
Committee Meeting

of

ASSEMBLY SCIENCE, INNOVATION AND TECHNOLOGY COMMITTEE

“The Committee will hear testimony from invited guests on the economic development opportunities presented by blockchain technology innovation in New Jersey”

The following bills will be considered:

A-1346, A-3613, A-3767, A-3768

LOCATION: Princeton Innovation Center BioLabs
303 College Road East, Suite A
Princeton, New Jersey

DATE: April 26, 2018
12:00 p.m.

MEMBERS OF COMMITTEE PRESENT:

Assemblyman Andrew Zwicker, Chair
Assemblyman James J. Kennedy, Vice-Chair
Assemblyman Roy Freiman
Assemblywoman BettyLou DeCroce
Assemblyman Christopher P. DePhillips



ALSO PRESENT:

Tara M. Howley
Andrew J. Ward
Office of Legislative Services
Committee Aides

Bianca Jerez
Assembly Majority
Committee Aide

Derek DeLuca
Assembly Republican
Committee Aide

Meeting Recorded and Transcribed by
The Office of Legislative Services, Public Information Office,
Hearing Unit, State House Annex, PO 068, Trenton, New Jersey



ANDREW ZWICKER
Chairman

JAMES J. KENNEDY
Vice-Chairman

HERB CONAWAY, JR.
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New Jersey State Legislature
ASSEMBLY SCIENCE, INNOVATION
AND TECHNOLOGY COMMITTEE
STATE HOUSE ANNEX
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TRENTON NJ 08625-0068

COMMITTEE NOTICE

TO: MEMBERS OF THE ASSEMBLY SCIENCE, INNOVATION AND TECHNOLOGY COMMITTEE

FROM: ASSEMBLYMAN ANDREW ZWICKER, CHAIRMAN

SUBJECT: COMMITTEE MEETING - APRIL 26, 2018

The public may address comments and questions to Tara Howley, Andrew Ward, Committee Aides, or make bill status and scheduling inquiries to Kimberly Johnson, Secretary, at (609)847-3840, fax (609)292-0561, or e-mail: OLSAideAST@njleg.org. Written and electronic comments, questions and testimony submitted to the committee by the public, as well as recordings and transcripts, if any, of oral testimony, are government records and will be available to the public upon request.

The Assembly Science, Innovation and Technology Committee will meet on Thursday, April 26, 2018 at 12:00 PM at Princeton Innovation Center BioLabs, 303 College Road East, Suite A, Princeton, New Jersey 08540.

The committee will hear testimony from invited guests on the economic development opportunities presented by blockchain technology innovation in New Jersey.

The following bill(s) will be considered:

A-1346 Gusciora/Muoio/Holley/ Barclay/Chaparro/Handlin/ Coughlin/Danielsen	Creates grant program for business accelerator and incubator networks; transfers \$1 million in societal benefits charge revenues to EDA to administer program.
A-3613 Eustace/Gusciora	Establishes NJ Blockchain Initiative Task Force.
A-3767 Zwicker	Directs Secretary of State to develop national marketing campaign promoting State's innovation economy.

(OVER)

Assembly Science, Innovation And Technology Committee

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April 26, 2018

A-3768

Zwicker/Eustace

Permits corporations to use blockchain technology for certain recordkeeping requirements.

Issued 4/18/18

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ASSEMBLY, No. 3613

STATE OF NEW JERSEY

218th LEGISLATURE

INTRODUCED MARCH 12, 2018

Sponsored by:

Assemblyman TIM EUSTACE

District 38 (Bergen and Passaic)

Assemblyman REED GUSCIORA

District 15 (Hunterdon and Mercer)

Assemblywoman VALERIE VAINIERI HUTTLE

District 37 (Bergen)

Co-Sponsored by:

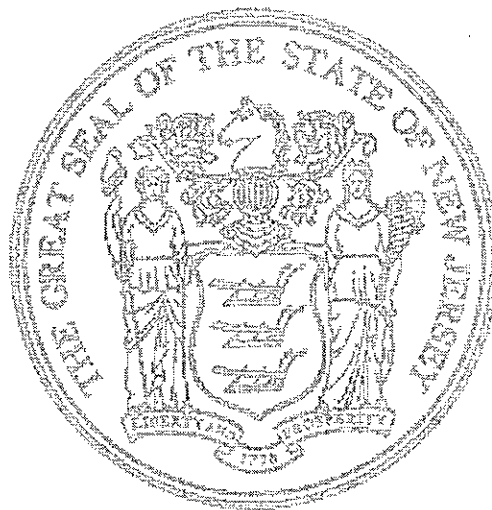
Assemblyman Zwicker

SYNOPSIS

Establishes NJ Blockchain Initiative Task Force.

CURRENT VERSION OF TEXT

As introduced.



(Sponsorship Updated As Of: 5/8/2018)

1 AN ACT creating the New Jersey Blockchain Initiative Task Force
2 to study if State, county, and municipal governments can benefit
3 from a transition to a Blockchain-based system for recordkeeping
4 and service delivery.

5
6 BE IT ENACTED by the Senate and General Assembly of the State
7 of New Jersey:

8
9 1. The Legislature finds and declares that:

10 a. The development of distributed databases and ledgers
11 protected against revision by publicly-verifiable open source
12 cryptographic algorithms, and protected from data loss by
13 distributed records sharing, colloquially called "Blockchain," has
14 reached a point where the opportunities for efficiency, cost savings,
15 and cybersecurity deserve study.

16 b. Blockchain technology is a promising way to facilitate a
17 transition to more efficient government service delivery models and
18 economies of scale, including facilitating safe, paperless
19 transactions, and permanent recordkeeping nearly
20 resistant/impervious to cyber-attacks and data destruction.

21 c. Blockchain technology can reduce the prevalence of
22 government's disparate computer systems, databases, and custom-
23 built software interfaces, reducing costs associated with
24 maintenance and implementation, streamlining the sharing of
25 information, and allowing more regions of the State to participate in
26 electronic government services.

27 d. Nations and municipalities across the world are studying and
28 implementing government reforms that bolster trust and reduce
29 bureaucracy through verifiable open source Blockchain technology
30 in a variety of areas, including medical records, land records,
31 banking, and property auctions.

32 e. It is in the public interest to establish a New Jersey
33 Blockchain Initiative Task Force to study if State, county, and
34 municipal governments can benefit from a transition to a
35 Blockchain-based system for recordkeeping and service delivery
36 and to develop and submit recommendations to the Governor and
37 the Legislature concerning the potential for implementation of a
38 Blockchain-based system.

39

40 2. a. There is established in the Office of Information
41 Technology, the New Jersey Blockchain Initiative Task Force. The
42 purpose of the task force shall be to study if State, county, and
43 municipal governments can benefit from a transition to a
44 Blockchain-based system for recordkeeping and service delivery.

45 b. The task force shall consist of 14 members as follows:

46 (1) two public members who shall be appointed by the
47 Governor;

48 (2) two members appointed by the President of the Senate;

1 (3) two members appointed by the Speaker of the General
2 Assembly;

3 (4) one member appointed by the Assembly Minority Leader;

4 (5) one member appointed by the Senate Minority Leader; and

5 (6) the Chief Technology Officer; the Commissioner of Banking
6 and Insurance; the Clerk of the County of Bergen; the Mayor of the
7 City of Newark, County of Essex; the Mayor of the City of Jersey
8 City, County of Hudson; and the Mayor of the City of Camden,
9 County of Camden, or their designees, who shall serve ex-officio.

10 c. Within 90 days after the effective date of this act, a majority
11 of the task force's authorized membership shall be appointed and
12 the task force shall hold its initial meeting. The task force shall
13 organize upon the appointment of a majority of its authorized
14 membership and shall elect a chair from among the members. The
15 members of the task force, other than those serving ex-officio, shall
16 serve for the duration of the existence of the task force. Any
17 vacancy shall be filled in the same manner as the original
18 appointment. The task force members shall serve without
19 compensation, but may be reimbursed for necessary expenses
20 incurred in the performance of their duties.

21 d. The task force shall study the issue of Blockchain
22 technology including, but not limited to, the following:

23 (1) opportunities and risks associated with using Blockchain and
24 distributed ledger technology;

25 (2) different types of Blockchains, both public and private, and
26 different consensus algorithms;

27 (3) projects and use cases currently under development in other
28 states and nations, and how those cases could be applied in New
29 Jersey; and

30 (4) how the Legislature can modify current State laws to support
31 secure, paperless recordkeeping.

32 e. Not later than 180 days after the initial meeting of the task
33 force, the task force shall issue a report to the Governor and,
34 pursuant to section 2 of P.L.1991, c.164 (C.52:14-19.1) to the
35 Legislature, and shall present its findings before the General
36 Assembly Science, Innovation and Technology Committee. The
37 report shall include a general description of the costs and benefits of
38 State and local government agencies utilizing Blockchain
39 technology; recommendations concerning the feasibility of
40 implementing Blockchain technology in the State and the best
41 approach to finance the cost of implementation; any draft
42 legislation the task force deems appropriate to implement
43 Blockchain technology; and any other information relevant to the
44 subject of the report.

45 f. The task force shall be entitled to the assistance and services
46 of the employees of any State board, bureau, commission, or agency
47 as it may require and as may be available to it for these purposes,
48 and to employ stenographic and clerical assistants and incur

1 traveling and other miscellaneous expenses, as necessary, to
2 perform its duties.

3 g. The Office of Information Technology shall assist the task
4 force in the performance of its duties and provide the task force
5 with studies, data, or other materials in its possession, to the extent
6 that such materials are relevant to the purposes of the task force.
7 The Office of Information Technology shall provide administrative
8 staff to support the task force.

9
10 3. This act shall take effect immediately and shall expire upon
11 the issuance of the task force's report.

12
13
14 STATEMENT

15
16 This bill establishes in the Office of Information Technology the
17 "New Jersey Blockchain Initiative Task Force." The purpose of the
18 task force is to study if State, county, and municipal governments
19 can benefit from a transition to a Blockchain-based system for
20 recordkeeping and service delivery.

21 The task force is to be comprised of 14 members as follows:

- 22 (1) two members appointed by the Governor;
23 (2) two members appointed by the President of the Senate;
24 (3) two members appointed by the Speaker of the General
25 Assembly;
26 (4) one member appointed by the Assembly Minority Leader;
27 (5) one member appointed by the Senate Minority Leader; and
28 (6) the Chief Technology Officer; the Commissioner of Banking
29 and Insurance; the Clerk of Bergen County; the Mayor of Newark;
30 the Mayor of Jersey City; and the Mayor of Camden, or their
31 designees, who will serve ex-officio.

32 The bill requires that, within 180 days after the initial meeting of
33 the task force, the task force is to issue a report to the Governor and
34 the Legislature and present its findings to the General Assembly
35 Science, Innovation and Technology Committee. The bill requires
36 the report to include a general description of the costs and benefits
37 of State and local government agencies utilizing Blockchain
38 technology; recommendations concerning the feasibility of
39 implementing Blockchain technology and the best approach to
40 finance the cost of implementation; any draft legislation the task
41 force deems appropriate to implement Blockchain technology; and
42 any other information relevant to the subject of the report.

ASSEMBLY, No. 3767

STATE OF NEW JERSEY

218th LEGISLATURE

INTRODUCED APRIL 5, 2018

Sponsored by:

Assemblyman ANDREW ZWICKER

District 16 (Hunterdon, Mercer, Middlesex and Somerset)

Assemblyman WAYNE P. DEANGELO

District 14 (Mercer and Middlesex)

Assemblyman JAMEL C. HOLLEY

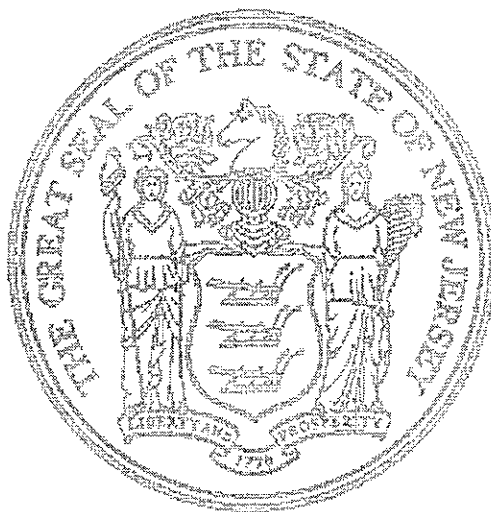
District 20 (Union)

SYNOPSIS

Directs Secretary of State to develop national marketing campaign promoting State's innovation economy.

CURRENT VERSION OF TEXT

As introduced.



(Sponsorship Updated As Of: 5/8/2018)

1 AN ACT directing the Secretary of State to develop a national
2 marketing campaign to promote the State's innovation economy
3 and supplementing chapter 16A of Title 52 of the Revised
4 Statutes.

5
6 **BE IT ENACTED** by the Senate and General Assembly of the State
7 of New Jersey:

8
9 1. a. The Secretary of State shall develop and undertake a
10 national marketing campaign to promote the State of New Jersey's
11 assets as an innovation economy, to attract people, businesses,
12 entrepreneurs, and investors in other states, and to both promote and
13 increase the State's high-technology and high-skilled workforce.
14 The marketing campaign shall include, but may not be limited to,
15 the following elements:

16 (1) a branding strategy to publicize the State's assets and to
17 strengthen the State's innovation economy brand;

18 (2) promotion of the State's employment opportunities in the
19 high-technology and high-skilled sectors of the economy, the well-
20 paying wages in those sectors, as well as the infrastructural,
21 workforce, investment, and other assets that make it ideal for
22 people, businesses, entrepreneurs, and investors to locate and grow
23 their business in New Jersey;

24 (3) targeted marketing to specific populations, including out of
25 state businesses, entrepreneurs, investors, recent college and
26 graduate school graduates, young professionals, and other persons
27 interested in starting a high-technology business or bringing a
28 research idea to commercialization; and

29 (4) any other element the Secretary of State deems appropriate.

30 b. The marketing campaign shall incorporate a range of media,
31 including radio, television, print, and internet platforms.

32
33 2. This act shall take effect immediately.

34

35

36

STATEMENT

37

38 This bill requires the Secretary of State to develop and undertake
39 a national marketing campaign to promote the State's assets as an
40 innovation economy, to attract people, businesses, entrepreneurs,
41 and investors in other states, and to both promote and increase the
42 State's high-technology and high-skilled workforce. The marketing
43 campaign would include, but would not be limited to, the following
44 elements:

45 (1) a branding strategy to publicize the State's assets and to
46 strengthen the State's innovation economy brand;

47 (2) promotion of the State's employment opportunities in the
48 high-technology and high-skilled sectors of the economy, the well-

1 paying wages in those sectors, as well as the infrastructural,
2 workforce, investment, and other assets that make it ideal for
3 people, businesses, entrepreneurs, and investors to locate and grow
4 their business in New Jersey;

5 (3) targeted marketing to specific populations, including out of
6 state businesses, entrepreneurs, investors, recent college and
7 graduate school graduates, young professionals, and other persons
8 interested in starting a high-technology business or bringing a
9 research idea to commercialization; and

10 (4) any other element the Secretary of State deems appropriate.

11 The marketing campaign would incorporate radio, television,
12 print, and internet media platforms.

ASSEMBLY, No. 3768

STATE OF NEW JERSEY

218th LEGISLATURE

INTRODUCED APRIL 5, 2018

Sponsored by:

Assemblyman ANDREW ZWICKER

District 16 (Hunterdon, Mercer, Middlesex and Somerset)

Assemblyman CHRISTOPHER P. DEPHILLIPS

District 40 (Bergen, Essex, Morris and Passaic)

Assemblyman TIM EUSTACE

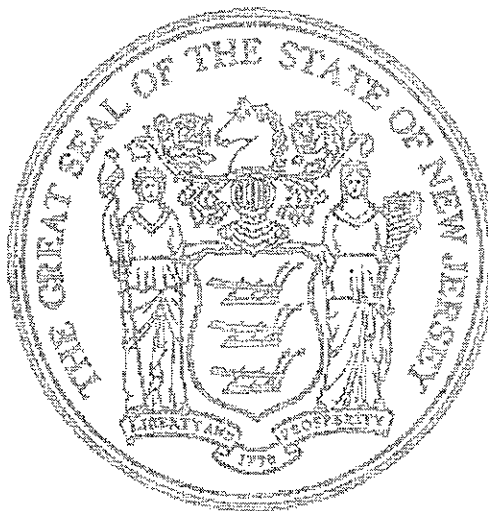
District 38 (Bergen and Passaic)

SYNOPSIS

Permits corporations to use blockchain technology for certain recordkeeping requirements.

