



Inside Erex

Functionality and real world scenarios

Paris, May 31, 2017

About me

Name

Mohammad Ali Koteich

Role

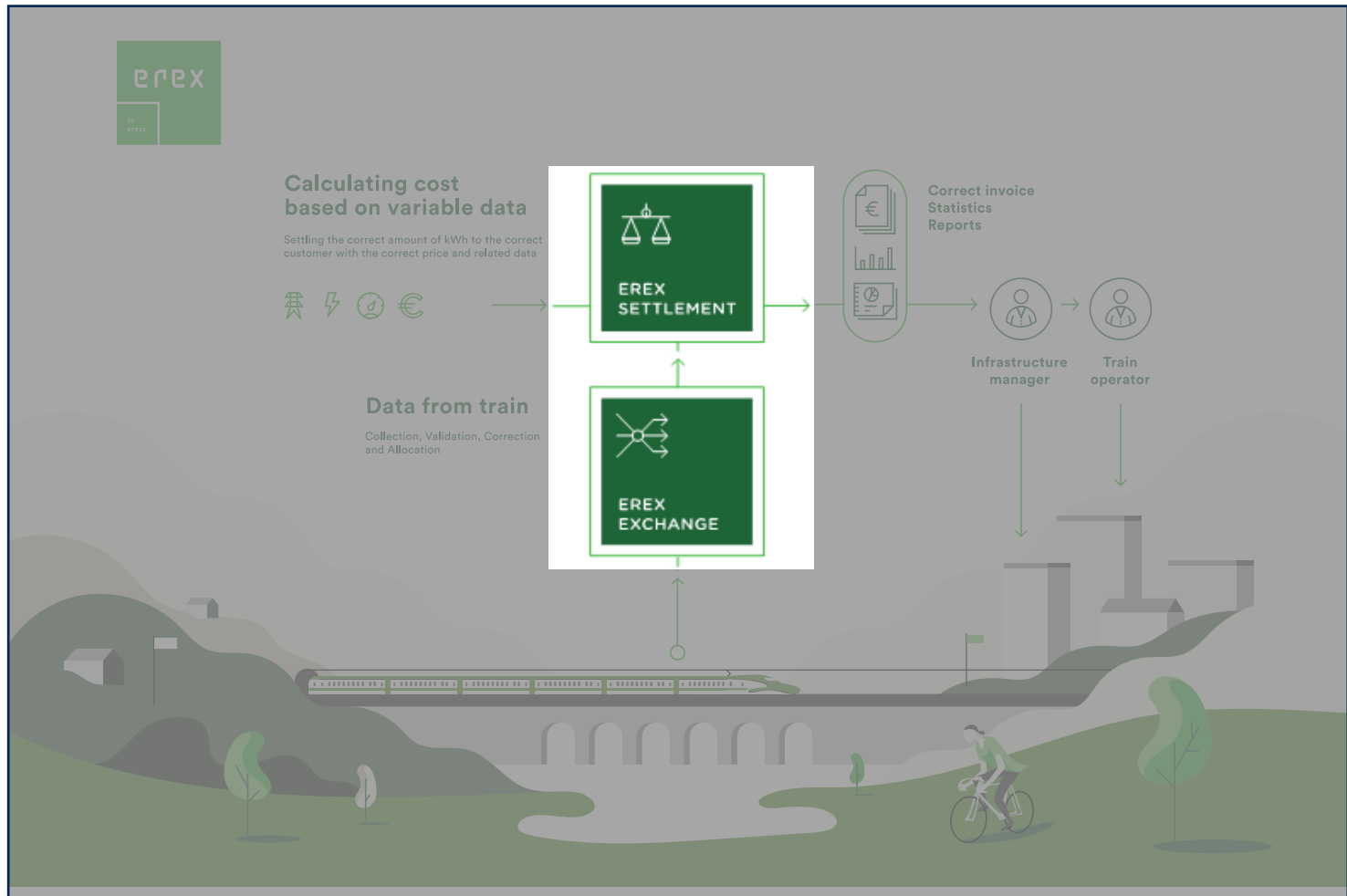
IT Business Analyst

Goal of this presentation

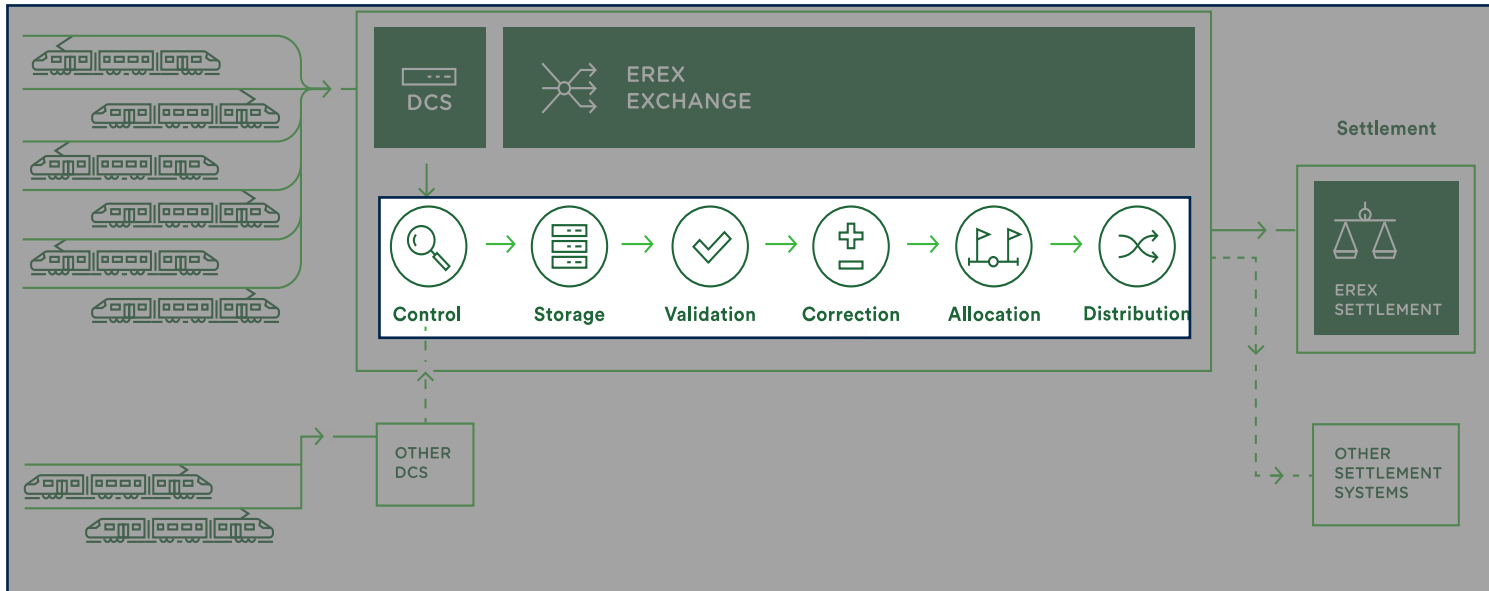
Showcase how Erex can be used

The Erex Eco-system

Two main web applications



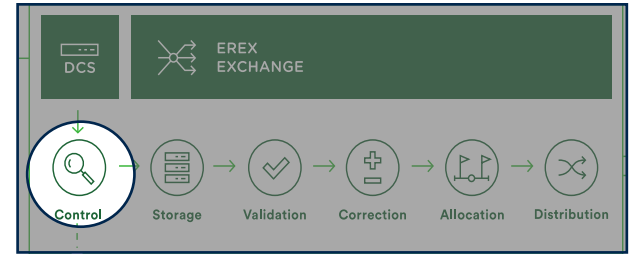
Erex Exchange



Users who interact with the graphical user interface:

- Infrastructure managers who have the responsibility of validating and distributing metered data
- Traction unit administrators can retrieve data for their traction units, and delegate data access to applicable train operators.
- Eress administration

Control of input files



erex Messages

▼ mohammad_koteich | Log out
Erex Exchange
Time zone GMT

Status Processes Queries Report Administration

► Operator view Message Log Process Log Event Monitor Import control

From: 09/05/2017 22:00 To: 10/05/2017 22:00

Process Statistics

Procedure Name	Total	Not successful
allocation	1672	0
export	1673	0
validation	1691	19

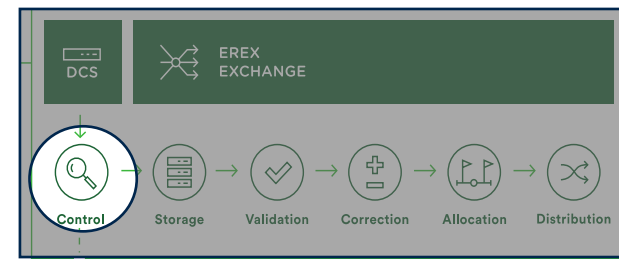
Message Log (2536)

All	2536
UTILTS Import	481
UTILTS Validation	628
OK	474
PARTLY_REJECTED	7
REJECTED	147
Export	1427

Event Monitor (12017)

ConsumptionPoint	12017
Speed exceeded, successfully interpolated	2017
Generation without movement	3052
Consumption without movement	3699
Speed exceeded, but no interpolation possible within set timerange	245
Missing location and quantity value	164
Movement without consumption	120
Speed exceeded, single record corrected	6
Pole detected	1194
Missing quantity value	340
Power has exceeded maximum limit	1160

Control of input files



EREX Messages ▼ mohammad_koteich | Log out
Erex Exchange
Time zone GMT

Status Processes Queries Report Administration

Operator view Message Log Process Log Event Monitor Import control

Message log

From: 09/05/2017 22:00 To: 10/05/2017 22:00 UTILS Validation REJECTED Search

