CAPTURING THE SECOND BIOMETRIC WAVE

Dr Hemant Mardia, CEO of IDEX ASA
Disclaimer

This presentation includes and is based, inter alia, on forward-looking information and statements that are subject to risks and uncertainties that could cause actual results to differ. Such forward-looking information and statements are based on current expectations, estimates and projections about global economic conditions, the economic conditions of the regions and industries that are major markets for IDEX ASA (IDEX) and its subsidiaries. These expectations, estimates and projections are generally identifiable by statements containing words such as "expects", "believes", "estimates" or similar expressions. Important factors that could cause actual results to differ materially from those expectations include, among others, economic and market conditions in the geographic areas and industries that are or will be major markets for the IDEX businesses, market acceptance of new products and services, changes in governmental regulations, interest rates, fluctuations in currency exchange rates and such other factors as may be discussed from time to time. Although IDEX believes that its expectations and the information in this presentation were based upon reasonable assumptions at the time when they were made, it can give no assurance that those expectations will be achieved or that the actual results will be as set out in this presentation. IDEX ASA nor any other company within the IDEX Group is making any representation or warranty, expressed or implied, as to the accuracy, reliability or completeness of the information in the presentation, and neither IDEX ASA, any other company within the IDEX Group nor any of their directors, officers or employees will have any liability to you or any other persons resulting from your use of the information in this presentation. IDEX ASA undertakes no obligation to publicly update or revise any forward-looking information or statements in this presentation.
IDEX delivers fingerprint solutions to mass-markets, based on a unique flexible and cost efficient off-chip technology
IDEX in brief

- Unique, flexible and cost efficient off-chip sensor technology
- Strong industry experience and system level innovation supported by quality IP
- 122* staff with deep biometric expertise
- Supply chain and channel to market established
- Listed on Oslo Stock Exchange

As of 30 September 2017
Today’s speakers – IDEX’s executive management team

Dr. Hemant Mardia
Chief Executive Officer

Fred Benkley
Chief Technology Officer

Henrik Knudtzon
Chief Financial Officer

Stan Swearingen
Chief Products Officer
<table>
<thead>
<tr>
<th>Time</th>
<th>Section</th>
<th>Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:00</td>
<td>Capturing the second biometric wave</td>
<td>Dr Hemant Mardia, CEO</td>
</tr>
<tr>
<td>11:15</td>
<td>Unique, flexible and cost efficient solutions</td>
<td>Fred Benkley, CTO</td>
</tr>
<tr>
<td>11:30</td>
<td>Strong foundation to capture market growth</td>
<td>Stan Swearingen, CPO</td>
</tr>
<tr>
<td>11:50</td>
<td>Scaling to revenue and profitability</td>
<td>Henrik Knudtzon, CFO</td>
</tr>
<tr>
<td>12:00</td>
<td>Concluding remarks and Q&amp;A panel</td>
<td>Executive team</td>
</tr>
</tbody>
</table>
Demand for biometric solutions is undeniable

93% of consumers prefer biometrics to passwords in online payment applications

92% of banks want to adopt biometric technology

Source: Mastercard and University of Oxford
Large and growing market for fingerprint sensors

Fingerprint sensors shipped annually
Million units

* Source: IDEX estimates, Statista and Gartner

* Mobile (coated buttons)  ■ IOT  ■ Biometric cards  ▲ Display integration

CURRENT MOBILE SOLUTIONS
GLASS AND COATED BUTTONS

MORE ADVANCED
BIOMETRIC SOLUTIONS
VISION
Convenient security

HOW
Identification and authentication through scalable biometric solutions
The second wave of biometric adoption is building momentum

**FIRST WAVE**
Catalyzed by Apple

**SECOND WAVE**
Catalyzed by Mastercard

**Mobile sensors driven by industrial design**
- Dominated by capacitive sensors
- Multi-modal biometrics adoption
- Market commodisation

**Biometric solutions driven by convenience and security**
- Large market with global payment & ID standards
- Low power & scalable form factor
- Usability is paramount