CURRENT VERSION OF TEXT

As introduced.



(Sponsorship Updated As Of: 5/10/2018)

1 AN ACT concerning corporate recordkeeping and blockchain
2 technology and amending N.J.S.14A:5-28 and P.L.2009, c.176.

3
4 **BE IT ENACTED** by the Senate and General Assembly of the State
5 of New Jersey:

6
7 1. N.J.S.14A:5-28 is amended to read as follows:

8 14A:5-28. Books and records; right of inspection.

9 (1) Each corporation shall keep books and records of account
10 and minutes of the proceedings of its shareholders, board and
11 executive committee, if any. Unless otherwise provided in the
12 bylaws, such books, records and minutes may be kept outside this
13 State. The corporation shall keep at its principal office, its
14 registered office, **[or]** at the office of its transfer agent, or on an
15 electronic network, a record or records containing the names and
16 addresses of all shareholders, the number, class and series of shares
17 held by each and the dates when they respectively became the
18 owners of record thereof. Any of the foregoing books, minutes or
19 records may be in written form or in any other form capable of
20 being converted into readable form within a reasonable time,
21 including on an electronic network. A corporation shall convert
22 into readable form without charge any such records not in such
23 form, upon the written request of any person entitled to inspect
24 them.

25 (2) Upon the written request of any shareholder, the corporation
26 shall mail to such shareholder its balance sheet as at the end of the
27 preceding fiscal year, and its profit and loss and surplus statement
28 for such fiscal year.

29 (3) Any person who shall have been a shareholder of record of a
30 corporation for at least six months immediately preceding his
31 demand, or any person holding, or so authorized in writing by the
32 holders of, at least 5% of the outstanding shares of any class or
33 series, upon at least five days' written demand shall have the right
34 for any proper purpose to examine in person or by agent or attorney,
35 during usual business hours, its minutes of the proceedings of its
36 shareholders and record of shareholders and to make extracts
37 therefrom, at the places where the same are kept pursuant to
38 subsection 14A:5-28(1). If the records are kept on an electronic
39 network, the corporation shall convert any records so kept into a
40 clearly legible form upon the request of any person entitled to the
41 records in the timeframe required pursuant to this subsection.

42 (4) Nothing herein contained shall impair the power of any
43 court, upon proof by a shareholder of proper purpose, irrespective
44 of the period of time during which the shareholder shall have been a
45 shareholder of record, and irrespective of the number of shares held

EXPLANATION – Matter enclosed in bold-faced brackets **[thus]** in the above bill is
not enacted and is intended to be omitted in the law.

Matter underlined thus is new matter.

1 by him, to compel the production for examination by such
2 shareholder of the books and records of account, minutes, and
3 record of shareholders of a corporation. The court may, in its
4 discretion prescribe any limitations or conditions with reference to
5 the inspection, or award any other or further relief as the court may
6 deem just and proper. The court may order books, documents and
7 records, pertinent extracts therefrom, or duly authenticated copies
8 thereof, to be brought within this State and kept in this State upon
9 whatever terms and conditions as the order may prescribe. In any
10 action for inspection the court may proceed summarily.

11 (5) Holders of voting trust certificates representing shares of the
12 corporation shall be regarded as shareholders for the purpose of this
13 section.

14 (6) A corporation may impose reasonable limitations or
15 conditions on the use or distribution of requested materials provided
16 to a demanding shareholder: (a) pursuant to either subsection
17 14A:5-28(2) or 14A:5-28(3); or (b) prior to the order of a court
18 pursuant to subsection 14A:5-28(4).

19 As used in this section, "electronic network" means one or more
20 electronic networks or databases, including one or more distributed
21 electronic networks or databases that utilize blockchain technology,
22 administered by or on the behalf of the corporation.

23 (cf: P.L.2017, c.364, s.1)
24

25 2. Section 2 of P.L.2009, c.176 (C.14A:1-8.1) is amended to
26 read as follows:

27 2. (1) Any notice required or permitted pursuant to the
28 provisions of N.J.S.14A:1-1 et seq., or by a certificate of
29 incorporation or by-laws or any resolution of directors or
30 shareholders, may be provided by electronic transmission as
31 follows:

32 (a) Any notice to shareholders given by the corporation pursuant
33 to any provision of N.J.S.14A:1-1 et seq., or by a certificate of
34 incorporation or by-laws or any resolution of directors or
35 shareholders, shall be effective if given by a form of electronic
36 transmission consented to by the shareholder to whom the notice is
37 given.

38 (i) Any consent given pursuant to paragraph (a) of this
39 subsection shall be revocable by the shareholder by written notice,
40 and not electronic transmission, to the corporation.

41 (ii) Any consent given pursuant to paragraph (a) of this
42 subsection shall be deemed revoked if: (A) the corporation is unable
43 to deliver by electronic transmission two consecutive notices given
44 by the corporation in accordance with the shareholder's consent; and
45 (B) that inability becomes known to the secretary or an assistant
46 secretary of the corporation or to the transfer agent, or other person
47 responsible for the giving of notice following the second missed
48 delivery; provided, however, the inadvertent failure to treat that

1 inability as a revocation shall not invalidate any meeting or other
2 action.

3 (b) Any notice to shareholders given by the corporation pursuant
4 to any provision of N.J.S.14A:1-1 et seq., or by a certificate of
5 incorporation or by-laws or any resolution of directors or
6 shareholders, shall be deemed given:

7 (i) if by facsimile telecommunication, when directed to a
8 number at which the shareholder has consented to receive notice;

9 (ii) if by electronic mail, when directed to an electronic mail
10 address at which the shareholder has consented to receive notice;

11 (iii) if by a posting on an electronic network together with
12 separate notice to the shareholder of that specific posting, upon the
13 later of (A) that posting; or (B) the giving of the separate notice; or

14 (iv) if by any other form of electronic transmission, when
15 directed to the shareholder.

16 (c) An affidavit of the secretary or an assistant secretary or of
17 the transfer agent or other agent of the corporation that the notice
18 has been given by a form of electronic transmission shall, in the
19 absence of fraud, be prima facie evidence that the notice has been
20 given.

21 (d) For purposes of this section, "electronic transmission" means
22 any form of communication, not directly involving the physical
23 transmission of paper, including the use of, or participation in, an
24 electronic network pursuant to N.J.S.14A:5-28, that creates a record
25 that may be retained, retrieved and reviewed by a recipient, and that
26 may be directly reproduced in paper form by that recipient through
27 an automated process.

28 (2) This section shall not apply to notices required or permitted
29 pursuant to N.J.S.14A:6-5, N.J.S.14A:7-3, N.J.S.14A:12-10,
30 N.J.S.14A:12-12 or N.J.S.14A:14-15.
31 (cf: P.L.2009, c.176, s.2)

32

33 3. This act shall take effect immediately.

34

35

36

STATEMENT

37

38 This bill provides that corporations may utilize electronic
39 networks, including distributed electronic networks, in order to
40 meet recordkeeping requirements.

41 Current law requires corporations to keep records containing the
42 names and addresses of all shareholders, the number, class and
43 series of shares held by each and the dates when they respectively
44 became the owners of the shares. This bill provides that these
45 corporate records of shares may be kept on an electronic network.
46 It also provides that corporations may use electronic transmissions
47 from electronic networks to meet with certain notice provisions of
48 existing law.

1 As used in the bill, "electronic network" means one or more
2 electronic networks or databases, including one or more distributed
3 electronic networks or databases that utilize blockchain technology,
4 administered by or on the behalf of the corporation.

5 This bill is based on recent changes to the Delaware General
6 Corporation Law which allow Delaware corporations to utilize
7 distributed electronic networks, also known as blockchain
8 technology, in order to create and maintain certain shareholder
9 records and meet with certain shareholder notice requirements.
10 This bill clarifies that New Jersey corporations may use blockchain
11 technology in order to simplify recordkeeping requirements.

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ASSEMBLYMAN ANDREW ZWICKER (Chair): Welcome to the Science, Innovation, and Technology Committee hearing.

Before we get started, I just want to give my thanks to Princeton University for hosting us here at this absolutely incredible spot; to the staff of BioLabs, which I think is somewhere around here right now; to the staff of the Public Affairs Office at Princeton -- I know that they're somewhere here -- there they are, in the back; the Entrepreneur staff that's here from Princeton, as they continue to move into entrepreneurial areas -- Anne-Marie is here; thank you, Anne-Marie Maman, for being here; and to everybody today, as we come to talk more about what's going on when it comes to innovation in New Jersey, and a couple of topics that we'll address in today's hearing.

Before we get started, though, I would like to do a roll call.

MS. HOWLEY (Committee Aide): Assemblyman DePhillips.

ASSEMBLYMAN DePHILLIPS: Here.

MS. HOWLEY: Assemblyman Freiman.

ASSEMBLYMAN FREIMAN: Here.

MS. HOWLEY: Vice Chairman Kennedy.

ASSEMBLYMAN JAMES J. KENNEDY (Vice Chair): Here.

MS. HOWLEY: And Chairman Zwicker.

ASSEMBLYMAN ZWICKER: Here.

Thank you, everybody.

So a couple of business things first.

On our agenda was A-1346, which was about accelerating incubator networks. We are going to hold that Bill, if anyone is here for

that. There are some amendments we need to get worked out, so we'll come back to that one.

Before we do the two Bills that are specific to blockchain technology, we're going to do A-3767, which is a Bill of mine.

And if you would call it in.

MS. HOWLEY: Sure.

Assembly Bill 3767 directs the Secretary of State to develop a national marketing campaign promoting the State's innovation economy.

ASSEMBLYMAN ZWICKER: Thank you.

And so this bill comes out of the first hearing of this Committee, when we heard from stakeholders from all over the state about what New Jersey needs to do to really start to accelerate its innovation economy.

And the two things that we heard -- that came out over, and over, and over again -- one was to bring back the New Jersey Science and Technology Commission, and this Committee has already discussed a bill to do that and it's moved out of this Committee and onto consideration on the floor of the Assembly.

And the other thing that we heard was about promoting New Jersey; and we know that other states have been doing that quite a bit. I think most of the people in this room already know that New Jersey has this rich history of innovation, whether you want to go back to Thomas Edison, or Roebling, or Bell Labs; you know, New Jersey is the home of the phonograph, the light bulb, the transistor, the laser, and the UNIX operating system, which is my favorite one, down at Bell Labs. (laughter)

Only this crowd would even smile at that. (laughter)

We know that; we know that New Jersey has this amazing location between New York City and Philadelphia. We know it has an incredible public education system; we know that it has some of the finest research universities, public and private, in the country. And we know that the time is now to start to advertise New Jersey beyond the stereotype of a reality TV show or, depending upon your age, “New Jersey -- what exit are you from?” Currently, I live at Exit 9.

And so this Bill is designed to start a campaign for New Jersey around innovation. And so that’s its intent; and we have, I think, two people who would like to testify on this.

The first one, Kurt -- something -- Kurt Watkins; Kurt Watkins.

Or is that in favor, no need to testify?

KURT WATKINS, Esq.: (off mike) Sorry; I thought I signed for the blockchain bills.

ASSEMBLYMAN ZWICKER: Blockchain; never mind.

Oh, Becky Perkins from BioNJ, in favor, no need to testify.

Anybody else on this Bill? I’m assuming all the other witness slips are for blockchain.

And if you haven’t already, and you intend to testify, if you would fill out a slip. It looks like everyone has; but if you haven’t, please do.

Okay; no one there?

Any comments from the Committee? (no response)

ASSEMBLYMAN DePHILLIPS: I would just like to say I strongly support the Bill.

I'm aligned with you on the goals we've heard in the Biotechnology Task Force Committee meetings, as well as the hearings we've had in this Committee -- that it is important for the State to get ahead of itself, as well as other states, in this area. We're in a dogfight with others states in the innovation area, and we need to compete; and one way to compete is to highlight the benefits of innovation right here in our own state. And I think this would go a long way to accomplishing that.

So I'm very much in support.

ASSEMBLYMAN ZWICKER: Okay. If you would, motion to move the Bill.

ASSEMBLYMAN KENNEDY: Move it.

ASSEMBLYMAN ZWICKER: Second?

ASSEMBLYMAN FREIMAN: Second.

MS. HOWLEY: On the motion to release A-3767.

Assemblyman DePhillips.

ASSEMBLYMAN DePHILLIPS: Yes.

MS. HOWLEY: Assemblyman Freiman.

MS. HOWLEY: Vice Chairman Kennedy.

ASSEMBLYMAN KENNEDY: Yes

MS. HOWLEY: And Chairman Zwicker.

ASSEMBLYMAN ZWICKER: Yes.

The Bill is moved.

Okay; now for the two Bills that are at hand.

The way this will work is, we're going to read into the record both Bills; then we'll hear testimony from people who wish to testify, and then we will vote on each Bill separately after the testimony is complete.

So if you would read the record in for both of the Bills.

MS. HOWLEY: Assembly Bill 3613 establishes the New Jersey Blockchain Initiative Task Force.

And Assembly Bill 3768 permits corporations to use blockchain technology for certain recordkeeping requirements.

ASSEMBLYMAN ZWICKER: Wonderful.

So most of us have read about blockchain technology, perhaps around cryptocurrency. But other states have started to really move on applications of blockchains, and this idea that digital records can be stored on multiple machines, each encrypted, tied together. It's a technology which applications are just starting to really be explored; and we have people here from both the regulatory perspective, from an entrepreneurial perspective, and from a technical perspective to talk about the potential of blockchain.

But it is the intent, certainly -- my intent, as the Chair of this Committee -- that this is the start of New Jersey becoming a national leader when it comes to the applications of blockchain technology. And these two pieces of legislation that we have before us are, I think, just the tip of that iceberg.

So I'd like to get started by calling up -- we have, to start, a group of students that were instrumental in producing some of the research for one of these Bills.

I'd like to ask Carlos Merino to come, right? And along with him -- you'll have to identify yourselves when you come up.

Please.

You may have to steal some chairs.

C A R L O S I V Á N M E R I N O: (off mike) That's correct.
(laughter)

So I had the privilege of working with these students; back in January I was--

ASSEMBLYMAN ZWICKER: Can you do me a favor? Before you get started, can you just, for the record -- your name and where you're from.

MR. MERINO: Okay; so my name is Carlos Iván Merino; I am from Hackensack, New Jersey.

And I have here -- we have Nicholas Ramos (phonetic spelling); and we have Stephen Vidal (phonetic spelling); and we have Sean Brady; and we have Paloma Camacho.

So back in January, we were trying to figure out what to do; because I have them as interns, and we decided that, all right, let's start doing research on blockchain. And at first, we didn't really know much about it except, like, you know, *bitcoin*.

So then we just started doing the research, and threw bitcoin out the window thinking, all right, let's look at blockchain, and this technology, and what it can do.

So when we put together this Bill, we just-- From what I have here, the goal of concentrating our efforts upon creating the New Jersey Blockchain Initiative, is to impart -- yield results comparable to other states that have already successfully implemented such committees. The primary objectives of the New Jersey Blockchain Initiative would be to implement blockchain technology in a way that streamlines transactional procedures of, and within, government agencies; and reforms ledger technology and

integrates bank involvement, while working with the established guidelines in each respective area.

So the New Jersey Blockchain Initiative is ultimately intended to simplify and bolster current processes in these areas and beyond. The mechanics of blockchain technology would allow for reduced risk of error and fraud in many different sectors of government, and deconstructing and supplementing the established structures in certain realms of State government.