Count: 147

Time stamp	Log	Type	Text	File name
10/05/2017 21:51	REJECTED	UTILS Validation	Rejected. All 4 time series are ignored.	TRP_9410600402550_01e875_1705102125.edi
10/05/2017 21:51	REJECTED	UTILS Validation	Rejected. All 4 time series are ignored.	TRP_9410600402550_01e85c_1705102100.edi
10/05/2017 21:51	REJECTED	UTILS Validation	Rejected. All 4 time series are ignored.	TRP_9410600402550_01e820_1705102000.edi
10/05/2017 21:31	REJECTED	UTILS Validation	EDI validation failed when trying to open the edi file	TRP_9110300003820_03b226_1705102000.edi
10/05/2017 20:42	REJECTED	UTILS Validation	EDI validation failed when trying to open the edi file	TRP_9110300003820_03b226_1705102000.edi
10/05/2017 20:32	REJECTED	UTILS Validation	EDI validation failed when trying to open the edi file	TRP_9110300003820_03b226_1705102000.edi
10/05/2017 20:22	REJECTED	UTILS Validation	EDI validation failed when trying to open the edi file	TRP_9110300003820_03b226_1705102000.edi
10/05/2017 20:12	REJECTED	UTILS Validation	EDI validation failed when trying to open the edi file	TRP_9110300003820_03b226_1705102000.edi
10/05/2017 19:21	REJECTED	UTILS Validation	Rejected. All 12 time series are ignored.	9185442519551_201705101900.edi
10/05/2017 19:21	REJECTED	UTILS Validation	Rejected. All 4 time series are ignored.	9185442519481_201705101900.edi
10/05/2017 19:21	REJECTED	UTILS Validation	Rejected. All 4 time series are ignored.	9185442519301_201705101900.edi
10/05/2017 19:21	REJECTED	UTILS Validation	Rejected. All 4 time series are ignored.	9185442519221_201705101900.edi
10/05/2017 19:11	REJECTED	UTILS Validation	Rejected. All 4 time series are ignored.	TRP_9410600402550_01e7e4_1705101900.edi
10/05/2017 18:51	REJECTED	UTILS Validation	Rejected. All 4 time series are ignored.	9184118600941_201705101835.edi
10/05/2017 18:11	REJECTED	UTILS Validation	From time can not be greater than or equal to end time (DTM=324)	UTILS-E30_20170510180232737_1185002003_708000320_8637.edi