“Our mission at Mastercard is to make biometrics in payment safe, simple and secure, and to that end we are proud of our Biometric Card solution. We find that IDEX’s deep expertise in fingerprint, culture of innovation and commercial focus positions them as one of our most credible partners in this field”

Bob Reany
Executive VP, Identity Solutions
Mastercard is the leading driver in the global biometric card market

- Defines industry standards
  - EMVCo

- Partners with technology leaders
  - IDEX

- Drives certification process
  - International Organization for Standardization

- Markets to issuers
  - Banks
  - Corporate
  - Government

- Drives the supply chain ecosystem
  - IDEMIA

- Creates consumer awareness and demand

IDEX’s focus on the biometric card market

IDEX’s strategic path

2013-2017

PRODUCT FOUNDATION
- Flexible off-chip platform
- Partner engagement
- Talent acquisition
- Institutional funding

2017-2018

LEVERAGE LEADERSHIP
- Tier 1 partners in payment
- Commercial roll-out in cards
- Expansion of card verticals
- Leverage into IoT market

2019+

DEFINE THE FUTURE
- Sensor integration driving lowest card cost
- Disruptive Display integration

CES LAS VEGAS, JANUARY 2018
UNIQUE, FLEXIBLE AND COST EFFICIENT SOLUTIONS
The second wave of biometric adoption is building momentum

**FIRST WAVE**

Dominated by smaller capacitive sensors
- ID constraint and high silicon cost driving need for smaller sensors
- Sensor with minimal digital intelligence
- Smaller sensors compensated by multiple enrols and strong algorithms
- Advanced packaging and coating to protect silicon from damage

**SECOND WAVE**

New biometric applications require more flexible and larger area sensors
- Usability and security drives larger sensors
- Decoupling sensing elements from silicon changed basic size/area cost trade-offs
- Digital intelligence integrated into driver ASIC
The off-chip sensing revolution

8x8mm sensor example

**SILICON SENSORS**

- Sensing plates on top metal layers of chip
- ASIC = sensing area

- Sensing area same as ASIC, ~70mm² for 8x8 sensor
- Silicon expensive, non-bendable
- Low flexibility for design and architecture
- Minimal digital intelligence

**OFF-CHIP SENSORS**

- Sensing plates on polymer substrate
- ASIC much smaller than sensing area

- Sensing area separated from ASIC, ~13mm² for any sensor size
- Polymer cheap and flexible
- High degree of flexibility for substrate and architecture
- High digital intelligence (processor, memory, encryption & firmware)
Sensors size drives performance and usability

**IMAGE CAPTURE**

Small sensor

- Small sensor = less data
  - -> more complex matcher
  - -> higher power/processing

Large sensor

- Larger sensor = more data
  - -> compact matcher
  - -> lower power/processing

**ENROLMENT**

Small sensor

- Small sensor = less data
  - -> more enrols

Large sensor

- Larger sensor = more data
  - -> fewer enrols
Fundamental advantage of off-chip sensing: cost

Indicative cost: off-chip vs silicon capacitive sensors

Percent

<table>
<thead>
<tr>
<th>Sensor area (Sqmm)</th>
<th>Current mobile relevant area</th>
<th>Card and IoT relevant area</th>
<th>Silicon sensor</th>
<th>Off-chip sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>20</td>
<td>20</td>
<td>40</td>
<td>60</td>
<td>80</td>
</tr>
<tr>
<td>30</td>
<td>30</td>
<td>60</td>
<td>90</td>
<td>120</td>
</tr>
<tr>
<td>40</td>
<td>40</td>
<td>80</td>
<td>110</td>
<td>160</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
<td>100</td>
<td>140</td>
<td>180</td>
</tr>
</tbody>
</table>

Significant cost and usability advantage at card system level
Fundamental advantage of off-chip sensing: card system integration

Conventional silicon sensor

- FPS Contacts Pad
- FPS Controller IC
- MCU / ASIC
- RF IC
- Secure Flash
- Discrete power management

IDEX off-chip sensor

- FPS Contacts Pad
- MCU / ASIC
- Integrated power management
- FPS Controller IC
- Secure Flash
- RF IC