The use of blockchain will allow a more direct consumer-to-consumer experience, helping to delay corruption and interference that can arise from the use of intermediaries. This would not only simplify processes, such as the transfer of property ownership, but also reduce costs related to the external validation logging of such transactions.

And the proposed use of blockchain technologies would, through the refining and streamlining of inherent processes of these fields, make the aforementioned examples possible for the State of New Jersey. The State government would, as previously alluded, be able to integrate blockchain into a multitude of different departments including, but not limited to, property records, both public and private, and finance, in the management of physical assets.

And despite being developed in 2008, the blockchain technology is still in its infancy, partly due to the gravely underutilized tool for policymakers and government agencies for the better part of the last decade. Thusly, the backing of New Jersey, promoting the blockchain initiative, would catalyze the accessibility and functionality of future blockchain prospects and applications. These various applications fulfill a

plethora of roles which would relate and have the potential to streamline government processes and procedures.

We feel very strongly about the Bill, and we look forward for it to move forward.

And it's been a great experience.

ASSEMBLYMAN ZWICKER: Thank you.

And if I may, to the students -- I had a chance to meet each of you before the hearing started. If you wanted to say something about -- should we do this?

UNIDENTIFIED MEMBER OF AUDIENCE: Yes.

ASSEMBLYMAN ZWICKER: Yes. (laughter)

All right; done. We don't need any more testimony.

UNIDENTIFIED MEMBER OF AUDIENCE: Thank you, thank you.

PALOMA COMACHO: We should absolutely do this.

I think it's important to always be on the forefront of innovation. I think it's part of our foundation as not only a state, but as a nation, to always be on the forefront and to try to create new ways to better this country for the people who live in it.

ASSEMBLYMAN ZWICKER: Thank you.

MS. COMACHO: And I think that this is an important way that we can do that and utilize the technology for the greater good.

ASSEMBLYMAN ZWICKER: So I just want to say to the four students -- thank you for the work that you did. Good luck in college.

MS. COMACHO: Thank you.

ASSEMBLYMAN ZWICKER: And after college, make sure you stay in New Jersey and become blockchain entrepreneurs. (laughter)

MS. COMACHO: Okay.

ASSEMBLYMAN ZWICKER: Thank you.

MR. MERINO: Thank you very much.

MS. COMACHO: Thank you so much. (applause)

ASSEMBLYMAN ZWICKER: Okay; we have a whole bunch of people who would like to testify.

I'd like to ask if you could keep your testimony to about five minutes each -- that would be helpful to give us time, here on the Committee, for any questions we may have.

So first is Rebecca Perkins, in favor, but no need to testify, right? Okay.

Next, from NJIT, Professor Qiang Tang -- I hope I'm saying that correctly -- in favor, and would like to testify.

Q I A N G T A N G, Ph.D.: Mr. Chairman, and Assemblymen and Assemblywoman--

ASSEMBLYMAN ZWICKER: I don't think -- we're not amplified, right?

MS. HOWLEY: No, we're not.

ASSEMBLYMAN ZWICKER: So the microphones are for recording purposes.

DR. TANG: Okay.

ASSEMBLYMAN ZWICKER: Everything goes into the record as transcribed and recorded.

HEARING REPORTER: (off mike) I just found this (indicates)--

ASSEMBLYMAN ZWICKER: Okay.

HEARING REPORTER: --and I think this will--

ASSEMBLYMAN ZWICKER: So if we have amplification, it would be great.

And I just want to say, also for the record, how much I appreciate the OLS staff for everything that they're doing; as well as the Majority and the Minority staffs for coming out here.

DR. TANG: So I just go with this?

ASSEMBLYMAN ZWICKER: Yes, please; if you could. That will make it easier for everyone to hear.

ASSEMBLYMAN FREIMAN: Andrew, does he need both for the recording?

ASSEMBLYMAN ZWICKER: You should take the-- That one should be facing you, right? We need that one to transcribe--

DR. TANG: Oh, okay; very high technology.

ASSEMBLYMAN ZWICKER: --and you'll see-- Let us know if you can't hear. And then if you talk into that, that would be helpful.

DR. TANG: Okay.

ASSEMBLYMAN ZWICKER: Thank you.

DR. TANG: So, okay; I will start.

Mr. Chairman and Assemblymen; and good after everyone.

So first, I thank you very much for inviting me here to talk about the exciting blockchain technology.

I originally thought I might use a slide presentation, so I must go this way (indicates).

First, allow me to briefly introduce my own background related to blockchain, to justify our organizers making the right choice for me as a speaker.

So I've been working and doing research on blockchain technology for multiple years, and essentially I'm also the--

Oh, sorry; I need to introduce myself.

I'm Qiang Tang; an Assistant Professor from NJIT.

So I've been working on blockchain technology for multiple years; essentially, almost all the major layers, including the underlying cryptographic building blocks, the core blocks and consensus, and the centralized applications on top of it; and also closely related areas, like privacy, accountability, and copyright protection.

And also, our colleagues at the NJIT Cybersecurity Center have the supporting areas.

So I believe most of you have heard of and have some knowledge of blockchain technology; and there are many interpretations of this blockchain. But let me just abstract this cool, new technology just using one sentence. It essentially enables a common digital letter to be replicated across the whole Internet. So this singularly simple functionality actually turns out to be extremely powerful to enable a lot of fascinating applications, because-- The reason is that the form, or the type of the digital records in the ledger, could be essentially arbitrary.

So let me make an analogy, first, to briefly illustrate the core application.

So 20 years ago, our Internet technology -- or actually, maybe, even longer ago -- so the Internet essentially enables the message transmission so people can send a message to each other. But now, as we see, the Internet -- singularly, simple Internet technology actually enables most of the -- many of the UNICOM companies, and the whole big industry, that everybody here relies on now.

Blockchain technology -- we can view it as a more powerful generation of Internet technology. Not only can we send and transmit messages, but enable the exchange of any digital asset without relying on the major platforms.

So the first application-- This technology brings a lot of potential benefit. First let me give you a bunch of simple examples of the existing applications that we already see.

For example, cryptocurrency, which at least brings the money transferring internationally -- a much easier task. And a lot of decentralized applications are viewed on top of the blockchain platform. For example, we may view the decentralized data exchange market without relying on the platform, like Facebook. So if we can actually build some kind of an exchange market, then people don't need to worry about the privacy of the data; and the CEO of this company may not need to testify at Congress, like Mr. Zuckerberg. (laughter)

And also many other technology's applications could be in the logistics, like intellectual property protection and data storage; many, many.

And one more interesting phenomenon we observed recently is that the coins circulating on top of the blockchains actually enables a new token economy, which reshapes the modern company structure. For

example, they have totally different ways of doing fundraising or shareholding.

The key feature of this blockchain technology essentially enables us to remove the middleman in many of the businesses so it can reduce costs and increase transparency.

And this allows us not only to lift the existing economies -- for example, it can be applied in current big companies to help them exchange data; also it will create new economy, new industry, and even new business models. We're not able to envision it yet. But as we all know, Rome wasn't built in one day; so as this new technology and all the benefits -- it takes us time.

So there also are downsides to the existing blockchain. By downside I don't mean it's really inherently bad; it's just that there are several deficiencies in the current development.

So first, of course, we know the technology is pretty new and it is not mature yet. So there are several tensions which make the application, and many applications, not viable yet; but they have big potential. The first one is, all the data put onto the chain can be publicly replicated; and that causes a big problem of privacy. So researchers like us are working very hard, trying to leverage the cryptographic technology to achieve the best of both -- we will still have privacy, but we would like to still enjoy the benefit of this replication and the transparency of the data.

The second: Tension between efficiency and the security consensus. Efficiency, as we all know -- right? -- we want the faster transmission; we want a better utility. But the security problem in this blockchain domain particularly becomes as important as agility, because it

directly influences money. So there's huge tension. Also, researchers are working very hard to try to resolve this tension; and we're going to see big progress in the next couple of years to make this situation better.

And, of course, there are some other issues. Many people claim that data entering the blockchain, essentially, be certified in some way. But the data source -- that cannot be certified by blockchain stuff. We have to have external mechanisms work together with the blockchain technology.

There are many deficiencies as well; but to summarize them -- for technical deficiencies, it's fine as long as people work on it. And the good news is that we are already seeing huge progress over the last couple of years. I mean, like, 8 years ago, 10 years ago, when bitcoin just arrived, it essentially -- had only one limited utility. Now we see all kinds of decentralized applications -- very fancy concepts and very cool ideas.

So I would recommend, my personal opinion, to the State government -- of course, the first natural choice is to maybe consider supporting research centers, or research labs, dedicated to blockchain technology in New Jersey state; there might be a couple of choices.

While another thing we always talk about is academia-industry collaboration. But any policy could provide more incentives for this serious collaboration, not only just -- more than just fear of progress, or some very limited level of collaboration; that would be great.

Another major deficiency is actually on the workforce supply. So there's a very famous saying, and we all know it in the blockchain community, is that the number of startups is more than the number of experts. So it's good for people like me, maybe, because we are going to be needed. But it won't be good for the whole ecosystem, for the State, for the

whole industry. Because of the short supply of experts, actually we're already seeing drawbacks happenings. Several startups, because they have design flaws in their protocol, it leads to potential security problems and directly -- potentially directly leads, of course, to money loss. That's a serious problem; more serious of a problem than a regular security startup, or whatever.

So in this sense, of course, definitely the State government needs to take the lead to encourage and support education and training programs on blockchain. And on the other hand, I do think it's quite important -- even though it already exists in many of the current industries -- but for blockchain startups, I think the State government might encourage the startup to reach out to academia to search -- a seat for peer review to increase the scrutiny and the robustness check.

And also, even for institutional (indiscernible), they maybe should be encouraged to get in touch with academia to get the real review of the product to make sure the protocol is robust and has a certain level of scrutiny.

One last thing I would like say is, probably the government cares most about the accountability issue. Because new technology is a double-edged sword, right? It can be used by a gentleman here, and it can also be used by an underground business. Well, accountability, for most of the time, is mostly regulated by law, law enforcement, or policy; but maybe many new technology investments may also make the law enforcement easier and could be actually realizable in real life.

So that's most of my testimony; and thank you.

I will now take questions.

ASSEMBLYMAN ZWICKER: Thank you, Professor.

And I think part of -- clearly, part of the goal of this Task Force (*sic*) is to look at workforce -- to look at things beyond just applications. So that's where it will go.

Questions from the Committee? (no response)

Thank you so much. (applause)

DR. TANG: Thanks.

ASSEMBLYMAN ZWICKER: I love it, hearing my own applause. (laughter)

Next, from Rutgers University, is Vince -- and I'm going to mess your name up, too -- Smeraglia (indicating pronunciation).

VINCENT SMERAGLIA, Esq.: (off mike) Just in support; no need to testify.

ASSEMBLYMAN ZWICKER: In support; no need to testify. Got it.

Okay; then after that is John Wise from DATA and Loci.

JOHN WISE: Hello, everybody.

My name is John Wise, the CEO and founder of Loci, Incorporated, which is a Delaware C Corporation; also an international foundation as well.

I'm also the co-founder of the Digital Asset Trade Association, which has been doing some lobbying efforts around the country; state-by-state lobbying efforts around Wyoming, Colorado, Mississippi, Tennessee, and several other states.

In addition to that, I started a kind of a Y Combinator accelerator, that has been around blockchain education and entrepreneurial sort of expertise.

I really wanted to talk about blockchain as a whole, how it can really impact innovation, and how it can impact economic growth and stability within the state-by-state level. Fortunately, I've done this a few times before, with some other states; and I think New Jersey is actually really, really, really well positioned.

Before we get into anything that's esoteric about blockchain in general, it's important to note here that the concept of *blockchain* is not a new thing; it's actually been around for several hundred years. Computational is new; a computational blockchain. But you can actually think of a blockchain as a title-and-deed system, right? It's an internal registry, or an external registry, that has a consensus over the entire system -- over the users, over the people who are committing the thing. It's built specifically to inherently drive trust; in the case of a computational blockchain, we don't need trust, right? It's a trust-less system. You're getting the intermediary out of it, right?

But the concept of this auditable, transparent, and immutable system is not new at all. We have two main systems that are actually very prominent to New Jersey, which is the title and deed and land registration, and intellectual property. Both of these have been around for a long, long time.

Doing it computationally is not really that big of a thing. Cryptographically it can be quite a lot; but this is really just around the security of the chain, right? This is why bitcoin took so long, actually, to

really come to the sort of hockey stick of a growth curve; it needed a certain amount of strength of the chain, right? The length of the chain actually makes it much, much, much, much more secure. It needed a critical mass, really, in order to get there.

The reason I bring this up is that although these are very valid concerns that the previous speaker had, these are global concerns for everybody who is dealing with blockchain encrypted currency. This is not a state level that necessarily needs to be solved here. This is something that certainly shouldn't be scary in any respect, and the entire system doesn't nearly need to be as esoterically defined as it is.

A couple of things that I'd really like to bring up here -- as far as opportunities and potential for economic growth, for job growth within the state, and how it can really define and move the state further, right?

One of the first things is state-by-state exports. Oil, gas, electricity are huge exports for New Jersey; it's very similar to one of the last states that we did, which was Wyoming. They exported almost all of their electricity out of the state. And in Wyoming, they had a big issue -- they were getting Federal tax credits back for exporting all of this energy and electricity outside of the state. Well, Federal tax credits don't do that well if the bulk of your citizens are Native American tribes that don't pay Federal tax.

Ultimately the goals-- And some of the things that can happen with blockchain from the registration and legality perspective -- registering businesses, registering power consumption, supply chain, all of these things -- but also the cryptocurrency aspect is that you can start creating a singular currency for a state-by-state level, or even for things like trade associations

that are directly sponsored, without needing to go through the Federal level or even through the tax system. You can create these things that are completely flat, and you can have these systems called *smart contracts* that execute multiple different things at the exact same time.

Imagine one state-level or global-level escrow system in some respects. You can trust completely and implicitly exactly what's going to happen if all of the parties concur, right? This is the same purpose of a title-and-deed registration. You can trust that if the money is there to buy this plot of land, then the plot of land transfers ownership, right? This is exactly the point.

The other aspect is that this can really drive the economy within the state by being able to offer things like derivatives, futures, commodities -- all sorts of other things -- with a common currency on a state-by-state level. That also can dramatically streamline the money transmittal process and the money services businesses aspect, which has a huge, huge, huge impact, considering your adjacent states here especially.

Delaware and New York both have to do a large amount of transactions; and technically, from an IP perspective, it goes over the New Jersey airspace. Money transmittal is going to be a huge, huge, part of a lot of this for you guys, right? It can mean upwards of trillions of dollars potentially, annually, right?

Now, I know that sounds like a large amount of money, but when you think about the money that actually changes hands, not what's getting exported, it's very fast and it's a lot, a lot, a lot of volume.

So the biggest thing that I really wanted to offer is just any questions -- anything that I can dispel fears of; answer questions. I've been

around this space since April of 2010; I've been asked to be one of the leading economists for many different regulatory bodies, for the Federal and international. I've spoken at the World Economic Forum, which was in Davos; I'm going to be speaking at Bilderberg and several other other places. I've been a subject matter expert for about 13 governing bodies.

So from both the entrepreneurial perspective -- having started multiple businesses in this space; as well as -- my main business is actually intellectual properties stored in the blockchain; this is one of the biggest things-- I'd love to actually speak, maybe, after the fact about your previous bill as well; anything I can do.

There's a large, sort of, comingling here that can happen. In fact, just to speak on that very, very, very quickly -- intellectual property, with blockchain inclusion, ultimately can mean that there can be trade internationally for the very nature of an idea. This means that universities within the state or within the country can actually crowdsource research and development from anywhere else in the world, and export it anywhere in the world. This means a real collateralizable or commoditizable value or asset to intellectual thought, of which New Jersey is very rich in.

