

ASML

THE HIGH-TECH WORLD OF LITHOGRAPHY

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1. INTRODUCING ASML

ASML is a high-tech company operating from Veldhoven (the Netherlands) and manufacturing complex machines used by chips manufacturers for the production of integrated circuits, also known as chips. ASML is the technology leader and supplies the largest chips producers in the world.

Foundation & examples

- 90 percent of all major chips producers are ASML customers. 18 out of the Top-20 chips manufacturers worldwide are ASML customers. They include IBM, Samsung, TSMC and others.
- Independent sources have estimated that ASML has a market share of over 65% in the lithography market, which represents a total of 5 billion euros in 2008.
- ASML distinguishes itself from its competitors by its technological edge. The evolution towards ever faster, ever smaller and more energy efficient chips is dictated by the capacities of the systems at ASML. Even Japanese chips manufacturers choose ASML technology, which is remarkable because ASML's only two competitors are Japanese companies. In absolute numbers, ASML is one of the Top-3 companies in the Netherlands in terms of R&D investments. In 2007, ASML invested over 500 million euros in R&D worldwide. To raise the technological edge of ASML, R&D investments will increase once again in 2008.

- ASML designs, builds and integrates the systems but outsources the production of all components to more than 600 suppliers at home and abroad. This makes ASML flexible and enables the company to arrange matters quickly with the best-qualified companies.
- ASML collaborates intensively with its customers. This is why the company has over 60 offices worldwide. The Veldhoven branch focuses on R&D, supply chain management and assembly, the Wilton branch (USA) focuses on R&D, and Customer Support has offices in 16 countries including a brand-new Customer Services Centre in Asia. This customer-oriented approach has proved to be rewarding. ASML has been outscoring its competitors in international customer satisfaction studies for the past 6 years consecutively (source: VLSI Research)
- ASML employs a total of 6.821 people: 1,333 in Asia, 1,714 in the USA, and 3,774 in Europe. These numbers do not include the 1,649 contractors. (June 29, 2008)

2. BUSINESS MODEL

ASML is a stable and fast growing company with a clear focus on innovative technologies. To realize its growth ambitions, ASML relies on top-class scientists, designers and engineers in multiple disciplines: physicists, mechatronicists, software specialists, mechanics, electrical engineers and mechanical engineers who have a sense of entrepreneurship, international ambitions and the skills to collaborate in multidisciplinary top technology teams.

Foundation & examples

- Enabling technological progress:
Chips manufacturers worldwide are continuously looking for ever faster, ever smaller, ever cheaper and more energy efficient chips. The reduced size and price of memory chips has resulted in the creation of new applications such as portable multi-media players and laptop computers without harddisks. Every year, chips manufacturers want to half both the price and the size of each memory bit. Due to the increased capacity of the chips, computers and mobile telephones offer increasingly more options. The chips evolution is limited by the possibilities of the ASML systems. ASML is the global leader in one of the fastest growing markets of the past decades. For that reason it feels the pressure of its international customers as much as it feels the scrutiny and fiery breath of competitors worldwide. This is why top-level engineers can actually achieve true technological progress at ASML by coming up with unique

solutions. At ASML they can utilise their knowledge, creativity, and innovative strengths to their full extent.

- **Personal technological development:**
As ASML is the international market leader, the company uses the latest technologies. The speed with which ASML develops technologies for its customers requires immediate systems integration. To push back frontiers in the global chips industry, ASML employees regularly open up their own horizons as well. At ASML, personal development is not laid down in pre-paved career paths. Taking up projects and challenges flexibly will enable both horizontal and vertical growth within the organisation. ASML wants to maintain and, if possible, expand its technological edge; this is why the company invests in both R&D and the personal development of its employees. Ultimately, the people determine the innovative strength of the company – they make the difference.
- **A multinational company that treasures its engineers:**
ASML would not be ASML if it weren't for its engineers. Our engineers have made the organisation what it is today: an international market leader and the driving force behind technological progress. This is why ASML offers free rein to entrepreneurship, and why specialists are given full freedom to realise new technologies and concepts that contribute to ASML's technological edge. The non-hierarchic structure also makes it possible that ideas from anywhere in the organisation can be realised.
- **Multidisciplinary teams:**
ASML is responsible for the design, construction and integration of its machines. However, the components of the lithography systems come from over 600 national and international suppliers. ASML also collaborates with technical universities and research centres in order to have access to the best technologies at all times. This international knowledge network makes ASML flexible and enables the company to arrange matters quickly with the best-qualified companies. For that reason specialists at ASML always work in multidisciplinary teams and with the best partners including internal experts, international customers and suppliers, and world-class institutes such as IMEC and TNO. An environment with highly qualified and driven colleagues and partners requires flexible, mature employees who are willing to take responsibility: employees with a no-nonsense attitude who like to grow and reach to the top of their professional field.
- **Customer focus:**
New technologies emerge as a result of the input of international customers from Asia, the United States and Europe. ASML, in fact, serves two-thirds of