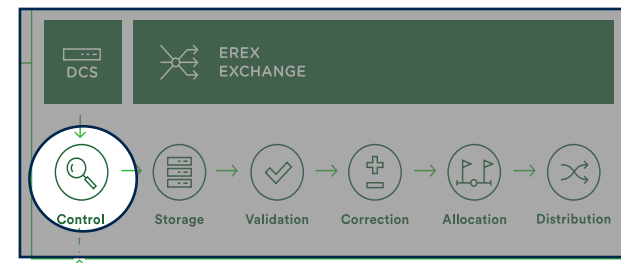
Message Log Details

[Download file](#)

Reimport Go to Entries

10/05/2017 18:11	REJECTED	UTILS Validation	From time can not be greater than or equal to end time (DTM=324)	UTILS-E30_20170510180232412_1185002002_708000320_8637.edi
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Control of input files



10/05/2017 18:11	REJECTED	UTILTS Validation	From time can not be greater than or equal to end time (DTM+324)	UTILTS- E30_20170510180232737_1185002003_708000320 8637.edi
Message Log Details Download file Reimport Go to Entities				

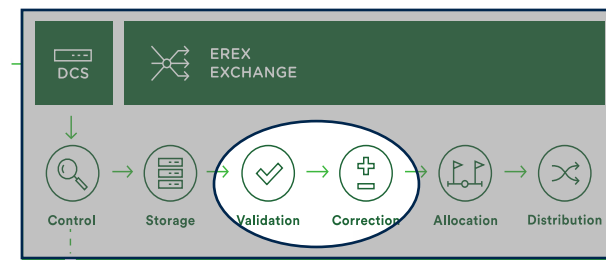
Internal benefit:

User has the possibility to correct data and re-import, such that the metered data can be used.

External Benefit:

User can inform upstream systems of data quality issues

Validation and Correction



EREX Messages ▼ mohammad_koteich | Log out
Erex Exchange
Time zone GMT

Status Processes Queries Report Administration

► Operator view Message Log Process Log Event Monitor Import control

From: 09/05/2017 22:00 To: 10/05/2017 22:00 Update

Process Statistics ●

Procedure Name	Total	Not successful
allocation	1672	0
export	1673	0
validation	1691	19

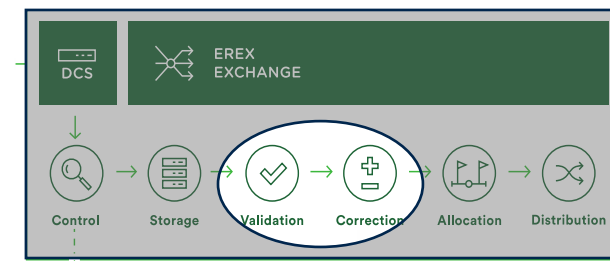
Message Log (2536) ●

Category	Count
All	2536
UTILTS Import	481
UTILTS Validation	● 528
OK	474
PARTLY_REJECTED	7
REJECTED	● 147
Export	1427

Event Monitor (12017) ●

Consumption Point	Count
Speed exceeded, successfully interpolated	2017
Generation without movement	3052
Consumption without movement	3699
Speed exceeded, but no interpolation possible within set timerange	245
Missing location and quantity value	164
Movement without consumption	120
Speed exceeded, single record corrected	6
Hole detected	1194
Missing quantity value	340
Power has exceeded maximum limit	1180