I'll leave it at that. If anybody has any questions, I'm here.

ASSEMBLYMAN ZWICKER: Thank you.

I have one question.

Since you've been working with a bunch of different states, what state, in our opinion, is currently leading when it comes to what it's doing for blockchain technology and why?

MR. WISE: I would say Wyoming is right now.

They were really one of the first movers in this respect. The Federal level was giving them a little bit of a raw deal when it came to Federal tax credits. They weren't really getting the most yield out of their energy exports. They weren't really seeing job growth, and they weren't really seeing the true RY for energy exports and commodities exports.

They're leading the way, partly because there were several businesses and people who had been around blockchain, who were kind of already coming up, and a couple I think who were going to be running for office. But on top of that, they really saw a big opportunity with some Native American tribes; they saw a big opportunity with some of the universities there. And that's really what I would say is going to lead the way in any state that will come next, or has come. Promoting the research institutions, universities, colleges -- anything like that, and even the enterprises -- to collaborate over a common consensus -- blockchain or anything along those lines -- is going to make a huge impact.

This is not a very complicated thing to do. One of the best ways to promote this is just through authorizing trade associations that are actually globally recognized trade associations -- kind of like Better Business Bureau or LEED-certification; you know, Good Housekeeping; whatever it is -- to kind of advise and help create the systems. And this is a global thing; the worst mistake that any state or local-level regulation can do is try to command ownership of something. The rest of the world is working on the same problems as us.

ASSEMBLYMAN ZWICKER: Thank you.

ASSEMBLYMAN FREIMAN: I have a question.

ASSEMBLYMAN ZWICKER: Assemblyman.

ASSEMBLYMAN FREIMAN: My next question is going to share my limited knowledge--

MR. WISE: Sure.

ASSEMBLYMAN: --behind this topic.

MR. WISE: Okay.

ASSEMBLYMAN FREIMAN: As we look at blockchain technology, are there -- as it merges and continues to grow -- is there a possibility that there are, perhaps, multiple protocols; is there a single uniformity associated with blockchains that's out there? So that's just the fundamental that I just don't understand yet about the blockchain technology itself.

MR. WISE: Sure. There is not a uniformity for good reason. Technical innovation is really what's driving this market, and that's what's going to define the best way.

But the best way is merely relative in perspective, right? Each protocol has its own sort of specific use cases. Bitcoin, for instance, was really intended to be a payment vehicle; that's one specific protocol. Think of that as cobblestone roads, right? It works pretty well for driving horse-drawn carriages or anything along those lines. Maybe Ethereum, or some of these other ones, could be similar to railroad systems or the highway systems -- interstate highway systems. There's a lot more to come.

ASSEMBLYMAN FREIMAN: So how do we establish guidelines, as the governmental entity, of when we think of realms of electronic medical records -- to ensure that if we say, "You know, we're requiring it," but yet it's critical that they're able to communicate with one another.

MR. WISE: Yes.

ASSEMBLYMAN FREIMAN: And we don't have this going -- we don't have different paths going on.

MR. WISE: Well, keep in mind that this is going on now, currently, with HIPAA compliance, and just about everything else--

ASSEMBLYMAN FREIMAN: Absolutely, absolutely.

MR. WISE: --around medical records, right?

ASSEMBLYMAN FREIMAN: We don't want to continue that.

MR. WISE: Exactly; well, it's kind of inevitable, right? That is the purpose of technological innovation and growth. I think what you do is make it *inclusive* without making it *exclusive*, right? You certainly don't want to require everybody to, necessarily, be on a blockchain, because not necessarily every small business would be able to do that kind of accounting or booking--

ASSEMBLYMAN FREIMAN: Okay.

MR. WISE: --for a few years.

And the other big side of it is, you really just want to make it open enough for, especially, research institutions in the state to be able to develop and work on these things constantly.

ASSEMBLYMAN FREIMAN: All right; so let me go back to my original question.

MR. WISE: Sure.

ASSEMBLYMAN FREIMAN: So, if you're saying, if you're on blockchain, will all blockchains be able to communicate with one another?

MR. WISE: No.

ASSEMBLYMAN FREIMAN: So then I go back to my original point of showing my ignorance on this -- so if you're saying, all right, electronic medical records-- If you're on blockchain, how do we ensure that one electronic medical records on blockchain can talk to another electronic medical records on blockchain? And yet, we're saying it's okay to have electronic medical records on blockchain -- and we just didn't create more confusion.

MR. WISE: So there are a couple of systems-- And this is going to be, sort of, industry-specific, right? Record keeping for medical systems is not the same as financial records, even though they are almost the same sort of data, right?

The biggest reason is that some things need anonymity, yet transparency and auditability. Some things just need the anonymity; some things need other variables.

Really, the biggest thing is to allow a choice, right? You can have this come to a vote; you can either make it that a trade association that you recognize ends up helping you define which one is the best opportunity; or even Princeton, or other research institutions, may be able to identify. For instance, I've heard of a couple of protocol layers; they're around medical records -- SimplyVital Health, MedChain; there are a few of these. Some of those have HIPAA compliance; some of them don't; some of them are around research for, say, cancer development that needs to be completely anonymized, but everybody needs, maybe, to get it; some things are around sharing your medical data. They each have specific use cases right? And you need to be able to ask an author for a bid, similar to, like, the SBIR process, small business research grants.

You can do this through the SBA; you can do this through Better Business Bureau; you can do this through our trade association, which is the Digital Asset Trade Association; or they can all work together.

There are many chains that are inclusive that are interoperable, and many chains that are completely exclusive. It just depends, right?

A great example, or way to explain this is, think of operating systems for a computing or a phone, right? A Macintosh, for instance; you're able to load PC software, and then you can use both systems; same for UNIX, right? However, PC is the other way around, right? You can't necessarily do this. They're all different operating systems; they're all different infrastructures; they're all different byways, highways, whatever.

ASSEMBLYMAN FREIMAN: Thank you.

MR. WISE: Absolutely.

ASSEMBLYMAN ZWICKER: Any questions?

ASSEMBLYWOMAN DeCROCE: I just have one.

MR. WISE: Yes.

ASSEMBLYWOMAN DeCROCE: When it comes to cybersecurity concerns -- I mean, you know, when you're talking about health records. What about the security of that information that should, under the HIPAA laws of New Jersey, be protected or whatever? How would that all be -- how do you assure the public that that's protected enough?

MR. WISE: Sure. So one of the main premises behind blockchain is something called a *hashing system*, okay? *Hashing* is basically saying -- there are three mikes; only one of these mikes is going to go

forward. Let's get a user identification, or something like that, that is completely anonymized, right?

At no point do you know the name of each of these mikes; in fact, the name and the profile would actually take up too much space on a blockchain anyway; it sort of defeats the purpose.

So, alternately, what you would be able to do, from a theory basis -- I'm not currently working on a medical blockchain, but I do advise a couple of these businesses -- ultimately, what they do is they allow the patients to have the go-between -- right? -- the only time where they can create the link. Anytime that there's a trial, a survey, a new doctor who requests their records, they just give an access key to be able to get this, right?

That's really the best way -- is to offer the citizens, the people who have this data, or who are producing this data -- this asset that does have intrinsic value here -- to be the ones to offer it up. Across the board, whether it's social media, whether it's your e-mail, whether it's phone records, payment records, or medicine, the same thing needs to happen, and that is exactly the purpose of blockchain. It creates a way for the broad strokes, the macro level, to stay completely auditable and transparent; and yet, immutable yet the private stuff to stay private. That is exactly the point.

ASSEMBLYWOMAN DeCROCE: So I'm just trying to understand completely with this.

MR. WISE: Sure.

ASSEMBLYWOMAN DeCROCE: So if a healthcare facility has blockchain, they have a patient. So they invite the patient to -- with a security member -- to log in to the portal. Is that how it works?

MR. WISE: So they can essentially just give a password.

ASSEMBLYWOMAN DeCROCE: Okay.

MR. WISE: Or they can create a new password, and they can give a password to anybody who wants to request it, right? In order to explain this, I think it's advantageous to explain how the system works currently, without blockchain, okay?

Currently, a health network, a hospital, anything like that will have a centralized database of exactly all of this. The issue with this is that it's very, very, very difficult to actually separate out patient user data -- who the patient is from what their records were. Things get lost; and for something like medical information, you really don't want two patients' information to get flipped.

ASSEMBLYWOMAN DeCROCE: Right.

MR. WISE: It ends up being a really big problem.

However, this also leads a huge exposure. That means it's one drawbridge to get into the entire system, okay?

Hospitals are much more focused on keeping the medical records correct and healing people than they are protecting data. Even a data company like Facebook is much more interested in making money than they are protecting user data, right? This is exactly the point. Each of those systems, or every one of those health networks, could store their data on the exact same database; and yet their own private system has only the user data, not the medical information.

ASSEMBLYWOMAN DeCROCE: I see.

MR. WISE: Okay? They are the ones that then are creating the link between the patients and the medical records. What that means is that research institutions, universities, clinical trials, or anything like this could use the blockchain data, which could be open sourced, explaining a macro level of everything that's going on with patients, or citizens of New Jersey or wherever. They could use all that information for medical research, clinical trials; and you can even export this data to international nations or other research institutions; you can even share it without ever creating a link or breaching to who the patients were.

This is a really big deal for, say, HIV or AIDS research -- right? -- where a lot of people would be very private about this. It would be the same thing for the human growth hormone research outside of the U.S., right? Much of this stuff is not legal in the U.S.

Another huge example, or good example here, is that in the U.S., genetics research is not patentable, yet it is in many other nations, right? This is extremely advantageous for us to get this information in.

ASSEMBLYWOMAN DeCROCE: To access that.

MR. WISE: Yes.

ASSEMBLYWOMAN DeCROCE: Just one other question, if you don't mind, Mr. Chairman.

ASSEMBLYMAN ZWICKER: Please.

ASSEMBLYWOMAN DeCROCE: How does that work with, like, banks and credit card companies? Because you're always hearing the horrors of individuals -- you know, their Social Security numbers being

stolen, people accessing into their credit cards, their checking accounts. How is the security on that when this is--

MR. WISE: Sure. So again, it's best to explain the way that the system works now.

For banks or credit cards, their access key is a social security number, a password, and a user name -- or a bank account and everything. All the data gets crushed together, and it leaves one very large point of entry. Not that big of a deal if you require every single bank to have a different password and user login. But this makes it too difficult for people.

You -- using a blockchain, you can create a network for banks or anybody else -- financial institutions, even enterprises, corporations, businesses, whether they are small or large -- to be on a common, sort of -- not necessarily a common protocol, but a common process -- right? -- and sort of a streamlined process, where these things can be audited by pretty much everybody. And thus, you limit both the exposure risk of data getting stolen, as well as fraudulent activity.

At the same time, that user, that person who has a credit card, a checking account, or something like that, doesn't actually need to give the bank any information about themselves, right? All they need to do is register, maybe, their public key with the state or whomever.

ASSEMBLYWOMAN DeCROCE: I see.

MR. WISE: One other thing that I just mentioned, that is kind of a technical point here, is that most logins for data -- whether it be social media or something else -- uses a single sign on, or they use a single password and user name. The way that blockchain and cryptocurrency business -- particularly bitcoin was really one of the bigger ones to kind of

get this out there -- is there is a public key which allows for basically identification, and there is a private key which allows for access. These things are both cryptographically secured. You can give out a very long public key -- like a wallet address or, in many respects, we'd think of it as like a routing number -- and then you would have your own account number, right? Both of these can require a password to get into.

ASSEMBLYWOMAN DeCROCE: Okay; thank you.

ASSEMBLYMAN ZWICKER: Thank you very much.

MR. WISE: Absolutely. (applause)

ASSEMBLYMAN ZWICKER: We're going to require clapping in all our hearings. (laughter)

Come to the State House; it's much different. (laughter)

Next, from AuraBlocks -- we have two people, so I'd like to ask you to come up together.

I'm sorry; I'm going to mess your name up. Murty Yarlagadda Kiran Kumar, and Richard Brownstein.

RICHARD BROWNSTEIN: Great.

ASSEMBLYMAN ZWICKER: And it's up to you how you want to-- Who wants to go first?

MR. BROWNSTEIN: I'll share a little bit; sure.

ASSEMBLYMAN ZWICKER: And if you could, for the record, who you are--

MR. BROWNSTEIN: My name is Richard Brownstein; I am the CEO for AuraBlocks.

KIRAN MURTY: My name is Kiran Murty; I am the CTO of AuraBlocks. We are a blockchain consulting company.

For a living, we talk to executives in organizations trying to convince them, and actually get them, to agree to our point of view as-- Blockchain, as a technology, is a phenomenal platform technology, for the next 10, 20 years, to innovate and build upon.

With that said, I'll let Richard start; and I'll take my few minutes.

MR. BROWNSTEIN: Now, we'll just kind of free-flow here a little bit.

We hear the word *blockchain* a lot; and oftentimes, it's just a common word. But what is it really? I'll give you my two-minute version to help you understand the version of it.

So pretend that you're on a stage; Kiran and I are on a stage, and there's an audience of 500 people. And I say, "I have \$5." Everyone writes it down on their pad of paper that Richard has \$5. And then I say, "I'm going to give Kiran \$2," and everyone on their pad of paper writes down, "Richard just gave Kiran \$2."

That essentially is what's going on. In other words, is there any dispute that I had \$5 to begin with? Well, if someone says, "no," I have 499 people who say I do; so the truth is, the majority wins.

And then the next block that was built was -- I gave Kiran \$2, and everyone wrote that down. And is there any dispute that I gave Kiran \$2? Well, maybe a few people are disputing; but the reality is, the majority wins; I gave Kiran \$2. That's really what blockchain is.

ASSEMBLYMAN ZWICKER: You owe him \$2 right now, by the way. (laughter)

MR. BROWNSTEIN: Yes, I owe him \$2 right now.

So now that we have a basic understanding of blockchain, let me just share about some of the opportunities that blockchain can solve.

Now, we use this as a *use case*. My background is financial services; for 28 years I was a CFP; I ran a financial company, about half a billion dollars. And I sold the company because I believed in this technology so much -- okay? -- that it's absolutely going to revolutionize a lot of-- It's going to get into the fabric of every single business that's out there.

So a common problem is knowing your customer, in the financial world. So when we go into a bank, all too often it's like, "Who are you? Write this down; show the ID." They go through a whole litany of *who are you* to verify that you are who you are, right?

And then when you open up another account at bank number 2, you do the same thing; and bank number 3. And then when you have to do anything else, it's always that bunch of information that has to be consumed by the bank or the financial institutional.

So now what would happen on a blockchain is -- think of the one bank that takes in all the information; and as all of the other banks believe that that bank is doing the right thing by getting the right information, I am now in control of my information -- not the banks anymore -- by using that blockchain concept, as you heard earlier, with the private key and public key, right?

So I might to go to bank number 2, and they say, "Who are you?" and I just reach in and give them a little bit of a private key -- personal key -- that gets them the information they want instantly. And I go to any institution; I'm in control. They can't access it, they can't give it

away. There might be a time limit to it, where you can use it for-- But I'm in control. That means if someone wants to use my information, they can pay me for it; so I can actually monetize my information. Let's say there's a study going on and they want to know certain things. I can release that information for a fee, right?

So there's a *know your customer* or *anti-money laundering* concept there, right?

Another possibility -- I come from the music industry as well, so I'm going to give you a music example.

When I was in the music industry in the early 1980s, my friends -- professional musicians, very famous -- were making a lot of money doing *jingle dates*; you know, advertising for radio and TV. They made a lot of money; and then they sent -- then they would do some records -- they were before CDs -- and they would sell their records and made a lot of money.

Now, roll the clock up; here's what's going on. Because there is no control of the digital information -- remember, when it's a record, you really couldn't copy that too easily, or you made a tape and you sent-- But now with digital, it can be sent all over the place, copied; they have DJs that take tunes from *A* and *B*, mash them together, and they're using parts of my tunes for something else. And now those same musicians, when they create music, they're going to wait two years; and before, they used to get a big check, now they get a very, very small check. And the reason is because the industry wants to pay them, but the problem is they don't know who to pay.