Discrete silicon sensing component

- Large number of supporting components
- Design complexity
- Complicates manufacturing
- Higher total cost

Integrated system solution

- Fewer components
- Simplified manufacturing
- Optimized biometric performance
- Optimal power efficiency
- Lower total cost solution
Significant barriers to entry

Barriers to entry

ACCUMULATED KNOWLEDGE BASE
- IDEX’s off-chip technology dates back to 2003
- Augmented IDEX’s technology through Picofield & IP acquisition
- Acquired unique embedded matcher technology

SPECIALIST TEAM
- Extensive experience from in-display integration/ touch screen market
- Originators of first fully integrated display and touch screens with ‘hover’ capability
- Building security expertise

SYSTEM EXPERTISE
- Off-chip leads to natural system integration
- Delivering end-to-end scalable solution

IP POSITION
- Extensive and high-quality fundamental patents
- Patents covering off-chip technology, biometric algorithms, packaging and system solutions
IDEX’s solutions for the second wave of biometric adoption

OFF-CHIP SENSOR OFFERING
- Unique **adaptability** in design and architecture
- **Cost advantage** in larger sensors
- Enabling superior **usability**
- New level of **systems integration**
- Significant **barriers to entry**

BIOMETRIC SMARTCARDS
- Limited power and processing power
- Flexibility for ISO form factor and durability
- Larger sensor critical for usability

IOT APPLICATIONS
- Limited power require larger sensors
- Larger sensor for usability
- Flexible sensors value proposition for wearable applications

IN-DISPLAY INTEGRATION
- In-display sensing compatible with off-chip polymer technology

CES LAS VEGAS, JANUARY 2018
STRONG FOUNDATION TO CAPTURE MARKET GROWTH
Significant growth expected in the market for biometric smart cards

Estimated annual shipments of biometric cards
Million units

Source: Embedded Security News January 2018
Market for biometric payment cards and Government ID gaining momentum

### MARKET DRIVERS

**Biometric payment card**
- User convenience - pull from mobile adoption
- Banks desire to differentiate
-Fraud reduction

**Government ID**
- Need for secure ID
- Increased mobility between countries
- Desire to give more people access to financial infrastructure

### BARRIERS TO ADOPTION

**Biometric payment card**
- Cost sensitivity
- Rigorous standards/certification protocols

**Government ID**
- Cost sensitivity
- Need for mass enrolment of population

### CUSTOMER PROFILE

**Biometric payment card**
- Banks that issue hundreds of thousands to million cards per annum
- Early movers have completed consumer trials

**Government ID**
- Government institutions and public programmes
- Each programme based on whole or part of population in country or state – in the millions to tens of millions (and beyond for large countries)

---

<table>
<thead>
<tr>
<th>Year</th>
<th>Biometric Payment Card (Million units)</th>
<th>Government ID (Million units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>30</td>
<td>20</td>
</tr>
<tr>
<td>2019</td>
<td>140</td>
<td>50</td>
</tr>
<tr>
<td>2020</td>
<td>230</td>
<td>90</td>
</tr>
</tbody>
</table>
**IDEX expanding customer engagement**

**Initial order from leading Asian security and authentication smart card provider**

- For biometric ISO form factor card for government ID and access control

**Accelerating customer pull across verticals and geographies**

- Multiple European top tier card integrators
- Active collaboration with several technology partners to deliver complete system solutions
- High activity with OEMs across APAC

### Access control and other

<table>
<thead>
<tr>
<th>Year</th>
<th>Million units</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>5</td>
</tr>
<tr>
<td>2019</td>
<td>12</td>
</tr>
<tr>
<td>2020</td>
<td>20</td>
</tr>
</tbody>
</table>

**MARKET DRIVERS**

- Easy and convenient user authentication
- User pull on the back of mobile adoption
- Not same stringent requirements

**BARRIERS TO ADOPTION**

- Sensitivity to cost
- Fragmented market — requires standardisation

**CUSTOMER PROFILE**

- Corporate or government organisations with desire to secure access
- Typically larger entities with potential in the hundreds of thousands
## Biometric card ecosystem