Validation and Correction



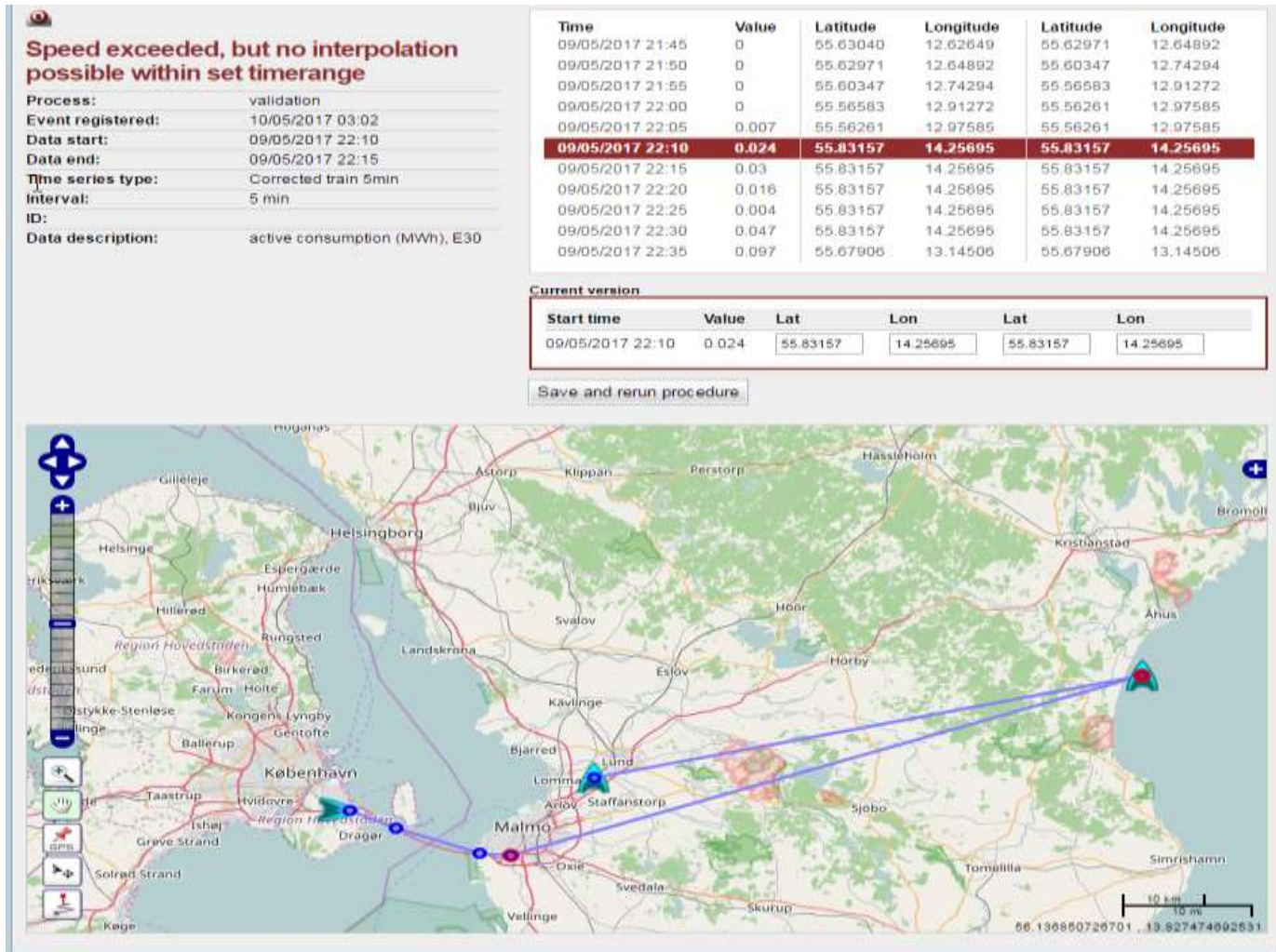
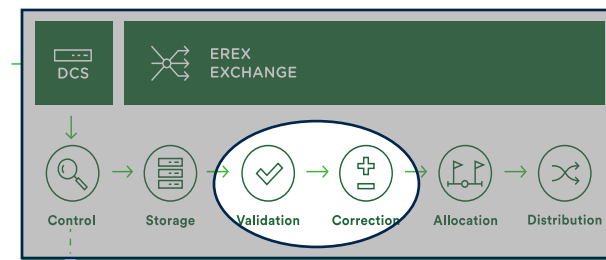
Checks for violations in:

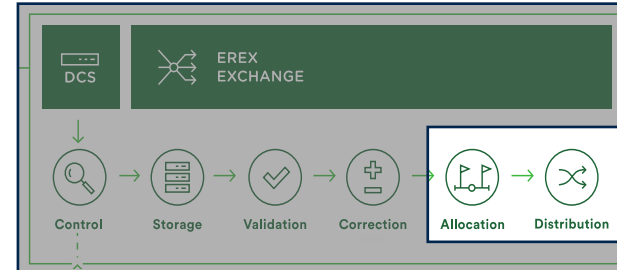
- Physical laws
- Configured limits
- Missing data

Event Monitor (12017)	
ConsumptionPoint	12017
Speed exceeded, successfully interpolated	2017
Generation without movement	3052
Consumption without movement	3699
Speed exceeded, but no interpolation possible within set timerange	245
Missing location and quantity value	164
Movement without consumption	120
Speed exceeded, single record corrected	6
Hole detected	1194
Missing quantity value	340
Power has exceeded maximum limit	1180

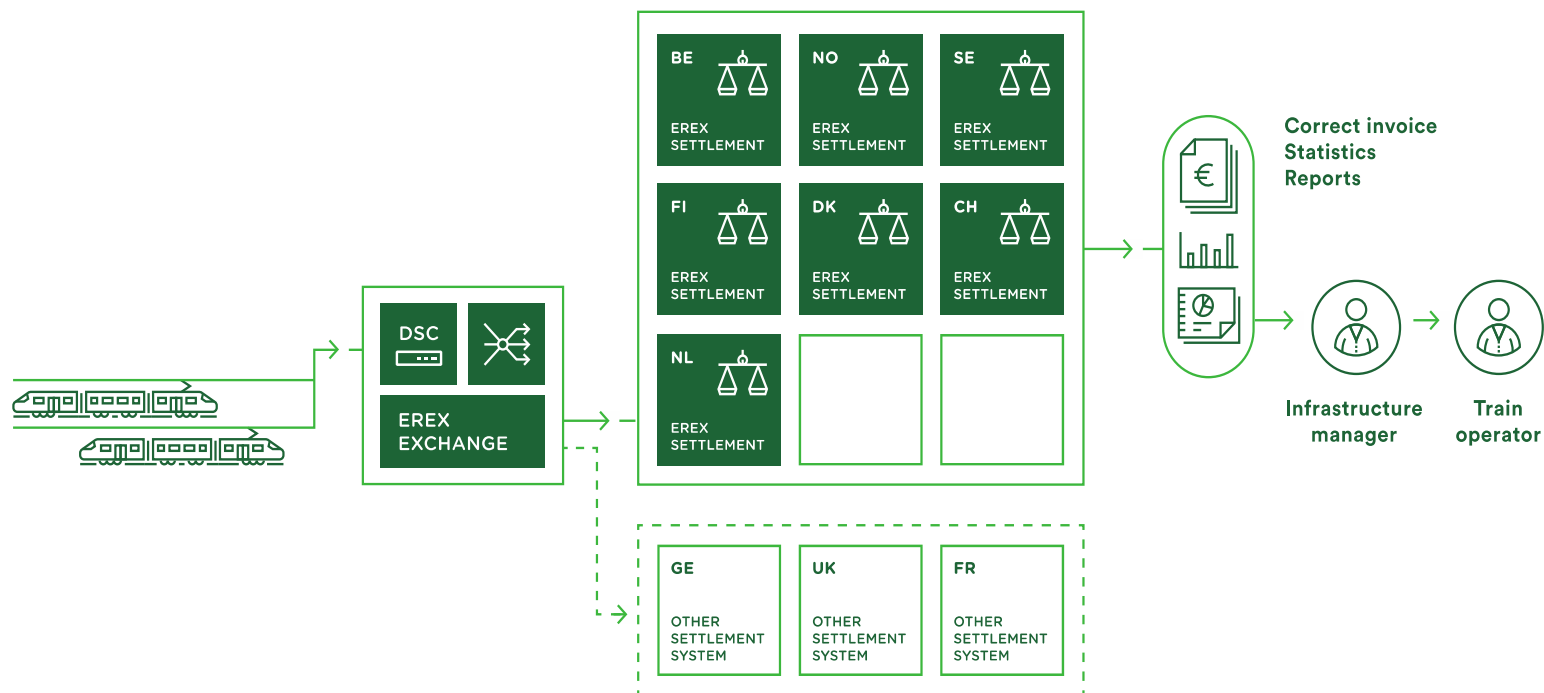
- Exchange will attempt to correct data, and notify the operator.
- Operator is given the chance to correct data that Exchange is unable to correct and re-send corrections.
- Location values that are unable to be corrected, and that are outside of any configured settlement area will not be forwarded anywhere.