And with blockchain, by being able to get my credentials as a watermark into the music, so that no matter where it's moved to it will always have my stamp on it; and using what's called a *smart contract*, which is nothing more than executable business logic, I can get paid instantly whenever that song is played anywhere. So that's a revolutionary structure to a broken industry, the music industry.

In supply chain -- one more example; last one. We learned recently that 95 or 99 percent of all the flowers, all the flowers that are sold in Europe, are actually grown in Kenya; believe it or not. All the flowers that are sold in Europe are grown in Kenya. Now, ask yourself -- one of the problems is that the flowers have to get on a ship to Europe and then distributed. And with bill of lading, and all the trade finance that goes on with the insurance, reinsurance, and everything that goes on; and there are multiple transactions -- oftentimes the shipment gets there before the paperwork does, and you'll get spoilage. Twenty-five percent of the shipment is garbage.

Just think about this. How many times do you think a transaction needs to take place to get flowers from Kenya to Europe? The answer is, 300 transactions. When I heard that, I thought, "Well, I'm thinking 12, 15 maybe." It's 300.

So with blockchain, what's going on is you have this one -- let's call it one *ledger* of this bill of lading and all your information relating to this boat of flowers. And everybody simultaneously has that same ledger. So they call it a *distributed ledger*, right? It's really one ledger, but everyone has it. And anytime somebody makes a change on that ledger, everybody knows it at the same time.

So all of these different systems, and transport vehicles, and bills, and so forth are always instantly updated as that shipment moves across the 300 transactions. So you'll always have a valid structure that will be real -- *the truth* they call that -- and that will be how blockchain can dramatically change the way supply chain and logistics can work.

So these are just some primary examples; and that's why we're in favor of putting this through as a bill for New Jersey.

MR. MURTY: All right; thanks, Richard.

I'll take five to seven minutes; and the next five to seven minutes I'll be talking about three distinct topics.

Sitting where you're sitting, I'm sure technology is just a tool for you. But what you're looking at, with respect to the blockchain as an ecosystem, is what broad strokes you can take, innovations you can put in place to bootstrap this ecosystem.

So my conversation is going to be around two things: one, consumer experience and consumer protection. If you look at the entire gamut of responsibility, sitting where you are sitting at can be aggregated too. I look at it as citizen services for everyone in the State of New Jersey, and what you can (indiscernible) as an experience, and their interaction with you as a government. And two, how you can protect them, being part of the system, as the State of New Jersey.

From a technology standpoint, what's happening in industry is twofold. The entire conversations that are happening in Delaware, Wyoming, Illinois, Arizona, and New York -- our friendly neighbor -- is around consumer protection. Consumer protection as in there is an entirely parallel capital market shaping up in the industry today called *crypto*.

Cryptocurrencies, as in they are finding a new medium to pay for services that we haven't in the past. A fiat currency and capital markets was what we knew and grew up with for the past 30, 40, or even 100 years, that is going to be changing in the next 10 or 20 years. And therein comes the whole conversation around consumer protection.

All the conversations in the states that I've detailed, and that are in progress today -- there is an entire set of conversations happening just around the fact that, should value be exchanged and paid for in currencies that we do not understand so far, how do we put consumer protection policies in place for this new medium of value exchange? That is section number one.

And that's where the laws around -- do we put policies and rulemaking in place to protect the consumer and make cryptocurrencies and the whole ecosystem around that legit?

And I'll go to the technology side of it, but I'm sure when you get to those broad strokes, you will commission the right people to help you with the nuances around the technology itself. But if you are looking at the country, the world, and industry itself, where activities are happening, there are two things: The technology is being used to enhance consumer experience; and an entire conversation is going on around consumer protection.

So we talk about consumer protection. Cryptocurrencies need policies and regulations as capital markets. There are bodies in the country that do it, and do it very well; the SEC is on the case, the FTC is on the case, Wall Street is looking at it. But from a state, what is that you can't be involved with? And my answer, or my view, or my sincere opinion is,

understand what is of concern to the consumer, to the lawmaking bodies at the national level; and what responsibility you would take as a share of it and say, "How would I promote innovation, not curtail it, but in a way I deliver on my responsibility around consumer protection?"

That is all that is happening around crypto.

Just know this -- that today people are exchanging real estate titles by escrow accounts and fiat currency. That might change in the next 5 or 10 years. And the question you should ask yourself, and our State itself is, are we positioned to enable that transaction in a medium that we don't understand so far, but we have to in the next five years?

So coming to consumer experience -- I don't like what I do on a regular basis in my life today. And the three experiences I don't like today are three things: As a resident of the state, I hate going to my primary physician doctor or pediatrician every single year when my kid goes from grade A, to a grade B, to grade C. My kids are in 3rd grade and kindergarten. Every time I do it, I need to go and submit a vaccination report. And you know what happens? The friend that stays, paid \$10, "Come tomorrow, I'll get you a paper. You can go and give it to the office and the school." Really? We are flying rockets to the moon, and we are launching private engines to space. And yet we console ourselves saying it's okay to go to a pediatrician and get a paper report of my kid's vaccination report and send it to the school. If you are looking at a fundamental platform technology to alter that behavioral pattern, wherein the school says, "Kiran, your kid is coming to 3rd grade; you want to send in an approval so that we get his vaccination report?" And by the way, that comes from the ledger, where Richard was talking about -- this uniform

system, sitting in the state system -- and all I delegate is access for one-time view and approval. That's blockchain.

Point number two: I own a little real estate property; most of them Section 8 and funded by the government -- the tenants are. Thanks to them -- I really thank them for supporting that, whatever those policies are. But the funny part there is, every year the property goes through four distinct applications for inspections. Every inspection has 20 things that they check out. Which is great; but you know what? Every such inspection does exactly the same thing, every single time, 80 percent of the time. What good use of the time is that for that inspector to do the same thing across four distinct siloed bodies within your organization that you are responsible for -- where you can save \$6 on a \$10 allocated budget and use it for something else? And that's the power of blockchain as a common ledger, where a township inspector, a State inspector, and a fire department will know exactly what this property has gone through during that academic year with respect to inspections; and is that something I'll buy, or redo, or say, "I'm okay with it"?

Experience number three: You're fielding press; and the press is asking you, "What happened that we had four people in this township get impacted with lettuce that was contaminated? Do you have answers?" And your answer is, "Well, the FDA is looking into it," or "We have our team looking into it. We'll figure out what the details are, and we'll get back to you." It worsens. You look at a system of every food or asset that is important to you and your citizens in the state and say, "How did this piece of food make it to where it did, and what is its track record with respect to something we call *provenance*?" How did this piece of asset or food item

come from wherever it did and land in my state? And you should say, “Let me take 10 minutes,” go back and check with my tech boys and say, “Who and where did this restaurant get the lettuce from, in the past 24 hours, that it served to its citizens?”

So there is no ambiguity in what you state and know, with respect to what is happening. There is data, and there is ledger data that everybody in that ecosystem knows. And that’s the power of blockchain.

So these are the three things, as use cases -- what the promise of the technology is, right? -- and all this comes from consumer experience. If you are looking at an Assembly or a Senate hearing, where you have 24 municipalities within your state all talking about one incident, but you overwhelmingly see this pattern where none of them have exactly the same piece of information every single time-- If you have 24 municipalities talking about an asset, and quantitatively qualifying it saying, “I have data *ABC* about this asset, and it doesn’t check out with 60 percent of the municipalities,” that’s a problem you can solve with this technology. And you can actually save dollars.

So consumer experience, consumer protection; consumer protection, where we talked about it -- consumer experience is what you can do; but what you can do about it from policy making, right? So where things are now, or what you can do, is figure out what the State is really good at; what consortiums -- unlike any other innovation, where innovators and entrepreneurs don’t want government to get in -- for this time around, we want government to actually get in the business of what we are trying to do. Unlike any other technology where it gets sold as a piece of productive software to one person, here is a technology where it needs to bring people

together; distinct parties that don't talk to each other, together, and say, "Let's build better systems." And no entity in the country is better positioned than government, wherein you can say, "I'm going to bring this consortium, or trade body, within my state," and say, "I'm going to set an agenda where everybody needs to play, and play well." And that will automatically spur innovation and jobs in this ecosystem.

With that said, thank you for the opportunity, and thank you very much.

ASSEMBLYMAN ZWICKER: Thank you very much.

Questions? (no response)

Any questions? (no response)

Thank you.

MR. BROWNSTEIN: Thank you.

MR. MURTY: Thank you.

ASSEMBLYMAN ZWICKER: Oh, yes; one second.

ASSEMBLYWOMAN DeCROCE: Just a comment.

Because you touched on municipalities. And before I was a legislator, for 20-some years I worked in local government. So one thing that I think could help the municipalities with this is, under OPRA -- Open Public Records Act -- and how the towns complain so much because they have to go to every department; they have to go and look up records all over the place, trying to verify the information that has to be back in a certain amount of time, according to the law that the Legislature has set. So this may certainly help the municipalities in that aspect.

ASSEMBLYMAN ZWICKER: Yes.

MR. BROWNSTEIN: One comment: Yes, it will; but what happens, that will be to the detriment-- Right now, all the municipalities-- Let's call about a land title, right? A land title is pretty much a uniform process with all the municipalities. In the blockchain world, if a couple of municipalities, locally, get together and say, "Let's develop our own blockchain for dealing with this issue" -- great. Then another group of municipalities does the same thing. But the problem is, they're development in what they're doing is very different from the first one. And now you're going to end up with fractionalized versions of the blockchain for municipalities and coordination.

MR. MURTY: And to add to that, Mr. Freiman's question was--

MR. BROWNSTEIN: I was just going to say--

MR. MURTY: Exactly; he said what's going to happen when these blockchains don't talk to each other? What you're witnessing in industry today is what you all witnessed back in the browser days -- where we had 20 browsers; and today we tend to have three or four. Interoperability is the name of the game. But should you commission those broad strokes, what we'll have is every municipality in our state talking to every other; and everybody calling an apple an apple, an orange an orange. And only you can do that.

ASSEMBLYMAN ZWICKER: Right; and I think that's exactly the point; unless you're still using Netscape, then-- (laughter)

MR. BROWNSTEIN: Thank you.

MR. MURTY: Thank you.

ASSEMBLYMAN ZWICKER: Right? Thank you.

Next is Alan Dickman from IBM.

BARBARA DeMARCO: Good afternoon.

I'm Barbara DeMarco with Porzio Governmental Affairs.

I'm here today with the world leaders -- global leaders in blockchain technology, IBM. And they have passed out for you two pieces of information; and Alan is going to give you an overview of what we're doing so far globally, as well as things that can be accessed by students, professionals, etc.

ASSEMBLYMAN ZWICKER: And what are you-- Identify yourself for the record, and tell us a little bit about what you're handing out.

ALAN DICKMAN: I'm sorry?

ASSEMBLYMAN ZWICKER: Identify yourself, but then also tell us what you're handing out.

MR. DICKMAN: So my name is Alan Dickman; I'm with IBM. I'm a blockchain solution consultant.

And we're handing out, essentially, two exhibits. The first is a one-page flyer on what IBM offers around blockchain for academia. You know, we've had New Jersey Institute of Technology and Rutgers here. And this offering is really -- it's a free offering, first off, and it makes available the information about blockchain for teaching purposes, and also gives information about how students can access blockchain for free.

The second is an exhibit around our ideas for -- in favor of the Bill that we're discussing.

Is that good?

ASSEMBLYMAN ZWICKER: Yes, thank you.

MR. DICKMAN: Okay.

So good afternoon, and thank you for giving me the opportunity to speak.

There are three imperatives that are driving IBM's vision for blockchain in State and local government. The first is actually open government, the ability to share information -- which we talked about just a moment ago -- cybersecurity, and privacy, and regulatory compliance.

So blockchain can help in a lot of ways at the State and local level. You can automate processes spanning multiple systems, and actually multiple organizations: State governments, municipalities, businesses, healthcare providers, and payers. It can choreograph the sharing of that information as well, secure the data with cryptography. You can use smart contracts to enforce regulations and assure better compliance, assure better consistency. You can capture information in a single place so that you can improve audits and verification. And using blockchain -- the other thing you can do is, you can replace all of these paper-based processes, which live inside of State and local governments, and you can reduce data reconciliation.

So slide 3 -- IBM has worked on more than 400 blockchain engagements worldwide, including with the Emirate of Dubai, the state of Delaware, a city in the Netherlands, and a port authority in the United States.

And so I agree with several people who spoke earlier that blockchain remains in the earliest stages of implementation across industries. But what we're seeing, through successful projects at least, is it's showing productivity increases of about 20 to 40 percent. And these are

just the first projects. There's additional value to be derived as additional projects are undertaken.

Other benefits include reduction in cost, delays -- reduction in delays, reduction in fraud, serving the underserved, as well as a lot of business model innovation.

So to the next slide -- there are different kinds of blockchains, *permissioned* blockchain as well as *permissionless*. IBM actually started down the road using a permissionless blockchain; but we found that it's a little bit difficult in several business solutions.

Now, there's no one size that fits all for blockchain; but IBM is recommending that for State and local government applications -- most State and local government applications -- you're probably going to want to use a permissioned blockchain.

Just as an example, you want to control the access to child support records, child protection records. So you need to control that; you can't do that with anonymity. You need the ability to identify who's doing what, and permissioned blockchain gives you that capability

Let's go to slide 5, please.

So as you've heard from other speakers today, several states are enacting legislation to foster the use of blockchain. A lot of them are codifying the rules concerning ICOs -- *initial coin offerings* -- that are used to raise funding. Colorado, where I come from currently, is considering managing the supply chain of marijuana use in blockchain. Delaware is in the process of implementing blockchain for uniform commercial code filings. Utah and Illinois have created proofs of concept with blockchain. There's one state that we're working with that is working on a disaster

recovery solution involving blockchain cognitive social media feeds and IOT.

So if New Jersey wants to be a leader in innovation around blockchain, you really need to move fast. In fact, really the real question is, what segment of government you want to be the leader in.

So slide 6: Recognize that blockchain is a platform. It's like an operating system. You build applications on an operating system. So what areas of government are ripe for blockchain applications? Well, so financial management may be the best target for blockchain solutions. For one thing, blockchain is largely proven in the financial community. And so it would be very easy to enlist financial institutions in a blockchain solution. Use cases here include clearing and settlement of accounts; issuance of tax or carbon credits; laws regulating the taxation of money transfer. But honestly, we've also talked to states about using it to do monthly settlement on their bank accounts that they hold in various banks. And one state in particular is thinking about using it for enabling the creation of comprehensive annual financial reports. Today, financial information sits in a number of systems that are not linked together; and it takes 180 days to produce the CAFR report. Where, if it all sits inside a blockchain, it could happen much quicker; and actually, the auditor has a much easier job looking at the information that you provide.

So financial management is the first area that is really ripe for blockchain.

The second is regulatory compliance. Here the use cases are licensing; you know, licensing of bank auditors, licensing of craft people, and re-licensing of them.

We've talked about supply chain; that's another good area.

But what about collection of tobacco, alcohol, or other value-added taxes -- putting that on the blockchain, getting vendors to put that information in so that you're sure that you're getting the tax revenue you're owed?

However, please also consider blockchain for citizen services, such as-- Because that's where you're going to provide the best -- you're going to, most directly, improve the lives of your citizens -- your residents of New Jersey. There are a lot of ideas here for use cases. There's e-residency, child protection services, Medicaid eligibility, welfare eligibilities, as an example.

And so I'm going to stop there; but I'm willing to take questions.

ASSEMBLYMAN ZWICKER: Thank you,

Three years from now, if you look into your crystal ball and you're looking at states all over the place -- right? -- what do you see as the next up-and-coming application? There are many on this last slide here; which one do you think is most ripe for really enabling a blockchain technology?