the world market for lithography machines for chips from Veldhoven. Innovation at ASML is a determining factor for the progress of its customers and should always be functional. At ASML, research results are applied in practice at an unequalled rate – on the one hand because the market is developing very rapidly, on the other hand because every minute of downtime of an ASML system will result in losses for the customers. This is why approximately 2,000 ASML specialists closely collaborate with almost all major names in the semi-conductor industries, and ASML employees are always standby to prevent or solve problems at customers'. All this requires a problem-solving capacity, systems knowledge, and an understanding of customer needs and requirements. It also requires international ambition, as most ASML customers are located outside of Europe.

3. ASML'S GLOBAL SUCCESS BASED ON SOLID FUNDAMENTALS



Lithography is the key to smaller and more powerful chips

The Semiconductor Manufacturing Process

A variety of complementary suppliers provide the other tools, materials and packaging equipment necessary to make ICs

Shrink

ASML

Road to global leadership in 24 years

1984

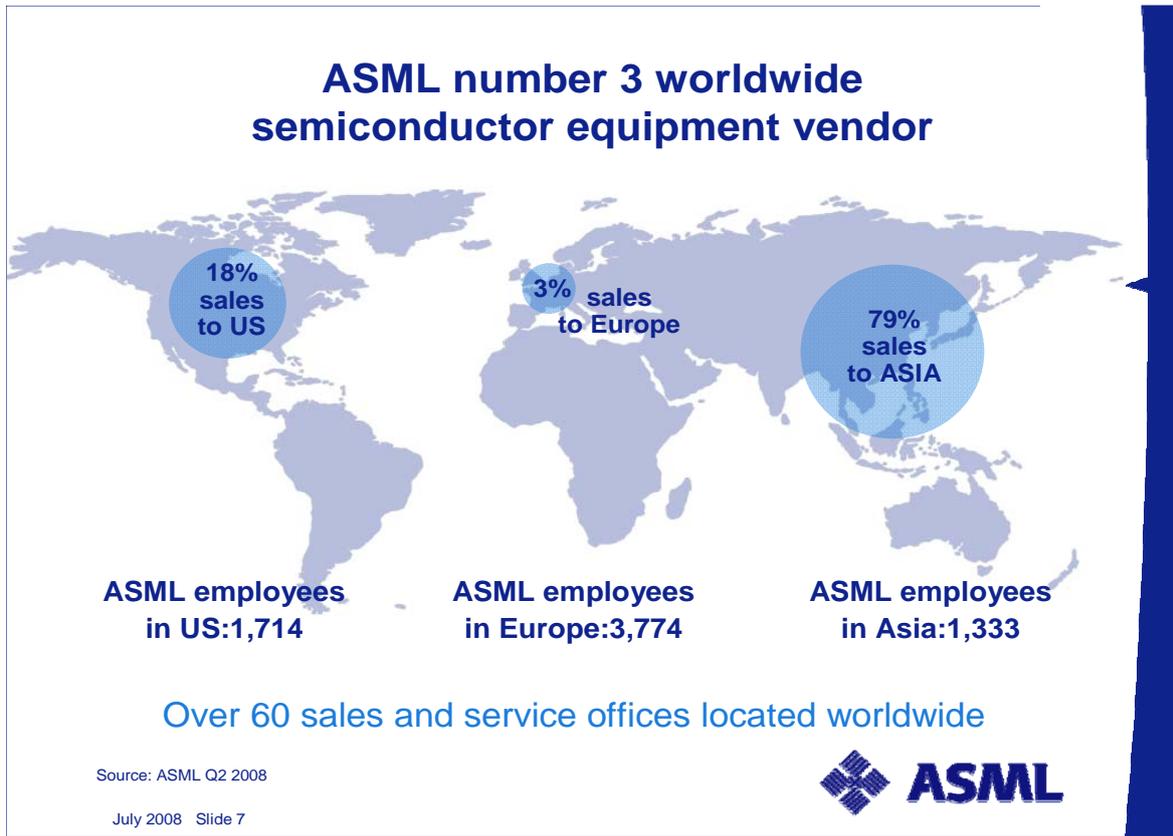
To ~ 65% market share

From < 1% share

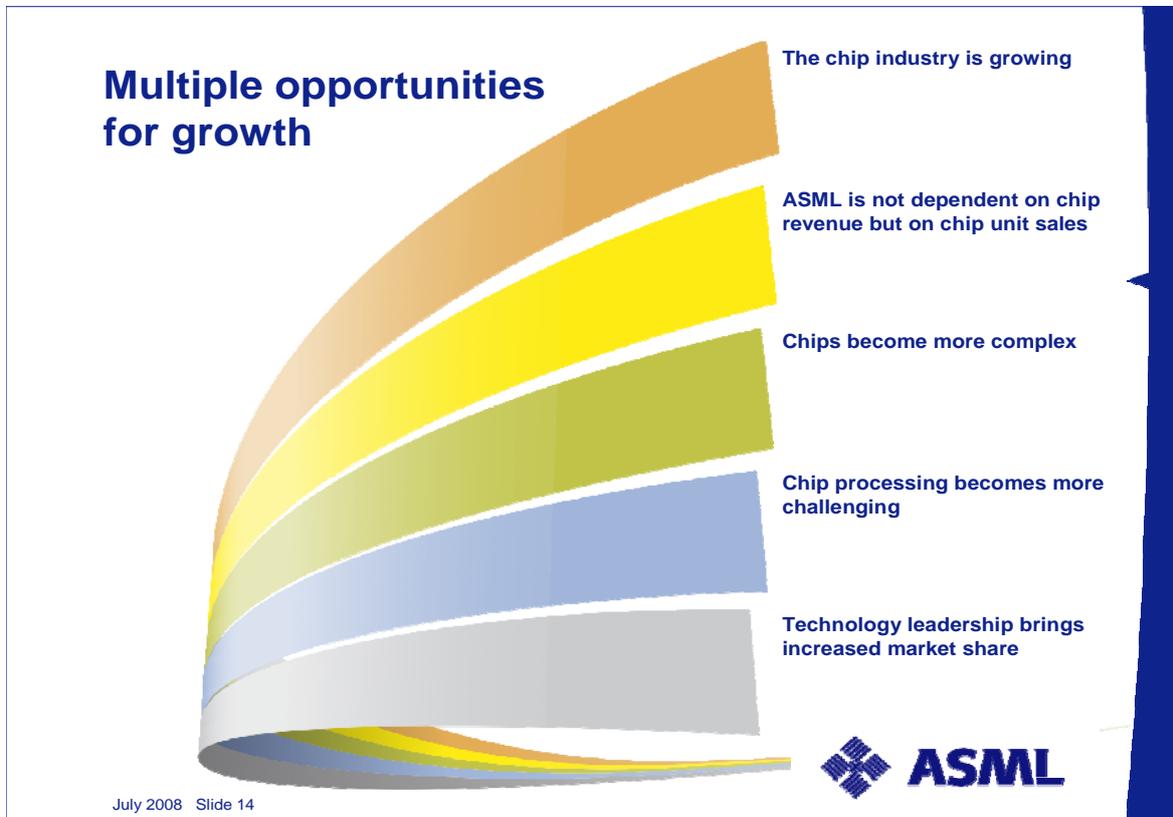
Total market: €463 million

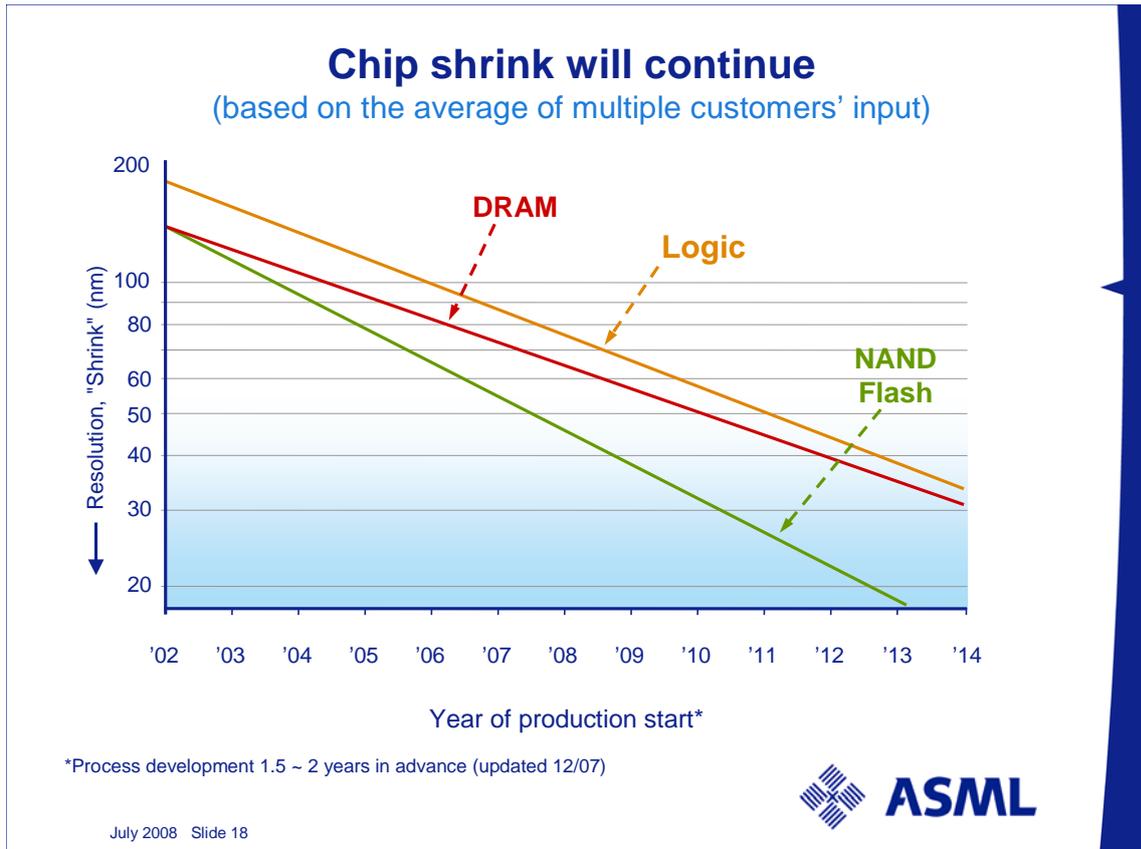
Total market: > €5 billion

ASML



4. ASML'S MULTIPLE ENGINES OF GROWTH





5. ASML TECHNOLOGY AND STRATEGY ROADMAP

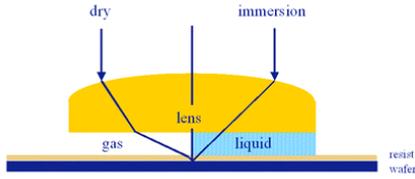
Fluid thinking: the liquid lens scanner

Water improves resolution and process latitude

The diagram illustrates the principle of the liquid lens scanner. It shows two configurations of a lens system. In the top configuration, a lens is positioned above a substrate, with a layer of air between them. This setup results in a wide, shallow focal spot. In the bottom configuration, the lens is positioned above a substrate, with a layer of water between them. The water layer is much thinner than the air layer, which results in a significantly narrower and deeper focal spot, thereby improving resolution and process latitude.

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Fluid thinking: the liquid lens scanner



The resolution limit of each wavelength is practically determined by the "refractive index" of the medium between the lens and the wafer.

$$R = \frac{k_1 * \lambda}{n * \sin(\alpha)}$$

The refractive index of all gasses is close to 1.0. In comparison, the refractive index of water at the 193-nm wavelength is 1.4.

- R – resolution
- K1 – process factor
- λ - exposure wavelength
- n – refractive index
- α - max angle of light

The larger the refractive index, the larger the potential advantages in DoF and/or resolution improvement.