Validation and Correction

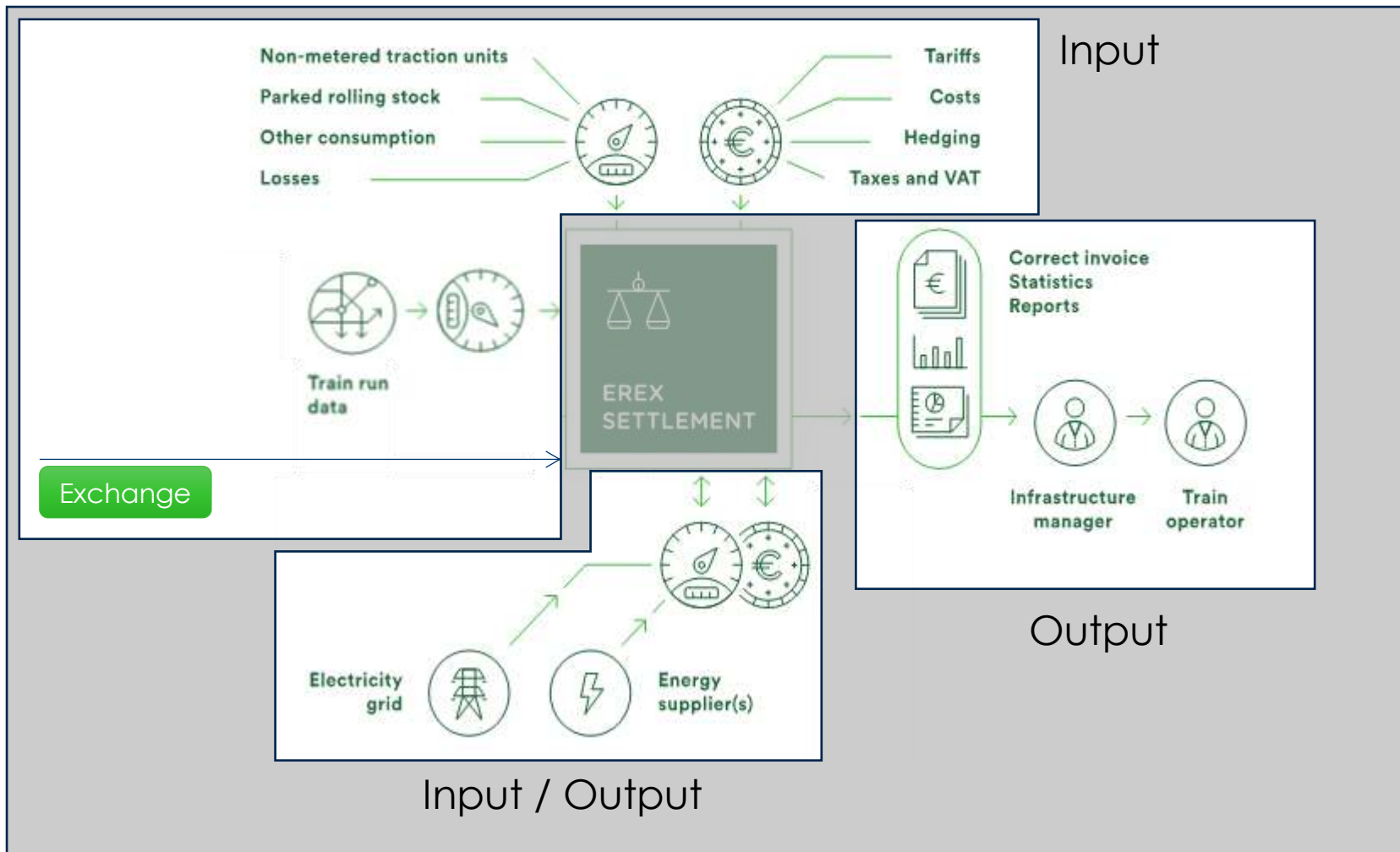




Railway Energy Data Flow



Erex Settlement



Input- Train run data control

Status

Processes

Queries

Report

Analysis

Administration

Operator view

Message Log

Process Log

Event Monitor

Unresolved Failures

Process step

No rows found.