MR. DICKMAN: I have to be honest; I don't think there's one area-- That's why I say I think you really have to choose where you want to lead.

I can tell you, if you're looking across a variety of industries, it's going to be supply chain, probably. Because there are things coming this year -- there's going to be a lot of announcements this year. In fact, some

have already happened; I mean, IBM and Mærsk, as an example, are doing global logistics in supply chain.

There are going to be some announcements; we're working with a lot of companies in the health care space, and there are going to be announcements this year around claims processing, and some around medical records; although that's a really difficult area.

In the government space, I would say, you know, there are a lot of use cases, but they all sort of fall under citizen identity -- the ability to identify a citizen.

Incidentally, there's an architecture that's evolving in that space, which isn't centralized; it's very decentralized. As an example, you know, giving me the ability -- I'm having trouble pulling out my wallet -- but giving me the ability -- oh, forget it -- to put my medical records in a digital wallet and determine who gets access to them, as an example. You don't actually care what the blockchain is under this architecture, because it can be Ethereum, it could be Hyperledger -- it can be anything, and the architecture supports that.

But also the ability to put hunting licenses, and property information, property taxes, residential information; and giving the citizen the ability to electronically control it. And I think that might be the biggest opportunity in State and local government.

ASSEMBLYMAN ZWICKER: Okay; thank you.

ASSEMBLYMAN FREIMAN: Well, I thank you very much.

And I don't know how I got tagged with the electronic medical records today-- (laughter) It was just an example, I assure you.

ASSEMBLYMAN ZWICKER: When are you introducing your first medical records legislation? (laughter)

ASSEMBLYMAN FREIMAN: Just an example.

So I find this fascinating; and again, my questions will share how little I know about this topic.

So the opportunity-- Applications of blockchain -- it's just emerging and it's just overwhelming, so-- Or at least -- not overwhelming, but it's just enormous, and I'm getting very excited about where we can go with this.

MR. DICKMAN: Good.

ASSEMBLYMAN FREIMAN: And I reflect back to your slide number 5; and something that struck me that you said -- you were conveying a sense of urgency; that we have to move fast if we want to take a lead and be a leader on this.

And forgive my question: Why? And the reason I'm asking that is, I think of Apple Corporation (*sic*). They weren't the first in anything. They were a fast follower, and a very intelligent fast-follower in almost everything. And they were very precise and thoughtful on how they went after things, and allowed others to make costly mistakes along the way.

So as we are learning that a lot is emerging, and a lot is filtering out, and a lot is to be had; in figuring out our space -- why the rush, versus the thoughtfulness? And not being slow; but why the bleeding edge?

MR. DICKMAN: So the only answer-- And the reason I mention that is simply because there's so much innovation going on across a number of states.

ASSEMBLYMAN FREIMAN: Okay; I'm not saying slow; I'm not saying not dive into this all the way.

MR. DICKMAN: Sure.

ASSEMBLYMAN FREIMAN: But-- Okay; thank you.

MR. DICKMAN: I mean, that's why I think you, you know-- Plus, I mean, think about the breadth of State and local government. I mean, the breadth is awe-inspiring; what, I mean--

ASSEMBLYMAN FREIMAN: It's exciting.

MR. DICKMAN: --what you guys do. So that's why I really think, you know, pick your battle.

ASSEMBLYMAN FREIMAN: Good insight; thank you.

ASSEMBLYMAN ZWICKER: Assemblywoman.

ASSEMBLYWOMAN DeCROCE: One question: Where is the Federal government on this issue?

MR. DICKMAN: On blockchain generally?

ASSEMBLYWOMAN DeCROCE: Yes.

MR. DICKMAN: Okay; well, you know, as large as the State of New Jersey is, the Federal government is actually bigger; it's hard to believe.

So there's a lot happening at the Federal level; and they're moving, I would say, with appropriate speed. There are blockchain groups that have formed inside of Congress to look at these issues; actually, somebody in my home state is actually part of that group looking at how blockchain can be used.

More generally, or more aggressively, we're actually working with the FTC and the CDC on, for example, clinical trials -- in applying blockchain within clinical trials.

ASSEMBLYWOMAN DeCROCE: I see.

MR. DICKMAN: Another thing that we're doing -- we talked about medical records. We're working -- sorry -- I work in the space, public sector, which includes health care, life sciences, state and local governments; and that's where I play and that's what I know the most about.

We're working with the FDA and the CDC on an architecture by which people can take control of their medical records. The medical information, you know, is not necessarily going to sit inside the blockchain. Companies have invested -- in fact, some of them have invested billions of dollars in EHR medical records systems and the like; and they're not going to suddenly scrub those and put everything into a blockchain. And there are questions of scalability and all kinds of things like that.

Really what they're looking at is using blockchain as sort of a gatekeeper that says, "You have the rights to this information. We verified that you have the rights to this information, and you have the rights to distribute this information to other players." And so we're working with the Federal government on an architecture by which you can do that; not just at an individual state level, but across the country.

ASSEMBLYWOMAN DeCROCE: The reason I ask that is because, when you're talking about the FTC, or the CDC, or any of them that they may be looking at and working with pertaining to health -- and I think about the FBI, and state government, and local government, and police, and global terror, and working with nations with this -- why can't

there be a solid system there where we could have information about individuals who can cause harm to us, and everybody have access to that information so it is shared across the United States and with other countries? I mean, I would think that would be at the lead of something the Federal government or the FBI should be looking at -- to work and break down, with the states and the local governments, to share the information from -- right where someone lives.

MR. DICKMAN: And there's no doubt about that.

You know, they're picking where they want to go first; medical records is a particularly good area. But you know, you think about cigarette taxes; everybody taxes cigarettes; they go across state lines. You know, a Federal opportunity would be in the supply chain of cigarettes or other tobacco products.

You also raise another issue that I think Assemblyman Freiman -- you know, that resonates with what you mentioned. You know, there are places where you don't want to get ahead; and some of these areas, like consumer medical information, is one of those areas where you don't want to get ahead because, ultimately, I think the Federal government is going to do something there.

ASSEMBLYWOMAN DeCROCE: Okay; thank you.

ASSEMBLYMAN ZWICKER: Thank you very much.
(applause)

Next we're going to call two people up, Lilya Tessler and Alexandra Scheibe, from McDermott, Will & Emery.

L I L Y A T E S S L E R, Esq.: Hello; good afternoon.

Thank you for inviting us to testify today.

My name is Lilya Tessler; I'm a partner at McDermott, Will & Emery.

A L E X A N D R A G . S C H E I B E , Esq.: And I'm Alexandra Scheibe; I'm also a partner at McDermott, Will & Emery.

Lilya is going to start; and then I'm going to speak for a few more minutes about Federal and State regulations.

MS. TESSLER: So Alexandra and I lead the firm's fintech and blockchain practice. We just wanted to also make a statement that the views expressed today are our own.

For those who are not familiar with McDermott, Will & Emery, we are a global law firm with 19 offices and over a thousand lawyers around the world. Our fintech and blockchain practice is known to be the industry leader in this space.

As many of you have heard from earlier speakers, blockchain is a transformative technology that will create innovation, and has the potential to foster economic growth within the State of New Jersey.

We have seen an explosion of new projects using this technology across many different industries.

Many of our clients are using it to revolutionize industry, such as health care, supply chain management, entertainment, telecommunications, and financial services. Nevertheless, each industry has its own regulations that need to be considered in the context of implementing blockchain technology, which we refer to *contextual regulation*.

The creation of digital assets, also known as *blockchain tokens*, is an important component of designing a blockchain ecosystem. Blockchain allows you to digitize any tangible or intangible asset. The features and

functionalities of each of these digital assets should be considered differently, in the application of the regulation, to the technology that stores or transfers such digital assets.

Digital assets may represent a medium of exchange, a licensed software, an ounce of gold, medical records, or your identity.

We also want to note that blockchain is a global phenomenon; and therefore, the focus of legislative initiatives on a global scale. Many countries around the world are embracing blockchain technology and implementing regulation to promote innovation and growth of technology companies within those jurisdictions. They are also trying to drive innovation into those particular countries.

New Jersey has an opportunity to create a friendly regulatory environment and deter the innovation from going to other states, as well as to other countries.

We're also seeing blockchain technology, digital assets, and virtual currency, specifically, as a focus of U.S. Federal regulators, including the U.S. Securities and Exchange Commission, the Commodities Futures Trading Commission, and Financial Crimes Enforcement Network. We've spent most of our time, in this last year, dealing with a lot of these Federal regulators and helping navigate this complex regulatory environment. We think it's very important to have a good coordination among the regulators, both at the Federal level and the state level.

When there's coordination, then the people who are designing and using the technology will have a better idea as to what the regulatory expectations are for the technology, rather than having to comply with

newer regulations across different states, and causing a lot of chaos and havoc for them as they try to implement this new technology.

At the Federal level, one open question is, when are blockchain tokens considered securities? As previously mentioned, blockchain tokens can be a digital representation of anything. It is clear when you tokenize equity in a company, that that would be a security regulated by the SEC. Yet it's uncertain if a blockchain token, that has other features and functionalities, would fit within the definition of a *security*, such as health records. No one would argue that health records themselves would be securities; but if they are digitized on a blockchain, are they securities?

Given the ambiguity, many blockchain projects are selling tokens pursuant to exemptions to Federal and state securities' laws. In addition to considering the securities laws, blockchain tokens are considered virtual currencies by the CFTC, and may be commodities which are regulated by the CFTC if they represent a swap, a derivative, or a futures contract.

The Federal regulation of secondary trading platforms for digital assets is also an important factor for states to consider when they adopt new legislation or enforce existing regulatory requirements.

The SEC has made public statements that trading venues for blockchain tokens and other digital assets -- such as exchanges or alternative trading systems, and other liquidity providers -- may be subject to SEC registration requirements if the tokens are deemed to be securities.

If the tokens are considered swaps, derivatives, or futures contracts, the platforms may need to be registered with the CFTC as a

futures commission merchant, swap execution facility, or as a designated contract market.

The same trading platforms may also be subject to registration requirements with FinCEN as a money services business. Given the breadth of this Federal regulation, it's important for state legislatures to adopt or enforce existing legislation that is consistent with the existing current Federal regime. Otherwise, companies developing these innovative blockchain technologies will suffer the unintended consequence of hindering innovation.

Blockchain projects that we deal with -- they all want to comply with the requirements at the Federal level, at the state level, and on a global scale most of the time. But they raise concerns that there are a lot of inconsistencies and there's a lot of ambiguity with this new technology. And it's very difficult to apply those laws and very difficult for us to interpret those laws, given all these inconsistencies among the various regulatory regimes. So it's something we want the Legislature to consider as they propose new regulation in this case.

We urge the State of New Jersey to collaborate with other regulators in creating consistent regulatory frameworks that apply to the creation of this technology.

I will now hand it off to Alexandra Scheibe to continue the discussion.

MS. SCHEIBE: Thanks, Lilya.

Just a little bit about my own background.

I have a background in both municipal and structure finance; and I came to the blockchain space over -- really, over the last year.

Our practice has really evolved in a lot of different ways. We represent financial institutions expanding into blockchain; startup companies; existing companies that are implementing blockchain solutions; consultants, advisers, and others seeking to provide services to blockchain companies; trading platforms and exchanges, as Lilya mentioned; family offices and investors; companies interested in adding infrastructure using blockchain to their existing industries; and also money transmitters that people have discussed today. So we're really trying to see a broad scope of the industry.

We also want to point out that we have heard a concern today that there's -- certain people may think that facilitating blockchain could attract bad actors or possibly fraud into the state. And one of the things we think is an opportunity for New Jersey, is that to build blockchain infrastructure from the beginning, and facilitate expansion in a deliberate way, is a good way to, you know, open the door for positive actors while keeping fraud and bad actors out of the state.

We spend a lot of time consulting people, obviously, on the legal and practical ways to do things. And we're very focused on enhancing opportunities for people who are trying very hard to follow law and regulation.

In addition, we wanted to point out that, as other people have said today, state lawmakers and regulators around the country have really taken an interest in blockchain. We wanted to give a brief overview at a high level of a lot of bills, and bills and statutes that have been introduced or adopted around the country, to address your fast follower point -- which I didn't even know you were going to say.

We understand about 38 states have determined to study blockchain in various forms; and have introduced bills or adopted laws addressing the blockchain space. We can't mention all the laws passed or bills studied; we can broadly classify them into, really, six categories: facilitation of growth of blockchain in a state or municipality; attracting industry to a state; allowing the use of data stored on a blockchain in various ways; addressing the treatment of blockchain tokens under certain state securities' laws; addressing taxation of virtual currency and blockchain tokens; and addressing money transmission.

I want to highlight some details in a couple of these areas. These descriptions, you should know, are taken from publications on a municipality or state's website, or other secondary sources.

In addition to the Wyoming discussion that we had earlier, I wanted to highlight the State of Illinois Blockchain Initiative. According to their website, Illinois recently announced a consortium of Illinois state and county agencies, known as the *Illinois Blockchain Initiative*, that's collaborating to explore innovations presented by blockchain and distributed ledger technology. The stated goal of the initiative is to determine if blockchain technology can be leveraged to create more efficient, integrated, and trusted state services, while providing a welcoming environment for the blockchain community.

Blockchain and distributed ledger technology has the potential to transform the delivery of public and private services; redefine the relationship between government and the citizen in terms of data sharing, transparency, and trust; and make a leading contribution to the state's digital transformation.

The Illinois Blockchain Initiative released its first report on January 31; and they have focused on several issues that we've highlighted here already, including addressing property records on the blockchain as a way to keep one immutable record; integrating government services in a more efficient way; identity verification; digitizing assets and tax credits; improvements of management of social welfare programs; and joining industry groups for further study.

We also wanted to highlight some of the issues in New York state. New York was one of the first states to really -- to get into the money transmission aspects of virtual currency, because of its nexus to financial services. One of the first major efforts to regulate cryptocurrency, rather than blockchain itself, happened in 2015 when New York's Department of Financial Services issued rules on the New York BitLicense, which says that anyone engaging in virtual currency business activity must obtain a license and meet certain requirements. If you are in New York, virtual currency business activity means receiving virtual currency for transmission, or transmitting virtual currency, or performing certain exchange services involving New York or New York residents.

We know that this is a controversial requirement. There are people in certain states who think that facilitating a money transmission license like this is beneficial; there are others who think that it's detrimental to business, and transacting outside of New York is beneficial so as not to have to require a BitLicense.

We also wanted to point out that there is a Uniform Law Commission discussing regulation of virtual currency business. They have promulgated a Regulation of Virtual Currency Businesses Act, which, this

year, has been introduced in Connecticut, Hawaii, and Nebraska; which might merit further study.

As you can see, the legal and practical implications for the use of blockchain technology and its regulation is enormous, and is being used in many industries in new and exciting ways. Even in our practice, we have spoken with many people who have interesting ideas about using blockchain to enhance existing industries and processes.

We have seen an amazing level of talent in this industry, and understand why New Jersey would want to learn and understand more about blockchain and its uses, and consider ways to help innovation using blockchain technology in the state.

We also want to underscore that market participants and municipal entities should want to prevent fraud; and New Jersey can and should study ways to attract the blockchain industry while preventing fraud.

Our blockchain practice has expanded rapidly in the last year, and we welcome the opportunity to discuss our views on expanding the industry. We appreciate that New Jersey, with its rich history, has a great interest and opportunity to facilitate growth of the blockchain industry.

We want to conclude by thanking the Science, Innovation, and Technology Committee for inviting us to speak today.

ASSEMBLYMAN ZWICKER: Thank you.

As you were speaking -- and what we're hearing, I think, over the last few witnesses, and some of the questions that we're getting -- is that it seems like we're heading towards, perhaps, a patchwork of regulatory and

other structures around the state; and to your question, Assemblywoman, about what's happening at the Federal level.

And as you were speaking, it reminded me that this Committee has considered and looked at State legislation around net neutrality. And out of this Committee came three pieces of legislation that are making their way through the Legislature. And some of the pushback that we got was that it would create different rules in different states when it comes to net neutrality.

