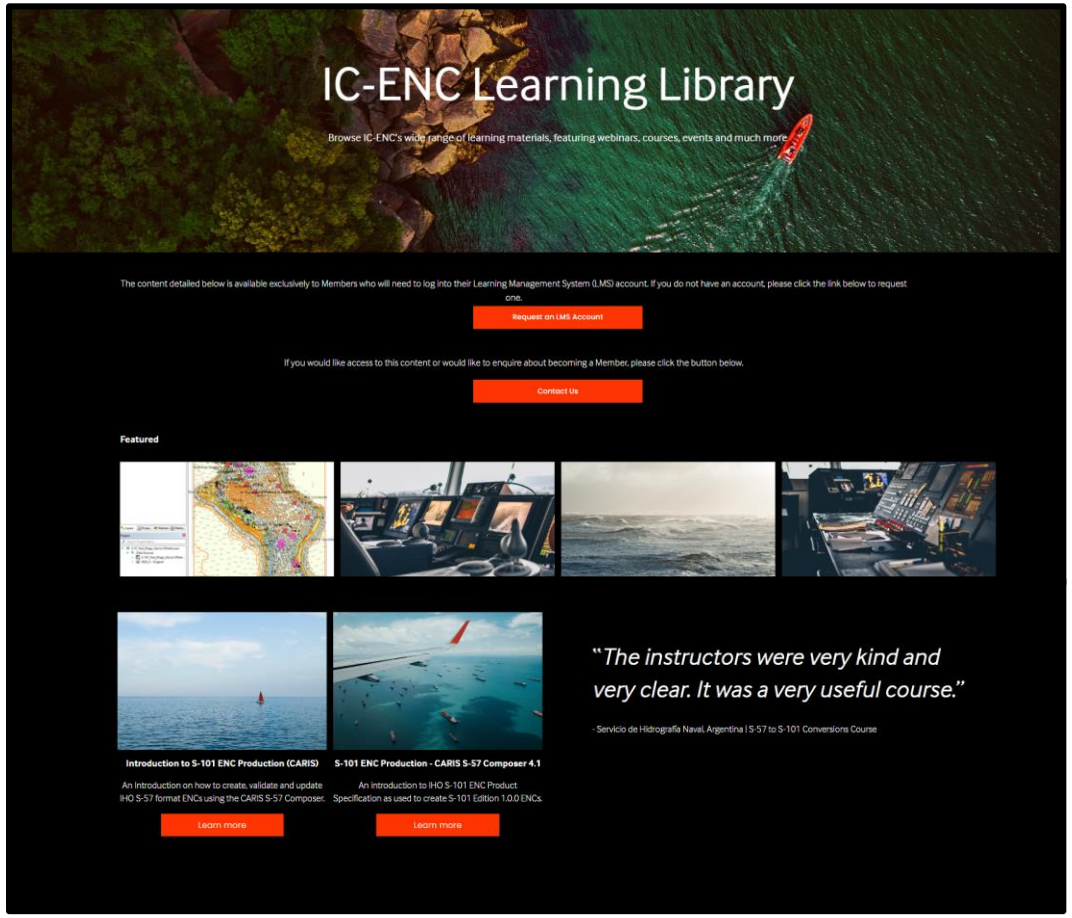
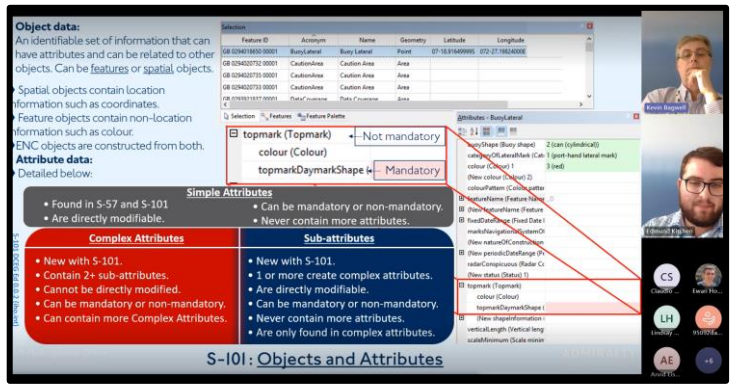
LMS Library Content

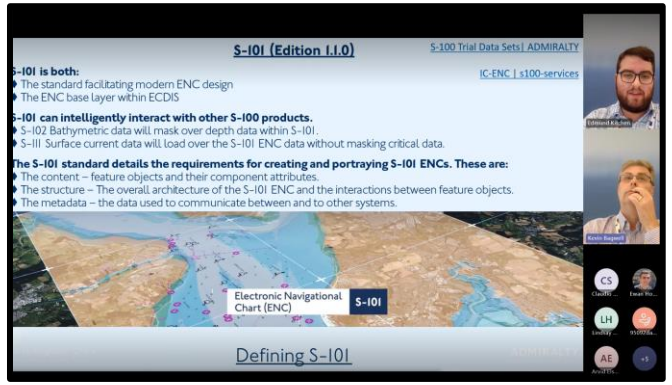
- Our full LMS Library content can be viewed on our IC-ENC website via the following link [LMS Courses — IC-ENC]

- 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 Webinars
- Technical Conference discussion recordings







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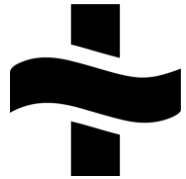
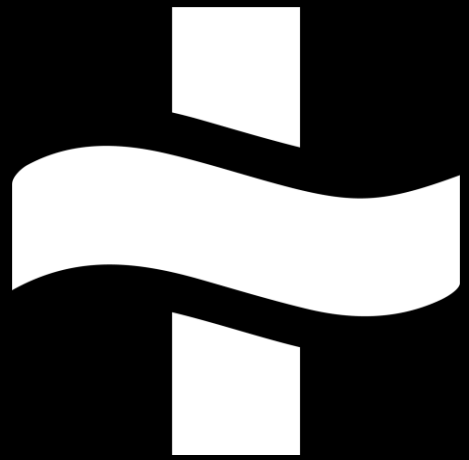
Summary

IC-ENC is supporting its:

- 50 Members,
- 4 Value Added Resellers,
- and 3 Distribution Partners

With their existing ENC requirements and their S100 transition and future needs

www.ic-enc.org