Failures

From:

01/11/2016

To:

28/12/2016

00:00

00:00

Update

Process Statistics

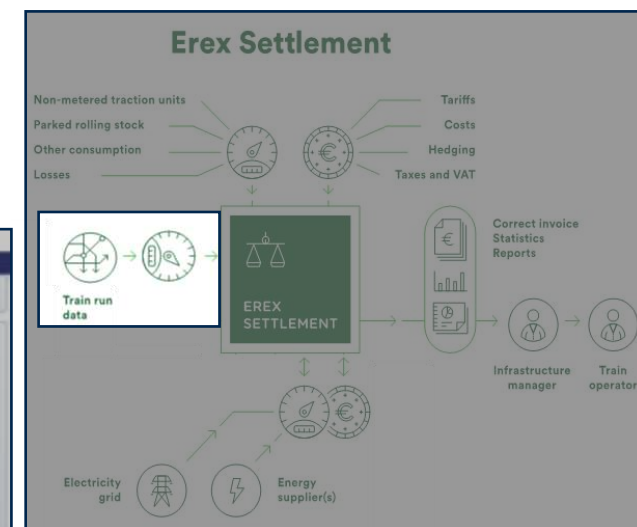
Procedure Name	Total	Not successful
estimate-train-run	72231	0
preprocessing	12551	0
calculate-unmetered-energy	31562	0
combine	855	0

Message Log (70337)

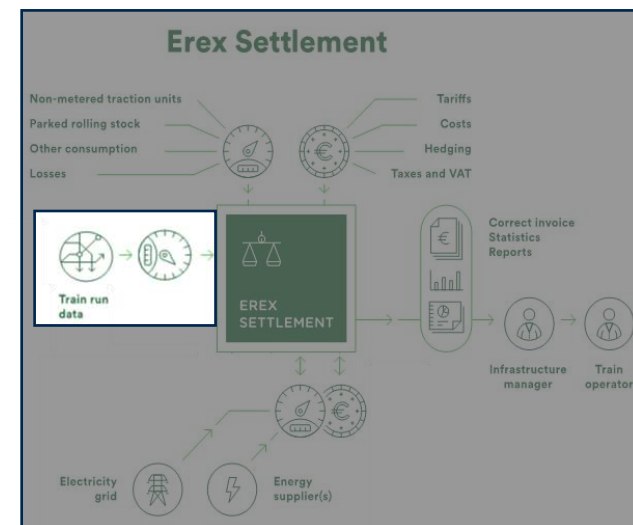
All	70337
Single Train Run Consultation	4
UTILTS Input	31421
Train Run Output	1048
Train Run Input	6443
PARTLY_REJECTED	79
REJECTED	310
ACCEPTED	6648
UTILTS Validation	31420
Bulk Train Run Consultation	1

Event Monitor (200716)

YrsTrain	736
Incomplete metered timeseries removed	348
Payload and metered locations did not match	170
Payload and metered energy did not match	3
Non measured location data ignored	197
Partial metered not used	20
TrainMeteringPoint	100078



Input- Train run data control

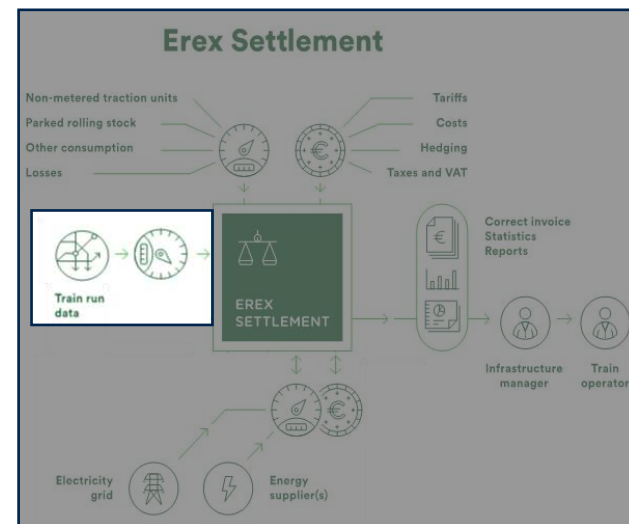


05:30	11:33					
24/05/2017 10:17	24/05/2017 16:47	Reported distance	2036	REJECTED because departure location = arrival location in a section. OCP id: 429985	42	
24/05/2017 10:17	24/05/2017 16:47	Reported weight	2036	REJECTED because departure location = arrival location in a section. OCP id: 429985	42	
24/05/2017	24/05/2017	Reported				

25/02/2017 14:31	25/02/2017 15:45	Reported distance	1943	REJECTED because train run railway undertaking is unknown: 3173	4	
25/02/2017 14:31	25/02/2017 15:45	Reported weight	1943	REJECTED because train run railway undertaking is unknown: 3173	4	

04/01/2017 03:22	04/01/2017 06:49	Reported distance	2301	REJECTED because traction unit is not registered in Erex	16	
04/01/2017 03:22	04/01/2017 06:49	Reported weight	2301	REJECTED because traction unit is not registered in Erex	16	

Processing of input



Status | Processes | Queries | Report | Analysis | Administration

► Operator view | Message Log | Process Log | Event Monitor

Unsolved Failures ✓

Process step: No rows found.