And you know, for those of us who-- It happened because of action occurring at the Federal level; and not just New Jersey, but other states decided to take action knowing full well that it was going to create this patchwork; and quite honestly, expecting that to, hopefully, then push back action at the Federal level.

So we're in a slightly different space here because, as you've pointed out, we are headed towards new regulatory structures and new applications that we're hearing from other witnesses. So I'd like to just get either of your opinions on-- What I'm hearing is, it is important for New Jersey to be smart -- and we could debate what *smart* might mean -- to regulate sufficiently, but not too much; to be consistent with Federal regulations so that in the end we are creating an ecosystem that enables the next applications. You know, it may be, as someone suggested, we're picking winners or losers.

So could you-- I mean, that was -- I'm not sure there was a question in that, so much as a -- perhaps a response in terms of, how do you see "smart" regulatory structures unfolding in New Jersey, since we are right at the very beginning?

MS. TESSLER: I'll start it.

It's a tough question to answer, because it really depends what -- where you are going to start with your blockchain regulatory issues. Is it a money services business, is it just blockchain in certain industries? You could start in a lot of different areas.

But I think the place to start is to think where are there gaps in existing regulation that didn't consider this technology. So, you know, there are a lot of people in the industry saying that digital assets may be a different asset class all together. And so thinking about where are the current gaps in the current legislation in the State, and should we start thinking about ways to figure out how to close those gaps so there are no bad actors in this space; but also use that same legislation to embrace those who are trying to innovate.

If that helps answer--

ASSEMBLYMAN ZWICKER: Okay. I mean, for instance, we're considering a piece of legislation around books and records that is, at this point, simply adding to what was written when there was nothing but paper--

MS. TESSLER: Yes.

ASSEMBLYMAN ZWICKER: --adding electronic networks, right?

MS. TESSLER: Yes.

ASSEMBLYMAN ZWICKER: And keeping it, I hope, both specific yet vague enough so that it's not so prescriptive; to allow this to occur and open it up to blockchain.

And it sounds like that's the sort of way where -- it's not so prescriptive; until, perhaps, we get to a particular application where, as we're hearing, things may be different depending on the applications.

MS. TESSLER: Yes.

ASSEMBLYMAN ZWICKER: Okay.

ASSEMBLYMAN DePHILLIPS: So I had a similar question; different than the Chairman's, but going to the issue of the Federal space in this technology.

And can this technology be utilized to track bad actors -- to the Assemblywoman's question about the FBI. You know, and we're concerned about homeland security in New Jersey; obviously, we're concerned about it nationally, globally. Can this technology be leveraged to assist law enforcement to track bad actors -- not necessarily just respond to bad actors -- but track them so that information can be shared instantaneously?

MS. TESSLER: So we're not technology people to figure out--

ASSEMBLYMAN DePHILLIPS: Sure.

MS. TESSLER: --how to design those. Based from our view, blockchain can be used for anything and for any industry. So you can certainly track bad actors, if you can figure out how to get their identity on a blockchain and track their movement. And maybe if they -- passports or other identifying information. You know, it's -- blockchain technology is used for anti money laundering tracking, I'm sure, by law enforcement. But we're not as well-versed in that area to really tell you how that gets implemented.

But we're seeing it across lots of different industries, so I don't see why that wouldn't be an area that wouldn't be able to be adopted at the Federal or global level.

MS. SCHEIBE: I guess just to add to that -- there are certainly areas where we can facilitate-- The technology can facilitate lots of these things -- tracking people, identity verification. That doesn't really speak to how other disciplines of law, that still will govern that activity, need to be followed while we're implementing the blockchain technology. I don't think we're saying we would want to override any other bodies of Federal or State law that would apply in that situation; just that once we're in a scenario where we can do the activity, use of the blockchain is a great way to achieve that.

ASSEMBLYMAN DePHILLIPS: Right. I guess I'm just grappling with the notion that the state governments should be out front on this technology. And I have no problem with the bills; I support the technology. I think the technology is exciting, innovative, and we need to do what we can here in New Jersey to advance the technology.

But I guess just, sort of, learning about this now, and why we haven't been hearing about it the other way -- why hasn't it been coming to us from the Federal level, back to the states to, sort of, plug holes?

I don't know if you can answer that.

MS. SCHEIBE: No, I think it's a great point.

I think that that same framework exists in a lot of other types of law and industry, which is just something we'll need to watch. I think you're right; there's a goal of facilitating development in New Jersey, while being mindful of not getting too far ahead of the Federal government.

ASSEMBLYMAN DePHILLIPS: Right. And we need to erect the proper security foundation to protect the information that will be shared instantaneously at the State level. We need to do that at the State level; we need to protect individuals and companies. But that has to happen at the Federal level, as well, or our efforts will be for naught.

ASSEMBLYMAN ZWICKER: Thank you, you two.

MS. SCHEIBE: Great; thank you.

MS. TESSLER: Thank you. (applause)

ASSEMBLYMAN ZWICKER: Next, Kurt-- I forgot. (laughter)

I can't wait until we have the next hearing in the State House; everyone will -- when we start applauding, they're going to be, like, "What's going on?" (laughter)

Kurt Watkins is next.

Kurt.

MR. WATKINS: Good afternoon, everyone.

My name is Kurt Watkins; formerly, as of last week, I was an attorney at Lowenstein Sandler, in their blockchain practice. I was hired out by one of my clients to be their GC as they expand into the space.

I've been working in it for about two-and-a-half years now. I think it is -- to echo everyone else here -- a very exciting technology; and I think a very exciting technology for government in particular.

I grew up the son of a city administrator in New Jersey, so I'm rather familiar with New Jersey governmental practice on a municipal level, and a little bit at the State level as well. And I think more so than any other of the emerging technologies that are currently out there, or

technologies in full production, blockchain really has the opportunity to make government better and more accessible by its citizens.

To echo what has already been said here, there are numerous applications for this; a lot of them will open up with identity. We've heard that that's going to be a big thing; there are several different approaches currently being worked on for it. But I think once it gets established, we'll see the ability for citizens to more seamlessly interact with their government in a productive way; you know, paying taxes, voting even. You know, right now I would not dare trust any of our electronic systems to really handle voting on a mass scale. However, a blockchain system -- just by the way it works and its configuration -- would probably be more secure than any paper system currently available. And, you know, it really offers these manifold benefits.

To speak to something I don't think has been really touched on throughout these conversations, is the issue of privacy. Many laws, for privacy purposes, are designed without blockchain in mind. They are designed under the centralized server model; blockchain is decentralized. It's always like the second or third word you hear about it. And this creates an issue with our current privacy laws. Our privacy laws right now anticipate that with data you would be able to create it, retrieve it, modify it, and delete it. Under blockchain, you can create it, retrieve, *append* to it -- only add; and then you can "burn" it, which would mean securing it with a private key and getting rid of the private key. Which is not truly deleting; which, if we're going to incorporate health records -- which has been a popular topic -- that would not work under HIPAA.

So the new technology that's coming out to make blockchain accessible in this sphere is also very exciting, and I think really worth looking at, because they would require changes to the privacy laws, or at least a new understanding of those privacy laws. What does it mean to *delete* something? And, you know, sort of to wax a little technical, there's this mathematical algorithm out there called the *zero-knowledge proof*, that would allow for these sort of interactions to occur. We learned about *hashing* earlier; the two of those, in tandem, I believe would significantly benefit this space. So I just wanted to focus on that as well.

Coming back to government, though -- you know, governmental inefficiencies are sort of legendary. But I think what blockchain really offers is the ability for all the agencies of governments to work together. There are going to be some blockchains that cannot talk to other blockchains; but, by and large, the thrust of interoperability I believe is one that will succeed. The Hyperledger project, in particular, is setting out excellent standards for various blockchain's fabric -- IBM being one of the leaders in it.

And so what you can create is, from top to bottom, governmental agencies talking to each other, exchanging information with each other. When a private citizen or company wishes to perform *X* action that requires 10 different levels of approval, well, everyone can know who's approving what, and when, and why; and who this person is, and, when necessary, you can close off that data to the public.

Additionally, one of the things I'm working on right now is using blockchain in tandem with existing technologies. The GDPR is a large issue coming to, really, all companies that might, just by any chance,

get European citizen data. And it, too, does not anticipate blockchain. And so the workarounds created for that are using a blockchain system as a gatekeeper -- as a way of verifying yourself to the system, making yourself known; and then transacting through more traditional means.

And I think that's a good sort of middle step so you don't have to fully embrace the technology, but you can use it and you can start putting it into production in a way that is beneficial to the State.

And to, sort of, now go back to what other panelists have been talking about -- there are various states leading the way in blockchain, as the Supreme Court opinion has pointed out. States are the test tubes of democracy; and I think this is a great space for New Jersey to take the lead with others states -- like Delaware, like Wyoming, and Illinois -- where we can look at -- what of our systems are redundant; what of our systems actually can be automated, and made better, more efficient, more transparent to the public?

OPRA is a great example of a use of blockchain technology, as it will develop. And I think it will ultimately make the government more efficient and also give the citizens a clearer understanding of what it's doing.

And that is why I am in favor of these Bills.

ASSEMBLYMAN ZWICKER: Thank you; thank you very much.

ASSEMBLYMAN FREIMAN: Can I ask a quick question?

ASSEMBLYMAN ZWICKER: Assemblyman.

ASSEMBLYMAN FREIMAN: We use the terminology *trust*, *trustworthy*, *privacy* in discussing blockchain. This is because I just don't

understand it well enough yet -- clearly I get the sense that blockchain is a quantum improvement in privacy, and technology, and confidentiality, compared to anything that exists.

ASSEMBLYMAN ZWICKER: Assemblyman, *quantum* is very small.

ASSEMBLYMAN FREIMAN: Okay (laughter) -- compared to what we should be discussing, right? (laughter)

So is it a correct terminology to say that this is a phenomenally improved level of trust or complete trustworthy? What would be a best way to describe blockchain?

MR. WATKINS: So the term has already come up that the buzzword, so to say, is *trustless*, if that makes sense.

But really, where this all comes from, is under the centralized server model, that we all know and love today, there's one space where the data is stored; and all the hackers, all the bad people with malicious intent are going to try to attack that server. And you can put all sorts of encryption around it--

ASSEMBLYMAN ZWICKER: Right.

MR. WATKINS: --and you won't necessarily make it the most secure-- Really, the best way to make a server secure is to unplug it and bury it under concrete. No one will get to that data, including the people who need it.

The blockchain -- what it offers is, by distributing out the information on the server, if any one of the nodes on this distributed system is compromised, the rest of the nodes are going to know that it's comprised because it is behaving in an ill-approved manner. And they'll

shut that node down, or prevent it from performing the action. So you'll hear, in blockchain one, of the attacks against it; is called the *51 percent attack*. And what this means is, you would have to control 51 percent of the computing power on the network. So take bitcoin; bitcoin has millions of nodes. So you would have to control 51 percent of all that computing power in order to break or hack into the bitcoin blockchain. And as systems get better, as protocols get better, and just by the sheer fact that blockchain has to use such advanced cryptography, the likelihood of any entity or person capable of doing that is extremely small; so small that you can say it won't happen.

Now, you did mention one word -- *quantum*. I will say that the quantum computer is sort of a big question mark in all of this. Its ability to simultaneously perform brute force attacks makes it possible that it might break those blockchains. However, quantum resistant algorithms are being developed now which hopefully will be appropriated in blockchains in the future.

ASSEMBLYMAN FREIMAN: Thank you.

ASSEMBLYMAN ZWICKER: I suspect that's what we'll see; I mean, to be determined.

MR. WATKINS: I certainly hope so.

ASSEMBLYMAN ZWICKER: Right.

Assemblyman.

ASSEMBLYMAN DePHILLIPS: So I agree with you that the technology can help State agencies work together in a coordinated and collaborative way. Do you have an opinion about on the Federal scale? I mean, can Federal agencies utilize the technology to do the same; and then

beyond that, can foreign governments work together, in a coordinated and collaborative way, share in the technology, leveraging the technology, to address global security concerns or other concerns?

MR. WATKINS: Certainly; I've actually had the privilege of working on two such projects. The first was with the Department of Defense in their procurement of supplies. And they were looking at basically a way to -- a monitor when you had to make sure that a company bought American, or bought from a minority-owned business. And how do you track that your goods actually come from such a place? You do it with a token on the blockchain for making sure that the cost of goods is really the correct cost, making sure that fraudulent activities don't occur -- all of that can be done on the blockchain. So we have been in discussions with them about how to roll this out across their various purchasers; and then their prime contractors and their subcontractors.

It's going to -- because of the distributive nature of the system, it requires buy-in from so many stakeholders. You can't just say -- like, I can't just say, "I'm going to have a blockchain and run it on my home computer," because it requires, necessarily, that all these parties work together.

So that's definitely the largest hurdle; but once you overcome that hurdle, it sort of creates a positive feedback mechanism where people will want to get on board.

To your question about foreign governments, I recently was talking to some members of the State Department. One of their projects right now is distributing foreign aid with blockchain. As we know, when we distribute foreign aid to governments whose democracies might not be

democracies, those funds have a tendency to be used for nefarious or, you know, not the activities they were intended for. Tokens -- again, a great way to track those funds and to hold them back, to only be used in pre-approved areas. So on that blockchain there would be -- the stakeholders would be various foreign entities, NGOs; and they would all need to talk together.

So those are just like some of the trial balloons that are going on. As I am aware right now, the Federal government's efforts in this space are extremely fragmented. When the DOD reached out to us at Lowenstein, they were unaware that the Federal government was doing any other program of blockchain, despite the fact there were like 15.

ASSEMBLYMAN DePHILLIPS: That's comforting. (laughter)

MR. WATKINS: Yes, yes.

So I think that's really why we have yet to see the Federal government push forward a coordinated sort of activity. As we heard earlier, the SEC is really the one who is on top of it the most. And to say that *they're on top of it*, I think, is being generous.

So I really do think that the states have made much better progress in this area than the Federal government. And, you know, maybe the Feds will take the lead from the states this time.

ASSEMBLYMAN DePHILLIPS: And then, just one final question.

To the concerns out there about privacy and confidentiality -- I mean, are there vulnerabilities in the technology that you can identify; or are you reasonably sure that the technology can combat those concerns?

MR. WATKINS: I am quite certain that the technology itself is better than all current forms of secure technology.

However, you know, it is not without its vulnerabilities. And, you know, one of those vulnerabilities is, if you're going to store all your data on the blockchain, you're going to distribute it out to all of your network participants; well, then, the compromising of one network participant exposes all of that data. There are various ways around that and, hopefully, no blockchain would ever get deployed that way. But it could be a problem -- the 51 percent attack that we just talked about.

But really, the biggest problem is, no one has ever breached the bitcoin blockchain itself -- despite the fact that it's probably the most attempted thing to be breached -- however, you hear all the time of people getting their bitcoins stolen from their home computers; that's still a problem. The end user is always going to be your weakest point, and securing, sort of, the transmission of the data, from the blockchain to your user -- and this interaction here is extremely vulnerable.

On top of that, there was a reference to it earlier -- the data input into your blockchain -- they're called *oracles*; it's a terrible name -- it's just basically a data feed into the blockchain. Those are going to be very insecure. If I say, "Perform X action when the weather hits 70 degrees," well, then I need to have information sources telling the blockchain when 70 degrees is, and those are all still very compromiseable.

So, you know, sort of the core of the blockchain is extremely secure; but once you start using it, that security starts to slip away. So it would still be something worth monitoring, worth investigating, and building on.

ASSEMBLYMAN DePHILLIPS: Thank you.

ASSEMBLYMAN ZWICKER: Thank you.

I just want to make one comment -- it's a little bit speculative on my part -- but you used the phrase *zero-knowledge protocol*.

MR. WATKINS: Yes.

ASSEMBLYMAN ZWICKER: And, Assemblyman, I have a colleague who's working on a zero-knowledge protocol, and it comes to nuclear weapon proliferation. And how do governments assure, without giving up top-secret information -- for instance, warheads -- how many there are, and-- We're reading about this in the news quite a bit.