<table>
<thead>
<tr>
<th>FINGERPRINT SENSOR</th>
<th>CARD INTEGRATORS</th>
<th>MARKET ENABLERS</th>
<th>ISSUERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDEXX</td>
<td>gemalto</td>
<td>Giesecke &amp; Devrient</td>
<td>Payment</td>
</tr>
<tr>
<td></td>
<td>IDEMIA</td>
<td></td>
<td>Financial inclusion/ID</td>
</tr>
<tr>
<td>tsmc</td>
<td></td>
<td></td>
<td>Access control/other</td>
</tr>
<tr>
<td>Amkor Technology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>mastercard.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>AMERICAN EXPRESS</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>UnionPay</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>VISA</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>KSID</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>FEITIAN</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CPI Card Group</td>
<td></td>
</tr>
</tbody>
</table>

CES LAS VEGAS, JANUARY 2018
Mastercard creating biometric card mass market

Strategic partnership with Mastercard formed
- **June 2015**
  - World’s first flexible touch sensor integrated in ISO standard card
- **April 2016**
  - ISO card bending tests passed
- **August 2016**
  - Successful live pilot with Mastercard
- **April 2017**
  - Successful end customer trials with Pick n’ Pay and ABSA Bank
- **August 2017**
  - Successful completion of trial with UniCredit Bulbank

Commercial roll-out
- **March 2016**
  - Passed compatibility testing in existing POS terminals
- **June 2016**
  - IDEX launches next-generation ASIC enabling contactless cards
- **February 2017**
  - Mastercard unveils Next Generation biometric card
- **August 2017**
  - IDEX launches sensor for contactless cards
BIOMETRIC CARD CHALLENGES

- Low power
- Processing capacity limited
- Memory constraints
- Flexibility/ durability required
- No screen for consumer feedback in enrolment or every-day use

IDEX’s OFF-CHIP SENSOR SOLUTIONS

- Off-chip enables use of polymer substrates providing flexible sensors and huge cost advantage for larger sensors
- Larger sensors offers superior performance and usability
- Compact algorithms
- Full system integration enables offering of biometric modules or sensor-only
- Self-enrol/ On-card enrolment
IDEX solution compatible with installed base and industry standards

**INDUSTRY STANDARDS**
Card design for ISO standards

**ISSUER**
Designed into mass enrolment system

**POS**
Compatible with existing POS terminals

- Certification critical in deployment (given security oriented payment industry)
- Certification process requires finalized solution and rigorous testing
Components

- One ASIC platform
- Multiple substrates, multiple designs & complete solution architectures
- Products achieving high yield

Supply chain

- World’s largest foundry
- Capacity >10 million 12-inch equivalent wafers in 2016
- One of the world’s largest provider of packaging services
- 20,000 employees world-wide
- Modules for cards, IoT and mobile

Multiple applications
Innovative architecture
- Low cost, high performance
- Intelligent sensor minimizes MCU workload
- Sophisticated power management

System Level Approach
- Providing full system solution
- Complete reference design and contactless power solution

Designed For Manufacture
- Designed to use existing process flow and equipment
- Fully qualified bendable sensor

Compelling roadmap
- Advance process node with additional sensor intelligence
- Simplify architecture to reduce components, cost and complexity
- State of the art packaging
Innovation agreement with global payments provider

- Validates IDEX’s total system solution
- Provides direct access to customer needs
- Improves development cycle time
- Enables early insight for future products
IDEX technology applicable across biometric solutions markets

OFF-CHIP PLATFORM

SENSOR PRODUCTS

• Contact based sensors
• Contactless sensors
• Biometric module
• Medium sized buttons sensors
• Display-integrated sensors

Low cost ASIC
Substrate and packaging technology
Embedded software
Strong foundation to capture market growth

PROVEN MARKET WITH HUGE EXPECTED GROWTH IN NEW VERTICALS

- Fingerprint sensors proven in mobile
- Next wave – biometric cards

POLE POSITION IN THE BIOMETRIC CARD MARKET

- Low cost, flexible sensor ideally suited for cards
- Established value chain based on scalable design
- Strong partnerships in card ecosystem