From: 01/11/2016 00:00 To: 26/12/2016 00:00 Update

Process Statistics ✓

Procedure Name	Total	Not successful
estimate-train-run	72231	0
preprocessing	12551	0
calculate-unmetered-energy	31562	0
combine	395	0

Message Log (70337) ✗

All	70337
Single Train Run Correction	4
UTILTE Import	31421
Train Run Output	1048
Train Run Input	6443
PARTLY_REJECTED	79
REJECTED	518
ACCEPTED	6548
UTILTE Validation	31420
Bulk Train Run Correction	1

Event Monitor (200716) ✗

TmsTrain	200716
Incomplete	
Payload and	
Payload and	
Non measur	
Partial meter	
TrainMeterin	

Event Monitor (683596) ✗

TmsTrain

26619

Incomplete metered timeseries removed

13220

Payload and metered locations did not match

6635

Payload and metered energy did not match

6

Partial metered not used

412

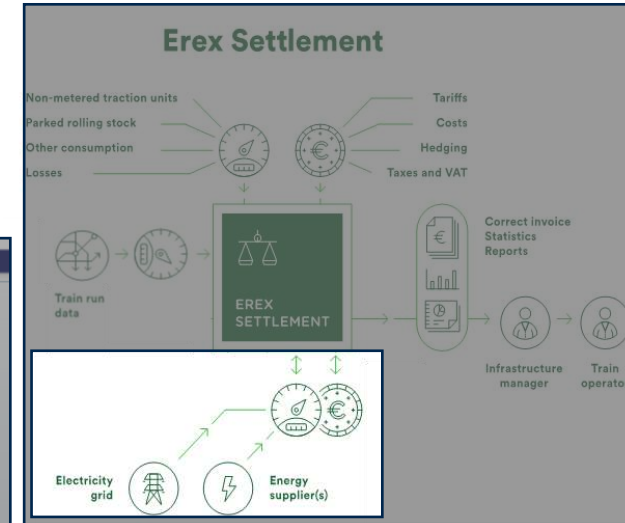
Non measured location data ignored

6346

TrainMeteringPoint

656977

Input- Energy prices



Status Processes **Queries** Report Analysis Administration

Queries

Selected Time Series Type

[Back to time series types](#)

EISpot price (EUR/MWh, hours)

Time range for EISpot price

Time Range ☒ From: 01/01/2017 plus 30 days Calculated date: 31/01/2017

☐ From: 01/01/2017 To: 00:00 31/01/2017 00:00

Time series data

Sum: 23,894.13

Count: 720

Export: ☒ Excel

[Show regular data](#)

1/60 12 << >> << >>

Start time	End time	Value	Created on	Created by
01/01/2017 00:00	01/01/2017 01:00	24.03	11/01/2017 16:31	system
01/01/2017 01:00	01/01/2017 02:00	24.03	11/01/2017 16:31	system
01/01/2017 02:00	01/01/2017 03:00	24.02	11/01/2017 16:31	system
01/01/2017 03:00	01/01/2017 04:00	23.19	11/01/2017 16:31	system
01/01/2017 04:00	01/01/2017 05:00	24.1	11/01/2017 16:31	system
01/01/2017 05:00	01/01/2017 06:00	25.01	11/01/2017 16:31	system
01/01/2017 06:00	01/01/2017 07:00	25.62	11/01/2017 16:31	system
01/01/2017 07:00	01/01/2017 08:00	25.87	11/01/2017 16:31	system
01/01/2017 08:00	01/01/2017 09:00	26.18	11/01/2017 16:31	system
01/01/2017 09:00	01/01/2017 10:00	26.74	11/01/2017 16:31	system
01/01/2017 10:00	01/01/2017 11:00	26.89	11/01/2017 16:31	system
01/01/2017 11:00	01/01/2017 12:00	27.48	11/01/2017 16:31	system

Output- Analysis

Status Processes Queries Report **Analysis** Administration

Combine results Visualization of train runs

Combine result search

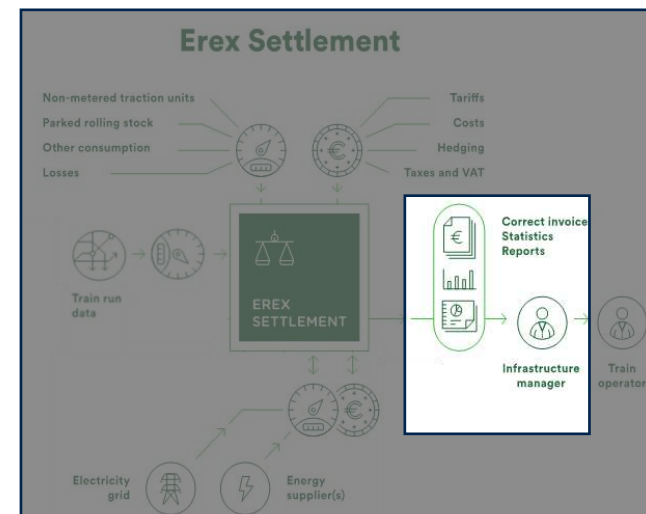
Period: 2017 March

Time Range: From: 01/03/2017 00:00 To: 01/04/2017 00:00

Train:

Customer: Select all Train Type: Select all Train Metering Point: Select all Traction unit(s) selected:

Search



Train runs where metered data was rejected (309)

☐ Select all

Train no. (reported value)	Start time - End time	Process time	User	Event
40274	30/03/2017 10:24 - 30/03/2017 12:10	04/04/2017 19:40	system	Payload and metered energy did not match

Train runs with no metered data received (65)

☐ Select all

Train no. (reported value)	Start time - End time	Process time	User
42878	10/03/2017 08:59 - 10/03/2017 10:29	07/04/2017 09:46	olel

Train runs with estimated result (103581)