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Next generation lithography: EUV



Albany

Prototypes shipped in 2006

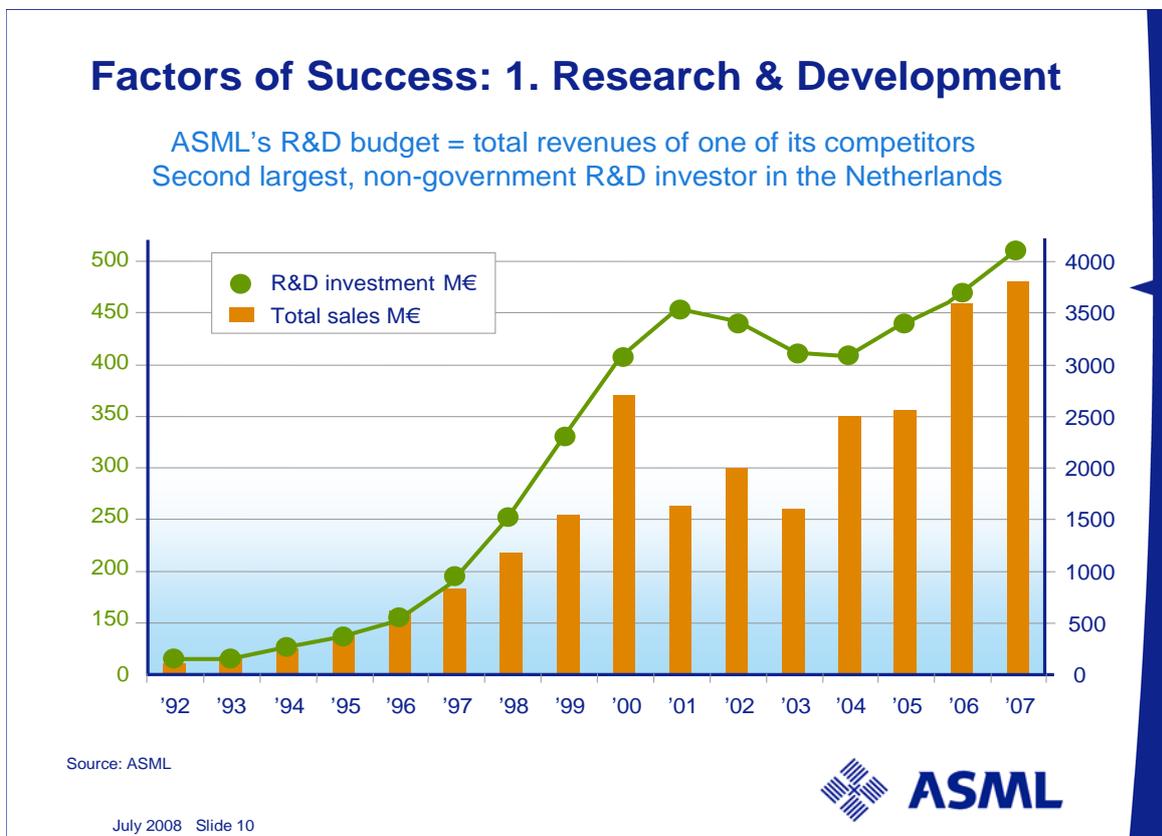
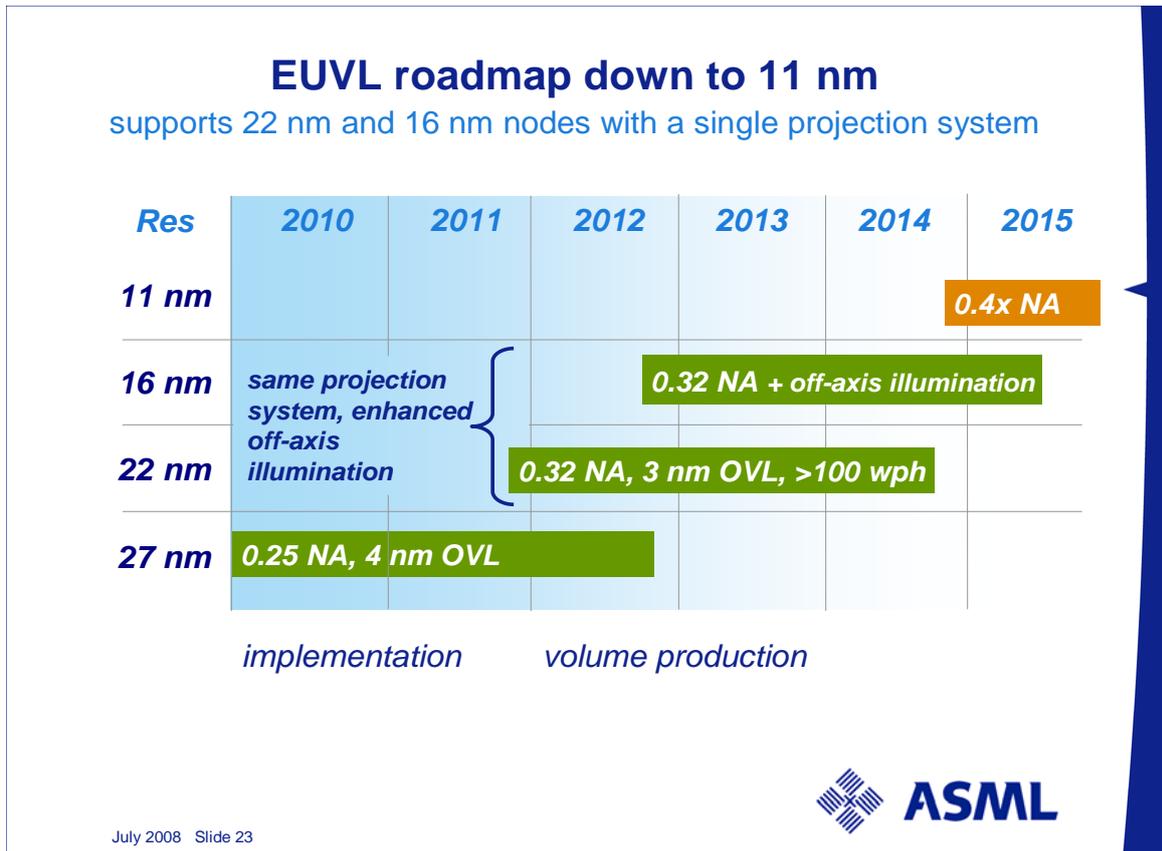