OFF-CHIP TECHNOLOGY PLATFORM CAN BE LEVERAGED IN OTHER KEY VERTICALS

- Card solutions can be adopted to IOT
- Path to display integration in mobile
SCALING TO REVENUE AND PROFITABILITY

Henrik Knudtzon, CFO
The second wave of biometric adoption building momentum

FIRST WAVE
Catalyzed by Apple

IDEX made significant investment in platform
• Off-chip sensor solutions
• Strong team currently at scale
• Strong IP portfolio

SECOND WAVE
Catalyzed by Mastercard

IDEX's path to profitability
• Securing significant revenue from leading position in biometric cards
• Leverage platform in IoT and mobile
**Significant revenue potential from biometric cards**

**BUILDING BLOCKS TO REVENUE IN PLACE**

- High growth market
- IDEX has differentiated value add products
- Partners and channel to deliver

**INDICATIVE 2020 MARKET POTENTIAL FROM BIOMETRIC CARDS**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biometric cards market outlook Million units</td>
<td>250-300</td>
</tr>
<tr>
<td>Attractive ASPs for sensor solutions for cards</td>
<td>USD 3-5 per unit</td>
</tr>
<tr>
<td>Addressable market</td>
<td>USD 750 – 1,500 million</td>
</tr>
<tr>
<td>IDEX market share ambition</td>
<td>2020 target of market share greater than 30%</td>
</tr>
</tbody>
</table>
# Indicative business scenarios

## Assumptions

<table>
<thead>
<tr>
<th>Average # units per customer</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Payment</td>
<td>600k</td>
<td>40</td>
<td>75</td>
<td>40</td>
</tr>
<tr>
<td>Financial inclusion/ID</td>
<td>10m</td>
<td>4</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Access control/other</td>
<td>350k</td>
<td>30</td>
<td>70</td>
<td>30</td>
</tr>
</tbody>
</table>

## 2020 Volume Scenarios

<table>
<thead>
<tr>
<th>Case</th>
<th>2020 volumes</th>
<th># IDEX customers per smartcard vertical</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>~75 Units</td>
<td>40 Payment</td>
</tr>
<tr>
<td>II</td>
<td>~150 Units</td>
<td>75 Payment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 Financial inclusion/ID</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 Financial inclusion/ID</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30 Access control and other</td>
</tr>
<tr>
<td></td>
<td></td>
<td>70 Access control and other</td>
</tr>
</tbody>
</table>
Targeting gross margin above 40%

Gross margin

- Shifting towards higher margin card market
- Investment already made in direct supply

Gross margin

- Shift from mobile to cards
- Shift to direct sales (no license-like sales)
- New ASIC
- Improved packaging
- Volume effect in purchasing

YTD Q3 2017

17%

Completed
Goals

40-45%
OPEX: at capacity to capture growth potential

- Significant investments have been made
  - Market ready products
  - New silicon
  - Team expansion

- IDEX organisation at capacity to capture growth potential
- Increased internal capacity leading to reduced external spend
- Other operational costs expected to remain stable
Capacity to finance growth

### Net cash position by quarter

<table>
<thead>
<tr>
<th>Quarter</th>
<th>NOK million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1’16</td>
<td>579</td>
</tr>
<tr>
<td>Q2’16</td>
<td>533</td>
</tr>
<tr>
<td>Q3’16</td>
<td>507</td>
</tr>
<tr>
<td>Q4’16</td>
<td>428</td>
</tr>
<tr>
<td>Q1’17</td>
<td>359</td>
</tr>
</tbody>
</table>

### Going forward

**Q4’17 and beyond**

- Strong cash balance of NOK 359 million, no financial debt
- OPEX not expected to increase during next 12 months
CONCLUDING REMARKS AND Q&A
IDEX positioned to capture second wave of biometric adoption

Large market opportunity

Significant cost and scaling advantage

Deep partnerships with market leaders

Proven compliance with standards