☐ Select all

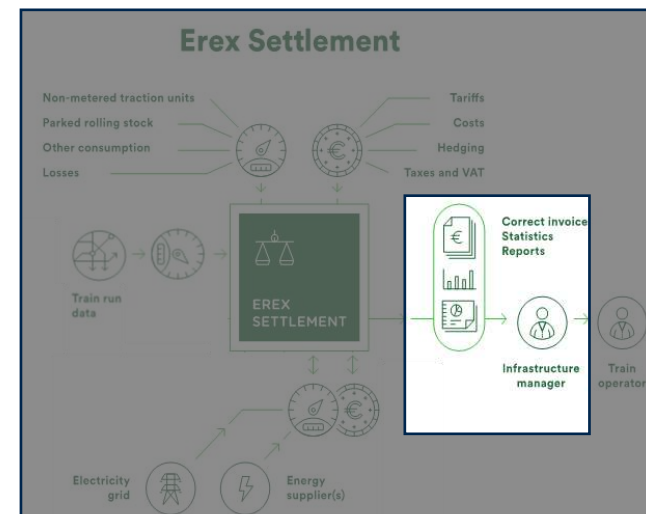
Train no. (reported value)	Start time - End time	Process time	User
54201	31/03/2017 16:44 - 31/03/2017 20:36	06/04/2017 08:38	system
15201	31/03/2017 00:00 - 31/03/2017 00:00	06/04/2017 08:37	system

Train runs with metered data used (1247)

☐ Select all

Train no. (reported value)	Start time - End time	Process time	User
47527	31/03/2017 05:31 - 31/03/2017 08:11	06/04/2017 08:37	system
47544	31/03/2017 19:06 - 31/03/2017 22:34	06/04/2017 08:37	system
48558	31/03/2017 21:10 - 31/03/2017 23:51	06/04/2017 08:37	system
47504	31/03/2017 13:00 - 31/03/2017 17:07	06/04/2017 08:37	system

Output- Reports / Settlement



Reports

Year: 2017

Language: Finnish

Report type

- ☐ Energy 1 Minute Values (CSV)
- ☐ Energy 1 Minute Values (XLSX)
- ☐ Mass and distance Report (Settlement dependency)
- ☐ Mass and distance Report (without settlement dependency)
- ☐ Settlement Correction Report
- ☒ Settlement Report
- ☐ Train Run Report (Settlement dependency)
- ☐ Train Run Report (without settlement dependency)

Date

Period: April

Customer: ☐ Select all

Railway Undertaking: ☐ Select all

Destination

My email

Settlement result

SUCCESS: settlement #(14399203) for the period 01/04/2017 - 01/05/2017

[Order report](#)

Output- Reports / Settlement / Invoice specification

Railway undertaker

Settled amount total (Euro)

Settled amount details (Euro)

Off Peak

Commodity

Grid cost

Total

Total (all time periods)

Settlement details

Off Peak

Payload (Million TonneKm)

Consumption (GWh)

Corrected consumption (GWh)

Energy per TonneKm (Wh)

Cost (Thousand Euro)

Energy unit price (Euro/MWh)

TonneKm unit price (Euro/MWh)

Total (all time periods)

Payload (Million TonneKm)

Consumption (GWh)

Corrected consumption (GWh)

Energy per TonneKm (Wh)

Cost (Thousand Euro)

Energy unit price (Euro/MWh)

TonneKm unit price (Euro/MWh)

Fakturaspesifikasjon for For energileveranse i april 2017

Fakturatyper: Avregning
Avregningsdato: 24.05.2017



Kostnader krafthandel	Pris	Volum	Kostnader
Kostnader innkjøpt elektrisk energi			
Elektrisk energi levert til forbrukspunkt		38,6500 MWh	
Elektrisk energi tilbakelevert fra forbrukspunkt		6,3450 MWh	
Netto elektrisk energi levert forbrukspunkt	267,80 NOK/MWh	32,3050 MWh	8 597,86 NOK

Andre kostnader relatert til

Administrasjonskostnader krafthandel

Opprinnelsesgarantier

Totale kostnader krafthandel

Kostnader nett

Omformings- og overføringskostnader

Andre kostnader relatert til nett

Administrasjonskostnader nett

Nettleie eksternt nett

Totale kostnader nett

Oppsummering

Totale energikostnader eksklusiv

Å betale (+) / Til gode (-) eksklusiv

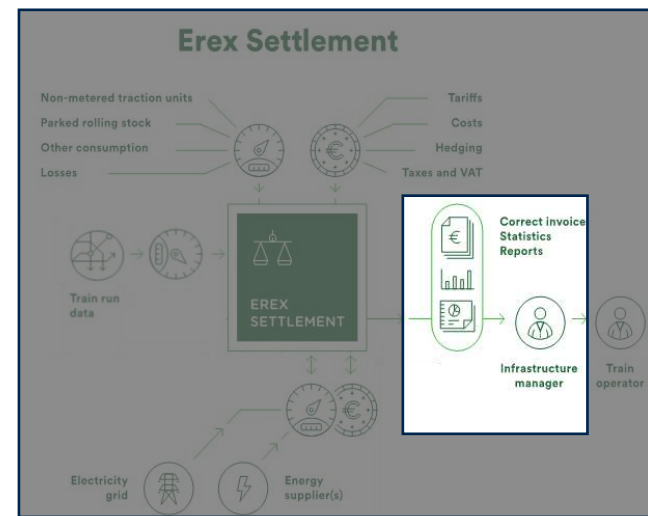
Merverdiafgift (0,00 %)

Å betale (+) / Til gode (-)

```
<?xml version="1.0" encoding="UTF-8"?>
```

```
- <ABWOrder xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLocation=
```

```
- <Order>
```



Unmetered
gers Total

Erex- Interesting findings

- By using data supplied from energy-meters, one train operator was able to uncover a production error in a series of traction units. This error was causing the units to consume a lot more energy than what was anticipated.
- Increased awareness of the energy consumption caused train operators in Norway to use doors that close automatically during stabling. These doors used to be left open until the next departure.
- A considerable amount of errors is uncovered by Erex in Train run data every month.
- Metered data relayed by the system is used by external systems for energy efficiency purposes.



Thank you for your attention

Inside Erex Functionality and real world scenarios

Paris, May 31, 2017