And so it was an interesting other-- You talked about the DOD, but this idea of zero-knowledge of the actual technology; yet through a blockchain the possibility of verifying, let's say, a warhead, is another thing around zero-knowledge that came to mind. You know, that's a Federal issue, but still it's a homeland security issue.

MR. WATKINS: Certainly.

Yes, zero-knowledge proofs are really-- It's funny; it's-- Like most of mathematics, the math was developed before the application.

ASSEMBLYMAN ZWICKER: Right.

MR. WATKINS: Zero-knowledge proof has a great use in blockchain because, you know, bitcoin is traceable because -- and the IRS does it all the time. You know, you can trace from wallet, to wallet, to wallet, to wallet, to the beginning of time; this is how it works. A zero-knowledge proof would cut it off only at the person talking to you; but you would still be guaranteed that veracity. And I think privatizing blockchain, making it work with our current privacy laws -- that would be a critical step.

ASSEMBLYMAN ZWICKER: Yes; thank you very much.

MR. WATKINS: Thank you. (applause)

ASSEMBLYMAN ZWICKER: Next witness is Joel-- Oh, geez.
I get it; I have two more before we're out of here.

Joel Phillips, from Siglo.

JOEL PHILLIPS: Good afternoon.

So I have two hours; is that right? (laughter)

ASSEMBLYMAN ZWICKER: Wait; hold on.

Thank you very much for your testimony; next witness.
(applause) (laughter)

MR. PHILLIPS: Just kidding; I'll be brief.

My name is Joel Phillips; I'm a founder of a blockchain protocol that is being launched, called *Siglo*. It's all about democratizing the monetization behind the users' data, and specifically applying it to emerging markets where that can make a big difference.

Thank you very much, by the way, for the privilege of being here.

But I'd just like to make a few comments, quickly, from an entrepreneurial perspective, about blockchain; about some problems that I see.

I think that the Internet, as we know it, is broken in a sense. I think that, 20, 30 years ago, whenever the Internet started -- it's changed everything; it's affected every aspect of our lives, there's no doubt about it -- the amount of value that's been created around it.

But Internet 2.0 came along, and it became all about a few big behemoth companies vacuuming up users' data and monetizing it on their

behalf; and, for the large part, you know, keeping that all inside of a little black box. I think this is recently, with Facebook and Cambridge Analytica, we've -- the mass population is beginning to see some of the shortcomings of the very centralized-based Internet; centralized again. We can list off two or three companies, and I think we all know who they are.

But I believe that blockchain is the solution to that. And I really believe, without a doubt -- and I think most experts would -- that as we go forward in the future, the new Internet is going to be much more distributed; it's going to be much more decentralized, and it's going to be much better off for it. And blockchain is what that's all about.

The problem is, as I see it -- and I'm a U.S. citizen; I'm from Colorado. I spend most of my time between New York, and Mexico, and Pennsylvania a bit. But the U.S. has always been a leader in innovation. You go to Silicon Valley, it's full of immigrants who come to this country because they have an idea. And there's an environment here where they can build stuff easily; and they can fail; and they can build again. And that's why we lead the world. And living in another country, I've seen how much farther ahead the U.S. is than any other place when it comes to an environment for innovation.

However, what I'm seeing now is, in the blockchain space -- which, again, I think is everything about where the future is going -- I'm seeing friends and other colleagues who have ideas, who have companies that they're starting. But what's happening now -- they're actually leaving the U.S. to do this. They're going other places, like Switzerland, and Singapore, and little places like Gibraltar -- places like that that have decided, "Hey, we're going to be progressive and create regulation that

allows blockchain to thrive,” and gives us a sandbox, so to speak, for it to be developed.

But it looks very concerning to me, as a citizen. I wish I could say that I was doing business here in New Jersey. But again, today, the regulation that exists, and the regulation that is trying to, kind of, put the rules around the game for blockchain, weren’t designed for that. And therefore, they don’t necessarily apply; and therefore, there’s a lot of risk, as an entrepreneur, if you’re going to start a company in the State of New Jersey or other states, that you might be solving a certain problem; but you happen to have this token, this cryptocurrency, that’s driving that economy, and you violated some rules that weren’t even designed for you; and, therefore, you can’t be doing that.

I guess I would urge you all, as legislators, the Committee, to really consider that; to really see the huge opportunity that exists right now to create and to attract entrepreneurs, engineers, blockchain architects -- all of these kinds of people -- to an environment where they can start building that kind of thing. I think that’s imperative.

And I think that, you know, there are a few states -- Wyoming is one of them that’s been brought up a couple of times, that it has, kind of, taken its first few steps here. But still, I think there’s a huge opportunity to lead among states, and even globally, into kind of trading that environment, that sandbox, where-- Because the industry is very nascent; and I think we’ve heard that from a lot of people. You know, there’s yet to emerge, I think, some of the blockchains -- the specific blockchains that are going to solve specific needs in different verticals. But again, if we can’t innovate, if

we can't build stuff, if we can't even fail at building stuff and learn, then that's not going to happen.

So I would just urge you all to really consider that. And, you know, the Task Force is a great first step; but I think that the Task Force should also look at how can we create a safer environment for this kind of innovation to take place.

So thank you.

ASSEMBLYMAN ZWICKER: I will say, the Task Force will fail if it doesn't consider the issues you're talking about; which is clearly blockchain -- as you and others have talked about, it is state, it is national, and it is international. And so this Task Force has to look at it within both the national context and within the international context to truly succeed. I think there's no doubt about that.

MR. PHILLIPS: Right; well, why should the U.S. be left behind here, right?

ASSEMBLYMAN ZWICKER: Right.

MR. PHILLIPS: And it's going to happen; you know, this is going to happen, and it doesn't matter whether it happens here, or whether it happens somewhere else.

ASSEMBLYMAN ZWICKER: And it's also clear -- you know, unlike, let's say, the birth of a *computership*, where you needed very sophisticated pieces of hardware; here you need computer powers, high-speed connections to the Internet. So you don't need the investment beyond that -- and the people -- to do it.

MR. PHILLIPS: Absolutely.

ASSEMBLYMAN ZWICKER: So, questions? (no response)
Thank you very much.

MR. PHILLIPS: Thank you. (applause)

ASSEMBLYMAN ZWICKER: And I believe our last witness ---
Nina Kaplan, from Blockchain Tech Solutions.

To whom I would just like to say, thank you for all of your
work in bringing such an esteemed panel of people here, along with
yourself.

So thank you.

N I N A A. K A P L A N: Sure; it's my pleasure.

I'm Nina Kaplan, and I'm CEO of Blockchain Tech Solutions.

I was born and raised in New Jersey, and my companies are
New Jersey companies. And I care a lot about what happens in New Jersey,
and that's why I'm here today.

I'm the last person to speak, so I'll try to be short.

A lot of issues have been addressed; I think a couple of things
that haven't been addressed--

Some of you asked questions about security; and blockchain is--
And I guess I would say that the fluctuations in the price of bitcoin have
been dominating the news; but in the meantime, blockchain startups are
quietly building the infrastructure for projects that are really going to
transcend what bitcoin does. And I think it can bring millions and millions
of dollars in new revenue to New Jersey, and jobs.

And one important thing to understand is that it doesn't rely
on intermediaries. I mean, right now we have banks, credit card companies
-- these are the intermediaries. And for the first time, with blockchain, you

can send money without these intermediaries. And the intermediaries are effective, but they have some problems. They are centralized, which means they can be hacked. And we've already talked about that a little, but I think we're all concerned about hacking; and there are some issues about security that came up. Blockchain is nearly impossible to hack into; it's very, very difficult. It has advance cryptography; and that's one of the advantages.

If you wanted to hack it, you'd have to-- It is so much harder than hacking now. You would have to hack into every computer, to millions of computers, on a-- In one database, you'd have to-- The cryptography is such that it's nearly impossible; so it's much, much safer. I mean, we all know about-- I was -- my account was compromised with Equifax; and so criminals have my social security number, they have all my information, you know? And there was a facility in Hackensack, in September, that was hacked; and about 17,000 medical records were compromised, and that everyone's personal, private information; medical information. So it's obviously a problem.

And another problem is, intermediaries are expensive; sending money now can cost up to 20 percent. And with blockchain technology, it's free, and it's also much faster. Intermediaries slow everything down tremendously. You can send an e-mail across the world, and it will arrive instantly. But with blockchain-- Well, yes, e-mails can be sent immediately; but if you send a payment, just to your utility company across town, that could take days. So they're slow, and they're costly; and then intermediaries -- social media intermediaries, like Facebook -- obviously we

discussed -- they're not securing data. So blockchain -- there's not a need for these intermediaries, so I think that's very important.

So blockchain is decentralized; and, as I said, it uses this very advanced encryption technology. Imagine if you had an Internet -- not just for information, but for value, like money and music -- that was secure from hacking, lightning fast, available to everyone, and free. And that would be ideal blockchain.

One area-- The banks see potential in blockchain, and they're racing to figure out ways to use it. They see savings of \$20 billion annually. Commercial enterprises and VC firms have invested more than \$3.8 billion in blockchain since 2014; over 50 global banks have publicly announced their respective blockchain initiatives.

So I think blockchain's first contribution to the banking industry will be in clearinghouses. I have a trade background; trade finance is an obvious area. It's very antiquated; it still runs on fax machines; you have to mail -- physically mail papers out. Documents -- you have to get a physical stamp on a piece of paper. You know, if you take a day to ship oil from -- I don't know, Singapore to Malaysia -- it could take a day. But then it would take a week to do all the paperwork.

And letters of credit are still sent around the world, via fax or mail. When -- some people have spoken already about this -- but when goods are shipped from China, as many as 50 people need to access the data.

So I think there's a lot of excitement-- And blockchain is really growing, and there's a lot of excitement in the biopharmaceutical and healthcare industries that are central to New Jersey's economy.

The number one potential application is really a matter of life and death -- and it's ensuring drug safety throughout the supply chain. The Drug Supply Chain Security Act will require medicine to be fully traceable; protected against counterfeit, dangerous, illegal, or stolen drugs; and making recalls faster and more complete. So blockchain is really -- is considered the solution for this problem. So there are a lot of applications for the pharmaceutical industry.

And as we discussed, obviously, there's a need for medical records to be on blockchain.

Also, New Jersey's second-largest industry is transportation; and blockchain is already being applied to -- for freight tracking, customs, local supply chain logistics.

And the states are being proactive, as we discussed; they are looking to blockchain for things like managing tax records, business licenses, Medicaid rosters, food stamps. I think -- I don't know if anyone mentioned -- Delaware has put-- Two-thirds of Fortune 500 companies are incorporated in Delaware; and they passed a law allowing companies to use blockchain technology to store and transfer securities.

We've mentioned Illinois. Cook County, that's in Chicago, is now using blockchain to build a land's record ledger.

And I think some other people had mentioned, for land titles -- involves a lot of different agencies, there's a lot of paperwork, it's costly; it's a very good -- it's very applicable to blockchain. A lot of state and foreign governments are already putting land titles on blockchain. They want to save millions, and prevent fraud, and improve efficiency. Other government

use cases include voting records, government benefits disbursements, and digital identities.

Blockchain can really help states and governments build trust, which is a problem; and protect sensitive data, and reduce costs, and improve efficiency.

So it's nearly impossible to hack; it's so much more secure. And New Jersey -- you know, the U.S. is being left behind, and we don't want to be left behind. This is like a -- almost like a new Internet, in terms of its importance, technologically. And imagine if we said, "Well, let's wait before we adopt the Internet." Imagine, you know-- And then in 10 or 20 years, imagine how far behind we'd be if we hadn't adopted it.

So I really think it's important for New Jersey to be a leader in the technology. I think it can really greatly improve lives for citizens.

A New Jersey resident, Chris Giancarlo -- he's the head of the CFTC; is also a New Jersey resident -- he's pro-blockchain. And I happen to know him a little bit; I went to school with his brothers.

So I think that's most of what I'm going to say, because I'm sure everybody's kind of overwhelmed. I don't want to say too much.

Did anyone have any questions?

ASSEMBLYMAN ZWICKER: So thank you; because you were talking--

Irony of ironies -- yesterday, while I was preparing for today's hearing, my Apple ID was hacked by someone in China, who downloaded several hundred dollars' worth of applications. I was literally doing research on blockchain technology as it happened. (laughter) So I think they knew that.

Any questions?

MS. KAPLAN: I know; I went to Equifax-- Ironically, Equifax was supposed to protect me in case of my information being stolen.

ASSEMBLYMAN ZWICKER: Right.

MS. KAPLAN: And then it was so ironic that it was -- it occurred.

The City of Plainfield, New Jersey -- they had a ransomware attack; and they held the whole city under ransom -- and that happens. So it's a big problem.

ASSEMBLYMAN ZWICKER: Assemblyman, any questions?

ASSEMBLYMAN DePHILLIPS: No.

ASSEMBLYMAN ZWICKER: Thank you very much.

MS. KAPLAN: Okay; thanks very much, Committee (applause)

ASSEMBLYMAN ZWICKER: So with that, it's time to vote on a couple of bills.

So the first one we're going to do is A-3613.

MS. HOWLEY: The Committee amended A-3613 to make technical changes.

ASSEMBLYMAN ZWICKER: Okay; so do you want to read those into the record, and then we'll have a motion to--

MS. HOWLEY: It was just technical.

ASSEMBLYMAN ZWICKER: Oh, just technical? Okay.

So can I have a motion to move A-3613?

ASSEMBLYMAN KENNEDY: So moved.

ASSEMBLYMAN ZWICKER: Thank you; and a second?

ASSEMBLYMAN FREIMAN: Second. (laughter)

MS. HOWLEY: On the motion to release A-3613, as amended.
Assemblyman DePhillips.

ASSEMBLYMAN DePHILLIPS: Yes.

MS. HOWLEY: Assemblywoman DeCroce.

ASSEMBLYWOMAN DeCROCE: Yes.

MS. HOWLEY: Assemblyman Freiman.

ASSEMBLYMAN FREIMAN: Yes.

MS. HOWLEY: Vice Chairman Kennedy.

ASSEMBLYMAN KENNEDY: Yes.

MS. HOWLEY: And Chairman Zwicker.

ASSEMBLYMAN ZWICKER: Yes.

Next will be A-3768.

And to the members of the Committee, if you have any closing statements, feel free. Certainly no obligation; but if you would like to say something, please feel free with those.

A-3768.

Oh; sorry. Can I have a motion to move it?

ASSEMBLYMAN FREIMAN: So moved.

ASSEMBLYMAN KENNEDY: Second.

ASSEMBLYMAN ZWICKER: Thank you.

MS. HOWLEY: On the motion to release A-3768.

Assemblyman DePhillips.

ASSEMBLYMAN DePHILLIPS: Yes.

MS. HOWLEY: Assemblywoman DeCroce.

ASSEMBLYWOMAN DeCROCE: Yes.

MS. HOWLEY: Assemblyman Freiman.

ASSEMBLYMAN FREIMAN: Yes.

MS. HOWLEY: Vice Chairman Kennedy.

ASSEMBLYMAN KENNEDY: Yes.

MS. HOWLEY: And Chairman Zwicker.

ASSEMBLYMAN ZWICKER: I just want to say thank you to everybody for coming today, for your testimony; to Princeton University and the BioLabs for hosting us in their beautiful space. A year from now-- I just heard today they signed their first tenant; a year from now, I expect, if we're back here, we'll see a tremendous amount of activity.

We have a lot of work to do here in New Jersey; but's it's clear that from all of our witnesses that the potential for blockchain technology is enormous. And I hope this is the beginning of New Jersey really, as one of our witnesses said, moving quickly and smartly into blockchain technology.

So thank you very much; and with that, we come to a close.

MS. HOWLEY: Thank you.

ASSEMBLYMAN ZWICKER: What, I don't get claps?

(laughter)

(MEETING CONCLUDED)