Leuven

Pilot production machine to ship in early 2010

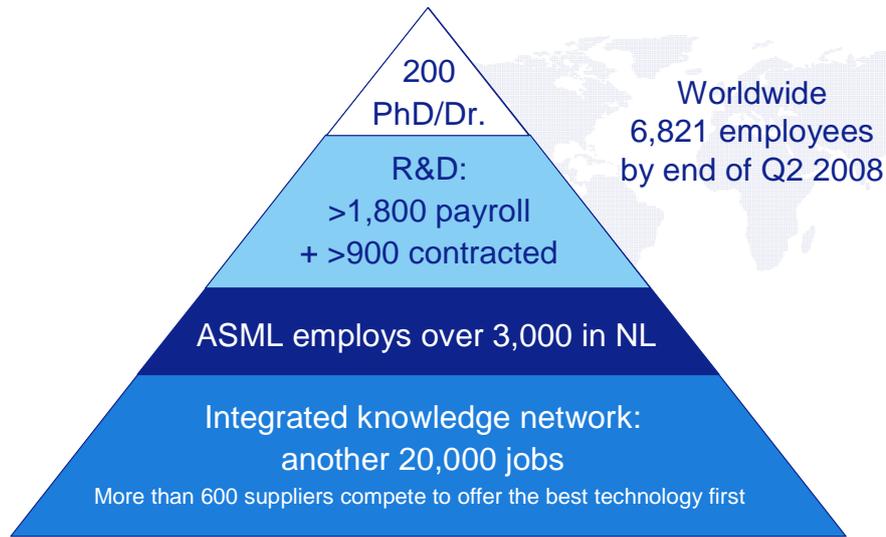
Orders for five production systems have been placed





Factors of Success: 2. Integrated knowledge network

ASML works with best research and development partners:
network of high tech companies and suppliers boosts competences



Source: ASML

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Commitment

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